

An Empirical Analysis of Impact of Macroeconomic Variables on Indian Stock Market



P.Radha, N.Gopinathan

Abstract: This research paper, using monthly returns of macroeconomic variables, Nifty, and stock price from 3 sectors, examines the impact of macroeconomic determinants on Nifty and banking sector stocks from May 2009 to July 2018. The paper also analyses the granger cause between macroeconomic variables and Nifty; macroeconomic variables and Indian banking sector stocks. This paper also extends the research work in finding out the impact before and during Narendra Modi government. Johansen's co-integration and granger causality tests were applied for this research work. The results of Johansen's co-integration proved that there is a long relation between selected macroeconomic factors, i.e. bank rate, repo rate, and reverse repo rate, and Indian stock market and also on banking sector share price. There is granger cause before Modi Government and during Modi Government. It is concluded that, a positive significant relationship exists between macroeconomic determinants and Indian stock market.

Index Terms: Banking Sector, CNX S&P Nifty, Granger Causality, Macroeconomic Factors.

I. INTRODUCTION

In the phase of growing industrial sector and commerce, stock plays a crucial role which ultimately affects a country's economy. The stock market acts as an intermediary between the industries and the investors. It intends to benefit both the parties. It provides long-term capital to the industries. Thereby industries expand their business and the investors will have various investments avenues. Further this positively impacts their wealth by investing surplus funds. The investors while investing their surplus funds observe the fluctuations in stock market by focusing on the indices available in the country and globally. The index returns are considered to be a bench mark to the investors to compare their portfolio returns, and also to predict the future movements in the market.

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The fluctuations in the stock prices will largely affect the economy of a country, and this in turn influences the future prices of the stock and investment decisions of the participants. It is evidently proved that stock market is greatly influenced by domestic economic variables.

Domestic economic factors may change due to the existing policies adopted in the economy and through global economies actions.

Exchange rate, stock prices in the international financial system and interest rates are the regular outside factors which influence the stock returns. For example, capital flows into the country are influenced by the interest rates followed by both domestic and global economies. Recently, Wall Street faced severe loss due to rapid increase in borrowing costs in U.S. Another example, depreciation of Indian currency against Dollar also showed negative impact on domestic market. Above examples reveal that, stock market has significant relationship with internal and external economic factors. This relationship can be a lead or lag. Lead relationship implies stock market leads economic factors, and lag relationship indicates economic factors lead the stock market. The present study intends to study the relationship between selected macroeconomic variables, i.e. Bank Rate, Repo rate & Reverse Repo Rate, and Indian Stock Market.

This paper acts as a useful tool to the investors to recognise the focus of macroeconomic determinants that they need to consider before investing. The research primarily focus on three macroeconomic determinants, i.e. Bank Rate, Repo rate & Reverse Repo Rate; Nifty as a reflection of Indian stock market and stock prices from Indian Banking Sector. Augmented Dickey Fuller (ADF) Unit Root test was applied to check stationarity among the variables. Further, to examine the existence of long run relation among the selected macroeconomic variables and Indian stock market, Johansen's co-integration model was applied.

II. OBJECTIVES

- To study the impact of macroeconomic variables on select banking securities from Indian stock market.
- To analyze long run relationship between macroeconomic variables and selected banking sector stocks.
- To observe the causal relationship between macroeconomic factors and stock prices.

III. EMPIRICAL LITERATURE

There are few popular studies available depicting the impact and relationship between macroeconomic factors and stock prices. The studies enumerate different stock exchanges like National Stock Exchange, Bombay Stock Exchange, Karachi Stock Exchange, Stockholm Stock Exchange. Few remarkable works of eminent researchers are outlined below; Atsuyuki Naka, David Tufte (2006), studied the impact of money supply, index of industrial production, money market rate, and consumer price index on Bombay Stock Exchange. This study incorporated Vector Error Correction Model, co-integration tests and coefficient of co-integration tests. Analysis of this study indicates that industrial production is positively correlated with stock prices, whereas inflation is negatively correlated with Indian stock prices. It was also found that Indian stock market had shown a downward trend which is not caused by publicly available variables. Due to negative trend, during post reform period, the stock market had declined by 25%.

