

Impact of Macroeconomic Variables on Price Volatility with Special Reference to NSE Nifty Fifty Indices

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Abstract

Stock market and fluctuations in share prices are the great reflectors of economic conditions of a country. In India, two stock markets played role in showing economic progression of the country to the entire world. Normally stock prices are highly influenced by macroeconomic variables. In the study, national stock exchange's major price index NSE nifty fifty has taken as dependent variable and five macroeconomic variables like imports, exports FDI, FIIs and crude oil have taken as independent variables. Five years data collected from 2017 to 2022 have taken from various website sources as secondary data. The statistical tools used for the study is mean, standard deviation, correlation and regression for the analysis of data. The results of the study also evidenced that, selected macroeconomic variables have significant impact on NSE nifty price volatility during the study period.

Keywords: Stock Exchange, NSE Nifty Indices, Macroeconomic Variables, Multiple Linear Regression and volatility.

Introduction

The stock or secondary market is the market for trading existing securities (stocks) issued by governments, semi-government bodies and other publicly traded companies through a joint stock company and also trading in securities issued by them and its own separate category of gilt edged government securities.

The stock market is subject to a large influence from macroeconomic variables which will vary depending on the overall financial conditions of a country and the policies of governments and their economies; the current and future events of macroeconomic variables will have significant impacts on stock market investment decisions; thus, the purpose of the study was to determine how macroeconomic variables have statistically significant and relevant effects on stock markets in various parts of the world by taking a statistical analysis of those macroeconomic variable changes since January 2003. This research will examine how different macroeconomic factors influence the stock market price of the Nifty Fifty (NSE) index in India through analysis of monthly data from April 2017 to March 2022. In this study, we will attempt to determine whether there is a significant causal link between macroeconomic variables and stock prices (as measured by the NSE Nifty Fifty index).

Definition Of Stock Exchange

“An association, organization or body of individuals whether incorporated or not, established for the purpose of assisting, regulating and controlling business in buying or dealing in securities”-The Securities Contracts (Regulation) Act, 1956.

National Stock Exchange

The concept of a National Stock Exchange was proposed by the high-level committee headed by M. J. Pherwani (formerly of UTI) in June of 1991. On November 1, 1992 the National Stock Exchange located in Mumbai, India had an initial paid-up capital of Rs. 25 crores at the time of its establishment. Its founders, which included IDBI (Industrial Development Bank of India), ICICI Bank, LIC (Life Insurance Corporation), GIC (General Insurance Corporation), associate corporations, SBI (State Bank of India), and SBI Capital Markets Limited, wanted to create an efficient marketplace for trading securities in India.

The NSE opened its Wholesale Debt Market on June 6, 1994 and began trading in Equities on November 1, 1994. The Wholesale Debt Market and Money Market segments were created to facilitate the needs of banks and financial institutions to carry out high-value transactions of public sector undertakings, UTI (Unit Trust of India) Units, Treasury Bills, Government Securities and Call Money (for use by financial institutions).

The NSE does not operate on a physical trading floor; rather, it utilizes a fully automated, screen-based Trading System having two markets. Both the Wholesale Debt Market and the Capital Market are operated via telephone telex (tele-graphy), through the use of Personal Computer (PC) Terminals housed in the broker's office. The NSE operates in a manner whereby both Issuers of Securities and Investors leverage the benefits created by the Trade via its screen-based National Network, where Transactions are made Transparent and Effective (cost efficient) by Regulations. As of March 31, 2023, approximately 2,000 companies traded on the NSE.

Macroeconomic Variables Used In The Study

This study considered five macroeconomic variables namely imports, exports, foreign direct investment, foreign institutional investors and crude oil.

Imports

An import is goods or services bought in one country that was produced in another. Imports and exports are the components of international trade. If the value of a country's import exceeds the value of its exports, the country has a negative balance of trade, also known as a trade deficit.

Exports

The products and offered services created in one country and sold to buyers anywhere else are referred to as an export. The two components of international trade are the imports of a specific country and the exports of that same country. There are a number of common exports that many countries exchange for each other's goods and services, and they include things like the importing of energy, natural resources, materials, such as food and fabrics, and finished consumer goods, such as electronic devices.

