Linkages Between Global Capital Flows, Stock Market, and Monetary Policy : Evidences from India

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Abstract

Globalization set into motion financial liberalization of economies, which led to integration of financial markets globally, resulting in global capital flows (GCFs) from developed economies to emerging market economies (EMEs). 'Push' factors were seen as the reason for capital flows to an economy and found a high proportion of synchronization of GCFs across financial markets, well-exemplified in the asset bubble (AB) formation, and financial crisis of 2008 (Ghosh, Qureshi, Kim, & Zalduendo, 2014). The role of financial linkages and transmission channels in the spread of the crisis was examined by Blanchard, Dell'Ariccia, and Mauro (2010) and Dungey, Osborn, and Raghvan (2013). In India, RBI manages the impact of GCFs on the economy and its effectiveness depends upon the efficacy of the transmission channel, especially the asset price and credit channel. Therefore, conditional to an efficient transmission channel, should the RBI contemplate an interest rate response to contain plunging asset prices during an AB formation, making it imperative to investigate the working and effectiveness of the asset price channel in India. The current paper scientifically probed this question, 'Can the RBI manage asset prices in the event of a bubble?' The study used monthly time series data of various variables of BSE from January 2004 - 2013 and checked the causality between them. Results established causality between GCFs to India and BSE turnover with a 2-month lag. Results of pairwise Granger causality concluded that repo rate Granger caused BSE Sensex returns with a 3-month lag, which is relatively a long-lag, if RBI wants the mechanism to work during a crisis situation. The credit channel was most sluggish (32-month lag), implying that if RBI slashed interest rates to increase availability of credit in the market, then its move might not be impactful as banks might not pass on the cut to the customers/real economy.

Key words : **global capital flows (GCFs), asset bubbles, monetary policy, Granger causality, India**

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It has been two decades since India witnessed global capital flows (GCFs). Initially, the domestic growth rates, sound economic policies, and perception towards India's economy were touted as the reasons behind attracting international capital flows. According to Tewari and Pathak (2013), the mass media coverage about India in the foreign media has positively impacted the foreign institutional investments (FIIs) about India as a destination. The positive coverage about India in foreign media and a lagged rise in FII investment is a clear indication of the information effect. However, over a period of time, it was soon clear that excess liquidity around the world was also a major reason for the influx of foreign capital along with the domestic factors. The most convincing argument in favour of GCFs is that it facilitates allocation of capital to the most productive use and thereby increases global economic growth and welfare.

India, through liberalization, opened its doors to the rest of the world in 1991, but had a closed capital account before 1991, and during this era, it witnessed restrictions on capital mobility. FDI was the first to be liberalized, followed by portfolio flows. Liberalization removed distortions in the economy caused by government

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intervention, tax reforms, setting up of disinvestment ministry, de-licensing of various industries, and relaxing the Monopolies and Restrictive Trade Practices (MRTP) Act. These reforms gave greater operational flexibility to the industry and were ably accompanied by reforms in the financial sector and capital markets. Though capital account liberalization started in the 1990s, India has a history of capital inflows in the form of external assistance (since 1950s) ; external assistance and foreign investments (since 1960s); and external assistance, foreign investments, NRI deposits, and other forms of capital since 1970s (Sethi, 2008).

Researchers have established the impact of the reforms in the financial sector and capital markets on the performance of the industry and the economy as a whole (Jalan, 2000 ; Rangarajan, 1997 ; Reddy, 2000). Allowing international capital flows into the Indian economy is perceived as a turning point in the Indian economy landscape.

Various studies on global capital flows and its impact on macroeconomic variables were undertaken by Singh, Tripathi, and Pardesi (2014) ; Srikanth and Kishore (2012) ; Chandra (2012) ; Verma and Prakash (2011) ; Sethi (2008); Kohli (2003) ; Singh et al. (2014), who proved that there is a bi-directional causality between Nifty and FIIs as well as between Sensex and FII movements. They also established that the FII flows caused volatility in the Indian stock markets. Sethi (2013) used a pair wise Granger causality test to establish a long run equilibrium relationship between foreign private capital flows and economic growth. According to him, strong economic growth successfully attracted private capital flows into the country. On the other hand, Chandra (2012) observed that FII flows to India have reduced the volatility since FII flows result into an increase in liquidity in the domestic markets as the domestic retail investor base is narrow in India, the excess liquidity helps stabilize the stock markets. Srikanth and Kishore (2012) also tested the bi-directional causality between FII flows and BSE Sensex and reported a positive impact of FII flows on the Sensex as well as the foreign exchange reserves of India. Verma and Prakash (2011) empirically tested the interest rate sensitivity of four major components of capital flows – FDI, FII, ECB, and NRI deposits. According to them, FDI and FII inflows were not sensitive to interest rate differentials. However, ECB and NRI deposits showed sensitivity towards interest rate differentials, which was statistically significant.

