Received 23 March 2022
Revised 17 May 2022
19 June 2022
3 August 2022
13 September 2022
Accepted 27 September 2022

Assessing the long-run and short-run effect of monetary variables on stock market in the presence of structural breaks: evidence from liberalized India

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Abstract

Purpose – The present study examines the long-run and short-run effects of monetary factors (money supply, interest rate, inflation and foreign currency exchange rate) on the Indian stock market.

Design/methodology/approach – The study used sophisticated econometric tools to analyse monthly observations from January 1993 to December 2019.

Findings – The augmented Dickey–Fuller (ADF) test indicates that the variables involved in the present study are either I(0) or I(1). The Bai–Perron test multiple break point test identifies four breakpoint dates in the Indian stock market index series. The breakpoint dates are incorporated as different dummy variables in the autoregressive distributed lag-error correction model (ARDL-ECM) regression. The *F*-bounds test reveals that the variables in the study are cointegrated within the time period under consideration. This study's findings show that the interest rate, which is a proxy for monetary policy instrument, and the foreign currency exchange rate have a negative impact on the Indian stock market. Furthermore, the authors find that structural changes significantly affect the performance of Indian stock market.

Practical implications – The study's outcomes indicate that economic factors should be taken into account by investors and portfolio managers when formulating long-term investment strategies. The government, through the Reserve Bank of India, should exercise caution in avoiding discretionary actions that could increase interest rates since the flow of funds to the stock market will be disrupted. To reduce risk, investors should keep a close eye on how interest rates and foreign exchange rates are rising.

Originality/value – The study covers a long period of time, which the majority of previous work did not consider. Furthermore, the study uses different dummy variables in the ARDL model to represent structural breaks (as determined by the Bai–Perron multiple break point test).

Keywords Indian stock market, Structural breaks, ARDL-ECM model, Monetary variables, Unit root test

Paper type Research paper

1. Introduction

Monetary policy is the method by which a country's monetary authority regulates the money supply. The goal of monetary policy, it is said, is usually price stability and economic growth for a country (Okpara, 2010). Monetary policy is classified as either contractionary or

IIM Ranchi journal of management studies
Vol. 2 No. 1, 2023
pp. 70-81
Emerald Publishing Limited
e-ISSN: 2754-0146
p-ISSN: 2754-0138
DOI 10.1108/IRJMS-03-2022-0034

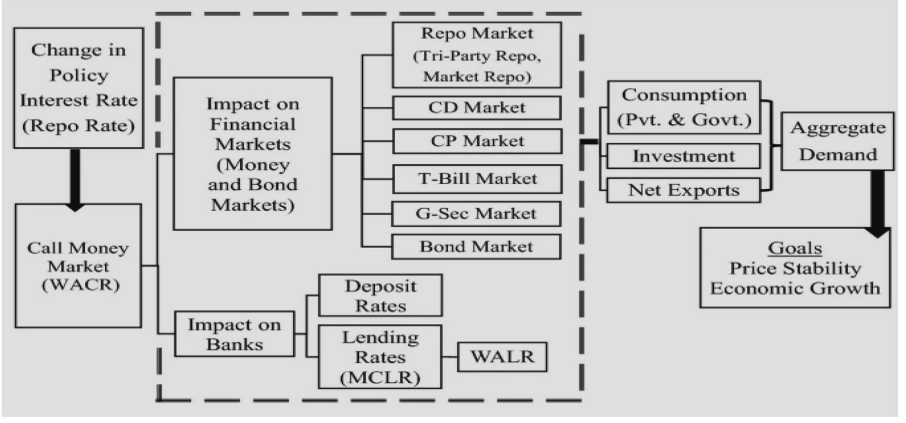
expansionary by economists. An expansionary monetary policy is one in which the central bank rapidly expands the overall money supply in order to combat unemployment. The central bank reduces interest rates under this type of monetary policy in the aim of encouraging businesses to borrow and expand.