Foreign Direct Investment

An investment in another country that involves buying or acquiring ownership interest in a company is called FDI. This can be any kind of investment made by an investor from one nation to another.

Foreign Institutional Investors

An investor in a financial market outside of their home country is referred to as a foreign institutional investor (FII). Examples of FIIs include pension funds, investment banks, hedge funds and mutual funds.

Crude Oil

Petroleum also known as crude oil or simply oil is a naturally occurring yellowish-black Liquid mixture of mainly hydrocarbons and is found in geological formations. The name petroleum covers both naturally occurring unprocessed crude oil and petroleum products that consist of refined crude oil.

Statement Of The Problem

With rapid economic growth, India has emerged as a rapidly growing economy globally and is expected to be among the fastest growing economies in the world in the next decade. Despite a slowdown in the earnings of Indian corporate businesses due to the large amount of capacity currently in place and banks not being able to lend, the two major stock markets in India - the Bombay Stock Exchange and the National Stock Exchange - continue to remain strong. The relationship between the real economy and stock market performance has been discussed extensively in recent years as it relates to emerging markets. Nowadays stocks are very much a part of today's global marketplace for countries; therefore, many countries have incorporated stocks into their respective economies. The degree to which the stock market affects a country's macroeconomic environment can be determined by the criteria used to assess the performance of its economy and by evaluating its performance in relation to that of the world. Generally speaking, macroeconomic conditions have an important role to play in creating national economies. This research paper is a preliminary investigation of the impact of certain macroeconomic variables on stock market movement in India through an analysis of the performance of the NSE Nifty 50 Index. This will contribute to the existing body of literature. The primary focus of this study is to explore the overall effect of selected macroeconomic variables on stock price volatility in the form of changes in the value of the NSE Nifty 50 Index. It is expected that this research will be beneficial to policymakers when formulating, implementing, and evaluating macroeconomic policy and to investors who need to adapt to the flux of macroeconomic conditions and determine the best way to make investments; in short, this research will demonstrate how selected macroeconomic variables are affecting the stock markets of developing countries.

Objectives Of The Study

- To understand the various macroeconomic variables and its impact on economy.
- To study the changes in selected macroeconomic variables during the study period.
- To study the price level changes of NSE nifty fifty indices during the study period.
- To identify the relationship between NSE nifty fifty indices and selected macroeconomic variables.
- To find out the impact of selected macroeconomic variables on NSE nifty fifty indices.

Research Methodology

● Dependent Variable

NSE Nifty Fifty Indices Have Served as the Dependent Variable Within this Research Study.

● Independent Variables

The Five Macro-Economic Variables Import, Export, Foreign Direct Investment (FDI), Foreign Institutional Investors (FIIs) And Crude Oil Have Served as The Independent Variable in This Research Study.

Source of Data

Statistical data can be divided into two categories: Primary and Secondary.

Primary Data

Primary data is an original set of data, collected for the first time, which originates from the researcher.

Secondary Data

Secondary data is data already collected and may have been previously used for another purpose; they may include sources such as Websites, Journals, Articles and Books or any combination thereof. The research will be conducted based on secondary data sources.

Data Period

The study conducted from the monthly data taken from April 2017 to March 2022 on the financial year basis.

Tools used for the Study

Mean, standard deviation, correlation and multiple linear regression analysis is used for the study. The study to find out the relationship between selected macroeconomic variables and NSE Nifty Fifty indices are measured by applying correlation and multiple linear regression analysis using Statistical Package for Social Sciences (SPSS version 26).

HYPOTHESIS

Null Hypothesis (H_0): There is no significant relationship between selected macroeconomic variables and NSE nifty fifty indices.

Alternative Hypothesis (H_1): There is a significant relationship between selected macroeconomic variables and NSE nifty fifty indices.

Limitation Of The Study

- The study covers only five macroeconomic factors considered for the study.
- The study period limited to 5 years only i.e., from April 2017 to March 2022.
- The study performance is measured only through NSE nifty fifty indices.