L.M.C.S. Menike (2006), used monthly data from 1991 to 2002 on variables like money supply, inflation rate, exchange rate, interest rate and Colombo Stock market. Exchange rate is highly influenced on Colombo Stock Exchange than other variables. High negative relation subsists between macroeconomic variables than positive relation. For 10 companies, money supply was positively significant and negatively significant for 5 stocks. Interest rate had shown negative impact on 14 stocks and positive impact on 2 stocks. Inflation had negative effect on 15 stocks and positive effect on 3 stocks. Exchange rate had negatively influenced 12 stocks, whereas positive influence on 10 stock prices.

Shahid Ahmed (2008), investigated the causal relationship between Indian stock market and macro economic variables. Sensex and Nifty are proxies for Indian stock market, and selected macro economic variables are interest rate, index of industrial production, exchange rate, foreign direct investment, exports and money supply. The period of study is from 1995 to 2007 on quarterly basis. To know long run relation, Johansen's co-integration test was applied. The results proved that export-Nifty, exchange rate-Nifty and interest rate-Nifty have no co-integration. FDI-Nifty depicts a long run relation. Money Supply-Nifty, Nifty-index of industrial production is also having long run relation under varying assumptions. Same results shown for Sensex and macro economic variables except for FDI-Sensex, as this disclosed no long run relation. Toda and Yamamoto Granger causality test proved that, there is no bidirectional between index of industrial relation and Nifty, exchange rate and Nifty. There are unidirectional between Nifty and Exports, interest rate and Nifty, FDI and Nifty.

Sagarika Mishra, Harminder Singh (2010), by taking monthly data from 1998 to 2008 to test whether Indian stock market is driven by macroeconomic variables. The macroeconomic factors considered for this study are exchange rate, industrial production, foreign institutional investment, interest rate and inflation. The study was conducted to find the relationship between Indian stock market, and selected macroeconomic variables, and also volatility. Non-parametric and semi-parametric tests were applied. Industrial production had shown significance towards volatility, but FII had shown positive significance only towards Sensex volatility. It also found that if interest rate goes beyond 6%, both Sensex and

Nifty volatility went up. If inflation goes beyond 10%, only Nifty volatility went up.

Pramod Kumar Naik, Puja Padhii (2012), had employed ADF unit root test, VAR, Johansen's Co-integration test, VECM and Granger Causality test to find the effect and relation between Indian stock market and revisited stock prices. The data were collected from 1994 to 2011 on monthly basis. Index of industrial production, exchange rate, treasury bills, wholesale price index and money supply are included in macroeconomic fundamentals. Results prove that industrial production and money supply impact positively the stock prices whereas stock prices are insignificant with inflation. There is an insignificant relation between Treasury bill rate & exchange rate and stock prices. By administering Granger Causality test, long run relation exists between macroeconomic variables and stock prices.

Samveg Patel (2012) in a study explored the relationship of macroeconomic variables on Indian stock market. The selected macroeconomic factors are interest rate, oil prices, exchange rate, money supply, gold price, index of industrial production & silver prices. The study period was from January 1991 to December 2011. The data were collected on monthly basis for the same period. To test the relationship, various tools like Augmented Dickey Fuller Unit root test, Vector Error Correction Model Granger Causality test and Johansen Co-integration test were used. The results proved that there exists a long run relation between selected macroeconomic variables and Sensex & nifty. By applying Granger Causality test, it was identified that exchange rate granger causes Sensex and Nifty. Indian stock market indices granger causes oil prices & index of industrial production.

Joseph Tagne Talla (2013) in a study verified the relationship between macroeconomic variables and Stockholm Stock Exchange. The selected macroeconomic factors for the study are consumer price index, exchange rate, call money rate and money supply. Monthly data were collected from January 1993 to December 2012. The results proved that Consumer price index and exchange rate had negative impact on stock price. Money supply had shown a positive impact on stock price. Granger causality test was applied and it has revealed that there is no unidirectional or bidirectional relation between variables and stock price except for inflation. Consumer price index granger causes stock prices.