In contrast, a contractionary monetary policy raises interest rates, leading the money supply to grow more slowly. The most prevalent use of this policy is to control inflation. The transmission of monetary policy in India through the use of the interest rate channel is seen in Figure 1. Changes in the repo rate affect the weighted average call money rate, which affects all other money market and bond market rates. Changes in the repo rate have an impact on the bank's deposit and lending rates, affecting the economy's aggregate demand. Central banks manage aggregate demand to achieve their aims of price stability and economic growth.

Having discussed the concept of monetary policy and the relationship between interest rate and money supply, we will now focus our discussion towards the impact of monetary variables on stock market. The monetary variables that are selected for the present study are interest rate, money supply, inflation and foreign currency exchange rate. Prior literature suggests that interest rate has a significant effect on stock market. A change in interest rate affects the stock prices in two ways (Ratanapakorn & Sharma, 2007). First, a rise in interest rate leads to an increase in the discount rate resulting in a fall in the intrinsic value of stocks. Second, increase in interest rate in money market and bond market attracts the investors towards money market instruments and bonds, and thus investors substitute their portfolio in favour of T-bills and bonds.

Generally, money supply and stock prices are linked through the liquidity effect (Bhattacharjee & Das, 2021b). It is theorized that excessive money supply increases the overall liquidity of the economy. The increase in the liquidity raises the spending power of investors which results into higher demand for stocks. This results into upward movement of stock prices.

Inflation also significantly affects the stock market. It is argued that rise in inflation makes input prices higher and as a result consumers consume less (Al-Sharkas, 2004; Naik, 2013). This decrease in consumption results in the decline in firm's revenue and profits. High inflation is also linked with economic slowdown. Thus, inflation can be negatively linked to stock prices. For foreign currency exchange rate, the effect on the stock market can be either



Source(s): Adapted from Dua (2020)

Figure 1.
The monetary policy transmission in India through the interest rate channel

positive or negative. For an export dominant economy, a weak domestic currency against foreign currency is beneficial. A weak domestic currency is linked with increase in exports as the exported goods becomes cheaper internationally. This can boost economic growth as well as firm's profitability. However, for an import dominant nation, weak domestic currency in relation to foreign currency has adverse effect on the economy. A weak domestic currency implies higher cost of foreign inputs. With high cost of foreign inputs, the earnings and profitability of firms gets adversely affected. The economic growth of a nation can also be stunted.

The Indian stock market has experienced multiple upheavals since the 1991 fundamental reforms. Since 1991, the Indian stock market has seen foreign institutional investors enter, the Harshad Mehta scandal, panic selling as a result of the Kargil War of 1999, the global financial crisis of 2007–2008, post-financial crisis bull run, bull run during pre- and post-2014 general elections, demonetization and the implementation of the Goods and Services Tax. Given the above discussion, it is worth looking at the dynamic relationship between monetary variables and the Indian stock market over this time period. The study considers four monetary variables, namely interest rate, foreign exchange rate, inflation and monetary expansion, i.e. money supply. Using advanced econometric approaches, this study examines the link between the Indian stock market and selected monetary variables from January 1993 to December 2019. The research spans a long period of time, which the majority of past research has ignored. Furthermore, in the autoregressive distributed lag-error correction model (ARDL-ECM) regression model, different dummy variables are used to indicate structural breaks.

The remaining of the study is prepared as follows: section 2 contains the literature review, section 3 has the data and econometric techniques used in the investigation, section 4 contains the study findings and section 5 concludes.

2. Literature review

Over the last four decades, the relationship between monetary variables and stock prices has been widely researched. This section summarizes the findings of previous investigations.