While most of the researchers mentioned above focused on the FII flows, its cause, and impact on stock markets, Sethi (2008) focused on the macro scenario stating that capital inflows do not contribute towards industrial production and economic growth in India. He cited two reasons for this – firstly; the amount of capital flows was not sufficient to cause an impact and secondly; the capital flows have not been utilized adequately such that they would have a significant impact. Similar results were reported by Carkovic and Levine (2002). They found that economic growth was not affected independently by FDI inflows, though they stated that sound economic policies of the host country could result into a robust economic growth, which could attract FDI inflows at the same time. Chakraborty and Nunnenkamp (2006) carried out a Granger causality test between FDI and output in which they found the variables to be cointegrated in the long run. However, they noted that the role of output growth in attracting FDI was comparatively stronger than that of FDI in encouraging economic growth.

A recent study by Ranjan and Agrawal (2011) on the determinants affecting FDI inflows to the BRIC countries of which India is a part, established market size, economic stability, growth prospects, labour cost, infrastructure facilities, and trade openness as the relevant factors. With one of these factors being adversely affected in most BRIC nations except India, it replaced China and become the top destination for FDI in 2015, with a 20% share and a total of $ 63 billion worth of investments (FDI Intelligence, 2016).

Olaberría (2012) empirically looked at a panel of 40 countries from 1990 to 2010 and found that emerging countries were "more likely" to experience an explosion in asset prices during periods of large GCFs. As India continues to attract more and more of GCFs due to varied domestic, international, and macroeconomic factors, it becomes imperative that we take a closer look at the pros and cons of this inflow as empirical research has shown that one of the biggest downsides of GCFs is excess liquidity, which can easily spill over to various commodities and assets, resulting into a sharp increase in their prices.

This paper not only evaluates the causal relationship between GCFs and important stock market indicators, like the returns on BSE, volatility of BSE index and BSE Sensex value, but it also goes beyond this usual domain and empirically validates the relationship between Repo rate (policy variable) and the stock market in order to verify if the Central bank is able to reign in any explosion in stock market prices because of the excess liquidity caused by GCFs.

Global Capital Flows and Stock Markets

In this section, I closely look at the impact of GCFs on stock market prices, returns, volatility, and liquidity of various economies, which have been recipients of GCFs.

Levin and Zervos (1998) established that stock markets in emerging economies became more liquid, larger in size, more volatile, and more integrated after capital control liberalization and ,therefore, recommended lowering the barriers to capital flows in order to give an impetus to the equity markets and also to promote economic development. Henry (2000) and Patel (2017) also demonstrated that liberalizing the stock markets resulted into high growth rates of private investments. On the other hand, Singh and Weisse (1998) concluded that stock market development and foreign portfolio flows were unlikely to result into faster economic growth for developing economies. Srikanth and Kishore (2012) observed that net FII flows had a positive impact on the Indian stock market as well as the foreign exchange reserves. Bekaert and Harvey (1998) and Errunza (2001) found evidences that FII flows did not have a significant effect in increasing the volatility of stock returns. However, Jo (2002) suggested that stock market volatility did increase in the presence of FII flows. Bansal and Pasricha (2009) conducted an event study pre-post the opening of the Indian stock market to FIIs and noted that there is a substantial drop in volatility of the Indian stock market after the opening of the markets to FIIs.

Equity market returns were found to have a significant impact on FII investments, and a significant positive correlation was reported by Singh et al. (2014), Chandra (2012), Bohn and Tesar (1996), and Brennan and Cao (1997).

Some authors also reported that lagged stock market returns had a greater impact on the FII investment flows. Researchers did not find causation from FIIs to stock market returns (Rai & Bhanumurthy, 2003), but in some cases, researchers found bi- directional causality between FIIs and the stock market (Chandra, 2012; Goudarzi & Ramanarayanan, 2010). They not only reported a bi-directional causality between FIIs and BSE 500, but also went on to state that the Indian financial policy makers should devise a system and establish such funds that would avoid/hedge the possible negative effects of capital outflows. Such hedging or policy action is required since Kumar and Vashisht (2009) noted that the Indian stock market reported a fall of $1.3 trillion when FIIs pulled out $12 billion during the period of September - December 2008. This emphasized the risk posed by enormous and unstable capital inflows. Varying and often considerably contradicting findings related to the impact of FIIs on the Indian stock market have been reported, making it an interesting area of further research. Other empirical work done on East Asian emerging-market economies stated that share prices responded positively to portfolio inflow shocks. However, the indirect channel (through the domestic money supply) did not work in economies that were on a floating exchange rate system, since the Central bank of these countries could sterilize the cash inflows by intervention in the foreign exchange markets. The indirect channel fueled share prices for those countries that were on a fixed peg (Taguchi, 2012). It was observed by Aitken (1998) that shift in the sentiment of institutional investors who determined asset prices in emerging markets resulted in periods of bubble like situations. In a seminal paper, Reinhart and Reinhart (2008) analyzed data for 66 countries checking whether "capital flow bonanzas" led to increase in real equity prices and real house prices and conclusively established the phenomenon by proving that increase in capital flows represented a foreign demand for the local assets.