Review Of Literature

Aditya Prasad Sahoo, Dr.BCM Patnaik and Dr.IpseetaSatpathy (2020) conducted a research on impact of macroeconomic variables on stock market- A study between India and America. This research investigates how macroeconomic elements affect both India's and America's stock markets from 2015-2019. Eleven pieces of literature were reviewed in the literature review. Secondary data was analysed, using statistical methods including correlation, regression analysis, t-tests, and ANOVA. It was found that three macroeconomic variables in India have a negative correlation with the stock market while one has a positive correlation; conversely, in America all four macroeconomic variables have a positive correlation with stock market performance, except for GDP.

Ms. Aanchal (2017) studied the impact of macroeconomic variables on Indian stock market. The study aims to check that whether the development in the stock market is a result of growth in various macroeconomic variables and to find the cause and effective relationship between the stock indices and macroeconomic variables. The study will utilize a sample of five macroeconomic variables, including exports and imports, inflation, investments, and CNX Nifty 50 market indices. An analysis of these five variables will be performed

using October 2004-2015 data. Statistical methods (Augmented Dickey Fuller Test, Unit Root Test, Granger Causality Test & correlation) will be carried out using EViews 7. The study results found a positive correlation coefficient between CNX Nifty 50 & 5 macroeconomic Variables under study.

Dr. Gurcharan Singh and Salony Kansal (2010) find out whether or not trading in derivatives will affect daily price changes (volatility) in the stock market; their study used the National Stock Exchange in India (NSE) to accomplish this. Researchers also performed this research to determine if there were any changes in stock market prices after the introduction of futures and options (F & O) type products. The study has been taken S & P, CNX Nifty Index as a proxy for the stock market and the major derivatives products considered significant as futures and options. The study has been conducted over a period from 1995-1996 to 2008-2009 on the financial basis. Their study is based on secondary data which have been collected various websites. In literature review, they reviewed seven literatures related to the study. The statistical analysis used by the researchers involved a paired t-test. The results of their research demonstrate that the introduction of derivative trading has led to an increase in stock market volatility. In each case where derivative products were analyzed using the paired t-test, the null hypothesis (Ho) was rejected, while the alternate hypothesis (H1), was accepted.

Jawad Khan and Dr. Imran Khan (2018) to evaluate the relationship of macroeconomic variables to stock price movements, this research studies the factors influencing the Karachi Stock Exchange from May 2000 through August 2016. Macroeconomic variables studied include: change in interest rates, inflation rate, growth rate in the money supply, exchange rate, growth rate of industrial production as an indicator of economic activity, and growth rate of exports. To analyse the data, the researchers used a variety of statistical procedures, including descriptive statistics, a correlation matrix, the Augmented Dickey-Fuller test, the Phillips-Perron test, lags selection, the Wald test, and the Auto Regressive Distributed Lag (ARDL) model. The results of this study show that there is a strong long-term link between the money supply, exchange rate, and interest rate and stocks. For the Karachi Stock Exchange, the long-term correlation coefficients indicate that inflation rate, exports, and economic activity do not correlate with stock prices, which is an inconclusive finding.

Debasis Mohanty, Jakki Samir Khan and Shakti Ranjan Mohapatra (2021) this research will investigate the influence of macroeconomic variables on the Indian stock market (Sensex). The primary research question is whether there is any correlation between macroeconomic variables (GDP growth, unemployment, US \$ movement, inflation rate, debt to GDP ratio, and manufacturing to GDP ratio) and returns from investing in the Sensex. In this research project the Return from the Sensex (dependent variable) will be compared to the selected macroeconomic variables (independent variables). The secondary data for this research will be sourced from existing data for the time period between 1991 & 2020. The statistical tools employed to conduct the analysis will include – Augmented Dickey Fuller Test, Optimum Lag Test, Co-integration Test (Bound Test), Correlation LM Test, Granger Causality Test, and the Auto-Regressive Distributed Lag (ARDL) Model. The results of the Bound Test will demonstrate the existence of a Long Run Relationship between the dependent and independent variables (as indicated by the F-statistic > Upper Bound value). The explanatory macroeconomic variables (GDP Growth, US\$ Movement, Debt to GDP Ratio, Manufacturing to GDP Ratio) have a positive effect on the Returns from Investing in the Sensex, while the macroeconomic variables (Inflation & Unemployment) have a negative effect on the Returns from Investing in the Sensex.