Laopodis (2010) used the VAR methodology to study the dynamic links between the federal funds rate and the US stock market from 1970 to 2004. In comparison to the 1970s and 1980s, they noticed a divergence between Fed rates and market movements in the 1990s. Further analysis revealed that monetary policy change had asymmetric effects on the stock market, and that such interventions were more tumultuous during bear markets than during bull markets. Okpara (2010) observed that monetary policy had a strong impact on Nigerian stock returns. The author advised the government to avoid raising interest rates since it would deter capital from flowing into the Nigerian stock market. Money supply, industrial production, exchange rate and short-term interest rate all have a positive impact on stock prices in Japan, according to Mukherjee and Naka (1995), whereas long-term interest rate and inflation have a negative impact. Apergis and Eleftherion (2002) looked at the dynamic link between stock returns, inflation and interest rates in Greece, and found that only inflation had a substantial negative impact on stock returns. Lu, Metin IV, and Argac (2001) documented that the impact of monetary growth and interest rates faded as the Turkish market matured and foreign currency prices regained their expected significance.

Mookerjee and Yu (1997), on the other hand, were unable to establish a link between inflation and stock returns in the Chinese stock market. Patra and Poshakwale (2006) investigated the effects of the exchange rate, money supply, trading volume and inflation. Zare (2017) investigated the relationship between macroeconomic variables and the Iranian Stock Exchange using an autoregressive distributed lag model. They concluded that interest

rates hinder stock returns in Iran, whereas domestic credit to the private sector, foreign currency exchange rates and inflation propel returns. Using the Johansen cointegration test and a vector error correction model, Gachunga and Kuso (2019) explored the macroeconomic determinants of stock returns in Kenya. The findings revealed that during the study period, macroeconomic indicators and the Kenyan stock market were cointegrated. The study also found that money supply has a negative impact on Kenyan stock prices, while exchange rates and short-term interest rates had a favourable impact. In Kenya, unexpected inflation was found to play no role in predicting stock returns. Using the unit root test, Johansen cointegration test, vector error correction model (VECM), impulse response function and variance decomposition, Al-Majali and Al-Assaf (2014) explored the long-run and short-run relationship between stock market index and important macroeconomic indicators performance in Jordan. The study's findings revealed that stock market performance and macroeconomic variables have a long-run equilibrium relationship. It was also discovered that the stock market index and the consumer price index, as well as credit to the private sector and the weighted average interest rate on time deposits, had a bi-directional long-run link.

In the Indian context, Naik (2013) used Johansen cointegration test, VECM and Granger causality test to investigate the effect of short-run interest rate, industrial production, money supply, inflation and exchange rate on the stock market index. The author observed that inflation adversely affect the stock market index while money supply has a positive influence on the index. In another empirical study, Giri and Joshi (2017) observed that the macroeconomic forces were cointegrated with the performance of Indian stock market. Their study further revealed that inflation, exchange rate and economic growth positively affected the stock market performance. Based on the results of variance decomposition analysis, the authors concluded that the development of stock market in India is explained by its own shocks. In a recent study, Bhattacharjee and Das (2021a) found that exchange rate money supply and inflation significantly affect the Indian stock market. They also observed feedback mechanism between exchange rate and Indian stock market performance.

The empirical finding on the monetary variables' impact on the stock market is conflicting. In addition, past research has demonstrated that the relationship between monetary variables and the stock market changes over time. As a result, we investigate the relationship between the two variables in this study utilizing advanced econometric methods and approaches across a longer period of time. The study's findings will reveal important details on the dynamic relationship between monetary variables and the performance of the Indian stock market. From January 1993 to December 2019, we considered the study period for this study. This time period encompasses the Indian economy's significant developments (i.e. deregulation, internationalization and privatization).

Based on the economic theories and empirical literature, the following hypothesis can be formulated:

H1. There is no significant relationship between money supply and the Indian stock market in both long run and short run.

H2. There is no significant relationship between interest rate and Indian stock market in both long run and short run.

H3. There is no significant relationship between inflation and the Indian stock market in both long run and short run.

H4. There is no significant relationship between foreign currency exchange rate and stock market in India.