Monetary Policy and Managing Asset Price Bubbles - The Dilemma

Central Banks around the world have primarily targeted inflation since the last 30 years and have been largely successful in containing it though in the current times, they face a more serious challenge of maintaining financial stability of which increased volatility of asset prices is a key dimension (Greenspan, 1997). The World Economic Forum, Global Risk Report (2016) ranked the risk of an "asset bubble" ninth on its list of "Top 10 risks in terms of impact".

In a classic study, Kindleberger (1996) observed that during a typical asset price bubble, the prices came down heavily and instances of contractions in real economic activity were observed. Central banks have to respond to the volatility in asset prices, as Janet Yellen (2013), then a candidate to head the Federal Reserve, commented "I would not rule out using monetary policy as a tool to address asset-price misalignments." (Rushton, 2013). Although monetary policy cannot be the only tool to address asset-price misalignments, a completely benign policy towards asset-price misalignments would not help either in creating arguments and counter-arguments. However, Bernanke, Gertler, and Gilchrist (1999) questioned that only if inflation is affected by asset price fluctuations, should the Central bank step in ?

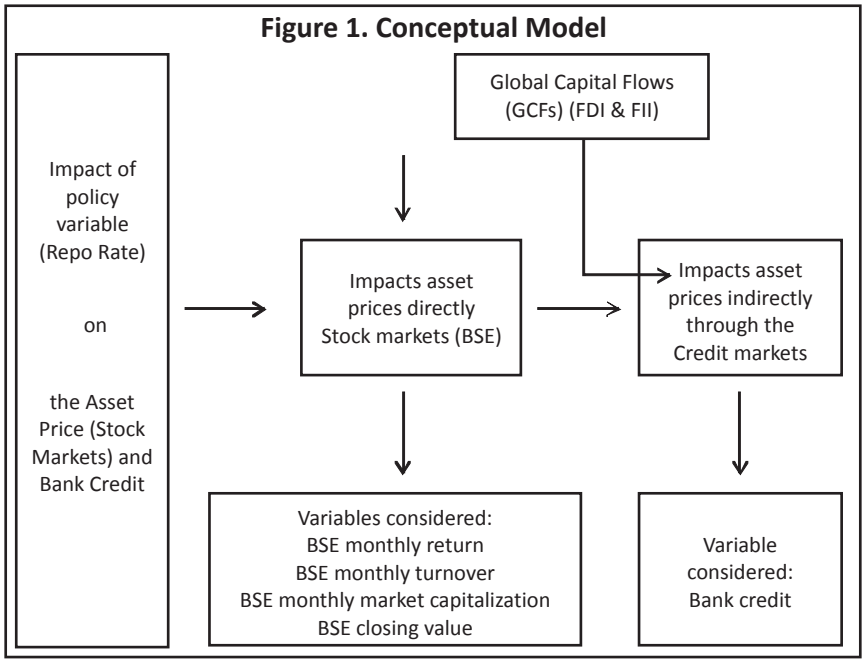
Cogley, Kwan, Lopez, and Rudebusch (1999) laid down a strong case for the non-intervention of Central banks in tackling asset bubbles since it is extremely difficult to identify over valued assets as there is a definite risk of deflating assets, which are not genuinely overvalued. Also, the use of monetary policy for asset prices could make the Central bank deviate from its main target of managing inflation (Bernanke et al., 1999). On the other hand, Mussa (2002) and Paddeda (2017) mentioned that asset prices should play a significant role in the conduct of monetary policy. The prices of real estate, currency, stocks, and bonds are important macroeconomic variables which have a significant influence on the primary objectives of a Central bank, that is, price stability, financial stability, and growth of the economy. However, according to the above mentioned authors, monetary policy is too blunt an instrument and can ,therefore, not affect a particular asset only.

Recent literature on bubbles focuses on bubbles fuelled by or accompanied with credit booms. These types of asset bubbles create a feedback loop in which lenders do not attend too far to the credit standards of the borrowers but readily lend to borrowers of a particular asset class since the asset price is ever increasing. Later, when the bubble bursts, the feedback loop reverses, which is far reaching in its impact, and it goes beyond the asset class to which lending had taken place. The bursting of the bubble results in a cut down in the supply of credit, due to which the demand for the asset reduces and asset prices plunge further. This results into a loss in the balance sheets of financial institutions and recovery of bad loans invite write offs since asset prices no longer cover the outstanding loan balances. The balance sheet loss diminishes credit and investment in other asset classes too, and this leads to cut down in spending by businesses and households, which weakens economic activity and increases macroeconomic risks in the financial markets (Mishkin, 2011). Therefore, the policy of "leaning against the bubble" is considered to be too proactive and risky as compared to the policy of "cleaning up the bubble".

