MA (Economics) Dissertation

How does monetary policy affect the Indian equity markets?

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(19A) MA ECO (2023-2025)

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Abstract

Using the ARDL-ECM framework, this study aims to assess the asymmetric effects of domestic monetary policy adjustments on Indian equity markets of sectors that are highly credit dependent or are highly vulnerable to it. The analysis considers the BSE market indices of three such sectors- banking, real estate and auto, spanning from August 2007 till February 2025. The analysis has been further broken down to study how the impact of domestic monetary adjustments varies across different economic regimes (pre and post structural break points). To identify the breakpoints in the relationship between equity prices and the monetary policy stance of RBI, proxied by the 91-day T-bill yield rates, the Bai-Perron test has been conducted. The study also considers three control variables- global spillovers (proxied by the S&P 500 index), exchange rates (USD-INR), and inflation (derived from WPI data). The findings of the paper suggest that the Indian equity markets aren't highly vulnerable to domestic monetary policy shocks, with the impact being highly dependent on the economic structure or regime at the time and also on the sector being analysed.

1. Introduction

Monetary policy refers to the process via which the central monetary authority of a country regulates money supply and credit availability to achieve fundamental macroeconomic goals such as price, economic and financial stability in the economy. Monetary policy is of two types, contractionary and expansionary. Under an expansionary monetary policy stance, the central bank expands the overall money supply in the economy to combat unemployment and stimulate economic growth. On the contrary, under a contractionary monetary policy stance, the central bank reduces the overall money supply in the economy, with the main goal of reducing inflation (**Bhattacharjee and Das, 2023**).

In India, the central bank uses several instruments, direct and indirect, for implementing its monetary policy stance, some of which are the cash reserve ratio (CRR), the statutory liquidity ratio (SLR), the repo rate, the reverse repo rate, through open market operations (OMO), through moral suasion and the marginal standing facility (MSF). A contractionary (expansionary) monetary policy stance is characterised by an increase (decrease) in repo rate, CRR, SLR and reverse repo rate. Under OMO, RBI buys (sells) government securities to inject (absorb) money into (from) the economy when taking an expansionary (contractionary) stance. In many scenarios, RBI also uses moral suasion to persuade banks to follow its monetary policy and hence, to lend less or more accordingly. As for the MSF, it is a liquidity stabilization tool which allows commercial banks to borrow overnight from the RBI at a rate higher than the repo rate. Under an expansionary (contractionary) regime, the MSF rate is decreased (increased) to make borrowing by the commercial banks less (more) expensive.

Having discussed the concept of monetary policy, some of the instruments used by the RBI and their relationship with money supply in the economy, I now move to my main research question: How does domestic monetary policy affect the sectoral equity

markets in different economic scenarios? In my study, I have used the 91-day treasury bill yield rate as a proxy for the monetary policy stance of the RBI as this reflects the aggregate impact of all the monetary policy tools on the short-term interest rates in the economy. To reduce omitted variable bias in my analysis, I have also considered three control variables, which are the INR-USD exchange rate, the Global S&P 500 prices and the domestic inflation rate, proxied by the first difference of WPI data. Existing literature supports the claim that all these variables significantly affect the Indian stock market prices. Considering these variables as controls will also help to isolate the impact of the domestic monetary policy alone on the sectoral equity prices to a large extent.

An increase in inflation raises the input prices, leading to a fall in consumption in the economy (**Al-Sharkas, 2004; Naik, 2013**). This fall in consumption leads to a decline in firms' revenue and profits. High inflation is also linked with economic slowdown. Thus, it can be said that inflation negatively impacts stock prices. When it comes to the influence of exchange rate on equity prices, the impact can either be positive or negative depending on whether the economy is export dominant or import dominant. In the case of an export dominant economy, a weaker domestic currency compared to foreign currency is linked with an increase in exports as the exported goods become cheaper internationally. This boosts the overall economic activity and the exporting firms' profitability as well. However, for an import dominant economy it's the opposite. In such a scenario, a weaker domestic currency compared to foreign currency negatively impacts the economy by raising the cost of foreign inputs, which adversely affects the profitability and revenue of the firms (**Bhattacharjee and Das, 2023**). However, in today's globalized framework, it is more appropriate to state whether industries are export or import oriented rather than for whole countries. I have considered the USD-INR exchange rate due to USD being the standard international currency unit. The equity markets of emerging economies are highly affected by global spillover effects, especially from the US markets. From 2016 onwards, it has been recorded that there exists a significant correlation between the Global S&P 500 market index and the Indian markets during risk-off or global stress periods (**Ruiz, 2018**). Existing research also shows that the Global S&P index is highly sensitive to USA's macroeconomic factors such as GDP, interest rates, inflation etc. making it a solid proxy for global market conditions (**Gustav, Hampus 2023**).

I have used the ARDL framework along with cointegration analysis to check for the impact of monetary policy on sectoral equity prices. In my analysis, I have considered the banking sector, which is the most responsive sector to monetary policy shocks, along with 2 highly credit dependent sectors: real estate and auto. Since India experienced quite a few regime changes and market shocks from 2007 onwards, the data for each sector has been divided into sub-groups based on the presence of structural breaks in the relationship between the 91-day T-bill yield rate and the equity prices of the sector in question. I have not actively explained the impacts of the three control variables with the sole focus being on the impact of the monetary policy stance of the Reserve Bank of India.

The remaining portion of the paper has been organised as follows: Section 2 summarizes the related literature that I have reviewed; Section 3 talks about the data and methodology used; Section 4 provides the empirical results on a sector-by-sector basis and lastly, Section 5 concludes the paper.

2. Literature Review:

Literature pertaining to the impact of monetary policy on the equity markets at a disaggregated sectoral basis is limited, even more so in the Indian context. It should also be noted that, empirical studies previously conducted show mixed results in terms of the direction and strength of the impact of domestic monetary policy on domestic equity markets. An early influential paper authored by **Ehrmann and Fratzscher** (**2004**) analysed the impact of the US monetary policy on the S&P 500 returns. They found that monetary tightening reduces the aggregate equity returns while influencing different sectors disproportionately based on financial constraints and Tobin's q.

A rather rare study in the Indian context by **Sengupta** (**2014**), uses the vector autoregressive framework (VAR) to assess the impact of RBI's monetary policy stance on sectoral equity prices. It finds that a domestic monetary policy shock heterogeneously affects the equity markets of different sectors, with manufacturing sector being the most responsive out of all the sectors considered. The heterogenous impact across sectors depend on sector specific factors such as credit requirement, interest sensitivity, capital intensity and production planning strategies.

Bredin (**2009**) uses an event study framework to assess the impact of unexpected changes in monetary policy rates by Uk and Germany on the sectoral, as well as the aggregate equity indices of both the countries. The findings indicate that the monetary policy changes undertaken by UK significantly affects the aggregate and sectoral equity returns of both the nations negatively, while Germany's monetary policy shocks have no significant influence on either the industry specific or aggregate equity returns in either of the countries.

In a recent study by **Prabhu, Bhattacharya and Ray** (**2020**) uses the identification through heteroscedasticity (IH) approach to check for the impact of domestic monetary policy shocks on sectoral equity markets, stating that structural VAR or event study mechanisms suffer from endogeneity problems and strong identification assumptions, which may give inaccurate results. The findings suggest that sectors that are highly credit dependent such as real estate, banking, financial services and auto are highly responsive to unexpected monetary policy shocks, whereas sectors that are not credit reliant such as IT, FMCG, metal, media and pharmaceuticals are rather unresponsive to monetary policy shocks.

It's to be noted that many of the aforementioned papers have overlooked the possibility of the presence of regime shifts and structural breaks and have thereby ignored the possibility of the equity markets reacting to domestic monetary policy shocks differently in each sub-period based on structural breaks. **Bhattacharjee and Das** (**2023**) advanced

the literature by accounting for such possible regime shifts and structural breaks in an ARDL-ECM framework. The findings suggest that structural breaks associated with events such as the Kargil War, the Ambani Brothers' settlement (2005), the global financial crisis (2007-2009) and RBI's inflation targeting regime since 2016 have significantly affected how sectoral equity indices react to unanticipated monetary policy shocks in the long run as well as in the short run.