Data Analysis And Interpretation**Table-1-Annual fluctuation in NSE NIFTY 50 INDEXES during April 2017 to March 2022**NSE (NIFTY FIFTY INDICES)

YEAR	MAX	MIN	MEAN	S.D
2017-2018	11171.55	9075.15	10030.48	453.13
2018-2019	11760.20	10004.55	10857.18	363.95
2019-2020	12430.50	7511.10	11491.62	823.82
2020-2021	15431.75	8055.80	12013.87	1959.47
2021-2022	18604.45	14151.40	16654.57	1113.88

The above table-1 shows NSE (Nifty) price for the five years from 2017-2018 to 2021-2022. A steady growth shown in maximum price level for the five years and it was found high of 18604.45 in the year 2021-2022. Variation shown in minimum price, during the study period and lowest minimum price of 7511.10 shown in the year 2019-2020. Standard growth shown in the mean of nifty prices and highest mean of 16654.57 found in the year 2021-2022. Standard deviation for the five years reveals a minimum fluctuation of 363.95 shown in the year 2018-2019.

Table-2-Annual fluctuation in Imports during April 2017 to March 2022 IMPORTS

(US \$ million)

YEAR	MAX	MIN	MEAN	S.D
2017-2018	42801.16	34215.04	38726.07	2553.87
2018-2019	45731.11	36591.13	42837.54	2522.78
2019-2020	46683.35	31470.92	39559.10	3560.88
2020-2021	48898.86	17083.41	32667.79	9659.63
2021-2022	63090.56	38834.62	51087.60	7439.66

The above table-2 explains annual import data for a period of five years from 2017-2018 to 2021-2022. Maximum import for the study period increases gradually for the first four years and sudden high of 63090.56 shown in the financial year 2021-2022. In case of minimum import, a minimum of 17083.41 was found in the year 2020-2021. Average of import for the selected period has little variations and a high of 51087.60 was found in the year 2021-2022. Standard deviation of imports revealed that a minimum fluctuation of 2522.78 was measured in the year 2018-2019.

Table-3-Annual fluctuation in Exports during April 2017 to March 2022EXPORTS (US \$ million)

YEAR	MAX	MIN	MEAN	S.D
2017-2018	29167.03	22292.63	25281.08	2331.44
2018-2019	32725.19	25754.24	27506.63	1898.32
2019-2020	29849.71	21490.67	26107.31	1916.15
2020-2021	35256.60	10159.83	24301.56	5997.50
2021-2022	44573.71	30750.58	35167.03	3825.50

Table -3 explicit the export data of India for the given period of study, a little ups and downs shown in the maximum export level for the study period and a high amount of 44573.71 was recorded during the financial year 2021-2022 and a minimum amount of export of 10159.83 was recorded during the covid period from 2020-2021. An average export lies from 24000 to 28000 for the first four years and eventually a high average of 35167.03 was found in the year 2021-2022. S.D of the data exhibits a minimum fluctuation of 1916.15 during the financial year 2019-2020.

Table-4-Annual fluctuation in Foreign Direct Investment during April 2017 to March 2022 FOREIGN DIRECT INVESTMENT (US \$ Million)

YEAR	MAX	MIN	MEAN	S.D
2017-2018	7681.82	-67.83	2324.48	2007.80
2018-2019	4260.41	789.18	2559.33	1150.03
2019-2020	6788.60	1850.74	3584.43	1440.49
2020-2021	18247.37	-914.40	3662.92	5235.41
2021-2022	8801.57	354.15	3215.54	2476.03

The above table-4 shows the fluctuations of foreign direct investments in India during the five years starts from 2017-2018 to 2021-2022. A high variation was found in the maximum level of annual FDI during the last five years and a maximum of 18247.37 was found in the year 2020-2021. Minimum amount of FDI shows positive as well as negative values during the study period high withdrawal with negative value of 914.40 was found during the study period 2020-2021. Average for the study period shows highest value of 3662.92 during the financial year 2020-2021. SD of the data showed minimum fluctuation of 1150.03 for the year 2018-2019.