However, Bordo and Jeanne (2002) clearly disagreed to the use of inflation targeting monetary policy and then reacting to a burst of an asset price bubble by injecting liquidity into the system. Instead, they suggested the use of a more proactive monetary policy which included asset prices in the objective function of the Central bank. Borio and Lowe (2002) clearly stated that a low inflation environment for a long period of time is, in fact, a pre-cursor to an episode of financial instability.

As we have seen from the discussion above, that though there are various opinions, which researchers have shared, they broadly fall into one of the two categories - "lean" or "clean" (White, 2009). This very clearly goes on to demonstrate that the response of the monetary policy to asset bubble prevention, formation, or at the time of bursting of a bubble is a contentious issue with no simple and straight-forward correct answer.

In an Indian context, Singh and Pattanaik (2012) studied the dynamic interactions between monetary policy, asset prices, credit market, and real activity. They found a very visible asset price transmission channel of



monetary policy in India and also noted that higher interest rates were accompanied by a contraction in credit, output, and asset prices. They, therefore, suggested that the direct use of monetary policy to tackle asset prices might not be ideal as it also affects other variables in an undesirable way, and they also suggested the use of micro and macro prudential measures to address the concerns of financial stability because of asset price bubbles. A noteworthy finding of this research, in the case of India, is the strong positive relationship between credit built up and asset prices. It is perceived that asset price bubbles, which are fuelled by credit expansions are far more damaging than simply those which project irrational exuberance.

Therefore, a monetary response to credit and asset markets may be required, if excess demand shows up in the credit market as well as the asset market. The current paper goes beyond this discussion of whether or not a monetary response is required in an Indian context, it settles the debate by evaluating whether a monetary response by the Central bank would yield the desired results on the impact area, that is, credit and asset markets. The current research, therefore, proposes to test the conceptual model depicted in Figure 1.

Research Objectives

(1) To ascertain if global capital flows (FDI & FII flows) in India lead to possible asset price misalignments in the stock market.

(2) To ascertain how the monetary policy transmission takes place through the asset price channel (stock prices) and the credit channel.

Research Method

(1) Data - Type and Size : The research involves extensive use of secondary data made available through credible sources like the government agencies available on a public domain in India. Monthly time series data from

January 2004 up to December 2013 was collected from the *Handbook of Statistics on Indian Economy*, RBI website (www.rbi.org.in), the Indiastat website (www.indiastat.com), and the BSE website (www.bseindia.com). The data on the following 10 variables were collected :

(i) FII flows *(FII)*, .
(ii) FDI flows *(FDI)*,
(iii) FDI and FII flows combined *(FDINFII)*,
(iv) BSE monthly return *(BSERET)*,
(v) BSE monthly turnover *(BSETOVER)*,
(vi) BSE monthly market capitalization *(BSEMKTCAP)*,
(vii) Closing value of the BSE *(SENSEX)*,
(viii) Money Supply *(M3)*,
(ix) Repo Rate *(REPORATE)*,
(x) Bank Credit *(BKCR)* .

(2) Statistical Tests : To check the goodness of quality of data and to empirically validate the research objectives, a series of statistical tests were performed. The impact of global capital flows (GCFs) on stock market, housing market, and other macroeconomic variables is validated by estimating a vector autoregressive (VAR) model and running a pairwise Granger causality test (Granger, 1969). The other tests used during the study include :

(i) Unit root test- Augmented Dickey Fuller test ,
(ii) Cointegration test - Johansen's co-integration test.

The details of the tests are given in the sub-sections that follow :

(i) Augmented Dickey Fuller Test : Prior to the pairwise Granger causality test, the data was subjected to the unit root test to determine if the data is stationary and to determine their order of integration. Granger and Newbold (1974) had observed that regression results from the VAR models with non-stationary variables could be spurious since non-stationary data cannot be modelled or predicted because such datasets have a variable variance and a mean value that keeps on changing/alters such that it does not revert to a long-term mean. Non-stationary processes could be of four types :

- Pure random walk,
- Random walk with drift,
- Deterministic trend,
- Random walk with drift and deterministic trend.

A unit root test for each of the variable in the model was conducted because a unit root is often a theoretical inference of models which hypothesize the rational use of information that is accessible to economic agents (Phillips & Perron, 1988). Traditionally, most economic variables are non-stationary; hence, the presence of unit-root is tested using the Augmented Dickey-Fuller Test (Dickey & Fuller, 1979). The non-stationary data was then transformed into a stationary data by differencing and then the process becomes difference-stationary. The disadvantage of differencing the data set is that one observation is lost every time the data is differenced.

