Indian Institute of Management Calcutta

Working Paper Series

WPS No 822 /March, 2019

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Does the Devil lie in the detail?

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Impact of Monetary Policy on the Indian Stock Market: Does the Devil lie in the detail? [1,2]

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Abstract

The weak link between the stock market and monetary policy is well-known. Nevertheless, in popular perception the link between monetary policy and stock prices in India is perceived to be significant. Towards explaining this disconnect, the present paper probes into the impact of Indian monetary policy announcements on disaggregated sectoral stock indices using the identification through heteroscedasticity (IH) approach. The paper also looks at the impact of US monetary policy on Indian stocks. Our findings suggest that at the sectoral level, there exist two types of stocks in terms of their sensitivity to monetary policy. Illustratively, the impact of monetary policy on banking and financial services stocks has been found to be significant. In terms of surprise policy announcements, the impact on the realty sector also turned out to be significant besides banking and financial services. On the contrary, the influence of monetary policy on sectors like media, metal, pharmaceuticals, information technology or fast-moving consumer goods has been found to be insignificant. Robustness checks corroborate the validity of these baseline results. Although US monetary policy announcements had no significant impact, unconventional monetary policy (quantitative easing) measures had an impact on fast moving consumer goods and the media sector. Such difference in monetary policy response can perhaps be explained in terms of the structural features of the sectors, such as, relative dependence of various sectors on bank credit or presence of foreign investors in the Indian equity market.

Keywords: India, Stock Market, Monetary Policy, Event Study, SVAR, Heteroscedasticity

JEL Classification: E44, E47, E52

[1] Views are entirely personal and do not reflect those of the institution(s) to which the authors belong**.**

[2] An earlier version of the paper was presented in the India Finance Conference 2018 held at the Indian Institute of Management Calcutta from 20-22 December, 2018. Authors are indebted to Professor Gagari Chakrabarti for her insightful comments on the paper.

Impact of Monetary Policy on Stock Market in India:
Does the Devil lie in the detail?

1. Introduction

The relationship between monetary policy and the stock market is one of the vexed questions of macroeconomics provoking a vast body of literature. In the standard IS-LM model, the traditional transmission mechanism runs *via* the bond market where the equity market is conspicuously absent. Later research on monetary policy transmission suggests that the stock market is the conduit of the propagation of monetary policy shocks through several channels.

First, the present value of future earning flows decline consequent to a rise in interest rate that would depress equity markets *via* Tobin's q – the market value of a firm's assets relative to their replacement costs (Tobin, 1978). If q is high, the market price of firms is high relative to the replacement cost of capital and *vice versa*. Second, higher real interest rates make alternative investments such as bonds more lucrative which would then necessitate an increase in the required return on stocks thereby reducing its price. Third, investors generally demand an equity premium for holding stocks that are viewed as relatively risky investments. Therefore, the expected yield on stocks *ceteris paribus* can rise only through a decline in the current stock price (Bernanke, 2003). Cumulatively, the price and return on stocks significantly affect consumption and investment behaviour of both household and firms through the real balance (wealth) effect which, at a macro level, have an impact on overall economic activity (Bernanke & Kuttner, 2005). Finally, monetary policy could influence market sentiment, which – being vulnerable to both 'news and noise" – can cause erratic market movements.[3] While rational behaviour would suggest that stock prices incorporate all relevant information from policy announcements,[4] macroeconomic data releases and geo-political developments, market sentiments often drive stock prices to levels beyond those consistent with macroeconomic fundamentals.

Notwithstanding media observations and popular perception, empirical research seems to suggest that the evidence on monetary policy-stock market relationship in the Indian context is rather weak (Sasidharan, 2009; Agarwal, 2007; Bhattacharyya and Sensarma, 2008; Ray and Prabu, 2013). While many of these studies either followed event study method or structural VAR framework, a relatively recent approach to discern the impact of monetary policy on stock prices is through *identification via heteroscedasticity* (IH) whereby if the structural shocks have a known correlation (usually zero), the identification problem can be solved by the extent of heteroscedasticity of the structural shocks (Rigobon and Sack, 2004).[5] A recent paper using the IH approach, however, found weak relationship between unexpected monetary policy announcements and Indian stock market returns (Prabu *et. al*., 2016).

Insofar as the relation between stock prices and monetary policy is concerned, is there any disconnect between popular perception – as reflected in media reporting and discussions – and

[3] Indian financial dailies are replete with statements such as "Indian stock markets closed lower on Wednesday after the Reserve Bank of India kept the key repo rate unchanged" (*Financial Express,* December 6, 2017) and "The domestic equity market fell for a third straight session on Tuesday, as investors chose to remain on the side lines ahead of the outcome of RBI's monetary policy meet (*Economic Times*, June 5, 2018)."

[4] In the Euro Area, technology shocks are found to be more influential *vis-à-vis* monetary shocks for movements in stock prices; in fact, stock prices are found to respond significantly to technology news shocks over a period (Berg, 2012).

[5] As this approach allows for identification of the parameter of interest under a weaker set of assumptions than required under the event-study approach common in the literature, this is more general (Rigobon, 2003).

empirical evidence from academic literature? We seek to probe this puzzle in stock price behaviour at a disaggregated level. We argue that the aggregate stock market index often camouflages the diverse behaviour of various stocks. In particular, we hypothesise that *a priori* one can distinguish between two types of stocks in terms of sensitivity to monetary policy: (a) Type I stocks which are highly responsive to monetary policy shocks – these stocks are either related to the financial sector or hugely dependent upon bank credit; and (b) Type II stocks that are less/not sensitive to monetary policy.

In terms of methodology, we use the identification through heteroscedasticity (IH) approach to study the impact of both domestic and foreign (US) monetary policy announcements on Indian sectoral stock returns. While there have been few studies in India exploring the domestic monetary policy-stock market relationship at an aggregate level, ours is the first study at a sectoral level which provide valuable insights about the Indian economy. In terms of the key role played by foreign institutional investors in Indian equity market, we also study the impact of the US monetary policy on Indian stock market. In view of a recently proliferating field of research analysing the impact of US unconventional monetary policy (UMP) on financial markets of emerging market economies (EMEs) after the 'taper tantrum' of May 2013 (Bowman *et al*., 2015; Patra *et al*., 2016), we also study the impact of UMP on sectoral stock indices.

Besides the paucity of research, the Indian case-study is exciting for several reasons. First, India is one of the fastest growing economies in the world with an average real GDP growth of 7.8% over the 12-year period 2004-16, besides being the third largest economy in purchasing power parity terms. Second, although a primarily bank-based system, there has been greater reliance by firms and corporates of late on the stock and corporate bond market as the banking sector turned increasingly risk averse given the high incidence of stressed assets in their balance sheet. Finally, India made a transition from a largely regulated to a market economy since 1991; consequently, the transmission mechanism of monetary policy is still evolving which merits greater research attention.

The remaining part of the paper is organized as follows. Section 2 briefly summarises the related literature. While Section 3 delves into some of the stylized facts and institutional details, Section 4 lays out the methodology and explore the data. Results and inferences drawn from them are discussed in Section 5 while Section 6 concludes.

2 Received Literature

The impact of monetary policy on the stock market has spawned wide-ranging empirical research pursued through alternative methodologies, as mentioned earlier. A panel-VAR based study on seventeen industrialized countries shows that stock prices fall sharply in response to monetary policy tightening with the trough being reached after four quarters, but a recovery thereafter (Berg, 2013). On the contrary, Laopodis (2006) found inconclusive evidence while examining the dynamic linkages between the federal funds rate and the S&P500 index for 1970-2003; for the 1990s in particular, the study found no consistent relationship between actions taken by the Fed and the response of the stock market.