Table-5-Annual fluctuation in Foreign Institutional Investors (FIIs) during April 2017 to March 2022 FIIs (Rupees Crore)

YEAR	MAX	MIN	MEAN	S.D
2017-2018	16850.00	-11834.00	2215.58	10714.02
2018-2019	40576.39	-25774.00	1358.88	15649.10
2019-2020	19888.65	-47571.14	2964.31	18576.93
2020-2021	43361.91	-3155.77	14976.46	14854.54
2021-2022	16122.00	-22795.28	-6103.18	9610.10

The above table-5 shows the fluctuations of foreign institutional investments in India during the five years starts from 2017-2018 to 2021-2022. A high variation was found in the maximum level of annual FIIs during the last five years and a maximum of 43361.91 was found in the year 2020-2021. Minimum amount of FIIs showed negative values during the study period high withdrawal with negative value of 47571.14 was found during the study period 2019-2020. Average for the study period shows highest value of 14976.46 during the financial year 2020-2021. SD of the data showed minimum fluctuation of 9610.10 for the year 2021-2022.

Table-6-Annual fluctuation in Crude Oil during April 2017 to March 2022 CRUDE OIL (US \$ / bbl)

YEAR	MAX	MIN	MEAN	S.D
2017-2018	76.73	53.96	67.54	7.39
2018-2019	68.58	57.27	61.83	3.37
2019-2020	53.60	21.04	40.59	9.39
2020-2021	83.92	60.46	71.60	7.57
2021-2022	116.80	78.07	96.81	12.68

The above table-6 the price level of crude oil for the selected period of study. Maximum price level shows high variation during the period and highest value of 116.80 was found in the year 2021-2022. Minimum price level of crude oil reveals lowest value of 21.04 during the financial year 2019-2020. High modulations also found in average price of crude oil and maximum average price of 96.81 recorded in the year 2021-2022. SD of the data depicts low variation of 3.37 found in the year 2018-2019.

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation table-7 explained the relationship between study variables, NSE nifty is taken as dependent variable and imports, exports, FDI, FIIs and Crude oil are taken as independent variables. Four variables namely imports, exports, FDI and crude oil have positive relationship with NSE nifty, imports, exports and crude oil are having high positive association with NSE nifty, FDI has moderate positive association with NSE at the same time FIIs have negative impact on NSE Nifty.

Regression Analysis

The study investigated the NSE nifty fifty indices and some of the macroeconomic variables, using statistical packages for social science (sp) software (version 26), to test the relationships between these variables using multiple linear regression analysis; results correspond to this type of assessment provided below. Tables of results are presented in the model summary, anova, and co-efficient tables.

	NSE	IMPORTS	EXPORTS	FDI	FIIs	CO
Pearson Correlation	1	.715	.898*	.396	-.495	.747
Sig.(2-tailed)		.175	.038	.509	.397	.147
N	5	5	5	5	5	5

Table-7 CORRELATION

Table-8 -MODEL SUMMARY

Model Summary ^b									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.999 ^a	.998	.993	218.96037	.998	186.616	3	1	.054

a. Predictors: (Constant), CRUDE OIL, FOREIGN DIRECT INVESTMENT, IMPORTS

b. Dependent Variable: NSE NIFTY FIFTY INDICES

The above table-8 result of Model Summary reveals that, R² of five independent variables namely imports, FDI, FIIs and Crude oil showed 99.8% impact of share price volatility in NSE nifty fifty indices. It means that only 0.2% volatility is based on other factors which are not included in this study. R shows that 0.999, it shows strong linear relationship exist between selected macroeconomic variable with NSE nifty fifty indices.

Table-9- ANOVA

ANOVA ^a						
1	Model	Sum of Squares	df	Mean Square	F	Sig.
	Regression	26841223.986	3	8947074.662	186.616	.054 ^b
	Residual	47943.644	1	47943.644		
	Total	26889167.629	4			

a. Dependent Variable: NSE NIFTY FIFTY INDICES

b. Predictors: (Constant), CRUDE OIL, FOREIGN DIRECT INVESTMENT, IMPORTS

ANOVA table-9 shows that, the sum of square (26841223.99) reveals that all independent variables as a whole can account for difference in dependent variable. The residual value of 47943.644 ANOVA table shows how the unexplained variables have an impact on price volatility of NSE nifty fifty indices. R² in model summary is ascertained with the help of the following formula

$$R^2 = \frac{\text{Regression sum of square}}{\text{Total sum of square}}$$

The results show that there is a significant relation between NSE nifty fifty indices and selected macroeconomic variables.