(ii) Johansen's Cointegration Test : Watson and Teelucksingh (2002) stated that hypothesis testing based on ordinary least square (OLS) for two variables is justified if only they are integrated as *I*(0). However, if some of the variables are integrated as *I*(1), there is a possibility that the OLS results indicate spurious correlation, and it is not possible to establish a causal relationship between the variables. As already mentioned, one of the ways to solve this problem in the data set is to take a first difference. Granger (1986) proved that if the variables are co-integrated, it would not matter since the undifferenced variables and the differenced variables would form an error correction mechanism (ECM).

A cointegration test using the Johansen method was taken up to ascertain the presence of long-run equilibrium relationship between two or more variables in a single equation system. It is possible that the co-integrating variables may step away from their relationship in the short run, however, in the long run, their association would be restored.

Technically, two times series *xt* and *yt* are said to be integrated of order one (represented as *I*(1)) if there exists a parameter α such that :

$U_t = y_t - \alpha x_t$ is a stationary process.

This indicates that there are two-time series that tend to drift all over the place; however, they do not tend to drift away from each other. The implication of the co- integration test is that if two variables are co-integrated, then one variable could Granger cause the other or vice versa. This multiple cointegration test is very sensitive to the lag length used in the test; so, the Akaike Information Criteria (AIC) is used as Ivanov and Kilian (2001) suggested that with monthly data, AIC tends to be more accurate, especially in the context of VAR models.

(iii) Pair - Wise Granger Causality Test : A vector autoregressive (VAR) model is an econometric model that shows the linear interdependencies among multiple time series data. The advantage of using a VAR model is that one does not have to determine whether a particular variable is endogenous or exogenous. As mentioned in the earlier section, the co-integration between two variables indicates imperfect market under the efficient market hypothesis and the error correction model suggests that at least one of the variables can be predicted. Therefore, a Granger-causality test (Granger, 1969 , 1986) is applied to determine the direction of causation between series X_t and Y_t. The causality test was conducted based on bivariate system [*X, Y*].

Given two-time series X_t and Y_t , X_t is said to have Granger caused Y_t if Y_t can be better predicted using the histories of both X_t and Y_t than it can be done by history of Y_t alone. This relationship can be formulated in an equation form as under :

$$Y_t = a_0 + a_1 Y_{t-1} + \ldots + a_p Y_{t-p} + b_1 X_{t-1} + \ldots + b_p X_{t-p} + U_t \quad \ldots\ldots (1)$$

$$X_t = c_0 + c_1 X_{t-1} + \ldots + c_p X_{t-p} + d_1 Y_{t-1} + \ldots + d_p Y_{t-p} + V_t \quad \ldots\ldots (2)$$

It is considered autoregressive because of the appearance of the lagged dependent variable on the right hand side and the term vector is due to the fact that the equation deals with a vector of two (or more) variables (Gujarati, Porter, & Gunasekar, 2012).

As per the literature in econometrics (Granger, 1969), a particular variable Granger causes another if it is possible to predict the other variable accurately because of the presence of the former variable. Granger causality reflects the ability to predict another variable better and not necessarily an actual causal relationship. The absence of Granger causality is tested by estimating the above VAR model (equation 1 and 2).

Testing H_0 : $= = \ldots = 0$ against H_1= Not H_0, is a test that X_t does not Granger cause Y_t.

In each case, rejection of the null hypothesis implies that there is Granger causality between the variables. In testing for bilateral causality, it is possible to arrive at any one of the following four results:

(i) Unidirectional Granger causality from variable X_t to Y_t;
(ii) Unidirectional Granger causality from variable Y_t to X_t;
(iii) Feedback or Bi-directional causality; or
(iv) No causality.

(iv) Augmented Dickey Fuller Test : Unit root test was applied to each variable at level as well as at first difference of non- stationary variables. After first difference of all the variables were stationary, as indicated by the Augmented Dickey-Fuller test statistics (Table 1), the value of ADF test for the data is lower than the critical value at 5% significance level and the *p* - value is less than 5% for all the variables, which proves the absence of unit roots in the series.

Results

The test results are outlined in the Table 1, which indicates that variables - *BSE return, FDI, FII*, and combined *FDI* and *FII inflows* are stationary at their level *I*(0). However, the other non-stationary variables are found to be stationary at their first differences and ,therefore, are integrated as order one *I*(1).