A study based on the event-study approach reported a high stock price multiplier (range of 2.6-4.7) for the US economy during the period 1989-2002 for unexpected changes in monetary policy although it noted that monetary policy, while important, contributes very little in day-to-day stock price fluctuations (Bernanke and Kuttner, 2005). Based on market level data for the period 2003–2009, evidence from Thailand suggest a negative impact on stock returns from the expected change in the repurchase rate while unexpected changes were found to have no effect (Vithessonthi and Techarongrojwong, 2012)

Pioneering the IH approach[6] in a seminal paper on monetary policy-stock market relationship, Rigobon and Sack (2004) reports a decline of 1.7% in the S&P index as a result of unanticipated increase of 25-basis point in the short-term interest rate, which is derived from the Eurodollar futures market. Other studies using the same methodology, however, have reported mixed results. While studies on Europe, United Kingdom and Turkey found statistically significant impact of short-term interest rates on stock markets (Kholodilin *et al*., 2009; Coralla, 2006; and Duran *et al*., 2012, respectively), those on Hungary, Germany and Poland reported contrary findings (Rezessy, 2005; Coralla, 2006; and Serwa, 2006; respectively). In the Indian context, unanticipated policy announcements during 2004-14 were found to have weakly significant impact on banking stocks whereas few UMP announcements by the US Fed such as LSAP in 2008 and Operation Twist in 2011 also had some impact (Prabu *et al*., 2016).

The literature relating to the impact of monetary policy on the stock market at a disaggregated sectoral level is rather limited. An early influential paper by Ehrmann and Fratzcher (2004) suggested (i) a tightening of 50 basis points in US monetary policy, on an average, reduces S&P500 stock returns by about 3%; (ii) individual stocks react in a highly heterogeneous fashion due to financial constraints and Tobin's q; and (iii) there are strong industry-specific effects of US monetary policy. Furthermore, stocks having low cash flows, small size, poor credit ratings, low debt to capital ratios, high price-earnings ratios or high Tobin's q are significantly more affected with both firm and industry-specific effects having an important role.

In an event study framework, the impact of unexpected changes in the monetary policy rates of UK and Germany (Euro Area) is studied on the aggregate and sectoral equity returns of both the countries. The findings indicate that while UK monetary policy surprises have a significant negative influence on both aggregate and industry level returns in Germany and UK, German (Euro Area) monetary policy shocks have an insignificant impact in both countries (Bredin *et al*., 2009). At the same time, sectoral returns in the US, as compared to the EU, are found to be more responsive to macroeconomic (including monetary policy) news shocks with some evidence of an asymmetric reaction to positive *vis-a-vis* negative shocks (Anderson *et al*., 2017).

An event study on the impact of ECB monetary policy (both policy rates and liquidity provision) announcements on the stock price of large European banks during the crisis period June 2007–June 2013 indicate that banks were more sensitive to non-conventional measures as compared to interest rate decisions. Similar types of intervention, however, had a differential impact depending on the severity of the phase of the crisis. Banks with weaker balance sheets and high operating risk were more sensitive to monetary policy interventions (Ricci, 2015).

In the Brazilian context, a study analysing the effect of the anticipated and unanticipated components of monetary policy decisions on the returns of the Brazilian IBOVESPA index and 53 constituent stocks found that monetary policy, despite having a significant effect on the stock market, is only responsible for a small proportion of market variation. At the sectoral and firm level classification, the financial and industrial goods are found to be significantly affected by monetary policy (Val *et al.*, 2018). A rare study on India using a vector autoregression (VAR) framework finds that the impact of a monetary policy shock on the various sectors of the economy is heterogeneous with manufacturing

[6] This approach allows for identification of the parameter of interest under a weaker set of assumptions than required under the event-study approach common in the literature. The event-study approach turns out to be an extreme case of the heteroscedasticity-based estimator. Thus, the latter estimator can be used to test whether the stronger assumptions under the event-study approach are valid, and, correspondingly, the extent to which the event-study estimates are biased (Rigobon, 2003).

being the most responsive. The differential sectoral effects depend *inter alia* upon factors such as capital intensity, interest sensitivity, export-orientation and production planning strategies (Sengupta, 2014).

3 Institutional Details and Some Stylized Facts

As a prelude to the empirical exercise, this section looks into certain structural features of the Indian economy which define the scope of our research question.

3.1 *Key features*

First, the Indian growth narrative has eluded the usual trend of economic development, whereby an economy moves from the primary sector (agricultural dependence) to the secondary sector (industrialisation) in the initial stages of development and then transits to the tertiary sector (services-led growth) (Kuznets, 1973). On the contrary, India has virtually leap-frogged from the primary to the tertiary sector, unlike China. Despite having a per capita income of around USD 2,000 (in 2017 at current prices and at market exchange rate), the Indian economy has been dominated by the services sector with a share of about two and a half times that of industry in 2017-18 (Table 1).

[Table 1 to come about here]

Second, this feature of GDP is also reflected in the composition of the Indian corporate sector. Including construction, the share of services sector in the authorized capital at 50 per cent is marginally higher than that of industry (Table 2).

[Table 2 to come about here]

Since services sector is perceived to be less dependent on bank credit, the responsiveness of the stocks of services sector to monetary policy could be different from the traditional industry stocks. This primacy of services sector has important implications for the research question raised in our paper.

3.2 *Stock Market*

The Indian stock market has undergone significant makeover with establishment of a demutualized modern stock exchange (National Stock Exchange - NSE) and an effective securities market regulator – Securities and Exchange Board of India (SEBI) – as a result of wide-ranging reforms since the early 1990s. Such transformation has reflected in various market indicators such as size, liquidity, transparency, stability and efficiency. Illustratively, average daily turnover in the stock market for Bombay Stock Exchange (BSE) was Rs. 30 billion (USD 0.5 bn) and the NSE was Rs. 172 billion (USD 2.5 bn) while market capitalization was placed at Rs. 94,753 billion (USD 1403.8 bn) for BSE and Rs. 93,104 billion (USD 1379.3 bn) for NSE as on March 2016. The size of the market - measured by stock market capitalisation to GDP ratio - has improved significantly from 24.3% in 1992–93 to 88.4% in 2015–16 for BSE. While the size of the Indian market still remains smaller than advanced economies such as the US, UK, Australia and Japan, it is significantly higher than many other emerging market economies. According to the World Federation of Exchanges, the BSE and the NSE were ranked at 10th and 11th position, respectively, in terms of market capitalization as of 2016 – ahead of emerging market economies, except China and Hong Kong.

As already indicated, taking into account stylized facts and in terms of *a priori* considerations, we segregate the sectors into two types: sectors like auto, banks, financial services or realty are termed as Type 1 stocks, where monetary policy is expected to have an impact. On the contrary, sectors such as information technology (IT), media, fast moving consumer goods (FMCG), metal and pharmaceuticals (Pharma) are termed as Type 2 stocks that are less likely to be influenced by monetary policy.

Interestingly, sectoral stock indices, both Type 1 and Type 2 stocks, have generally shown an upward trend except during periods of market uncertainty such as (i) global financial crisis of 2008-2009; (ii) the euro area debt crisis of 2010-2012; and (iii) during the taper tantrum of 2013 (Figure 1).

[Figure 1 to come about here]

3.3 *Monetary Policy*

During the period of our analysis (April 2004 - June 2016), the monetary policy framework in India has undergone significant paradigm shifts. Since 1998, monetary policy formulation was premised on the "multiple indicator (MI) approach", which had replaced the erstwhile "monetary targeting (MT) with feedback" adopted since 1991. In the monetary policy statement of April 1998, the Reserve Bank of India (RBI) announced that it would switch to a multiple indicator approach "to widen the range of variables that could be taken into account for monetary policy purposes rather than rely solely on a single variable such as growth in broad money". Under the MI approach, information content from a host of quantity variables such as money, credit, output, trade, capital flows, fiscal position and related variables along with price variables such as rates of return on different financial market instrument, inflation and exchange rate were juxtaposed with output data for drawing policy perspectives (Mohanty, 2010).