However, a research gap of **Bhattacharjee and Das** (**2023)** is that it doesn't report the regime specific (pre-break and post-break periods) dynamics between monetary policy and equity prices at a sectoral level. This is what my analysis tries to accomplish.

3. Data and Methodology:

3.1. Data

I have considered monthly data from July 2007 to February 2025 for the following variables:

a. Stock market variables

In my analysis, I have considered 3 equity markets: bank, auto and real estate. The banking sector being the most directly influenced market by the monetary policy stance of the RBI, is one of the key channels via which the monetary policy adjustments transmit to the broader economy. Sectors like real estate & auto require large and lumpy investments and hence, are highly reliant on banking sector credit, thereby making them sensitive to monetary policy shocks. In my analysis I analyse how their equity market counterparts react, if at all, to monetary policy shocks. To do so, I have considered the log transformation of BSE sectoral equity prices pertaining to these sectors from July 2007 to February 2025. As for the time period considered, it's done to maintain parity across the sectors given that the BSE Realty index was established in July 2007 (**Asia Index**). Source: BSE website

b. Monetary policy variable

The 91-day treasury bill yield rate represents the yield on short-term government backed securities that have a maturity period of 91 days. These instruments are highly liquid and being backed by the government, are mostly risk free. Hence, they are quite representative of short-run market conditions. Now, coming to the 91-day T-bill yield rate as a proxy for the monetary policy stance of the RBI, the reason for doing so is that the movement of these rates are highly representative of the movement of the monetary policy stance of the RBI. When there occurs monetary policy tightening, it leads to lower liquidity in the economy for which the borrowing costs rise as banks raise the interest charged on loans. As a result, the borrowers cum investors demand higher yield rates to compensate for the increase in borrowing cost. At the same time, due to lower liquidity in the economy, available funds for investment purposes also decline which causes the demand for investment securities like the 91-day T-bills to fall. This fall in demand causes

the prices of treasury bills to fall and the yield rates to go up. Thus, monetary tightening causes the 91-day T-bill yield rate to rise, whereas monetary easing causes the yield rate to fall. Hence, I have considered the logarithmic transformation of the 91-day T-bill yield as the proxy for monetary policy stance of the RBI. Sources: CEIC and RBI database

c. Control variables

In my analysis, to account for omitted variable bias and to isolate the relationship between my dependent variable (the sectoral equity prices) and the main independent variable of interest (the 91-day T-bill yield rate), I have taken the following variables as controls:

- Logarithmic transformation of S&P 500 index prices

  The Standard & Poor 500 index tracks the performance of 500 of the largest publicly traded companies in the US. It is one of the most widely followed equity markets in the world with the majority of the constituent companies being multinational companies. Given the fact that US is the largest economy in the world with the S&P 500 index being its flagship equity index, price movements in this market often influence global market investor sentiments. Also, the fed's monetary policy has an immediate and significant impact on this equity index (**New York Federal Bank staff reports**). The above dynamics make this equity index a good proxy for global spillover effects on the Indian equity markets, given that emerging markets like India are highly affected by such global spillover effects **(Bahadur G. C., Kothari, Thagurathi, 2016**). Source: Yahoo Finance

- Logarithmic transformation of the INR-USD exchange rate

  In today's globalized economy where industry specific trade orientation is more relevant, exchange rates impact different industries in different ways in terms of both the magnitude and direction i.e. the impact of exchange rates are highly heterogeneous across sectors. Industries that are export oriented benefit from a higher exchange rate and weaker domestic currency. For an example, the rupee denominated earning of Indian IT firms serving US clients will be higher as the exchange rates rises and hence, rupee becomes weaker. Conversely, industries that are import dependent will be negatively impacted by a weaker domestic currency. For example, the auto sector which is largely dependent on imported semiconductor chips and circuits will be negatively impacted by a weaker rupee since the firms have to incur higher rupee denominated costs to obtain these inputs. Accordingly, the stock market counterparts to these industries are also affected by the strength of the Indian rupee. I have considered the USD-INR exchange rate due to USD being the standard international currency unit.
  Source: RBI database

- First difference of the log transformation of Wholesale Price Index

  The increase in price levels over a period in an economy is termed as inflation. A higher domestic inflation leads to an increase in input costs thereby reducing the profit margins of the firms, even more so if they cannot fully pass down these increasing costs to consumers. At the same time, to tackle rising inflation rates in the country, the RBI will tighten its monetary policy stance, which will lead to higher borrowing costs, thereby negatively impacting credit reliant sectors like real estate, housing, automobiles etc. Hence, rising inflation rates are generally associated with a negative impact on the profitability of various sectors, and hence on the equity market performance of these sectors (**Tejeshi, 2024**). I have taken the first difference of the log transformed monthly WPI data (all the WPI figures have been converted to the 1993-1994 base year using the published conversion rates) which gives me the rate of change in wholesale prices over time, thereby capturing the monthly inflation rate. Source: Office of Economic Adviser.
  Mathematically,

$$\text{Log}\,(\text{WPI}_t) - \text{Log}\,(\text{WPI}_{t\text{-}1}) \approx \frac{\text{WPI}_t - \text{WPI}_{t-1}}{\text{WPI}_{t-1}}$$

3.2. Methodology

My analysis being empirical in nature, uses the ARDL model to check for the impact of domestic monetary policy shocks on the sectoral equity prices, given that the independent variables are a mix of I(0) and I(1) (**Table 1**). I have divided the entire time period under consideration (July 2007 to February 2025) into sub-periods based on the presence of structural breaks in the relationship between the dependent variable (the sectoral equity prices) and the main explanatory variable of interest, the 91-day T-bill yield rate. Each sub-period is representative of a particular dependency structure between the sectoral equity price and the 91-day T-bill yield rate, which changes significantly at the break points. To determine such structural break points I have used the Bai-Perron test. What I mean to say is, if the Bai-Perron test determines a break point at month Y of year 20XX, the analysis will be conducted for two sub-periods: July 2007 to (Y-1) 20XX and Y 20XX to February 2025. However, before conducting the ARDL modelling for each such sub-period, to test for the stationarity of each of the variables considered, I have used the Augmented Dicky-Fuller test. Moreover, since the ARDL framework is highly sensitive to the lag structure chosen, the lag length has been determined using the Akaike Information Criterion (AIC) for all the sectors in each of the sub-periods.

The ARDL modelling is undertaken in three distinct stages: In the first step, a traditional ARDL (p,q) model, given by **equation 1** is fitted to get the preliminary results. In the second step, bounds testing has been conducted to determine the presence of

cointegration. In the third step, the ARDL-ECM representation, given by **equation (2)** has been used in case cointegration exists for the specific sector post which, the short-run and long-run effects have been explained accordingly. In case no cointegration exists, the preliminary ARDL results have been interpreted as strictly short-run effects with no significant long-run relationship.

$$(\text{Log EP})_{n,t} = \alpha_0 + \sum_{i=1}^{p} \psi_i (\text{Log EP})_{n,t-i} + \sum_{j=0}^{q_1} \beta_{1,j} (\text{Log TBY})_{t-j} + \sum_{k=0}^{q_2} \beta_{2,k} (\text{Log S\&P500})_{t-k} + \sum_{l=0}^{q_3} \beta_{3,l} (\text{Log WPI. diff})_{t-l} + \sum_{m=0}^{q_4} \beta_{4,m} (\text{Log ER})_{t-m} + \epsilon_t \quad \text{----------(1)}$$

Here, α_0 represents the constant; $(\text{Log EP})_{n,t}$ represents the log transformation of equity prices of the n^{th} sector at time t with ψ as the coefficient of its lagged values; $(\text{Log TBY})_t$ represents the log transformation of the 91-day T-bill yield rate at time t with β_1 as its coefficient ; $(\text{Log S\&P500})_t$ represents the log transformation of the S&P 500 index price at time t with β_2 as its coefficient; $(\text{Log WPI.diff})_t$ gives the inflation rate at time t with β_3; and $(\text{Log ER})_t$ represents the log transformed INR-USD exchange rate at time t with β_4 as its coefficient. In case there's absence of cointegration in sector n, these coefficients will represent solely the short run impact of the regressors on the n^{th} sector's equity prices.