Table 1. Unit Root Test - Augmented Dickey Fuller Test

Variable	ADF Test Statistic	Critical value at 5%	Probability	Order of Integration
FDI	-5.504990	-3.486064	0.0000	I (0)
FII	-7.284138	-3.486064	0.0000	I (0)
FDI & FII	-11.19859	-3.486064	0.0000	I (0)
BSERET	-9.884033	-2.885863	0.0000	I (0)
LBKCR	-12.06152	-2.886074	0.0000	I (1)
LBSEMKTCAP	-9.613900	-2.886074	0.0000	I (1)
LBSETOVER	-12.55021	-2.886074	0.0000	I (1)
LM3	-11.22446	-2.886074	0.0000	I (1)
LREPORATE	-4.398567	-2.886290	0.0005	I (1)
LSENSEX	-9.849734	-2.886074	0.0000	I (1)

The results obtained in the Table 1 are important since Cuthbertson and Nitzsche (2002) mentioned that the analysis of co-integration suggests that its exclusively the VAR in first differences which is misspecified in-case of the presence of some cointegrating vectors among the *I*(1) series. The authors further clarified the reason stating that some pertinent stationary variables are omitted (i.e. the error-correction, cointegrating vectors) when a VAR is solely in first differences which may impact the parameter estimates from the omitted variables bias.

(1) Johansen's Cointegration Test : The above variables once tested for stationarity were further tested for co-integration. The long run equilibrium relationship between the variables is checked by applying the Johansen's cointegration test. The Table 2 and Table 3 show the results of the same. It is observed that the trace statistic value is greater than the critical value and the probability value is less than 5 %. The results indicate that there are

Table 2. Unrestricted Cointegration Test (Trace)

Hypothesized No. of CE(s)	Trace Statistic	5% Critical Value	Probability **
None *	440.9413	285.1425	0.0000
At most 1 *	334.7107	239.2354	0.0000
At most 2 *	263.2164	197.3709	0.0000
At most 3 *	205.0738	159.5297	0.0000
At most 4 *	163.0941	125.6154	0.0000
At most 5 *	124.4003	95.75366	0.0001
At most 6 *	88.83296	69.81889	0.0007
At most 7 *	58.86574	47.85613	0.0033
At most 8 *	36.79715	29.79707	0.0066
At most 9 *	20.26253	15.49471	0.0088
At most 10 *	7.580211	3.841466	0.0059

Trace test indicates 11 co-integrating eqn(s) at the 0.05 level.
* denotes rejection of the hypothesis at the 0.05 level.
**MacKinnon-Haug-Michelis (1999) *p*-values

Table 3. Unrestricted Cointegration Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Max-Eigen Statistic	5% critical value	Probability **
None *	106.2306	70.53513	0.0000
At most 1 *	71.49426	64.50472	0.0094
At most 2 *	58.14261	58.43354	0.0534
At most 3 *	41.97967	52.36261	0.3789
At most 4 *	38.69389	46.23142	0.2546
At most 5 *	35.56730	40.07757	0.1478
At most 6 *	29.96721	33.87687	0.1366
At most 7 *	22.06859	27.58434	0.2169
At most 8 *	16.53462	21.13162	0.1951
At most 9 *	12.68232	14.26460	0.0876
At most 10 *	7.580211	3.841466	0.0059

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level.

Table 4. Unrestricted Cointegration Test (Trace)

Hypothesized No. of CE(s)	Trace Statistic	5% Critical Value	Probability **
None *	103.8013	47.85613	0.0000
At most 1 *	70.16076	29.79707	0.0000
At most 2 *	40.08770	15.49471	0.0000

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level.
* denotes rejection of the hypothesis at the 0.05 level.
**MacKinnon-Haug-Michelis (1999) *p* - values.

Table 5. Unrestricted Cointegration Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Max-Eigen Statistic	5% critical value	Probability **
None *	33.64056	27.58434	0.0074
At most 1 *	30.07305	21.13162	0.0021
At most 2 *	24.71775	14.26460	0.0008

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level.
* denotes rejection of the hypothesis at the 0.05 level.
**MacKinnon-Haug-Michelis (1999) *p*-values.

11 co- integrating equations. To ascertain the manner in which monetary policy transmission takes place through the asset price channel (stock market) and the credit channel, the data on Total Bank Credit *(BKCR)*, BSE monthly closing value *(SENSEX)*, and Repo rate *(REPORATE)* was subjected to Johansen's cointegration test. The test on the above three stationary variables is summarized in the Table 4 and Table 5. It is observed that the trace statistic value is greater than the critical value and the probability value is less than 5 %. The results indicate that there are three cointegrating equations.

(2) Pair wise Granger Causality Test : The analysis of the results in this section are segregated into two parts :

[i] Global capital flows and the Indian stock market.
[ii] Asset price channel and credit channel of transmission of monetary policy in India.

[i] Global Capital Flows and the Indian Stock Market : The variables considered under this section are :

- Foreign Institutional Investment flows – *FII flows*,
- BSE return – *BSERET*,
- BSE market capitalization – *BSEMKTCAP*,
- BSE turnover – *BSETOVER*.