Rather than according primacy to price stability as the sole objective of monetary policy, the MI approach embraced three distinct objectives. In this framework, growth, price stability and financial stability gained ascendancy in the hierarchy of policy objectives depending on the phase of the business cycle. This eclectic approach remained unchallenged during the unprecedented boom phase of the economy during 2003-2008 (average real GDP growth of 8.3 per cent) but ran into trouble in the post-crisis period. The unwinding of fiscal stimulus – which was introduced during the crisis – was inordinately delayed resulting in a speedier post-crisis recovery but accompanied by higher inflationary pressures. The macroeconomic situation seriously worsened during the taper tantrum of May 2013 when higher inflation coupled with rising external sector vulnerability from sharp depreciation of the Indian Rupee resulted in the Indian economy getting branded among the "*Fragile Five*".[7] Rising disapproval of multiple – and often conflicting – monetary policy objectives led to much rethinking in policy circles. India finally moved over to a "flexible inflation targeting" (FIT) framework in August 2016 whereby the Reserve Bank of India (RBI) was mandated by the government to maintain price stability as its main objective, while being cognizant of growth.

In consonance with the changing policy framework, the operating procedure of monetary policy has also undergone subtle modifications during this period. With the introduction of the liquidity adjustment facility (LAF) in June 2000, steering overnight money market rates emerged as the key challenge in daily liquidity management operations. The LAF was operated through overnight fixed rate repo (liquidity injection rate) and reverse repo (liquidity absorption rate) since October 2004 to provide necessary guidance to the term structure of interest rates in the economy (Patra and Kapur, 2012; Ray, 2013). Subsequently, a new operating procedure was introduced in May 2011, wherein the overnight weighted average call rate (WACR) was explicitly recognised as the operating target of monetary policy. Besides, a new Marginal Standing Facility (MSF) was institutionalised under which banks could borrow overnight at their discretion up to a specified limit while they could park surplus liquidity at the reverse repo rate from the RBI. Under this framework, the repo rate became the single independently varying policy rate, which was solely reflective of the monetary policy stance. Accordingly, the operating

[7] *Fragile Five* was a term coined by a financial analyst at Morgan Stanley in August 2013 to represent EMEs (*viz*., Brazil, India, Indonesia, South Africa, and Turkey) that had become overtly reliant on unreliable foreign investment to finance their growth.

procedure was characterised by a symmetric policy corridor in which the MSF formed the ceiling (100 basis points above the repo rate) and the reverse repo rate acted as the floor (100 basis points below the repo rate) with the repo rate emerging as the key rate for fine-tuning operations. Apart from the period of the global financial crisis (2007-2008) and the taper tantrum (May-August, 2013), the WACR has generally remained range-bound (Figure 2). In August 2014, the LAF was further refined with the introduction of variable rate repo and reverse repo auctions of longer maturity beyond the overnight segment.

Regarding the frequency of monetary policy announcements, the practice of half-yearly policy transited to a quarterly schedule from 2005. Subsequently, mid-quarter policy announcements were made a regular feature since 2011 thus making the number of scheduled policy announcements eight in a year. There were, however, instances of unscheduled policy announcements, particularly during the peak of the global financial crisis and the taper tantrum. Since the introduction of FIT in April 2016, bi-monthly policy announcements have been introduced.

[Figure 2 to come about here]

3.4 *Sectoral characteristics and linkages*

What is our basis of *a priori* identification of stocks in terms of their perceived potential sensitivity to monetary policy? A few institutional details may be considered at this juncture.

First, there are evidences of imperfect transmission of monetary policy signals to the ultimate lending or deposit rates although this difference seems to be on the wane in recent years (Acharya, 2017). Thus, given the structural features of Indian credit market (like presence of priority sector norms) one would *a priori* expect that the impact of monetary policy may not be completely transmitted to the ultimate borrowers / depositors.

Second, an important feature of the Indian banking industry is the coexistence of public sector and private banks. While the share of public sector banks in total assets of the banking system has come down over the years, they still comprise about 70 per cent of aggregate deposits and advances. Besides, while the share of deposits in aggregate liabilities of the public sector banks is higher than that of private banks, share of borrowing seems to be higher for private banks (Table 3). In fact, there are evidence that the transmission of monetary policy could vary across private and public banks (Ray, 2008).

[Table 3 to come about here]

Third, changes in monetary policy rates tend to influence the supply of bank credit to various sectors of the economy – while rate hikes *ceteris paribus* would constrict the flow of credit, easing of rates would enhance such flows. If there are no regulatory restrictions on sectoral credit, flow of credit to a particular sector, however, would be largely determined by the extent of its dependence on banks. After all, in a credit constrained economy like India, *ex post* supply of credit is equal to its *ex ante* demand. Thus, credit demand from these sectors would reflect in higher supply of credit from banks. Illustratively, data on bank loans (as proportion of total liabilities) for various sectors (roughly corresponding to the sectoral indices) for the period 2005-2016 (end-March) reveal higher dependence on bank credit for sectors like auto, media, metal and realty (Table 4).[8] The high dependence on bank credit by these four sectors could potentially render the impact of monetary policy more effective *vis-à-vis* other sectors, besides reflecting the impact of wider macroeconomic and institutional developments

[8] This apart, the dispersion in share of bank credit as measured by range (*i.e*., the difference between maximum and minimum) for these four sectors (*viz*., auto, media, metal and reality) seems to be almost in line with the average share.

within these sectors. Such stylized facts enable us to *a priori* identify two types of stocks – one which could be more responsive to monetary policy than the other.

[Table 4 to come about here]

Finally, the above information can be juxtaposed with data on deployment of gross bank credit from major sectors which is made available by the RBI on a monthly basis. While a one-to-one mapping between the sectors indicated in the sectoral indices of NSE and those from gross bank credit is not tenable, information on consumer durables, housing and vehicle loans from the latter can plausibly be mapped with fast moving consumer goods (FMCG), realty and auto indices of the former. Information gleamed from the data on gross bank credit for the period 2008-2017 (end-March) suggest much higher dependence of consumers on bank credit for housing and auto loans in contrast to consumer goods (Table 5), which is in consonance with the trend emerging from Table 4 depicting a greater share of bank funding (except metal) to these two sectors.[9] Of course, consumer durables, in line with their smaller value *vis-à-vis* housing and vehicle related loans, accounted for a smaller proportion of bank credit.

[Table 5 to come about here]

What are the implications of these structural features in determining the extent of influence monetary policy exerts across different sectors? Theoretically, these structural features like primacy of services sector, bank ownership patterns, dependence on bank loans, extent of listed firms, seem to indicate that the different sectors may have different interest rate sensitivities. Accordingly, the impact of monetary policy could vary across these sectors.

4 Data and Methodology

4.1 *Data*

a. *Stock Market Variables*

Sectoral Indices: As our analytical framework is premised on discerning the relationship between monetary policy and stock prices at a disaggregated level, we investigated the sector-specific stock price index listed in the National Stock Exchange (NSE). While a detailed account of these sectoral indices is provided in the Annex, a schematic representation of the various indices is in Table 6.

[Table 6 to come about here]

b. Monetary Policy Variables

While most studies on the US use federal funds futures data for extracting the unanticipated component of policy announcements, there is no similar information available in the Indian context.[10] We, thus, use the 3-month interest rate swaps (IRS) as the proxy that captures the unanticipated impact (surprise effect) of monetary policy actions. The IRS is a better proxy for monetary policy as these are actively traded; anticipated changes in monetary policy actions are already factored in the contract and any change in yield after the policy announcements reflect the unanticipated component as market participants quickly adjust their portfolios in response to the surprise element of policy actions. As a robustness check, we also use the 91-day Treasury bill rate - which is the most liquid segment in the

[9] In fact, after every monetary policy announcement the media is abuzz with discussions on: how would it impact the equated monthly instalment (EMI) burden of housing and auto loan account holders?

[10] Some of the ticker services do a poll of select market analysts about the anticipated course of monetary policy actions (*viz*., a change in repo rate or cash reserve ratio). Such polls, however, reflect an inherent bias as it is based primarily on bankers' opinion and are derived from a very small sample (often on a self-selection basis).

money market - as the proxy for monetary policy. Second, we have taken all the sectoral indices of NSE-Mumbai as explained above. Our period of consideration spans from April 2004 to June 2016 covering 88 monetary policy announcements by the RBI. These days are considered as policy days while the previous trading day is considered as a non-policy day.