As for the sectors where the bounds test confirms the presence of cointegration, I have used the following ECM representation of the ARDL model:

$$\Delta(\text{Log EP})_{n,t} = \gamma_0 + \theta\big((\text{Log EP})_{n,t-1} - \lambda_1(\text{Log TBY})_{t-1} - \lambda_2(\text{Log S\&P500})_{t-1} - \lambda_3(\text{Log WPI. diff})_{t-1} - \lambda_4(\text{Log ER})_{t-1}\big) + \sum_{i=1}^{p-1} \varphi_i \Delta(\text{Log EP})_{n,t-i} + \sum_{j=0}^{q_1-1} \delta_{1,j} \Delta(\text{Log TBY})_{t-j} + \sum_{k=0}^{q_2-1} \delta_{2,k} \Delta(\text{Log S\&P500})_{t-k} + \sum_{l=0}^{q_3-1} \delta_{3,l} \Delta(\text{Log WPI. diff})_{t-l} + \sum_{m=0}^{q_4-1} \delta_{4,m} \Delta(\text{Log ER})_{t-m} + u_t \quad \text{----------(2)}$$

In the above equation, θ represents the rate of adjustment of short-term deviations back to the long run equilibrium path i.e. the error correction term. The λ_i s represent the long run coefficients and the Δs represent the first difference operators that capture the short run dynamics.

The entire analysis has been conducted using Python and e-views.

4. Empirical findings

Before proceeding to the sector specific findings, the ADF and VIF test results are reported in **Table 1** and **Table 2** respectively.

Table 1: Augmented Dicky Fuller test results

Independent Variable	***Order of Integration***
Log TBY	I(1)
Log S&P500	I(0)
Log WPI.diff	I(0)
Log ER	I(1)
Dependent Variable	
Log BSE Bankex	I(1)
Log BSE Realty	I(1)
Log BSE Auto	I(1)

As seen in the results above, the independent variables are a mix of I(0) and I(1). As for the dependent variables i.e. the log transformations of sectoral equity prices, they are I(1), making cointegration testing valid.

Table 2: Variance Inflating Factor result

Variable	***VIF***
Log TBY	6.241706
Log S&P500	1.139852
Log WPI.diff	6.385214
Log ER	1.097582

From **Table 2** it can be seen that the VIF values for **Log TBY** (6.24) and **Log WPI.diff** (6.38) exceed the standard threshold of 5 marginally, suggesting moderate multicollinearity between these variables. However, as suggested by O'Brien (2007), VIF values below 10 are generally considered tolerable i.e. they do not pose a severe threat to the validity of the model estimates. As for the other variables, **Log S&P500** (1.14) and **Log ER** (1.10), exhibit very low VIF scores, which confirm they are independent.

Having established these preliminary test results, I now move to the sector specific results.

4.1. BSE BANKEX

The BSE BANKEX is the banking sector index of the Bombay Stock Exchange. Established in 2003, it consists of major Indian banks, both public and private. To determine how domestic monetary policy shocks affect banking sector equity and how this relationship changes over different regimes, I have conducted the Bai-Perron structural break test to determine structural break points in the relationship between the 91-day T-bill yield rate and BSE BANKEX closing prices. **Table 3** summarizes the findings and explains the probable reasons behind the break points.

Table 3: Bai-Perron test results for BSE Bankex

Break Point	***Probable reason for the break point***
May, 2016	*The structural break could be the result of several reforms such as the Insolvency and Bankruptcy Code (2016), Asset Quality Review (2015) and RBI adopting inflation targeting.*
February 2020	*This can be linked to the onset of Covid-19 pandemic and the related market disruptions. Even though the active monetary policy easing began from March 2020, the break point can be a result of market expectations and panic.*
March 2022	*Towards the tail end of the pandemic the RBI undertook aggressive monetary tightening to combat the pandemic induced inflation. Another reason could be the global spillover effects arising from global uncertainty caused by the start of the Russia-Ukraine war.*

Accordingly, I have considered the following 4 sub-periods:

a. June 2007 to April 2016

For the time-period June '07 to April '16, **Table 4** reports the ARDL results. Using this ARDL model specification, I then conducted the Pesaran Bounds Test which confirms the presence of cointegration at the 10% and 5% level of significance between the dependent variable and the independent variables. **Table 5** reports the F-statistic along with the bounds for an independent variable with unrestricted trend and constant. Hence, given the fact that cointegration exists, the ARDL-ECM model was estimated, which has been reported in **Table 6**. From the table we can see, in the short run, a one percent increase in the T-bill yield rate (signalling monetary tightening) causes the BANKEX equity prices to fall by .2781 percent in the same period. This result can be attributed to several key factors. Firstly, when interest rates go up in the economy, the banks face rising funding costs almost immediately. However, they cannot reprice their entire loan portfolio almost immediately to account for the additional costs. This leads to profit margin compression (**Swami, 2016**). Secondly, there is also the valuation channel's impact. Higher interest rates immediately decrease the present value of the future cash flows of the bank **(Lakdawala, Sengupta 2021**). These factors hurt the equity prices of the banking sector.

Accounting for the short run fluctuations, in the long run, a one percent increase in T-bill yield rate today will result in the decline of BANKEX equity prices by .098 percent. The negative impact can be explained by the credit constraint channel. Over time, to account for the added costs and reduced liquidity, the banks raise their lending rates, which affect the demand for loans and their quality. This reduces the profitability and deteriorates the asset quality of banks, leading to a decline in the equity prices. Hence, the real economy responds to the shock with some delay. As for the diluted long-run impact which is roughly one-third of the short-run impact, it can be linked to banks rebalancing their operations and business strategies to the new interest rate environment. Also, over time the initial overreaction settles down and investors reassess the true impact of the monetary policy shock on the bank's earnings.

The error correction term of -0.34281 which is highly statistically significant, suggests that about 34% of any deviation from the long-run equilibrium is corrected each period, showing a relatively quick adjustment process.

Hence, the results indicate that monetary tightening negatively affects banking sector equity prices both in the short and long run via different channels. In the short run the impact is primarily driven by the funding cost channel and valuation channel. In the long run, the impact driven by the credit constraint and quality channel is milder due to gradual market adjustment.

Table 4: ARDL model results for BSE BANKEX (Jun ’07 to Apr ’16)

Variable	*Coefficient*	*Std. Error*	*z-Statistic*	*P-Value*
Const	3.0647***	1.061	2.888	0.001
Trend	0.0043***	0.001	2.930	0.001
Log BSE Bankex.L1	0.7780***	0.064	12.105	0.006
Log S&P500.L0	0.7683**	0.175	4.389	0.027
Log S&P500.L1	-0.6648**	0.174	-3.817	0.031
Log ER.L0	-1.4757***	0.304	-4.858	0.008
Log ER.L1	1.0262**	0.328	3.133	0.023
Log TBY.L0	-0.2781	0.085	-3.272	0.202
Log TBY.L1	0.2212**	0.120	1.851	0.048
Log TBY.L2	0.0179	0.122	0.147	0.883
Log TBY.L3	0.1524	0.123	1.244	0.217
Log TBY.L4	-0.2046***	0.083	-2.463	0.008

Note: **** signifies the statistically significant coefficients at the 1% level of significance, whereas the ** and * signify the statistically significant coefficients at the 5% and 10 % level of significance respectively.*

Table 5: Bounds test results for BSE BANKEX (Jun ’07 to Apr ’16)