3. Data and methodology

3.1 Data

The impact of monetary policy and foreign currency exchange rates on the Indian stock market is investigated in this study. From January 1993 to December 2019, the study used monthly observation. The Bombay Stock Exchange Sensitive Index represents the Indian stock market (SENSEX). The interest rate is proxied using the weighted average call money rate (WACR). The narrow money supply (M1) is used to measure the economy's money supply, while the wholesale price index is used to gauge inflation (WPI). The INR–USD exchange rate is utilized as a proxy for the foreign currency exchange rate. The data for the stock market come from the BSE website, while the data for other macroeconomic factors derive from the Reserve Bank of India's (RBI) database. For the purpose of the analysis, the variables are log-transformed and the econometric analysis is conducted with the help of EViews software.

3.2 Methodology

The study is empirical in nature and applied the ARDL model. We have deployed the Bai–Perron test for multiple structural breaks in order to explore the presence of structural breakpoints in the stock market data. The structural breakpoints will be considered in the regression model for further analysis. Incorporating the structural breaks identified by the Bai–Perron multiple breakpoint test will help in building a stable model. For determining the stationarity status of the time series variables we have applied the augmented Dickey–Fuller (ADF) unit root test. The unit root tests are executed prior to the ARDL test. Further, the ARDL test is sensitive to the selection of optimal lag length, and thus, it is also determined prior to the estimation. The optimal lag length is determined on the basis of Schwarz information criterion (SIC).

Following the research of Shin and Pesaran (1999) and Pesaran, Shin, and Smith (2001), the ARDL model can be specified by the following equation:

$$\Delta y_t = \alpha_0 + \sum_{i-1}^{p} \beta_i \Delta y_{t-i} + \sum_{i=1}^{p} \delta_i \Delta x_{t-i} + \sum_{i-1}^{p} \varepsilon_i \Delta z_{t-i} + \lambda_1 y_{t-1} + \lambda_2 x_{t-1} + \lambda_3 z_{t-1} + \mu_t \quad (1)$$

where α and μ are the constant term and error term, respectively. β, δ and ε are the short-run dynamics, while λ_1, λ_2 and λ_3 corresponds to the long-run relationship.

The ARDL analysis is divided into two parts. The cointegration of the variables, using *F*-bounds test, and the long-run effect of the independent variables on the dependent variable are computed in the first step. The error correction model is performed in the second step, using the least square technique, to determine the time period during which the deviation in the dependent variable is removed and to reflect the short-term effect of independent variables on the dependent variables.

We also deploy pair-wise Granger causality test to determine the direction of causality in the short run. This test is a statistical hypothesis test that determines whether one time series is helpful in predicting another. If there is uni-directional causality from X to Y, it means that X increases the prediction of Y. Uni-directional causality from Y to X suggests Y increases the prediction of X, while bidirectional causality indicates that X increases the prediction of Y and vice-versa. The general form of pair-wise Granger causality test (proposed by Granger (1969)) can be written in the following manner:

$$Y_t = \sum_{i=1}^{n} \alpha_i Y_{t-1} + \sum_{j=1}^{n} \beta_j X_{t-j} + \mu_{1t} \quad (2)$$

$$X_t = \sum_{i=1}^{n} \omega_i X_{t-1} + \sum_{j=1}^{n} \delta_j Y_{t-j} + \mu_{1t} \quad (3)$$

4. Empirical findings

The Bai–Perron test detects four breakpoint dates (December 2005, March 2014, May 1999, and December 2009). The breakpoint in December 2005 corresponds to the Ambani brothers' settlement. The settlement boosted the SENSEX to cross the 7,000 mark. The breakpoint on March 2014 coincides with the Indian general elections where NDA registered a historic win. The breakpoint on May 1999 coincides with the Kargil War between India and Pakistan, and the breakpoint on December 2009 coincides with the bull run post global financial crisis. We have captured the breakpoint dates with the help of binary dummy variables and incorporate them into the ARDL regression model. Our later analysis unravels the long-run and short-run impact of the breakpoints on Indian stock market. The stationarity status of the variables must be determined before selecting the suitable time series model. The vector autoregressive model (VAR) is useful to explore the relationship between Indian stock market and monetary variables if the variables are determined to be stationary at the level. The Johansen cointegration test is the proper technique to explore the linkage between the variables when the variables are integrated of order 1. When the variables are integrated in a mixed order, however, the ARDL model is fit.