4.2 ***Methodology***

There are various solutions to the traditional problem of identification in a simultaneous equation model – instrumental variable (IV), two-stage least squares (2SLS), or generalised method of moments (GMM) have all been applied to solve this problem. Rigobon (2003) used a novel approach to solve the problem of identification by exploiting plausible differences in the variances of error terms across sub-samples of the data.

To illustrate Rigobon's approach, a two variable simultaneous equation model with a monetary policy variable (M) and a variable capturing the state of stock market (S) may be considered as follows:

$$(1) \quad M = \beta\, S + u$$

$$(2) \quad S = \alpha\, M + v$$

where, *u* and *v* are random shocks to monetary policy and the stock market, respectively. Here, we are interested in the α parameter *i.e*., the contemporaneous reaction of the stock market to monetary policy.

The above equation cannot be estimated directly due to endogeneity problem. To solve the endogeneity issue, Rigobon (2003) used the heteroskedasticity in the residuals of equation (1) and (2) to estimate the $\hat{\alpha}$ and $\hat{\beta}$ parameters. First, the system of equation is solved for the reduced form equation by inserting M in equation 2. The reduced form equation of (1) and (2), however, is an unidentified system. After all, we need to estimate four unknowns, *viz*., $\hat{\alpha}$, $\hat{\beta}$, σ_u^2, and σ_v^2 while only three moments are generated, *viz*., Var(M), Var(S), and Cov (MS) from the variance-covariance matrix of the reduced form equation. Rigobon (2003) suggested a new approach for identifying such a system.

Let us assume that there are two regimes in the variances of the structural shocks: high and low volatility and that the structural parameters are stable across the regimes. In that case, we are able to split our data into two sub-samples ($j \in A, B$) with identical parameters α and β, but different variances for *u* and *v* so that $\sigma_{u,A}^2 \neq \sigma_{u,B}^2$, and $\sigma_{v,A}^2 \neq \sigma_{v,B}^2$. These two separate sub-samples now yield two separate variance-covariance matrices and six moments, which can be solved for the six unknowns *viz*., $\hat{\alpha}$, $\hat{\beta}$, $\sigma_{u,A}^2$, $\sigma_{u,B}^2$, $\sigma_{v,A}^2$ and $\sigma_{v,B}^2$. Thus, while splitting the sample adds two new unknowns (also two additional variances) and generates three useful information, Rigobon's method identifies the system. The difference in the two variance-covariance matrix yields the following equation:

$$(3) \quad \Delta\Omega = \Omega_A - \Omega_B = \lambda \begin{bmatrix} 1 & \alpha \\ \alpha & \alpha^2 \end{bmatrix}; where, \lambda = \frac{\sigma_\varepsilon^A - \sigma_\varepsilon^B}{(1-\alpha\beta)^2}$$

The α parameter can be estimated by using the change in variance-covariance matrix $\Delta\Omega$ as the instrument for identification. It may be noted that this method relies on two critical identification assumptions. First, the parameters (*i.e*., α and β) are stable in the different sub-samples. Secondly, the data can be split into sub-samples with different relative variances of the structural shocks.

Following Rigobon and Sack (2004), we divide our period into two sub samples *i.e*., policy days (P) and non-policy days (NP). Policy days are those when decisions are announced by the RBI while non-policy day refers to the previous trading day. Here, only assumption required is that the variance of

monetary policy shock increase from non-policy days to policy days while there is no systematic change in the variances of shocks from non-policy days to policy days.

In this study, we use both the IV regression and the GMM estimator of IH approach to estimate the impact of monetary policy on stock prices. First, we group the changes in the two variables in the two subsamples *i.e*., policy days (P) and non-policy days (NP) into one vector. As discussed in Rigobon and Sack (2004), we normalise the variables by dividing by the square root of the number of dates in each subsample as NP has more observations than P. Second, the two instruments given by Rigobon and Sack (*op cit*.) for estimating the IV approach are obtained by interchanging the signs of the variable on the NP days. Finally, the required α parameter is estimated using IV and GMM methodology. In the IV approach, we use one of the instrument while we use both the instruments as the moment conditions in the GMM method to estimate α parameter.

5. Empirical Results and Implications

5.1 *Descriptive Analysis*

Table 7 shows that the standard deviation in policy rate changes *i.e*., 3 month IRS are higher for the policy days when compared to the non-policy rates, which is one of the prerequisite for applying IH methodology. Further, the covariances and the correlations of sectoral stock market indices with the policy rate on the policy days are higher than the non-policy days implying that the stock market reacts to unexpected policy changes.

[Table 7 to come about here]

5.2 *Baseline Results with 3-month IRS representing monetary policy*

The results of the impact of monetary policy on sectoral indices of the NSE using IH approach from two methods, *viz*., IV and GMM estimator is presented in Table 8. The IV estimator findings provide evidence of significant monetary policy impact on Type I sector *viz*., banking, financial services and auto stock indices which are highly dependent on bank credit. Type II sectoral indices, except IT, show expected sign but are not significant. The GMM analysis corroborates the results from IV about monetary policy impact on banking and financial services stocks while the rest turned out to be insignificant.

[Table 8 to come about here]

5.3 *Unannounced Monetary Policy Announcements*

Market players often correctly anticipate the likely path of monetary policy and adjust their portfolios accordingly in advance resulting in minimal market movements after the policy announcement. It is the surprise announcements which catches the market off guard resulting in volatile price movements. In order to clearly delineate the surprise effect of monetary policy announcements on the sectoral indices, we also estimated the response of sectoral stocks to unscheduled monetary policy announcements. In our sample, we had 21 such unscheduled announcements which caught the market unaware.

The effect of surprise monetary policy announcements also showed similar results to the baseline results. The monetary policy pass-through to Type 1 stocks *viz*., banking and financial services were along expected lines (Table 9). In addition to these stocks, the GMM results also provide evidence of unannounced monetary policy affecting the realty index, possibly because equated monthly

instalment (EMI) – which is directly affected by the prevailing interest rate to be paid on housing loans – have a bearing on housing market conditions.

[Table 9 to come about here]

5.4 *Robustness Checks*

We subject our findings to a couple of robustness checks. First, we estimate the IH method using a two-day window with 3-month IRS as the monetary policy variable. Second, we use the 3-month T-bills rate as a proxy for policy variable to capture the surprise effect of monetary policy actions (Duran *et. al*., 2012; Rezessy, 2005) as an alternative to the 3-month IRS rate. Anticipated changes in monetary policy actions are already factored in by the market in Treasury bill yields and any change after the policy announcement reflects the unanticipated component of policy. Moreover, the 91-day Treasury bill rate is most liquid at the short end of the money market and are least influenced by the uncertainty regarding the timing of policy decisions – also, it is broadly aligned with the effective policy rate.

Based on the above, we re-estimate the impact of monetary policy on sectoral stocks in a two-day window. The estimates reiterate the baseline results suggesting that monetary policy negatively affects the financial (including banking) stocks and the realty sector *i.e*., Type 1 stocks (Table 10). The impact of monetary policy on sectoral indices using the 3-month T-bills rate suggest that although policy announcements affect the Type 1 stocks negatively, the coefficients are statistically insignificant (Table 10).

[Table 10 to come about here]

5.5 *Does US monetary policy influence sectoral stock prices?*

Since foreign institutional investors (FIIs) are major players in the Indian stock market, it has often been hypothesized that US monetary policy can have a significant bearing on market dynamics as foreign investors are quite active in the Indian stock market. Further, the interest rate hike or reduction reflects how well the US economy is doing, which is important for Indian stocks such as Pharma and IT companies, which gets most of their revenues from the North American Markets. As a result, we measure the impact of US monetary policy announcements on sectoral stock indices. Beside the standard policy rate decisions, we also study the impact of UMP keeping in view the spillover effects on emerging markets.[11] Our findings suggest that although US monetary policy announcements had no significant impact on sectoral stock indices in India, UMP (quantitative easing) measures announced by the Federal Open Market Committee (FOMC) had a positive (but significant) impact only on FMCG and Media Indices (Table 11).