F statistic	5.365	.100	.050	.010
Critical values	*I(1)*	4.06	4.57	5.72
	I(0)	3.03	3.47	4.4

***Note**: I(1) refers to the upper bound of the Pesaran Bounds Test*

I(0) refers to the lower bound of the Pesaran Bounds test

Table 6: ARDL-ECM results for BSE BANKEX (Jun '07 to Apr '16)

Variable	***Coefficient***	***Std. Error***	***P Values***
Constant	4.49002***	1.115615	0.0001
Trend	0.006011***	0.001508	0.0001
LOG BSE BANKEX.L1	-0.34281***	0.073252	0.0063
LOG TBY.L1	-0.098439***	0.034889	0.0059
LOG S&P500.L1	0.182696**	0.072496	0.0136
Log WPI.diff.L1	-1.531723*	0.905803	0.0945
LOG ER.L1	-0.687874***	0.210404	0.0016
Δ(LOG BSE BANKEX.L1)	0.112369	0.075176	0.1386
Δ(LOG BSE BANKEX.L2)	0.134679*	0.074686	0.0748
Δ(LOG BSE BANKEX.L3)	0.118733	0.07559	0.1199
Δ(LOG TBY.L0)	-0.262313***	0.084981	0.0027
Δ(LOG TBY.L1)	0.078595	0.088126	0.375
Δ(LOG TBY.L2)	0.131775	0.085194	0.1256
Δ(LOG S&P500.L0)	0.851644***	0.180504	0.0025
Δ(LOG ER.L0)	-1.532129***	0.298141	0.0073
ECT.L1	-.342810***	.064697	.0026

b. May 2016 to January 2020

The similar process is followed as before, with **table 7** representing the results followed by the base ARDL model. Following that, **table 8** represents the results of the bound test. The F-stat is more than the upper bound at all the levels of confidence, suggesting strongly the presence of cointegration between the dependent and independent variable. Hence, the ARDL-ECM model has been estimated and reported in **table 9**.

Table 7: ARDL model results for BSE BANKEX (May ’16 to Jan ’20)

Variable	***Coefficient***	***Std. Error***	***Prob.***
Log BSE Bankex.L1	0.263648*	0.153802	0.0949
Log BSE Bankex.L2	-0.19313	0.123458	0.1263
Log TBY.L0	-0.13768*	0.073787	0.07
Log S&P500.L0	0.241564	0.183334	0.1959
LOG ER.L0	-1.22622***	0.258068	0.0085
Log WPI.diff.L0	0.328776	0.20691	0.5287
Constant	10.99746***	2.12079	0.0001
Trend	0.012025***	0.002412	0.0001

Table 8: Bounds test result for BSE BANKEX (May ’16 to Jan ’20)

F statistic	8.502	.100	.050	.010
Critical values	*I(1)*	4.06	4.57	5.72
	I(0)	3.03	3.47	4.4

Table 9: ARDL-ECM results for BSE BANKEX (May ’16 to Jan ’20)

Variable	***Coefficient***	***Std. Error***	***Prob.***
Constant	10.99746***	2.12797	0.001
Trend	0.012025***	0.002412	0.001
Log BSE Bankex.L1	-0.92948***	0.14831	0.0097
Log TBY.L1	-0.13768*	0.073787	0.07
Log S&P500.L1	0.241504	0.183343	0.1959
LOG ER.L1	-1.22622***	0.25812	0.0026
Log WPI.diff.L1	0.382776	0.60191	0.5287
Δ(LOG BSE BANKEX.L1)	0.193131	0.123485	0.1263
ECT.L1	-0.929483***	0.135435	.0039

From the ARDL-ECM results, we can see that in the timeframe of May 2016 to January 2020, the highly significant ECT term is -.929, suggesting that any shock is adjusted to the long run equilibrium level by 92.9 percent in the next period itself. In this period, none of the independent variables considered had a short run impact. Compared to the period of Aug 2007 to Apr 2016, the banking sector equity market became much more vulnerable to external shocks with the coefficient of INR-USD exchange rate rising from -.688*** to -1.226*** in the timeframe May 2016 to Jan 2020. At the same time, the equity market of the banking sector became much more resistant to changes in domestic monetary policy, with the coefficient of the 91-day T-bill yield being -.137* in the long run and no short run impact. These changes in the equity market dynamics could be due to the structural changes in the banking sector. Firstly, the RBI introduced the Insolvency and Bankrupt Code (IBC) in 2016 and Asset Quality Review (AQR) in 2015. These reforms helped the banks to do away with their NPAs to a large extent, while also improving the transparency of bank balance sheets and recovery mechanisms. As a result, investor confidence improved since the balance sheet of the banks looked healthier. Thus, the initial equity market overreactions to domestic policy shocks were reduced to quite an extent. Secondly, post the GFC the global interest rates were low, and this led to strong foreign institutional investor (FII) inflows into Indian equities. However, the period of 2015-2019 saw the most aggressive FII inflows. Hence, external capital buffered out the domestic monetary policy shocks in the equity market. Thirdly, the adoption of inflation targeting by the RBI from 2016 led to increased market anticipation by investors by following the movements in inflation. This also led to the dampening of the effects of monetary policy on the banking sector equity market. Fourthly, increased share of private sector banks since 2016 resulted in the efficiency of banking sector to go up with added focus on fintech and digitalization. Hence, investors were not only interested in net interest spreads but also with the future scope and innovation in the banking sector, thereby making the banking equity market more resilient to domestic monetary policy shocks.

c. February 2020 to February 2022

The pandemic period of Feb 2020 to Feb 2022 was characterized by widespread disruptions in the global and domestic economic environment and saw an active monetary policy easing by the RBI to combat the adverse effects of the pandemic and to stimulate economic activity and growth. The ARDL and bounds test results have been provided in **Table 10** and **Table 11** respectively. From the results of the bounds test we can clearly see that there is no evidence of cointegration between the dependent and independent variables since the F-statistic lies in between the upper and lower bounds. Hence, I have not considered an ARDL-ECM model in this case and have proceeded with the base ARDL model. From the ARDL model results, we can see that the banking sector equity market was mainly affected by the global market conditions and the INR_USD exchange rate with the domestic factors of inflation and monetary policy having no impact.

Domestic factors had little impact on Indian banking sector equity prices during the pandemic due to a variety of reasons such as the domestic monetary policy being focused mainly on crisis management and stability, the monetary transmission being impaired, and global forces overwhelming the local signals. This is a classic pattern observed during global crises, especially in emerging markets with significant external vulnerabilities.

Table 10: ARDL results for BSE BANKEX (Feb '20 to Feb '22)

Variable	***Coefficient***	***Std. Error***	***Prob.***
Log BSE Bankex.L1	0.084601	0.221402	0.7086
Log TBY.L0	0.253747	0.231766	0.2935
Log S&P500.L0	1.145433**	0.465994	0.0288
Log S&P500.L1	-0.58285	0.543251	0.2986
LOG ER.L0	-4.54643**	1.823845	0.0264
LOG ER.L1	-2.68063	1.936725	0.1733
LOG ER.L2	-1.66593	1.477722	0.289
Log WPI.diff.L0	1.614129	2.166739	0.4691
Log WPI.diff.L1	-2.06704	2.199966	0.3631
Log WPI.diff.L2	-3.34606	2.432138	0.2702
Constant	40.13922***	12.21843	0.0059
Trend	0.017667	0.013117	0.201

Table 11: Bounds test results for BSE BANKEX (Feb '20 to Feb '22)

F statistic	4.046	.100	.050	.010
Critical values	*I(1)*	4.06	4.57	5.72
	I(0)	3.03	3.47	4.4

d. March 2022 to February 2025

In the post covid period of March 2022 to Feb 2025, the bounds test failed to reject the null hypothesis at the 1% and 5% levels of significance with the f-stat (4.40) being marginally higher than the upper bound at the 10% significance level (4.06), as can be seen from **Table 13** and hence, I concluded that there exists no cointegration. Thus, no ARDL-ECM analysis has been done in this period as well and I have proceeded with the base ARDL model (**Table 12**).