Muhammad Arshad Haroon, Hummera Jabeen, (2013), in their research established the relationship between macroeconomic fundamentals and Karachi Stock Index. Inflation and interest rates are the two macroeconomic factors for this study. 3-month, 6-month and 12-month Treasury bill rates were proxies as interest rate and wholesale price index, consumer price index and sensitive price index are proxies as inflation rate. The data for the study consists of a period from 2001 to 2010. Regression analysis and correlation tests were used for this study, and it was concluded that macroeconomic variables had significant relation with Karachi Stock Exchange. Further, the study assessed that Treasury bill rates had significant effect on the exchange.

A research study was carried out by Ahmed Imran Hunjra et al (2014), on the effect of interest rate, GDP, inflation rate and exchange rate on Pakistan Stock Exchange. To support this research, data were collected from 2001 to 2011.

By applying Augmented Dickey Fuller Unit Root test, all data is stationary at first level of difference. Granger Causality tests revealed GDP, exchange rate, inflation rate and interest rates were in-significant relationship with Pakistan Stock Exchange. Johansen's Co-integration test proved that there is long run relationship between macroeconomic determinants and Pakistan Stock Exchange and no existence of short run relationship.

Afrin Rifat (2015), tested the evidence of impacting of monetary policies on Dhaka Stock Exchange. Discount rate of Bangladesh and consumer price index are taken for the study as macroeconomic determinants from January 2003 to December 2013. The results showed no significant relationship between Bangladesh Stock market and monetary policies.

Mahmoud Ramadan Barakat, Sara H.Elغازar & Khaled M.Hanafy (2016), tested the relationship of macroeconomic indicators with Egypt and Tunisia stock market. Macroeconomic factors which are selected for the study are deposit rate, CPI, money supply and exchange rate. The period of the study is from 1998 to 2014. Johansen co-integration test proved that there is a long run relationship between macroeconomic variables and two stock markets. On the other hand, Granger Causality test showed that there are unidirectional Granger Cause between interest rate and Egypt. However, bidirectional relationship exists among exchange rate, money supply and EGX 30. A Granger Cause running from EGX 30 to CPI. Bidirectional relationship exists between interest rates and Tunisian Stock Market. There is no Granger Cause between CPI and TUNINDEX. But unidirectional relationship exists between exchange rate and Tunisian Stock Market.

Adedoyin IsolaLawala, Russell Olukayode Somoye et al (2017), have examined the relationship between monetary & fiscal policies and Nigerian Stock Market. Monthly data were used from January 1985 to December 2015. The variables that are considered for this study are consumer price index, money supply, real gross domestic product, exchange rate, interest rate, and government expenditure. The results proved that monetary-fiscal policies have long run relationship between macroeconomic factors and Nigerian Stock Market.

Slah Bahloul, Mourad Mroua and Nader Naifar (2017), analyzed the impact on Islamic stock market by considering certain macroeconomic determinants such as inflation rate, yield curve, money supply and interest rate. The results revealed that there is no impact of interest rate, yield curve and inflation on Islamic stock market. It also explains, investors' behavior plays key role on Islamic stock market than macroeconomic fundamentals. Granger Causality test was also applied and revealed that all the selected variables except conventional stock market return has granger cause on Islamic stock market.

Vuong Quoc Duy and Le Long Hau (2017) studied the effect of Vietnam stock market by macroeconomic variables from 2006 to 2015. Money supply, exchange rate, and consumer price index are macroeconomic variables selected for the study. Vector Error Correction Model had proved macroeconomic variables had effect on Vietnam stock market. It had shown that stock market prices increased due to increase in money supply and other economic activities. But increase in inflation leads to decline in economy which in turn reduced the stock price. The raise in exchange rate results in

changes in the cash flows which lead to decrease in stock price.

The reviews discussed above reveal that there are very negligible studies in this area of study. The studies on macroeconomic factors in relation to their impact on nifty or stock exchanges are assessed to be usual but there are no studies identified with regard to the studies conducted on macro economic factors influence on banking industry stocks. This article compares the significant relationship of the above variables before and during Modi Government.