The results of the ADF unit root test at the level and at the first difference are shown in Table 1. The null hypothesis that the variable has a unit root in levels cannot be rejected for any of the time series variables except the interest rate, as shown in the table (INT). SENSEX, MS, INF and EXR, on the other hand, are stationary at first-difference. The ADF results indicate that the variables are mixed order integrated, i.e. SENSEX, MS, INF and EXR are I(1), while INT is I(2) (0). Thus, the ADF results support the ARDL application for further analysis.

We determined the appropriate lag length based on SIC, as mentioned earlier in the paper (see Table 2). The optimal lag, according to the SIC, is one month. Tables 3–5 show the findings of the ARDL test, the *F*-bounds test, long-run coefficients and short-run dynamics, respectively.

According to the *F*-bounds test, if the computed *F*-statistic is greater than the upper bound critical value, the variables in the study are cointegrated. We can conclude that there is no cointegration between the variables if the calculated *F*-statistic is less than the lower bound critical value. If the estimated *F*-statistic lies between the upper bound critical value and the lower bound critical value, the cointegration is inconclusive. Table 2 demonstrates that the estimated *F*-statistic (3.582029) is more than the upper bound critical value at the 5% level of significance (3.15). As a result, the stock market index and monetary variables are cointegrated. In simpler terms, it can be said that there is a long-run equilibrium linkage between the Indian stock market and monetary variables.

		SENSEX	MS	INT	INF	EXR
ADF unit root test (at level)	*t*-statistic	−2.22	−1.50	−4.55***	−1.74	−1.86
	p-value	0.4718	0.8253	0.0014	0.7271	0.6712
ADF unit root test (first-differenced)	*t*-statistic	−17.09***	−5.55***	–	−11.82***	−16.14***
	p-value	0.0000	0.0000	–	0.0000	0.0000

Note(s): *** denotes significance at 1% level
Null Hypothesis: the variable has a unit root

Table 1. ADF unit root test (with constant and trend)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1270.509	NA	2.41e−10	−7.958524	−7.659306	−7.838949
1	3086.799	3516.524	2.57e−15	−19.40447	−18.80603*	−19.16532*
2	3129.152	80.64665	2.30e−15	−19.51535	−18.61770	−19.15662
3	3159.974	57.70396	2.22e−15*	−19.55255*	−18.35568	−19.07425
4	3182.310	41.10383	2.26e−15	−19.53552	−18.03944	−18.93765
5	3203.770	38.80645	2.32e−15	−19.51290	−17.71760	−18.79546
6	3216.480	22.57777	2.51e−15	−19.43438	−17.33985	−18.59735
7	3237.272	36.27075	2.58e−15	−19.40749	−17.01375	−18.45089
8	3264.745	47.04574*	2.55e−15	−19.42329	−16.73033	−18.34712

Table 2.
Lag order

Note(s): * denotes lag selected by the criterion, for AR root graph refer to Figure A1 in Appendix
Source(s): Author's calculation

Null hypothesis: no levels relationship				
F-statistic	3.582029	10%	5%	1%
Critical values	Lower bound	1.85	2.11	2.62
	Upper bound	2.85	3.15	3.77

Table 3.
F-bounds test

Source(s): Author's calculation

Variable	Coefficient	Standard error	*t*-statistic	*p*-value
MS	0.239	0.647	0.369	0.7117
INT	−0.429	0.202	−2.122**	0.0346
INF	1.088	1.654	0.657	0.5111
EXR	−1.489	0.742	−2.006**	0.0457
D1	0.557	0.281	1.981**	0.0484
D2	0.566	0.225	2.508**	0.0126
D3	−0.006	0.234	−0.028	0.9777
D4	0.163	0.249	0.653	0.5138
C	7.017	3.392	2.068**	0.0394