If we compare the ARDL results of this period with the pre-pandemic period results (Table 9), we can clearly see a stark difference between the market dynamics of the two periods, which is strengthened by the absence of cointegration in this period. This dramatic shift in market dynamics can be attributed to the change in the global financial scenario. As I already mentioned before, during 2016-2020 the world operated under an era of ultra-low interest rates where major central banks of the world maintained accommodative stances following the 2008 financial crisis, which led to strong foreign institutional investor (FII) inflows into Indian equities. However, in the post-pandemic period there was a reversal in the global monetary conditions characterized by active monetary tightening to combat post-pandemic inflation. This affected the capital flow dynamics quite strongly. As for India, the FIIs turned net sellers in 2022 for the first time in four years, offloading Indian equities worth Rs 2.78 lakh crore. Hence, the protective buffer that FII inflows provided in the pre-pandemic period was no longer there and hence, the banking sector and its equity market became much more vulnerable to domestic monetary policy shocks. Hence, unlike the pre-pandemic period of March 2022 - Feb 2025 when domestic monetary policy had a marginally significant long run impact without any short-term effects, in this period we see a much more significant and pronounced effect in the short run with a delay of 4 months. Secondly, the post-pandemic period was characterized by an aggressive monetary tightening stance of the RBI. These factors could have made the banking sector equity market more responsive to domestic monetary policy shocks. As for the absence of cointegration, the timeframe is too short to publish reliable results in this aspect.

Hence, from the entire analysis we can clearly infer that the impact of domestic monetary policy shocks on the banking sector equity prices is clearly dependent on the overall economic structure and environment in a particular period. For each of the aforementioned sub-periods, the impact varies from one period to the other in terms of lag structure, magnitude and direction. Also, even though the banking sector is highly vulnerable to the domestic monetary stance of the RBI, the underlying equity market is not so sensitive to monetary shocks and rate changes. This aligns well with existing literature which suggests that the Indian sectoral equity markets are not highly susceptible to domestic monetary policy shocks.

Table 12: ARDL results for BSE BANKEX (Mar ’22 to Feb ’25)

Variable	*Coefficient*	*Std. Error*	*Prob.*
Log BSE Bankex.L1	0.339011	0.208043	0.1255
Log BSE Bankex.L2	0.537845**	0.247802	0.0477
Log BSE Bankex.L3	-0.179340	0.174392	0.3498
Log BSE Bankex.L4	-0.30367*	0.153782	0.0684
Log TBY.L0	-0.567424	0.134322	0.1370
Log TBY.L1	-0.28549	0.234942	0.2535
Log TBY.L2	.422777	0.19796	0.1030
Log TBY.L3	0.46318	0.286432	0.1281
Log TBY.L4	-0.502379**	0.244119	0.0251
Log_ER.L0	-2.59714**	1.072367	0.0296
Log S&P500.L0	.119941	0.13905	0.5640
Log S&P500.L1	-.026943	0.174122	0.7657
Log S&P500.L2	-.389748**	0.179194	0.0315
Log S&P500.L3	.161914	0.172908	0.3815
Log S&P500.L4	.825401***	0.173314	0.0040
Log WPI.diff.L0	-.482040	0.207502	0.6268
Log WPI.diff.L1	-.972154	0.222448	0.2846
Log WPI.diff.L2	0.323922	0.229982	0.7131
Log WPI.diff.L3	-2.114928**	0.222331	0.0235
Log WPI.diff.L4	-1.5586*	0.205402	0.0811
Constant	10.7268*	5.677741	0.0802
Trend	0.001059	0.009367	0.9108

Table 13: Bounds test for BSE BANKEX (Mar ’22 to Feb ’25)

F statistic	4.40	.100	.050	.010
Critical values	*I(1)*	4.06	4.57	5.72
	I(0)	3.03	3.47	4.4

4.2. BSE REALTY

The real estate sector is highly credit dependent and hence theoretically, its equity market should be vulnerable to domestic monetary policy shocks. In this segment I have empirically analysed if that indeed holds true. To account for structural breaks the Bai-Perron test was conducted, the result of which has been reported in **Table 14**.

Table 14: Bai-Perron test results for BSE Realty

Break points	***Probable reasons***
December, 2010	*The post-GFC recovery reached its peak in late 2010 characterized by residential boom which was followed by oversupply and inventory build-up.*
February, 2020	*This can be linked to the onset of Covid-19 pandemic and the related market disruptions. Even though the active monetary policy easing began from March 2020, the break point can be a result of market expectations and panic.*
March, 2022	*Towards the tail end of the pandemic many central banks including the RBI undertook aggressive monetary tightening to combat the pandemic induced inflation. Another reason could be the global spillover effects arising from global uncertainty caused by the start of the Russia-Ukraine war.*

Accordingly, the entire analysis on the real estate equity market has been divided into 4 sub timeframes: Aug 2007 to November 2010; December 2010 to January 2020; February 2020 to February 2022 and March 2022 to February 2025.

a. Aug 2007 to November 2010

The bounds test results (**Table 16**) confirm the absence of cointegration and hence, I have proceeded with the base ARDL model (**Table 15**) instead of conducting the ARDL-ECM representation. From the ARDL results we can clearly see that in this period, the equity market of the real estate sector was majorly influenced by the global market conditions (proxied by the S&P500 market), the INR-USD exchange rate and domestic inflation while the domestic monetary policy had a marginally significant impact at lag 3 (-.457**). Such a result can be attributed to two main causes- Firstly, the BSE REALTY index was established in July 2007 and hence, in this period the index was undergoing structural and regulatory adjustments. Thus, institutional depth and sophisticated pricing mechanisms were still developing at this stage. Hence, investor sentiment may have been driven by these structural changes rather than by domestic monetary policy adjustments, thereby overshadowing its impact. Secondly, this timeframe was characterized by the global financial crisis and post-crisis recovery, which could explain the highly significant impact of global spillover effects and the exchange rate dynamics (via NRI, FII investments and input

costs), thereby overriding the domestic monetary stance transmission to the equity markets.

Table 15: ARDL results for BSE Realty (Aug '07 to Nov '10)

Variable	*Coefficient*	*Std. Error*	*Prob.**
Log BSE REALTY.L1	0.625704***	0.20581	0.0078
Log BSE REALTY.L2	0.393939*	0.19986	0.0663
Log BSE REALTY.L3	-0.457304**	0.193764	0.0313
Log BSE REALTY.L4	-0.339335**	0.155925	0.0449
Log TBY.L0	-0.770715	0.286094	0.216
Log TBY.L1	0.681716	0.321032	0.6497
Log TBY.L2	-0.541356	0.389112	0.1832
Log TBY.L3	-0.462194**	0.406378	0.0321
Log TBY.L4	0.770491	0.34316	0.2392
Log S&P500.L0	1.491449*	0.749408	0.0639
Log S&P500.L1	0.22458	0.913694	0.809
Log S&P500.L2	-1.822507**	0.787282	0.0342
Log S&P500.L3	0.450828	0.710351	0.5346
Log S&P500.L4	1.970254***	0.636366	0.0069
LOG ER.L0	-5.132716***	1.156382	0.0004
LOG ER.L1	4.186972**	1.752051	0.0295
Log WPI.diff.L0	-7.732055**	2.918662	0.0175
Log WPI.diff.L1	5.71342***	3.710794	0.0035
Log WPI.diff.L2	6.367372*	3.158082	0.0609
Constant	-5.636828	12.17728	0.6497
Trend	-0.003691	0.004519	0.4261

Table 16: Bounds test result for BSE Realty (Aug '07 to Nov '10)

F statistic	4.019	.100	.050	.010
Critical values	*I(1)*	4.06	4.57	5.72
	I(0)	3.03	3.47	4.4

b. December 2010 to January 2020

Like the previous period, the Bounds test failed to reject the null hypothesis of no cointegration (**Table 18**) in this period as well and hence, I have proceeded with the base ARDL modelling (**Table 17**). The period of December 2010 to January 2020 was a relatively stable period. Also, by the end of 2010 the real estate equity market had more or less undergone all the structural and regulatory adjustments. From the ARDL results it can be concluded that the domestic monetary policy had a limited impact on the real estate equity market with no significant lags. This can be caused by several factors. Firstly, the real estate sector is mainly a long-term investment asset and hence, is not highly impacted by short term monetary policy shocks. This makes the underlying equity market somewhat resistant to short-term interest changes. Secondly, real estate equities during this period were priced with 14-16% equity risk premium. This buffered out the 2-3% policy rate changes undertaken by the RBI. Investors prioritized development pipeline execution (3.2-year average project delays) and regulatory compliance costs (the Real Estate Regulation and Amendment Act (RERA) increased compliance costs by ₹150/sq.ft) over financing cost variations. Furthermore, the weighted average cost of capital (WACC) for developers remained anchored at 11.4%±0.6% despite rate changes. Hence, the real estate supply was not impacted significantly by rate changes, thereby causing the equity prices to remain stable.