IV. DATA AND METHODOLOGY

Monthly data is used to conduct the research in finding the significant relationship between macroeconomic variables and Indian Stock Market from May 2009 to July 2018. This period has been divided into two parts. Before Modi government period i.e. from May 2009 to July 2013 and during Modi government period i.e. from May 2013 to July 2018. Macroeconomic factors include Bank rate, Repo rate, and Reverse repo rate. CNX Nifty is considered as a reflection from Indian stock market. This study also extended in finding the relationship of these variables on stock prices from banking industry. As of 2018, out of 51 sectors listed in NSE, Banking industry has the highest market capitalization. So, the study focused on banking sector stocks especially on private banks. The private bank which fulfills all the criteria that corporate actions like stock split and mergers and acquisitions should not undergo and availability of stock price during the study period, are selected for research. Out of 19 private banks listed in NSE, only 7 banks got eligibility. The banks selected were IndusInd Bank, Karnataka Bank, Lakshmi Vilas Bank, City Union Bank, DCB Bank, Dhanlaxmi Bank and IDBI Bank . The data was collected from official website of RBI and NSE.

Rationale for Using CNX S&P Nifty and Macroeconomic variables

Bank Rate

Bank rate is the interest rate on the funds lending by Reserve Bank of India to its Commercial Banks. Higher bank rate will lead to increase in lending rates by commercial banks to corporate. This in turn will have an impact on the cash flows of the companies and its stock price. This will also result in money circulation in the economy.

Repo Rate

Recently in October 2018 as in article released by Business Standard, most of the experts expected to raise repo rate by 25 bps by RBI and it showed a large fluctuation on Indian stock. Due to this reason, Nifty has fallen 2.7% i.e. 283 points. But RBI, remained the repo rate unchanged.

Reverse Repo rate

It is the rate at which commercial banks lend their surplus cash with RBI for shorter period. This is the way where commercial banks can increase their interest income instead of keeping their funds ideal. A rise in inflation rate in the economy, it motivates the bank to invest with RBI to earn higher returns. This leads to deficit of funds to provide loans to their customers, which reduces the purchasing power of public. So, reverse repo rate has indirect relation with money supply.

Nifty

Nifty is a basket of 50 stocks from 12 different sectors. Market capitalization had tremendously increased from 1994-1995 i.e. 158181 crores to 2018-19 i.e. 8140887 crores. There is a growth of 50.47% during last 24 years. It is used as a benchmark for various purposes like portfolios, index funds and index based derivatives. Nifty covers about 65% of total float-adjusted market capitalization from NSE.

V. HYPOTHESES

- H₀: There is no causal relationship exists between Bank Rate, Repo Rate and Reverse Repo Rate and Indian stock market.
 - H₁: There is causal relationship exists between Bank Rate, Repo Rate and Reverse Repo Rate and Indian stock market.
 - H₂: There is positive impact of selected macroeconomic variables on Indian stock market.
- H₃: There is long run relationship exists Bank Rate, Repo Rate and Reverse Repo Rate and Indian stock market.

VI. EMPIRICAL FINDINGS

Augmented Dickey Fuller Unit Root Test was applied to test the stationarity. Depending on the time, mean and variance may change. The term stationarity means where mean and variance does not vary at a point of time. Table 1 verified whether there is stationarity for time series data which taken before Modi Government enters. It reveals that, at level, few variables are non-stationary at constant & constant and trend. Then stationary was checked at first difference, all the variables were found to be stationary.

Table 1: Augmented Dickey Fuller Unit Root Test

Variable	Level		First Difference	
	Constant	Constant and Trend	Constant	Constant and Trend
Bank Rate	-0.6134	-2.2778*	-6.1142*	-6.1203*
Repo Rate	-1.6687	-0.8659	-2.8198**	-2.8198**
Reverse Repo Rate	-1.6917	-0.7917	-2.4659**	-2.8872**
Indusind Bank	-0.3948	-2.5819*	-6.2814*	-6.1905*
Karnataka Bank	-2.2205*	-2.2966*	-5.1905*	-5.1358*
Lakshmi Vilas Bank	-2.4715*	-2.555***	-2.6723**	-2.842***
Cityunion Bank	-1.74	-2.1692*	-3.555**	-3.8264**
DCB Bank	-2.498**	-2.5123*	-5.2864*	-5.2714*
Dhanlaxmi Bank	-1.089	-2.8872*	-4.5723**	-4.5971**
IDBI Bank	-2.2365*	-1.4385	-5.0989*	-5.3641*
Nifty	-2.9254*	-2.8738	-7.5488*	-7.4806*

*: Significant at 1%. **: Significant at 5%. ***: Significant at 10%.