Note(s): **denotes significance at 5% level, D1 denotes dummy variable for December 2005, D2 denotes dummy variable for March 2014, D3 denotes dummy variable for May 1999 and D4 denotes dummy variable for December 2009
Source(s): Author's calculation

Table 4.
Long-run coefficients

The long-run coefficients of interest rate (INT) and foreign currency exchange rate (EXR) are negative and statistically significant at 5% level. The coefficient of interest rate is −0.429 which implies that 1% increase in relative interest rate leads to 0.429% decrease in SENSEX. The coefficient of foreign currency exchange rate is −1.489 which implies that 1% depreciation in INR against USD leads to 1.489% decrease in SENSEX. The long-run coefficients for dummy variables for December 2005 and March 2014 are positive and statistically significant at the 5% level. The coefficient of dummy variable for December 2005 is 0.557, while the coefficient of dummy variable for March 2014 is 0.566. The size of the coefficients implies that the structural change triggered by 2014 general elections where NDA registered a historic win have a greater positive impact on the Indian stock market as compared to the structural change due to the Ambani brothers settlement. The long-run coefficients of all other variables involved in the present study are found to be insignificant.

Dependent variable: SENSEX Variable	Coefficient	Std. error	*t*-statistic	Prob.
D(LNSENSEX(−1))	0.079	0.056	1.401	0.1621
D(LNMS1)	0.014	0.120	0.123	0.9021
D(LNINT)	−0.028	0.012	−2.317**	0.0211
D(LNWPI)	−0.669	0.533	−1.254	0.2106
D(LNEXR)	−1.539	0.176	−8.740***	0.0000
D(LNEXR(−1))	−0.002	0.196	−0.010	0.9913
D1	0.003	0.010	0.290	0.7715
D2	−0.003	0.011	−0.342	0.7325
D3	0.170	0.060	2.814***	0.0052
D3(−1)	−0.173	0.060	−2.864***	0.0045
D4	0.0006	0.012	0.051	0.9591
C	0.015	0.007	1.974	0.0492
ECT(−1)	−0.075	0.023	−3.142***	0.0018

Robustness check	Test statistic
Normality	3.8587 (0.145)
Serial correlation	1.935 (0.1461)
ARCH	0.351 (0.5536)
Ramsey RESET	1.1629 (0.2817)

Note(s): *** and ** denote significance at 1% level and 5% level respectively
Source(s): Author's calculation

Table 5.
Short-run dynamics

As far the short-run coefficients are concerned, we find that interest rate, foreign currency exchange rate and the dummy variable for May 1999 adversely affects the Indian stock market. The coefficient of interest rate is −0.028% which implies that 1% increase in WACR depresses the foreign currency exchange rate by 0.028% in the short run. The coefficient of foreign exchange rate is found to be −1.539 signifying that 1% depreciation in INR–USD exchange rate depresses the Indian stock market by 1.539%. From the results, H2 and H4 can be rejected.

From the output of Granger causality test (see Table 6), it can be observed that there is a unidirectional causality from interest rate (INT) to Indian stock market index (SENSEX), money supply (MS) to interest rate (INT) and foreign currency exchange rate (EXR) to interest rate (INT).

From the output of Granger causality test (see Table 6), it can be observed that there is a unidirectional causality from interest rate (INT) to Indian stock market index (SENSEX), money supply (MS) to interest rate (INT) and foreign currency exchange rate (EXR) to interest rate (INT). What should we make of the study's results now? The significant negative relationship between the interest rate and the Indian stock market index suggests that monetary policy, as measured by the weighted average call money rate, has an impact on the stock market in India. When the RBI raise the repo rate, future cash flows become less valuable in today's INR, diminishing the intrinsic value of companies. Higher interest rates in the T-bill and bond markets reflect rise in the repo rate. The increase in interest rates in the T-bill and bond markets drive investors to bonds and T-bills. As a result, stock market investors substitutes bonds and T-bills for their portfolios, causing stock prices to decrease. Another important finding that has emerged from the present study is the negative relationship