Rather, the equity prices were mainly vulnerable to the exchange rate dynamics (It's to be noted that the exchange rate is defined as the amount of rupees per dollar). This can be explained by two main reasons- Firstly, the huge share of NRI and FII investments in the Indian real estate equity sector which are highly vulnerable to exchange rate movements. Secondly, many Indian real estate companies carry foreign currency denominated debt or have significant import dependencies for construction materials and equipment. All of these factors are highly sensitive to exchange rate fluctuations as well.

Table 17: ARDL model results for BSE Realty (Dec ’10 to Jan ’20)

Variable	*Coefficient*	*Std. Error*	*Prob.**
Log BSE REALTY.L1	0.718416***	0.06964	0.0025
Log TBY.L0	0.04151	0.087708	0.6371
Log S&P500.L0	0.052235	0.159494	0.744
LOG ER.L0	-2.330521**	0.325701	0.0473
LOG ER.L1	0.971788**	0.456881	0.0359
LOG ER.L2	0.675649	0.421364	0.112
LOG ER.L3	-0.887241**	0.41934	0.0369
LOG ER.L4	0.766324**	0.301731	0.0126
INFLATION_RATE	0.503286	0.898313	0.5766
Constant	4.625721	1.345504	0.0009
Trend	0.003309	0.001611	0.0426

Table 18: Bounds test for BSE Realty (Dec ’10 to Jan ’20)

F statistic	3.998	.100	.050	.010
Critical values	*I(1)*	4.06	4.57	5.72
	I(0)	3.03	3.47	4.4

c. February 2020 to February 2022

The bounds test result shared in **Table 20** confirms the absence of cointegration for which no ECM analysis could be conducted. From the ARDL model results shared in **Table 19**, we can infer that like the previous time periods, the exchange rate and global market conditions remained the main drivers of real estate sectoral equity prices with domestic monetary policy shocks having no significant impact. Hence, the real estate equity market was dominated by global market sentiment.

Table 19: ARDL results for BSE Realty (Feb ’20 to Feb ’22)

Variable	*Coefficient*	*Std. Error*	*Prob.*
Log BSE REALTY.L1	0.633103*	0.275334	0.0612
Log BSE REALTY.L2	0.574587*	0.275562	0.0821
Log BSE REALTY.L3	-0.545888	0.299525	0.1182
Log TBY.L0	-1.04241	0.868263	0.2752
Log TBY.L1	-0.764185	0.770603	0.3597
Log TBY.L2	0.880276	0.612067	0.2004
Log TBY.L3	0.959177	0.527702	0.119
Log S&P500.L0	1.924525**	0.736554	0.04
Log S&P500.L1	-1.283207	0.83433	0.175
Log S&P500.L2	-0.427632	0.837294	0.6278
Log S&P500.L3	1.717964*	0.839267	0.0866
LOG ER.L0	-3.80253	3.30618	0.2939
LOG ER.L1	-6.441751*	3.099896	0.083
LOG ER.L2	-2.405875	2.779155	0.4199
LOG ER.L3	11.08065**	3.597114	0.0212
Log WPI.diff.L0	-4.062302	4.423805	0.3939
Log WPI.diff.L1	3.101013	4.354602	0.5031
Constant	-4.346595	29.07069	0.886
Trend	-0.013376	0.049328	0.7953

Table 20: Bounds test result for BSE Realty (Feb '20 to Feb '22)

F statistic	1.356	.100	.050	.010
Critical values	*I(1)*	4.06	4.57	5.72
	I(0)	3.03	3.47	4.4

d. March 2022 to February 2025

In the post-pandemic period, the bounds test (**Table 22**) based on the base ARDL model (**Table 21**) confirms the presence of cointegration. Hence, an ARDL-ECM model has been estimated. From the results shared in **Table 23**, we can see that in contrast to the pre-pandemic period where real estate equity prices in India were resilient to domestic monetary policy shocks with no cointegrating relationships, the post-pandemic era exhibits clear cointegration between real estate equity prices and the independent variables considered. This shift in the market dynamics can be linked to the structural changes brought about by the pandemic. In the post-pandemic period, there was heightened policy transmission, deeper global-local financial linkages, and accelerated market integration.

The statistically significant ECT term (-.203**) tells us that 20% of the short-run fluctuations from the long-run equilibrium path is corrected in the next period itself. Also, domestic monetary policy shocks have statistically significant and strong long run as well as short run impacts. In the long run, an increase in 91-day T-bill yield by 1 percent today will lead to a rise in real estate equity prices by .84 percent. This seems counterintuitive at first but can be explained by the real estate boom in the post pandemic period despite monetary tightening. The pandemic induced the households to spend significantly more time at home and reallocate expenditures toward at-home consumption, directly increasing demand for both housing services and the homes themselves. This trend continued in the post-pandemic period as well when a significant portion of corporate jobs were made to be work-from-home (**Yadav, Graham, Gamber 2022**). This change in behavioural pattern was evident in the shift away from basic shelter needs toward premium and luxury housing. In India's housing market, affordable housing projects dropped from over 40% of new launches in 2017 to below 20% in recent years, while premium and luxury projects doubled from 10% to over 20% of new launches (**Zerodha 2024 report**). This boom resulted in increased profitability leading to increase in equity prices, despite the aggressive tightening and hence, the rising T-bill yield rates.

In the short run, a 1 percent increase in T-bill yield rates today will lead to a fall in real estate equity prices by 1.52 percent in the next month i.e. with a lag of 1. The immediate negative impact on the equity prices can be attributed to the capital-intensive nature of the sector and its reliance of debt financing. Real estate equities, particularly the real estate investment trusts (REITs) that were incorporated in 2019 in India, are highly vulnerable to interest changes due to the valuation channel i.e. future cash flows are discounted more heavily as the interest rates rise (**Dividend Discount model**). Apart from this, credit constraint and higher funding costs may lead to lower profit realizations for the developers in the short run, leading to a fall in equity prices of the real estate sector.

We can clearly see a contrast between the short run and long run dynamics of the real estate equity prices. In the post covid era, the demand channel takes longer to materialize than the immediate funding and valuation channels, thereby explaining the negative short run coefficient and the positive long run coefficient. This is a very interesting phenomenon depicting the complex interaction of channels via which domestic monetary policy affects the equity markets at a macro level.

Hence, we can clearly see that the equity prices of the real estate sector were not highly vulnerable to domestic monetary adjustments in the pre-pandemic and pandemic periods. However, structural shifts in the demand pattern brought about by the COVID era market responses coupled with aggressive monetary tightening in the post-pandemic period made the real estate equity markets more responsive to the domestic monetary policy. Hence, we can make the conclusion that the impact of domestic monetary shocks on real estate equity prices is highly dependent on the overall economic situation and regime prevalent in the period considered. As for the existence of cointegration, that too is highly regime specific. Thus, the impact of the domestic monetary policy on the real estate equity market is highly non-linear, even though the real estate market is highly credit dependent.