[Table 11 to come about here]

5.6 *Reflection on findings*

How do we interpret the results? As indicated earlier, some studies have found heterogeneous impact of monetary policy on stock prices at the sectoral level (Ehrmann and Fratzcher, 2004; Bredin *et al*., 2009; Ricci, 2015). Our paper adds to this literature by providing evidence of significant impact on selective sectors such as banking, financial services, auto and reality. We provide some inferences and plausible explanations of the findings.

[11] The set of UMP announcements comprises large-scale asset purchases (LSAPs), the maturity extension program (MEP) or "Operation Twist" and several FOMC announcements in 2013 and 2014 that were perceived by investors as suggesting a change in policy stance (see Prabu *et al.,* 2016 for details).

First, banking stocks, followed by financial services, are found to be most affected by monetary policy decisions. This can be attributed to the fact that the Indian financial system remains a bank-based system in which monetary policy impulses mainly work through the banking channel (Aleem, 2010). As monetary policy decisions tend to affect the profitability of banks through balance sheet adjustments, valuation of banking stocks in the stock market provide an assessment of its impact. Financial services (including banking, insurance and housing finance companies) are significantly affected by monetary policy decisions on interest rates, which has significant influence on the future course of economic activity.

Second, as the estimated coefficients suggest, stocks of PSU banks are impacted to a greater extent than those of private sector banks. Given the wide outreach of PSU banks through branch networking across the country, particularly in the rural areas, monetary policy decisions tend to have a wider impact on their scale and scope of operations. Moreover, PSU banks bear social and developmental responsibilities of reaching out to the underprivileged sections of society resulting in higher incidence of losses due to loan write-offs from lending to small business and farm loan waivers. Consequently, their balance sheet is more sensitive to monetary policy decisions. Moreover, since the Government is the majority stakeholder in PSU banks, any policy decision that have a bearing on the viability of government finances tend to reflect in stock prices of these banks. In contrast, private sector banks with their restricted scale of operations confined to *niche* banking products and located mainly in urban areas can avoid many of the pitfalls faced by PSU banks; therefore, their burden of stressed assets are much smaller.

Third, monetary policy decisions are found to have an impact on the auto sector (from scheduled announcements) and the realty sector (from policy surprises) due to their higher dependence on bank credit as discussed previously. Since the advent of economic reforms, the income level in India has increased resulting in higher living standards among the burgeoning middle-class. Moreover, the aspirational drive of a young work force has led to a distinct shift in time preference in favour of present consumption. Consequently, more people opt for loans on housing and automobiles at an early age than the previous generations. Since monetary policy have a direct bearing on the interest amount that has to be paid on vehicle and housing loans through EMIs, auto and realty stocks are significantly influenced by rate decisions. While policy rate hikes would lead to higher EMI burden and *vice versa*, the consequent effect on demand conditions would directly reflect in stock price movements of the auto and realty sector.

Fourth, the impact coefficients are found to be much smaller in magnitude than in the US (Bernanke and Kuttner, 2005). This may be attributed to the much smaller changes in stock prices than in economies with market-based financial systems like the US (Ludwig & Slok, 2004). Moreover, the wealth effect is also limited; as a result, the asset price channel of monetary transmission is weak in India (Aleem, 2010). [12]

Finally, although US monetary policy announcements had no significant impact on sectoral stock indices, UMP (quantitative easing) measures of the FOMC had a positive (but statistically significant) impact on FMCG and Media Indices only (Table 11 - GMM estimation), which is similar to other findings on Europe and the US (Kim *et al*., 2013; Ricci, 2015). The impact on fast moving consumer goods and the

[12] Singh (2012) finds that a 10% increase in real stock wealth raises consumption demand by a mere 0.3%, which is consistent with stock wealth having a relatively low share in the asset portfolio of households. Consequently, it does not effect consumption demand significantly since consumers do not perceive changes in stock wealth to be enduring.

media sector can be attributed to higher capital inflows in these sectors consequent to significant liberalization of foreign direct investment (FDI) stipulations since 2006.

6 Concluding Observations

This paper tried to examine the impact of both domestic and US monetary policy announcements on stock indices at a sectoral level. We find heterogeneous impact of monetary policy announcements on sectoral stock indices with evidence of policy surprises having significant influence on a few sectors. Moreover, US quantitative easing is also found to have noteworthy impact on some sectors. The results are not unprecedented in the literature and can be attributed to several factors *viz*, (i) dominance of the bank lending channel; (ii) greater role of public sector *vis-vis* private banks; (iii) significant influence of monetary policy on demand for housing and automobiles; (iv) relative ineffectiveness of the asset-price channel of monetary transmission; and (v) sector specific affects arising out of financial liberalisation.

Nevertheless, some caveats are in order. First, while the impact of policy announcements on daily data is not evident for all the sectors, it can have some impact on a smaller window of about 25–30 minutes immediately after the policy announcement when traders cover their positions by adjusting their portfolio. Second, the unanticipated component of stock price movements can be better assessed from active trading if there is a futures money market instrument available similar to the Federal funds futures and the Eurodollar futures market. Finally, the impact of monetary policy on sectoral stocks can be analysed by controlling for the level of cash flows, firm size, credit ratings, debt to capital ratios, price-earnings ratios and Tobin's q. All these, however, merit a separate research agenda.

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Table 1: Sectoral Composition of Indian GDP		(per cent)
	2011-12	2017-18
Agriculture & allied activities	**18.5**	**14.8**
Industry	**22.9**	**23.5**
Mining & Quarrying	3.2	3.2
Manufacturing	17.4	18.1
Electricity, Gas & Water Supply	2.3	2.1
Services	**58.6**	**61.8**
Construction	9.6	7.8
Hotels, transport, and communication	17.4	19.4
Finance, Insurance, Real Estate & Business Services	18.9	21.7
Public Administration, Defence & Quasi-Government Bodies	12.7	12.9
GDP at factor cost	**100.0**	**100.0**

Notes:
(1) Indian financial years span from April - March; thus, 2011-12 refers to the period April 1, 2011 through March 31, 2012.
(2) Derived from GDP at basic price with base year 2011-12.

Source: Online Handbook of Statistics on Indian Economy, RBI; available at https://dbie.rbi.org.in/DBIE/

Table 2: Economic Activity wise Companies as on December 31, 2017				
	Companies		Authorised Capital	
	Number	% Share	Rs. Billion	% Share
Agriculture & Allied Activities	32,977	**2.9**	558.0	**0.9**
Industry	**256,962**	**22.5**	**27,335.8**	**46.0**
Manufacturing	231,356	20.2	13,829.3	23.3
Mining and quarrying	11,810	1.0	982.8	1.7
Electricity, gas & Water	13,796	1.2	12,523.7	21.1
Services	**834,369**	**72.9**	**29,711.5**	**50.0**
Construction	104,038	9.1	4,649.7	7.8
Business Services	342,144	29.9	9,213.3	15.5
Trading	151,297	13.2	3,170.3	5.3
Real Estate & Renting	74,441	6.5	1,270.7	2.1
Community, personal & social services	67,351	5.9	2,144.2	3.6
Finance	59,912	5.2	5,140.9	8.7
Transport, storage & communication	34,320	3.0	3,610.6	6.1
Insurance	866	0.1	511.8	0.9
Others	**19,464**	1.7	**1,796.2**	3.0
Total	**1,143,772**	100.0	**59,401.5**	100.0

Source: Government of India, Ministry of Corporate Affairs, Annual Report, 2017-18.