Table no.2 also verified whether there are stationary for time series data which was taken during Modi Government. At level, Karnataka Bank is stationary at 10% level of significance and IDBI Bank is stationary at 5% level of significance. To make all the variables stationary, first difference values are taken into consideration, where all the selected variables become stationary at 1%, 5% and 10% level of significance.

Table 2: Augmented Dickey Fuller Unit Root Test

Variable	Level		First Difference	
	Constant	Constant and Trend	Constant	Constant and Trend
Bank Rate	-1.3203	0.9618	-7.6844*	-4.1713**
Repo Rate	-1.7019	-0.5071	-7.5792*	-5.5192**
Reverse Repo Rate	-1.936	-1.0699	-7.0501*	-7.4102*
Indusind Bank	0.1542	-2.3611	-5.1361**	-5.1196**
Karnataka Bank	-3.22***	-3.244***	-4.933**	-4.973**
Lakshmi Vilas Bank	-1.677	-1.8634	-4.4184**	-4.5303**
Cityunion Bank	-0.8	-2.118	-3.2542**	-3.1871***
DCB Bank	-1.5312	-2.266	-3.122***	-3.0933***
Dhanlaxmi Bank	-1.977	-2.0875	-7.9692*	-7.9407*
IDBI Bank	-4.9899**	-5.4225**	-5.5545**	-5.504**
Nifty	-0.2761	-1.2191	-6.3245*	-6.3437*

*: Significant at 1%. **: Significant at 5%. ***: Significant at 10%.

Table 3 and table 4 shows analysis part of Johansen's Co-integration Test. This test was applied to identify whether long run relationship exists between macroeconomic determinants and Indian stock market and share price of banking sector stocks or not. The equation for Johansen's co-integration test was as follows:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \dots + \Gamma_{k-1} \Delta X_{t-k+1} + \Gamma_k X_{t-k} + \epsilon_t \quad (1)$$

$$\Gamma_i = -I + \Pi_1 + \dots + \Pi_i, i=1, \dots, k \quad (2)$$

Π_i indicates coefficient matrix and expresses the number of co-integrated vectors in the equation. Table 3 shows result of Johansen's Co-integration test before Modi Government and table 4 is during Modi Government. From table no.3, it can be inference based on trace test, at $r=0, r \leq 1, r \leq 2, r \leq 3$ and $r \leq 4$, null hypotheses is rejected as trace statistic value is higher than 5% critical value. In Maximum Eigen Value, at $r=0, r \leq 1$ and $r \leq 2$, alternative hypotheses is accepted as maximum Eigen value is higher than critical value at 5% significance level. From table no.4, it can be inference on the basis of trace test, at $r=0, r \leq 1, r \leq 2, r \leq 3, r \leq 4$ and $r \leq 5$, null hypotheses is rejected as trace statistic value is higher than 5% critical value. In Maximum Eigen Value, at $r=0$, alternative hypotheses is accepted as maximum Eigen value is higher than critical value at 5% significance level.



These results proved to be existence of long run relationship between selected macroeconomic variables and Indian stock market and also on banking industry in both the periods.