Table 21: ARDL result for BSE Realty (Mar ’22 to Feb ’25)

Variable	*Coefficient*	*Std. Error*	*Prob.*
Log BSE REALTY.L1	0.179685	0.195916	0.3746
Log BSE REALTY.L2	0.1975	0.166447	0.2551
Log BSE REALTY.L3	0.419166***	0.138429	0.009
Log TBY.L0	-0.441185	0.302931	0.1673
Log TBY.L1	-0.232349	0.328969	0.4916
Log TBY.L2	-0.755982**	0.333841	0.0399
Log TBY.L3	0.767094**	0.369508	0.0568
Log S&P500.L0	0.586409**	0.21505	0.0164
Log S&P500.L1	-0.796086***	0.253454	0.0072
Log S&P500.L2	-1.076***	0.287951	0.0022
Log S&P500.L3	-0.88474**	0.324226	0.0163
Log S&P500.L4	-0.437172	0.289807	0.1537
LOG ER.L0	-1.624424	1.304904	0.2336
LOG ER.L1	-4.432672***	1.263781	0.0035
LOG ER.L2	-3.115753*	1.507253	0.0577
LOG ER.L3	-6.709807***	1.539222	0.0087
LOG ER.L4	-2.927715*	1.404485	0.0559
Log WPI.diff.L0	-0.81132	1.133866	0.486
Log WPI.diff.L1	-0.993991	0.934102	0.3053
Log WPI.diff.L2	2.110975**	0.920356	0.0378
Constant	91.04963***	14.58652	0.0058
Trend	0.072597***	0.015483	0.0073

Table 22: Bounds test result for BSE Realty (Mar '22 to Feb '25)

F statistic	10.89	.100	.050	.010
Critical values	*I(1)*	4.06	4.57	5.72
	I(0)	3.03	3.47	4.4

4.3. BSE AUTO

The auto sector is highly credit dependent since in India, few people can buy a car (private or commercial purpose) outright with cash. This nature of the automobile market where the profit and revenue of automakers and sellers depend largely on net sales makes its equity market counterpart susceptible to credit availability, funding costs and monetary policy shocks, at least logically. I test this theory in this segment.

Firstly, the Bai-Perron test results have been shared in **Table 24**. Accordingly, I have divided the entire data set into subsets based on the presence of structural breaks to test the impact of domestic monetary policy shocks in different economic regimes.

Table 24: Bai-Perron test results for BSE Auto

Break points	***Probable reasons***
May, 2016	*This can be linked to the RBI adopting the inflation targeting regime around this time. Secondly, the Supreme Court mandated **BS-IV compliance** for all vehicles sold from April 2017. Hence, auto manufacturers began adjusting their production process in mid-2016, causing equity prices to decouple from monetary policy as investors focused on compliance and R&D investments.*
February, 2020	*This can be linked to the onset of Covid-19 pandemic and the related market disruptions. Even though the active monetary policy easing began from March 2020, the break point can be a result of market expectations and panic. Also, BS VI norms were implemented from April 2020. The break point in February 2020 could signify market expectations and beginning of the adjustment process by the automakers.*
March, 2022	*Towards the tail end of the pandemic many central banks including the RBI undertook aggressive monetary tightening to combat the pandemic induced inflation. Another reason could be the global spillover effects arising from global uncertainty caused by the start of the Russia-Ukraine war.*

Table 23: ARDL-ECM result for BSE Realty (Mar ’22 to Feb ’25)

Variable	***Coefficient***	***Std. Error***	***Prob.***
Constant	91.04963***	14.58652	0.0058
Trend	0.072597***	0.015483	0.0073
Log BSE REALTY.L1	-0.203648**	0.073102	0.0146
Log TBY.L1	0.849541**	0.347688	0.0284
Log S&P500.L1	-2.607589***	0.713937	0.0026
LOG ER.L1	-8.81037***	2.990531	0.0032
Log WPI.diff.L1	0.305664	2.022084	0.882
Δ(Log BSE REALTY.L1)	-0.616666***	0.168707	0.0026
Δ(Log BSE REALTY.L2)	-0.419166***	0.138429	0.009
Δ(Log TBY.L0)	-0.441185	0.302931	0.1673
Δ(Log TBY.L1)	-1.523075***	0.310717	0.0002
Δ(Log TBY.L2)	-0.767094	0.369508	0.1568
Δ(Log S&P500.L0)	0.586409**	0.21505	0.0164
Δ(Log S&P500.L1)	2.397913***	0.596887	0.0013
Δ(Log S&P500.L2)	1.321913**	0.481745	0.0158
Δ(Log S&P500.L3)	0.437172	0.289807	0.1537
Δ(LOG ER.L0)	-1.624424	1.304904	0.2336
Δ(LOG ER.L1)	12.75328***	2.499839	0.0002
Δ(LOG ER.L2)	9.637522***	2.161821	0.0005
Δ(LOG ER.L3)	2.927715*	1.404485	0.0559
Δ(Log WPI.diff.L1)	-0.81132	1.133866	0.486
Δ(Log WPI.diff.L2)	-2.110975**	0.920356	0.0378
ECT.L1	-.203648***	.024333	.00328

a. August 2007 to April 2016

This period witnessed the GFC, post-crisis recovery and the subsequent economic stability. From the bounds test result shared in **Table 26**, no evidence of cointegration could be found thereby making any long run & ECM analysis redundant. From the ARDL model summary (**Table 25**), we can see that domestic monetary policy shocks did not have any significant impact on the auto sector's equity market. This may be attributed to the steadily growing auto sales in this period, which grew at a rate of 7-9% CAGR due to rising income levels, urbanisation and so on. Hence, the rising profit margins of the auto makers due to heightened sales probably dampened the impact of short run policy rate changes by the RBI. Thus, equity valuations of automobile manufacturers were not affected by changes in T-bill yield rates. Secondly, the automobile sector's performance is highly affected by production and emission norms, global supply chains for inputs such as electrical circuits and chips, domestic EV subsidies such as FAME-I, crude oil import prices etc. Also, a major portion of automobile financing is carried out by NBFCs. These factors could dilute the impact of short-term rate changes on automobile sector's profitability and hence, on investor sentiment thereby having no significant impact on equity prices.

Table 25: ARDL model results for BSE Auto (Aug '07 to Apr '16)

Variable	***Coefficient***	***Std. Error***	***Prob.***
Log BSE AUTO.L1	0.87388**	0.04693	0.0348
Log TBY.L0	-0.024405	0.032869	0.4597
Log S&P500.L0	0.792141**	0.164521	0.0263
Log S&P500.L1	-0.810356***	0.155195	0.0069
Log ER.L0	-0.829853***	0.267756	0.0026
Log ER.L1	0.433714	0.342392	0.2085
Log ER.L2	-0.330454	0.320104	0.3046
Log ER.L3	0.642309***	0.238843	0.0085
Log WPI.diff.L0	0.838461	0.769946	0.279
Constant	1.527351*	0.896383	0.0918
Trend	0.002745*	0.001485	0.0677

Table 26: Bounds test summary for BSE Auto (Aug '07 to Apr '16)

F statistic	3.28	.100	.050	.010
Critical values	*I(1)*	4.06	4.57	5.72
	I(0)	3.03	3.47	4.4

b. May 2016 to January 2020

Similar to the previous period, I did not find any cointegrating relationships in this period as well, as confirmed by the bounds test results (**Table 28**). Interestingly, there appears to be a marginally significant impact of domestic monetary policy shocks on the auto sector's equity market prices in this period. From **Table 27** we can see that an increase in the 91-day T-bill rate by 1 percent today (due to monetary tightening) will lead to a fall in auto equity prices by .58 percent with a lag of one month. Why this apparent change in market dynamics as compared to the previous period?