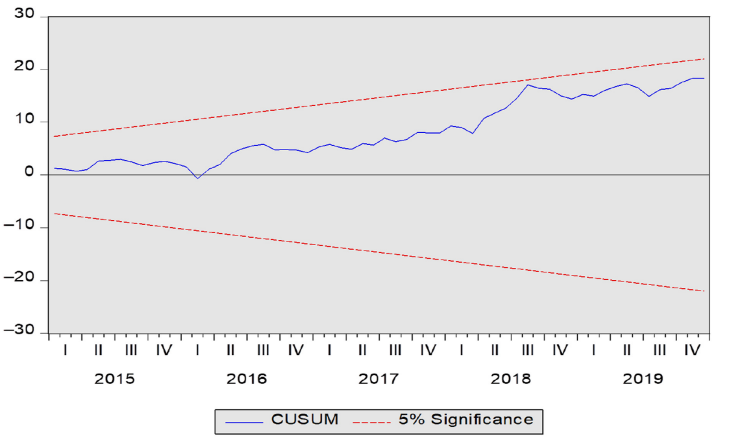
Null hypothesis	Obs	*F*-statistic	*p*-value
MS does not Granger Cause SENSEX	319	0.546	0.4603
SENSEX does not Granger Cause MS		0.091	0.7629
INT does not Granger Cause SENSEX	319	3.064*	0.0810
SENSEX does not Granger Cause INT		0.003	0.9526
EXR does not Granger Cause SENSEX	319	2.067	0.1515
SENSEX does not Granger Cause EXR		0.064	0.7991
INT does not Granger Cause MS	319	0.011	0.9133
MS does not Granger Cause INT		3.506*	0.0621
EXR does not Granger Cause MS	319	0.122	0.7263
MS does not Granger Cause EXR		0.592	0.4422
EXR does not Granger Cause INT	319	4.359**	0.0376
INT does not Granger Cause EXR		2.082	0.1499

Note(s): ** and * denote significance at 5% level and 1% level, respectively
Source(s): Author's calculation

Table 6.
Pair-wise Granger causality test

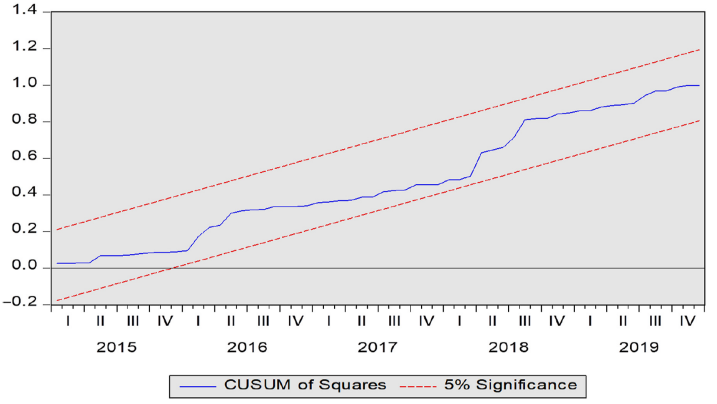
between foreign currency exchange rate, proxied by INR-USD exchange rate and Indian stock market index. The negative linkage is not surprising as India is an import-oriented economy and heavily relies on foreign inputs for production. The cost of imports of foreign inputs increases as INR becomes weak against USD. This increase in foreign inputs negatively affects the firm's earnings and profitability and thus, adversely affecting the stock prices.

We used a number of robustness checks to see if the ARDL model's residuals are (1) normally distributed; (2) homoscedastic and (3) not serially correlated. To determine the stability of the long-run and short-run parameters, we used CUSUM and CUSUM of squares plots. Table 5 summarizes the findings of the residual diagnostic checks. The residuals have a normal distribution, no serial correlation and are homoscedastic, according to the results (i.e. have equal variance). The Ramsey RESET test confirms that the model's functional form is accurate. The CUSUM (refer to Figure 2) and CUSUM of squares (refer to Figure 3) lines (shown in blue) remain inside the 5% critical boundaries, showing that the long-run and short-run parameters are stable and reliable. The robustness checks suggest that the model is fit for policy recommendation.