Table 3: Johansen's Co-integration Test

H0	Trace Statistic	5% Critical Value	Maximum Eigen values	5% Critical Value
r=0	446.3848*	285.1425	105.5256*	70.53513
r<=1	340.8592*	239.2354	102.2987*	64.50472
r<=2	238.5604*	197.3709	69.5875*	58.43354
r<=3	168.9729*	159.5297	41.5203	52.36261
r<=4	127.4526*	125.6154	35.3698	46.23142
r<=5	92.0828	95.7537	33.1027	40.07757
r<=6	58.9801	69.8189	23.4826	33.87687
r<=7	35.4975	47.8561	17.2128	27.58434
r<=8	18.2848	29.7971	11.0838	21.13162
r<=9	7.2010	15.4947	6.6593	14.2646
r<=10	0.5416	3.8415	0.5416	3.841466

Trace test indicates 5 cointegrating eqn(s) at the 0.05 Level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 4: Johansen's Co-integration Test

H0	Trace Statistic	5% Critical Value	Maximum Eigen values	5% Critical Value
r=0	310.7219*	239.235	68.15443*	64.505
r<=1	242.5674*	197.371	54.554	58.434
r<=2	188.0134*	159.53	46.08	52.363
r<=3	141.933*	125.615	37.221	46.231
r<=4	104.7122*	95.754	31.95	40.078
r<=5	72.76259*	69.819	28.435	33.877
r<=6	44.328	47.856	22.52	27.584
r<=7	21.808	29.797	13.91	21.132
r<=8	7.898	15.495	7.8705	14.265
r<=9	0.028	3.841	0.0276	3.8415

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table no.5 exhibits Granger Causality Test between macroeconomic variables and Indian stock market before Modi Government enters and table no.6 exhibits the same as above but during Modi Government. From both the tables, it can be observed that, all selected macroeconomic variables that are selected for this study does granger cause Nifty and banking sector share price at 5% significant level as the probability values are less than 0.05.

Table 5 : Granger Causality Test

Null Hypothesis:	F-Statistic	Probability	Decision
Dhanlaxmi Bank does not Granger Cause Bank Rate	3.7237	0.0321	Reject
DCB Bank does not Granger Cause Repo Rate	3.2925	0.0465	Reject
DCB Bank does not Granger Cause Reverse Repo Rate	3.8928	0.0278	Reject
Nifty does not Granger Cause Dhanlaxmi Bank	4.5505	0.0160	Reject
Repo Rate does not Granger Cause Dhanlaxmi Bank	5.0052	0.0110	Reject
Dhanlaxmi Bank does not Granger Cause Repo Rate	3.6814	0.0332	Reject
Reverse Repo Rate does not Granger Cause Dhanlaxmi Bank	6.5333	0.0033	Reject
Dhanlaxmi Bank does not Granger Cause Reverse Repo Rate	6.1149	0.0045	Reject
IDBI Bank does not Granger Cause Repo Rate	3.7707	0.0308	Reject
IDBI Bank does not Granger Cause Reverse Repo Rate	3.2780	0.0471	Reject
Lakshmi Vilas Bank does not Granger Cause Reverse Repo Rate	4.0801	0.0237	Reject

Table 6: Granger Causality Test

Null Hypothesis:	F-Statistic	Probability	Decision
City union Bank does not Granger Cause Nifty	3.42976	0.0413	Reject
Nifty does not Granger Cause IDBI Bank	4.84261	0.0126	Reject
Karnataka Bank does not Granger Cause Reverse Repo Rate	4.87048	0.0123	Reject

VII. SUMMARY AND CONCLUSIONS

The results of this paper proved that Bank Rate, Repo Rate and Reverse Repo Rate has significant positive relationship on Indian stock market which is proxied by S&P CNX Nifty and also on share price of banking sector stocks. Even though government changes and many policies are altered during 2009-2018, in spite of that, the macroeconomic factors had shown significant positive impact on Indian stock market. During the both different government periods which is studied in this paper, selected banking sector stocks like IndusInd Bank, Karnataka Bank, Lakshmi Vilas Bank, City Union Bank, DCB Bank, Dhanlaxmi Bank and IDBI Bank are positively depending on selected macroeconomic determinants. Granger Causality Test proved that all selected macroeconomic variables granger cause Nifty and share price of banking industry from India.



Nifty and banking stock does granger cause Bank Rate, Repo Rate and Reverse Repo Rate before Modi Government period. The same results during Modi Government period also. The results acquired from this study and the results of different authors that are collected in the literature part: Samveg Patel; Muhammad Arshad Haroon, Hummera Jabeen; Adedoyin IsolaLawala, Russell Olukayode Somoye et al, support each other.

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