Granger causality test results are outlined in the Table 6. The Table 6 indicates that FII flows do not Granger-cause the BSE returns and neither the BSE returns Granger-cause FII flows to India. No causality is observed between FII flows and the BSE market capitalization and vice versa. However, the null hypothesis is accepted in case of the FII-BSE turnover relationship meaning that FII flows do Granger-cause BSE turnover.

Table 6. Pairwise Granger Causality Test Results - Stock Market

Null Hypothesis: No Causality	Observations	Lags	*F*-statistic	Probability	Decision	Type of Causality
FII - BSERET	118	2	0.16291	0.84987	Accept Null	None
BSERET- FII			0.16932	0.84445	Accept Null	None
LBSEMKTCAP - FII	118	2	0.36065	0.69802	Accept Null	None
FII - LBSEMKTCAP			0.08124	0.92203	Accept Null	None
LBSETOVER - FII	118	2	0.82747	0.43978	Accept Null	None
FII - LBSETOVER			4.62525	0.01173	Reject Null	Unidirectional

Table 7. Pairwise Granger Causality Test Results - Monetary Policy and Asset Prices

Null Hypothesis: No Causality	Observations	Lags	*F*-statistic	Probability	Decision	Type of Causality
SENSEX-REPORATE	117	3	1.62652	0.18736	Accept Null	None
REPORATE-SENSEX			3.05883	0.03130	Reject Null	Unidirectional
REPORATE-BKCR	88	32	2.00999	0.04281	Reject Null	Unidirectional
BKCR-REPORATE			1.61599	0.11747	Accept Null	None

[ii] Asset Price Channel and Credit Channel in Monetary Policy Transmission in India : The variables used in this section are :

- Repo rate
- Bank Credit
- SENSEX RETURN

The test results are tabulated in the Table 7. The results indicate that a change in Repo rate causes a change in the BSE SENSEX at a lag of 3 months. The SENSEX is ,therefore, sensitive to monetary policy and stock prices respond quickly to a change in the policy rate. The bilateral causality test between Repo rate and bank credit indicates a lag of 32 months. It shows uni-directional causality from Repo rate to bank credit, but after a substantial lag, indicating monetary policy interest rate change takes a very long time in transmitting through the credit channel.

Discussion

The findings from the study throw up some very interesting results, which are pertinent in the current economic situation of the world at large and India specifically because financial markets are increasingly getting integrated and the capital flows across countries is an imminent reality (Sharma, Mahendru, & Singh, 2013). Each nation is working towards creating indigenous methods through which effective global capital can be managed both in terms of the quantity of flow and the impact of the flow such that economic benefits are maximized.

Large scale research on GCFs is conducted by international institutions like the International Monetary Fund, National Bureau of Economic Research, Banks for International Settlement, which conduct studies making a cross - national, long time period study and offer scientific validated results. However, a cross-sectional analysis of literature reflects varying and often contradictory results with one distinct conclusion that the time of investment, the economic makeup of the recipient, and the modelling of the cash flows by the Central bank holds a critical position in deciding both – dynamics and interaction of GCFs and the recipient nation's economic parameters.

India is one of the major economies of the world which has been a recipient nation of extensive global capital inflows over a period of time (1990 - 2016). Its image in the global financial markets stood transformed in 2016. From an economy that took small steps towards liberalizing in 1990s, to a developing nation and being a part of the emerging market economies in the 2000s, India finds itself in an envious position where it could be a global leader if it successfully replicates the export-led growth that it show-cased in the services sector in the manufacturing sector as well. With the Government's push through reforms and initiatives like “Make in India,” India could be the next global manufacturing hub. This certainly underlines India's prospects as an investment destination which may continue to attract GCFs from across the world. The findings of the current study are ,therefore, extremely pertinent in the context of India's current position in the global financial markets.

The study successfully establishes a relationship between GCFs and equity. The impact of FII flows on equity (with reference to BSE turnover) is a well-established research link reaffirmed by the current study and can be analysed further through additional variables to establish a link between the volatility of the market and FII flows. The absence of causality between FII flows and BSE returns is a finding that flouts a popularly accepted notion that the *'FII's drive the Indian stock market'*. However, the study spans over a decade (2004-2013) during which the positioning of the Indian economy amongst its global peers has changed substantially, and this could be a probable reason for the growing FII flows to the Indian stock market and also justifies the reducing relevance of BSE returns being the sole factor driving FII flows.