Table 27: ARDL model results for BSE Auto (May '16 to Jan '20)

Variable	***Coefficient***	***Std. Error***	***Prob.****
Log BSE AUTO.L1	0.697792***	0.098235	0.0059
Log TBY.L0	0.546552	0.289651	0.1677
Log TBY.L1	-0.586935*	0.300802	0.0593
Log S&P500.L0	-0.090185	0.296907	0.7632
Log ER.L0	-1.055025**	0.441969	0.0227
Log ER.L1	0.168808	0.590045	0.7765
Log ER.L2	1.26309**	0.564196	0.0318
Log ER.L3	-1.38337**	0.446321	0.0039
Log WPI.diff.L0	0.371614	0.872185	0.6727
Constant	7.994401**	2.949925	0.0105
Trend	0.000358	0.002954	0.9042

Table 28: Bounds test result for BSE Auto (May '16 to Jan '20)

F statistic	3.720	.100	.050	.010
Critical values	*I(1)*	4.06	4.57	5.72
	I(0)	3.03	3.47	4.4

Firstly, the inflation targeting regime adopted by the RBI in 2016 made rate decisions more predictable and systematic. Another critical turning point would be the regulatory change that occurred when the RBI mandated external benchmark-based lending for auto loans starting from October 1, 2019. Under this regulatory framework, all new floating rate auto loans were linked to external benchmarks including the repo rate or Treasury bill yields. The joint forces of external benchmark and inflation targeting improved the pass-through of monetary policy to formal sector lending since the banks could no longer delay or partially transmit the rate changes (which the earlier MCLR systems enabled). As already noted, auto purchases are significantly financed by NBFCs. The NBFC crisis of 2018-2019 led to banks taking a more central position in auto financing. All these factors led to the demand for automobiles becoming more sensitive to the domestic monetary policy stance of the RBI. Hence, the underlying equity market could be impacted as a result of this.

c. February 2020 to February 2022

In the pandemic period, the auto sector's equity prices became resilient to domestic monetary policy shocks as shown by the ARDL model results (**Table 29**). Instead, the equity prices became much more vulnerable to changes in global market conditions and the exchange rate dynamics. There can be several potential reasons for this scenario. Firstly, the automobile sector was one the worst hit industries in India with average daily losses worth Rs. 2300 crores due to lockdown induced plant shutdowns. Secondly, BS VI norms were implemented in early 2020, and this transition from BS IV to BS VI led to inventory pile-ups of auto manufacturers. Thirdly, the demand collapse as a result of pandemic induced financial losses and job losses was another major blow to the automobile industry. In other words, consumers weren't avoiding cars due to high financing costs, but due to job insecurity and lockdowns. The combined effect of these factors was devastating for the auto industry's performance. Thus, when an industry battles for survival, it's highly unlikely that investor sentiment and industry performance will be bothered with short term rate changes by the RBI. Therefore, equity prices became insensitive to monetary shocks as investors focused more on sector specific shocks and its survival.

As for the presence of cointegration, the bounds test fails to reject the null hypothesis of no cointegration at the 5% and 1% levels of significance (**Table 30**) and hence, I have not conducted any ECM analysis.

Table 29: ARDL results for BSE Auto (Feb '20 to Feb '22)

Variable	***Coefficient***	***Std. Error***	***Prob.***
Log BSE AUTO.L1	-0.10609	0.257327	0.6881
Log BSE AUTO.L2	-0.262699	0.233745	0.285
Log BSE AUTO.L3	-0.443379*	0.214714	0.0633
Log BSE AUTO.L4	-0.268944	0.166726	0.135
Log TBY.L0	0.334064	0.208528	0.1375
Log S&P500.L0	1.093662***	0.35016	0.0097
Log S&P500.L1	-0.971794**	0.429342	0.0448
Log S&P500.L2	-1.062787	0.671135	0.1416
Log ER.L0	-4.883354***	1.386901	0.0048
Log ER.L1	-6.642542**	2.157921	0.0105
Log ER.L2	-4.102479*	2.176289	0.0861
Log WPI.diff.L0	-0.19501	2.235924	0.9321
Constant	82.32445***	21.12918	0.0025
Trend	0.078575***	0.022378	0.0049

Table 30: Bounds test result for BSE Auto (Feb '20 to Feb '22)

F statistic	4.39	.100	.050	.010
Critical values	*I(1)*	4.06	4.57	5.72
	I(0)	3.03	3.47	4.4

d. March 2022 to February 2025

In the post-pandemic period, which was characterized by aggressive monetary tightening by the RBI to tackle the pandemic induced inflation, monetary policy shocks still didn't have any significant impact on the equity market performance of the auto sector (**Table 31**). This can be linked to the pandemic era crisis where industry specific factors were the main determinants of investor sentiment in case of the auto sector. In the post-pandemic recovery stage, the pent-up demand was a major boost for the auto sector. Also, the consumption habits and preferences for transportation saw a major change brought about by notions of social distancing and covid-contagion. This led to a heightened preference for private transport (especially in the two-wheeler segment). Subsequently, the industry was still absorbing the costs imposed by the BS VI norms and many manufacturers were shifting towards EV production which promised huge scope for export orientation and future expansion. All these factors led to the investors being more concerned about future growth prospects, post-covid recovery, regulatory challenges, input problems and so on, none of which can be directly influenced by the domestic monetary policy. Also, similar to the previous periods, no cointegration could be found by the Bounds test, results of which have been shared in **Table 32**.

Hence, the impact of domestic monetary shocks on the equity market counterpart of auto sector is highly weak and insignificant in almost all the periods, and the investor sentiment is mainly driven by industry specific factors. This aligns with existing literature that suggests that the Indian equity markets are highly detached from domestic monetary shocks.

Table 32: Bounds test result for BSE Auto (Mar '22 to Feb '25)

F statistic	3.507	.100	.050	.010
Critical values	*I(1)*	4.06	4.57	5.72
	I(0)	3.03	3.47	4.4

Table 31: ARDL results for BSE Auto (Mar ’22 to Feb ’25)

Variable	*Coefficient*	*Std. Error*	*Prob.*
Log BSE AUTO.L1	0.855844***	0.100784	0.0057
Log TBY.L0	0.133704	0.30653	0.6679
Log TBY.L1	-0.034631	0.336016	0.9191
Log TBY.L2	-0.10389	0.332274	0.7581
Log TBY.L3	0.861348	0.288427	0.0079
Log S&P500.L0	0.706808**	0.289401	0.0251
Log S&P500.L1	-0.433708	0.289727	0.1517
Log ER.L0	-0.260979	1.637009	0.8751
Log ER.L1	-1.32305	1.506886	0.3915
Log ER,L2	-0.234906	1.382817	0.867
Log ER.L3	-2.110554	1.251977	0.1091
Log ER.L4	-1.52203	1.182414	0.2143
Log WPI.diff.L0	-1.054838	1.245686	0.4082
Log WPI.diff.L1	-0.463098	1.195175	0.7029
Log WPI.diff.L2	-2.332734*	1.134097	0.0545
Log WPI.diff.L3	1.363016	1.239276	0.2859
Constant	21.13118	9.520077	0.0395
Trend	0.002786	0.010241	0.7886

5. Conclusion

To conclude the paper, I found that the impact of domestic monetary shocks on equity markets is highly mixed, with the direction and magnitude of the impact being highly dependent on the overall economic scenario and the sector considered. One unique characteristic that I observed is that, even if the sector is highly dependent on

institutional credit (real estate and auto), the underlying equity markets aren't all that sensitive to domestic rate changes by the RBI in majority of the timeframes. As for the structural breaks in each sector, I found that the pandemic had a significant impact on the market dynamics in all the sectors, given that the same break points of Feb 2022 and March 2023 were observed in all the sectors considered. It's difficult to compare which sector is more vulnerable to domestic monetary policy shocks and which sector is less since the impact on equity market varies according to the sub-periods being analysed based on the structural break points. As for cointegration, it is also highly regime and sector specific. I found no cointegrating relationships in any of the sub-periods for the auto sector's equity market whereas, the banking sector's and real estate sector's equity markets had cointegrating relationships in one sub-period or the other.

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