Table-10- REGRESSION CO-EFFICIENT

Coefficients ^a							95.0% Confidence Interval	
Model		Unstandar- dized B	Coefficien- ts Std. Error	Standardiz- ed Coefficien- ts Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	-8487.570	981.773		-8.645	.073	-20962.179	3987.039
	Imports	.220	.020	.573	11.261	.056	-.028	.469
	Foreign direct investment	2.413	.186	.561	12.977	.049	.050	4.775
	Crude oil	63.035	6.404	.491	9.843	.064	-18.336	144.405

a. Dependent Variable: NSE NIFTY FIFTY INDICES

Co-efficient table-10 shows that the value of changes in NSE nifty fifty prices is (-8487.570) (constant) when other independent factors to be taken as zero

Hence, we an equation

$$P_{NSE} = -8487.570 + 0.220 I + 2.413 F + 63.035 C$$

P_{NSE} - denotes price volatility of nifty fifty indices, I- denote imports, F - denotes foreign direct investment and C- denote crude oil.

Changes in NSE nifty fifty arises due to 0.220 changes in imports, 2.413 changes in FDI and 63.035 changes occurred in crude oil.

Findings Of The Study

- Standard growth shown in the mean of nifty prices and highest mean of 16654.57 found in the year 2021-2022. Standard deviation for the five years reveals a minimum fluctuation of 363.95 shown in the year 2018-2019.
- Average of import for the selected period has little variations and a high of 51087.60 was found in the year 2021-2022. Standard deviation of imports revealed that a minimum fluctuation of 2522.78 was measured in the year 2018-2019.
- An average export lies between 24000 to 28000 for the first four years and eventually a high average of 35167.03 was found in the year 2021-2022. S.D of the data exhibits a minimum fluctuation of 1916.15 during the financial year 2019-2020.
- FDI average for the study period shows highest value of 3662.92 during the financial year 2020-2021. SD of the data showed minimum fluctuation of 1150.03 for the year 2018-2019.

- FIIs average for the study period shows highest value of 14976.46 during the financial year 2020-2021. SD of the data showed minimum fluctuation of 9610.10 for the year 2021-2022.
- High modulations also found in average price of crude oil and maximum average price of 96.81 recorded in the year 2021-2022. SD of the data depicts low variation of 3.37 found in the year 2018-2019.
- Correlation of four variables namely imports, exports, FDI and crude oil have positive relationship with NSE nifty, imports, exports and crude oil are having high positive association with NSE nifty, FDI has moderate positive association with NSE at the same time FIIs have negative impact on NSE Nifty.

Conclusion

This research examines how macroeconomic factors affect the fluctuations in price at the NSE Nifty Fifty index. The five variables that are independent from each other and are being examined are as follows: – imports; exports; Foreign Direct Investment (FDI); Foreign Institutional Investors (FIIs); and crude oil. The NSE Nifty Fifty Index has been chosen as a dependent variable for this study. The correlation results of this analysis indicate that the macroeconomic factors of imports; exports; FDI; and crude oil have had a positive effect upon the price fluctuations of the NSE Nifty Fifty Index, while FIIs have had a negative impact on the NSE Nifty Fifty Index. The result of multiple linear regression analysis of model summary show, it was observed that NSE nifty fifty indices (dependent variable) has influenced by selected macroeconomic variables (independent variables) at 99.8% (R square value 0.998) by predicting independent variable. F statistics shows higher value which means the model is goodness of fit for further interpretation. The significance value is 0.054 is more than 0.05 at 5% significance level and indicates the null hypothesis rejected, so there is a significance relation between selected macroeconomic variables on NSE nifty fifty indices. The study has useful to policymakers, regulators, and investment community to choose more economic variables and varies stock indices for the study.

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