Table 3: Select Items of Assets and Liabilities of Commercial Banks

(Rs. billion)

	2017			2010		
Banks	Public Sector	Private Sector	All Banks	Public Sector	Private Sector	All Banks
Deposits	80,793	25,648	1,11,139	36,920	8,228	47,469
	(83.0)	(71.2)	(78.5)	(83.1)	(71.5)	(78.8)
Borrowings	7,219	4,835	12,807	3,138	1,494	5,314
	(7.4)	(13.4)	(9.0)	(7.1)	(13.0)	(8.8)
Investments	25,547	8,551	36,522	12,156	3,541	17,290
	(26.2)	(23.7)	(25.8)	(27.4)	(30.8)	(28.7)
Advances	55,572	22,196	81,162	27,010	6,324	34,967
	(57.1)	(61.6)	(57.3)	(60.8)	(55.0)	(58.0)
Total Liabilities / Assets	97,356	36,015	1,41,586	44,408	11,507	60,269

Note: Figures in brackets are percentage to respective bank-groups' total liabilities / assets.
Source: Statistical Tables relating to Banks in India, RBI.

Table 4: Loans from Banks as proportion of Total Liabilities (%)

Sectoral Indices	**Average Share**	**Maximum**	**Minimum**
Realty	22.7	27.9	11.8
Metal	17.6	37.3	3.1
Automobile	14.8	19.5	3.9
Media	13.9	18.2	8.4
Pharmaceuticals	9.4	13.0	5.0
Fast Moving Consumer Goods	7.3	9.9	0.0
Information Technology	3.2	6.3	0.1

Source: Authors' calculations using Prowess IQ database, Centre for Monitoring Indian Economy.

Table 5: Share of Consumer Loans from Banks in Total Personal Loans (%)

Personal Loan type	**Average Share**	**Maximum**	**Minimum**
Consumer Durables	1.2	1.9	0.9
Housing @	51.7	53.9	49.7
Vehicle Loans	11.0	12.4	10.5

Source: Authors calculations using data on sectoral deployment of gross bank credit, RBI.
@: including priority sector housing.

Table 6: Salient features of Sectoral Indices of NSE		
Name of Index	**Brief description**	**Number of stocks listed in NSE**
Auto	Reflect the behaviour and performance of the Automobiles sector which includes manufacturers of cars & motorcycles, heavy vehicles, auto ancillaries, tyres, etc.	15
Bank	Comprise the most liquid and large capitalised Indian banking stocks	12
Private Bank	Reflect the performance of the banks from private sector	10
PSU Bank	Account for a majority in terms of total assets along with total business share	12
Financial Services	Reflect the behaviour and performance of the Indian financial market which includes banks, financial institutions and housing finance and other financial services companies	15
Fast Moving Consumer Goods	Goods and products, which are non-durable, mass consumption products and available off the shelf.	15
Information Technology	Provides investors and market intermediaries with an appropriate benchmark that captures the performance of the IT segment of the market. Companies in this index are those that have more than 50% of their turnover from IT related activities.	10
Media	Reflect the behaviour and performance of the Media & Entertainment sector including printing and publishing.	15
Metal	Reflect the behaviour and performance of the Metals sector including mining	15
Pharma	Developed to capture the performance of pharmaceutical companies	10
Realty	Developed to synergize emerging opportunities arising out of favourable demographics, increasing purchasing power, existence of customer friendly banks & housing finance companies and favourable reforms initiated by the government to attract global investors thereby creating new investment avenues for global investors.	10

Source: NSE

Table 7: Variances, Covariances and Correlations on Policy and Non-Policy Dates						
	Standard deviation of asset prices		Covariance/ Correlation with policy rate			
	Non-policy dates (No of Obs.)	Policy dates (No of Obs.)	Non policy dates		Policy dates	
			Covariance	Correlation	Covariance	Correlation
Policy rate (3M IRS)	11.91 (2937)	18.29 (88)	-	-	-	-
Auto	1.49 (2937)	2.21 (88)	-0.634	-0.036	-8.935	-0.221
IT	1.73 (2937)	2.38 (88)	0.079	0.004	0.166	0.004
PSU Bank	2.19 (2925)	3.57 (88)	-2.183	-0.084	-19.076	-0.292
Financial Services	2.31 (2937)	3.13 (88)	-1.949	-0.071	-15.137	-0.264
FMCG	1.34 (2937)	1.84 (88)	-0.430	-0.027	-2.696	-0.080
Media	1.78 (2505)	2.13 (82)	-0.785	-0.035	-4.076	-0.102
Metal	2.33 (2937)	2.88 (88)	-0.570	-0.021	-3.117	-0.059
Pharma	1.25 (2937)	1.62 (88)	-0.465	-0.031	-2.591	-0.088
Bank	1.98 (2937)	3.29 (88)	-2.162	-0.092	-16.789	-0.279
Private Bank	2.00 (2688)	2.97 (85)	-2.276	-0.093	-13.205	-0.239
Realty	2.89 (2265)	4.54 (76)	-3.036	-0.083	-19.541	-0.229

Table 8: Impact of all Monetary Policy Announcements on Stock Markets			
	IV 2SLS Coefficients	GMM Coefficients	Over Identification Test (GMM)[a]
Auto	**-0.044****	-0.041	
	(0.05)	(0.13)	0.097
Bank	**-0.079*****	**-0.100****	
	(0.06)	**(0.05)**	0.028
PSU Bank	**-0.088****	**-0.131***	
	(0.05)	**(0.01)**	0.012
Private Bank	**-0.062*****	-0.057	
	(0.10)	(0.18)	0.093
Financial Services	**-0.068*****	**-0.073*****	
	(0.09)	**(0.10)**	0.216
IT	0.002	0.006	
	(0.91)	(0.74)	0.185
FMCG	-0.011	-0.010	
	(0.56)	(0.62)	0.101
Media	-0.018	-0.008	
	(0.46)	(0.71)	0.421
Metal	-0.007	0.002	
	(0.81)	(0.94)	0.243
Pharma	-0.008	-0.001	
	(0.63)	(0.95)	0.282
Realty	-0.088	-0.064	
	(0.17)	(0.36)	0.215
Note: The p- values are given in the brackets. *, ** and *** represents significance at the standard 1, 5 and 10 per cent confidence levels. [a]: P-value of the Hansen J-Test.			

Table 9: Impact of Unannounced Monetary Policy Announcements on Stock Markets			
	IV 2SLS coefficients	GMM coefficients	Over Identification Test (GMM)*
Auto	-0.020	-0.023	
	(0.293)	(0.209)	0.218
IT	0.017	0.021	
	(0.451)	(0.356)	0.163
PSU Bank	**-0.083***	**-0.094****	
	(0.060)	**(0.034)**	0.076
Financial Services	**-0.071***	**-0.081****	
	(0.073)	**(0.043)**	0.163
FMCG	-0.011	-0.017	
	(0.692)	(0.507)	0.129
Media	-0.003	0.004	
	(0.906)	(0.880)	0.466
Metal	-0.012	-0.020	
	(0.702)	(0.499)	0.329
Pharma	-0.001	-0.002	
	(0.977)	(0.910)	0.211
Bank	**-0.073***	**-0.090****	
	(0.078)	**(0.028)**	0.067
Private Bank	-0.039	-0.052	
	(0.338)	(0.197)	0.067
Realty	-0.082	**-0.093***	
	(0.111)	**(0.068)**	0.283
Note: The p- values are given in the brackets. *, ** and *** represents significance at the standard 10, 5 and 1 per cent confidence levels. [a]: P-value of the Hansen J-Test.			