Mukherjee, Bose, and Coondoo's (2002) study used data from 1999 to 2002 (pre-2004) to investigate the causality between FII flows and the Indian stock market to conclude that the returns offered by the Indian stock market was the single most important factor in determining the FII flows to India. A more recent study by Goudarzi and Ramanarayanam (2010) established bi-directional causality between FII flows and BSE500. Additionally, they suggested the use of limits and volume quotas during times of extreme boom to help tackle the negative impact of capital outflows, which has been blatantly refuted by the findings from Bose and Coondoo (2004), who applied a multivariate GARCH regression model to prove that restrictive policy measures targeted at achieving higher control of FII flows does not affect FII flows negatively.

On the other hand, in another recent study by Bansal and Pasricha (2009), it was found that FII flows did not result into any significant change in the stock market returns, and the volatility in the BSE had reduced after India opened its market to FIIs. With a plethora of conclusion from various studies offering validated results, the current study supplements the available pool of literature and lends this area to further complex analysis and assessment using short term versus long term data sets.

Yet another variable of the study is the Repo rate, and the study establishes a uni-directional relationship between Repo rate and stock market prices at a lag of three months. This indicates that the stock market-transmission channel is prompt and RBI can use interest rates as an effective monetary policy tool in case of a bubble episode in the stock market. However, interest rate is a blunt tool and should be used only for broad adjustments to the economy (Mussa, 2002). There are several opinions available in literature (as mentioned earlier) which state the merits and demerits of employing monetary policy to have an influence upon asset prices. The current research transcends and enriches the debate of whether or not monetary policy should be used as a tool and responds if monetary policy is capable of being used as a tool. The presence of a prompt and efficient transmission channel increases the Central bank's capability of influencing asset prices.

The study also reveals that Repo-rate Granger-causes bank credit and the lag is 32 months, indicating a sluggish lending channel (bank/credit channel). In order to put the duration into perspective, the study by Morsink and Bayoumi (2001) on Japan should be referred to where they used the VAR estimates to scrutinize the monetary policy transmission. It supports dominance of the bank lending channel. They concluded that at the end of two years, approximately two-thirds of direct impact of change in over-night call rate on private demand is supplied through loans from banks. According to Ramey (1993) and Meltzer (1995), the importance of the credit channel has been on a decline because of the availability of alternative sources of finance, like equity and bond markets. The current research can be extended further to analyze the relationship between bank credit and stock market performance.

Conclusion

The current research clearly establishes that FII flows have an immediate effect on the BSE turnover but not returns. This pass-through effect means that asset prices (stocks) are impacted by global capital flows. The results of the study also establish the relevance of both the asset price channel and credit channel of transmission. If RBI

decides to use monetary policy for asset price misalignment in the stock market, then it needs to be sure of the fact that the transmission mechanism is fast. We conclude through the analysis of the stock market - asset price channel that this channel should be relied upon during a bubble-like episode to control falling stock market prices since a Repo rate change has a reasonably quick impact on the stock prices.

The credit channel of transmission also works slowly and ,therefore, adjusting credit to a sector (stock market investors in particular) through an interest rate change is not going to be helpful during the crisis of a stock market crash caused by a bubble formation.

Implications

The research output of the work carried out has the following implications :

- The results derived for the stock markets are useful for investors who consider that the returns of the market are predominantly driven by FII flows. The results prove that this is not the case. Although FII flows do impact the BSE turnover, it does not show an impact on BSE market capitalization either. Better and more informed investment decisions can be made with the help of this information.

- The effectiveness of the monetary policy on stock markets is an important piece of finding for the policy makers since this can be used in case when an immediate response from stock prices is required.

- The lag involved between Repo rate and bank credit is an important finding for policy makers since the impact on aggregate demand and the real economy can be gauged from this.

Limitations of the Study and Scope for Further Research

The study is limited to India with a country specific of variables to study the research questions, but these variables may vary in a different country. Other variables within India may also be considered to make the study more focused. The period of the study is also a limitation since results achieved using the current time frame might not be consistent if a longer or shorter time frame from the one used is operated upon. No cross-national study is conducted, so any mention of other nations used in this study is only to understand the theoretical functioning of the economic and financial concepts. The results derived are specific to the Indian economy and it is not necessary that the same results will be derived in another country. Several reasons like size of the economy, the demographic pattern, the extent of and the type of global capital flows received, the response of the Central bank, the type of and degree of financial development of the economy are responsible for the inconsistency of results across nations. Therefore, replicating the research would require a careful analysis of the variables to be used. A long sampling period in a pairwise Granger causality test may hide the causality, to this extent the research suffers from the limitation of the choice of the sampling period used. Monthly data used may result into measurement errors due to seasonal adjustment factors.

Further research in this area is possible by undertaking a comparison between emerging economies which are experiencing an inflow of capital from the international markets. The policy responses of each Central bank can be examined to recommend “best practices” for emerging economies that attract capital inflows. The study can also be extended further in India by including other important macroeconomic variables like growth rate, consumption, and inflation.

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