Source(s): Author's Calculation

Figure 2.
CUSUM plot



Source(s): Author's Calculation

Figure 3.
CUSUM of squares

The results of Granger causality test show the predicting ability of variables involved in the study. We find that interest rate (with 1 lag) has the ability to predict Indian stock market index. We also find that money supply and interest rate has the ability to predict interest rate and exchange rate, respectively.

5. Concluding remarks

The present study investigates the long-run and short-run effect of monetary variables (money supply, interest rate, inflation and foreign currency exchange rate) on Indian stock market index, proxied here by BSE SENSEX. The study used monthly observation from January 1993 to December 2019 and employed ARDL test and pairwise Granger causality test for the analysis of data. Before deploying the ARDL framework, we have applied the Bai–Perron test for multiple structural breaks in order to explore the presence of structural breakpoints in the stock market index. The Bai–Perron test identifies four breakpoint dates (December 2005, March 2014, May 1999 and December 2009) and included the same in the regression model. In the next stage of the analysis, we have employed ADF unit root test to determine the stationarity status of the variables. The results of the ADF unit root test showed that the stock market index, money supply, inflation and foreign currency exchange rate are integrated of order 1, while interest rate, proxied by weighted average call money rate, is integrated of order 0.

The noteworthy findings of the ARDL test are as follows: (1) we found that the Indian stock market index and the selected monetary variables are cointegrated, i.e. a long-run equilibrium relationship exists between them. This finding is supported by the research works of Al-Majali and Al-Assaf (2014), Zare (2017), Giri and Joshi (2017) and Gachunga and Kuso (2019); (2) interest rate and foreign currency exchange rate showed a negative effect on Indian stock market index both in the long-run and short-run. The results are consistent with the findings of Zare (2017) and Bhattacharjee and Das (2021a); (3) we found that structural change triggered by the settlement between Ambani brothers in 2005 and positive sentiments during pre- and post-2014 general elections positively influence the Indian stock market and d) we found negative effect of the 1999 Kargil War on Indian stock market in the short run. The pair-wise Granger causality test revealed that interest rate has the ability to predict the Indian stock market index. Investors and portfolio managers should consider monetary variables in their long-term investment strategies, according to the findings of the study. Since the flow of funds to the stock market will be disturbed, the government, through the

Reserve Bank of India, should be cautious in avoiding discretionary policies that could raise interest rates. Investors should keep a close watch on the changing trend of foreign exchange rate and interest rate to prevent risk. Furthermore, the Indian stock market index's lag response to changes in domestic monetary factors demonstrates the Indian stock market's informational inefficiency.

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Further reading

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Appendix

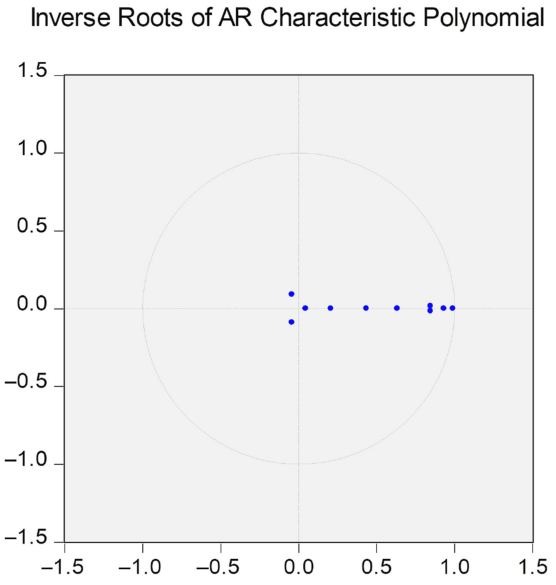

Figure A1.
AR root graph

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