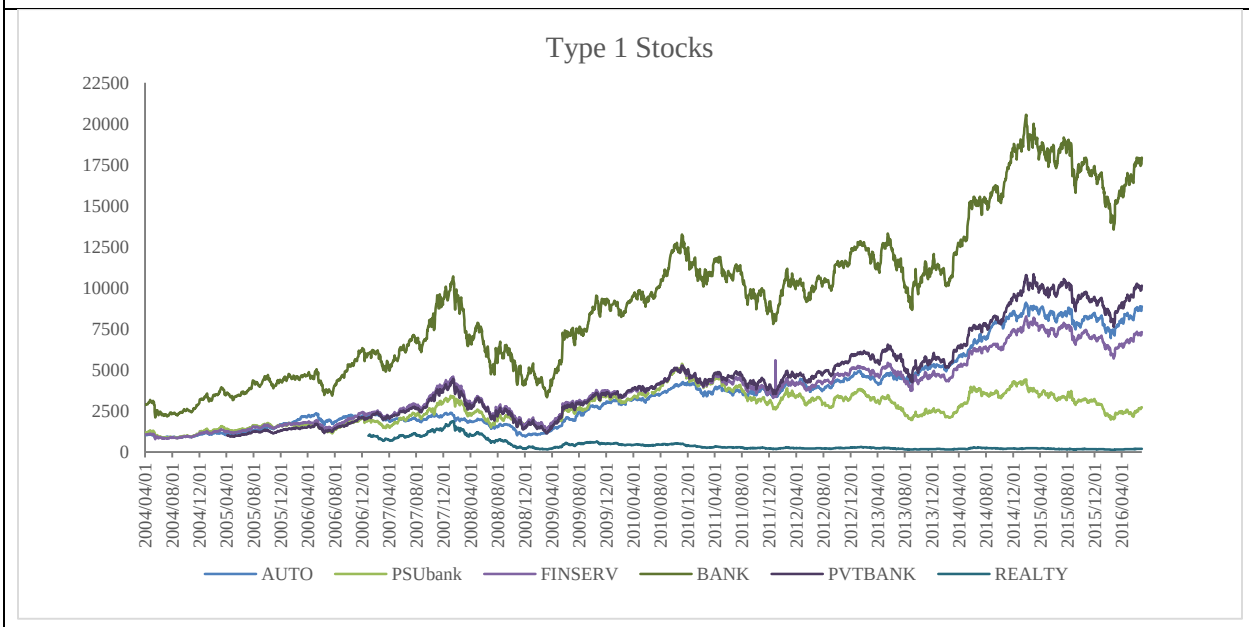
Table 10: Impact of Monetary Policy on Indian Sectoral Indices – Robustness Checks

Sectoral Index	2-day window with 3 month IRS			3-month T-bills rate representing policy		
	IV 2SLS coefficients	GMM coefficients	Over Identification Test (GMM)*	IV 2SLS coefficients	GMM coefficients	Over Identification Test (GMM)*
Auto	-0.010 (0.159)	-0.007 (0.342)	0.089	-0.010 (0.300)	-0.008 (0.390)	0.085
IT	0.002 (0.697)	0.002 (0.682)	0.316	0.000 (0.999)	0.000 (0.970)	0.184
PSU Bank	**-0.031*** (0.009)**	**-0.024* (0.062)**	0.002	-0.011 (0.554)	-0.005 (0.779)	0.007
Financial Services	**-0.026*** (0.009)**	**-0.025** (0.013)**	0.482	-0.010 (0.616)	-0.009 (0.650)	0.155
FMCG	-0.000 (0.951)	0.001 (0.932)	0.031	0.003 (0.530)	0.003 (0.474)	0.101
Media	-0.005 (0.475)	-0.003 (0.629)	0.215	0.000 (0.964)	0.001 (0.866)	0.429
Metal	-0.002 (0.764)	-0.001 (0.926)	0.245	0.010 (0.331)	0.011 (0.239)	0.255
Pharma	-0.003 (0.472)	-0.001 (0.878)	0.173	0.004 (0.295)	0.004 (0.232)	0.293
Bank	**-0.029*** (0.007)**	**-0.023** (0.043)**	0.015	-0.012 (0.524)	-0.007 (0.698)	0.020
Private Bank	**-0.026*** (0.003)**	**-0.022** (0.010)**	0.132	-0.007 (0.638)	-0.004 (0.799)	0.088
Realty	**-0.043*** (0.007)**	**-0.035** (0.033)**	0.170	-0.008 (0.742)	-0.007 (0.752)	0.220

Note: The p- values are given in the brackets. *, ** and *** represents significance at the standard 10, 5 and 1 per cent confidence levels. [a]: P-value of the Hansen J-Test.

Table 11: Impact of US Policy and UMP Announcements on Indian Sectoral Indices						
Sectoral Index	**Monetary Policy Announcements**			**Unconventional Monetary Policy**		
	IV 2SLS coefficients	GMM coefficients	Over Identification Test (GMM)*	IV 2SLS coefficients	GMM coefficients	Over Identification Test (GMM)*
Auto	0.031 (0.587)	0.048 (0.347)	0.481	0.035 (0.756)	0.060 (0.575)	0.481
IT	0.000 (0.992)	0.013 (0.778)	0.470	0.048 (0.628)	0.041 (0.685)	0.470
PSU Bank	-0.039 (0.437)	-0.014 (0.749)	0.271	0.010 (0.941)	-0.030 (0.813)	0.271
Financial Services	-0.012 (0.792)	-0.003 (0.955)	0.037	-0.034 (0.805)	-0.029 (0.828)	0.037
FMCG	0.034 (0.471)	0.034 (0.408)	0.997	0.011 (0.838)	**0.082* (0.089)**	0.997
Media	0.016 (0.839)	-0.020 (0.779)	0.320	0.083 (0.119)	**0.114** (0.017)**	0.320
Metal	0.036 (0.693)	0.057 (0.491)	0.606	0.036 (0.792)	0.038 (0.780)	0.606
Pharma	0.025 (0.573)	0.019 (0.597)	0.824	-0.045 (0.420)	-0.018 (0.735)	0.824
Bank	-0.041 (0.368)	-0.017 (0.685)	0.204	-0.043 (0.767)	-0.094 (0.492)	0.204
Private Bank	-0.052 (0.261)	-0.013 (0.769)	0.092	-0.030 (0.839)	-0.039 (0.791)	0.092
Realty	-0.003 (0.974)	0.019 (0.855)	0.480	0.042 (0.787)	0.010 (0.946)	0.480
Note: The p- values are given in the brackets. *, ** and *** represents significance at the standard 10, 5 and 1 per cent confidence levels. [a]: P-value of the Hansen J-Test.						

Figure 1: Movement in Sectoral Stock Indices



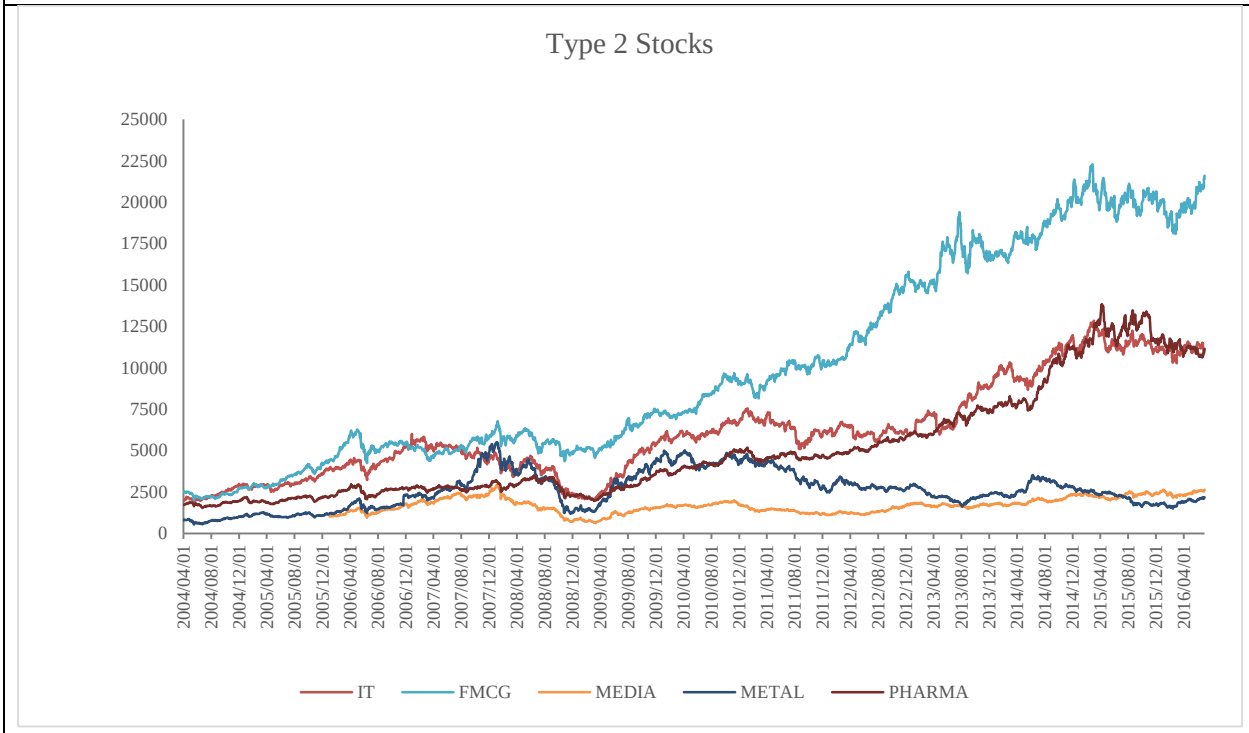
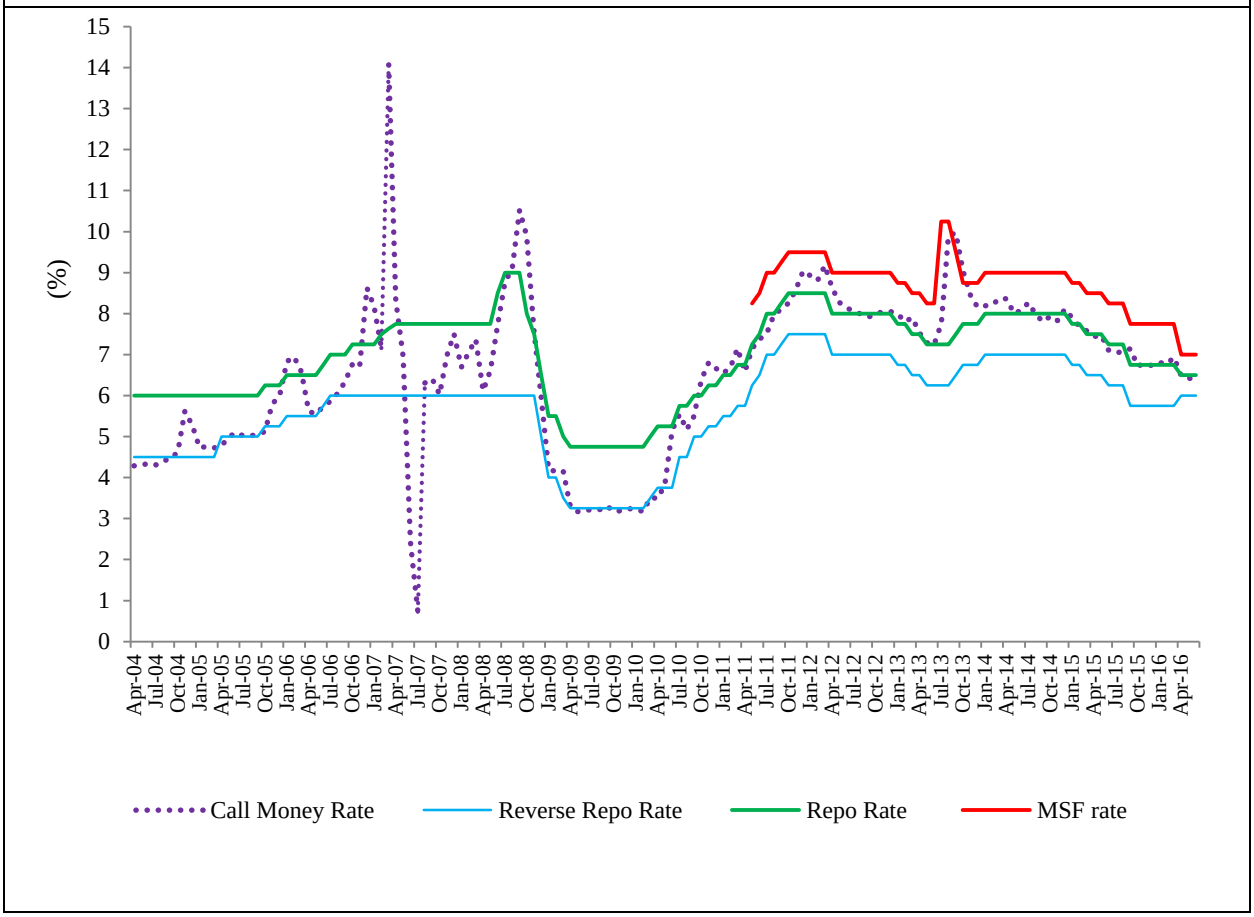


Figure 2: Weighted Average Call Money Rate and the Policy Corridor



Source: Handbook of Statistics on the India Economy, RBI.

Annex

i. *Auto Index*: The Nifty Auto Index is designed to reflect the behaviour and performance of the Automobiles sector which includes manufacturers of cars & motorcycles, heavy vehicles, auto ancillaries, tyres, etc. The Nifty Auto Index comprises of 15 stocks that are listed on the National Stock Exchange.

ii. *Bank Index*: Nifty Bank Index is an index comprised of the most liquid and large capitalised Indian Banking stocks. The index has 12 stocks from the banking sector which trade on the National Stock Exchange.

iii. *Private Bank Index*: It is designed to reflect the performance of the banks from private sector. The Nifty Private Bank Index comprises of 10 stocks that are listed on the NSE.

iv. *PSU Bank Index*: PSU Banks account for 70.3 per cent in terms of total assets held for 2006-07 along with total business share amounting to 73 per cent for 2006-07. The Nifty PSU Bank Index has been developed to capture the performance of the PSU banks.

v. *Financial Services Index*: It is designed to reflect the behaviour and performance of the Indian financial market which includes banks, financial institutions and housing finance and other financial services companies. The Nifty Finance Index comprises of 15 stocks that are listed on the National Stock Exchange (NSE).

vi. *FMCG Index*: FMCGs (Fast Moving Consumer Goods) are those goods and products, which are non-durable, mass consumption products and available off the shelf. The Nifty FMCG Index comprises of maximum of 15 companies who manufacture such products which are listed on the National Stock Exchange (NSE).

vii. *Information Technology (IT) Index:* In order to have a good benchmark of the Indian IT sector, the Nifty IT sector index provides investors and market intermediaries with an appropriate benchmark that captures the performance of the IT segment of the market. Companies in this index are those that have more than 50% of their turnover from IT related activities like IT Infrastructure, IT Education and Software Training , Telecommunication Services and Networking Infrastructure, Software Development, Hardware Manufacturer's, Vending, Support and Maintenance.

viii. *Media Index:* The Nifty Media Index is designed to reflect the behaviour and performance of the Media & Entertainment sector including printing and publishing.

ix. *Metal Index:* The Nifty Metal Index is designed to reflect the behaviour and performance of the Metals sector including mining. The Nifty Metal Index comprises of maximum of 15 stocks that are listed on the National Stock Exchange.

x. *Pharma Index:* Indian companies have taken advantage of the opportunities in the regulated generics market in the western countries and made deep inroads especially in providing low cost equivalents of expensive drugs. Pharma outsourcing into India and low cost Healthcare services are expected to be the key areas of growth in the near future. In addition, the inherent potential of biotechnology has also attracted many new companies and this is also a key growth area for Indian companies. The Nifty Pharma Index has been developed to capture the performance of the companies in this sector.

xi. *Realty Index*: Real estate sector in India is witnessing significant growth owning to favourable demographics, increasing purchasing power, existence of customer friendly banks & housing finance companies and favourable reforms initiated by the government to attract global investors. The Nifty Realty Index has been developed to synergize these emerging opportunities along with their Index expertise creating new investment avenues for investors. Nifty Realty Index represent about 0.4% of the free float market capitalization of the stocks listed on NSE

and 71.1% of the free float market capitalization of the stocks forming part of the Realty sector universe as on March 31, 2016.