

***MACROECONOMIC FACTORS
AFFECTING STOCK PRICE
VOLATILITY – A STUDY ON
INDIAN STOCK MARKET***

**Dr. S. Ranjith Kumar
Neha Banu**



www.jpc.in.net

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

Dr. S. Ranjith Kumar

Neha Banu

Copyright 2023 © Jupiter Publications Consortium

ALL RIGHTS RESERVED

ISBN 978-93-91303-81-5



9 789391 303815 >

ISBN: 978-93-91303-81-5

First Published: November 2023

DOI: www.doi.org/10.47715/JPC.B.978-93-91303-81-5

Price: 200/-

No. of. Pages: 50

Jupiter Publications Consortium

22/102, Second Street

Venkatesa Nagar, Virugambakkam

Chennai 600 092, Tamil Nadu, India

Website: www.jpc.in.net

Printed by: Magestic Technology Solutions (P) Ltd

Name of the Monograph:

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

Authors:

Dr. S. Ranjith Kumar

Neha Banu

ISBN: 978-93-91303-81-5

Volume: I

Edition: First

Published by: Jupiter Publications Consortium.

Printed by: Magestic Technology Solutions (P) Ltd.

info@magesticts.com | www.magesticts.com

Copyright @2023. All rights reserved.

No part of this publication may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written permission of the publisher, except in the case of brief quotations embodied in critical reviews and specific other non-commercial uses permitted by copyright law. For permission requests, write to the publisher, addressed "Attention: Permissions Coordinator," at the address below.



www.jpc.in.net

Jupiter Publications Consortium

Address: 22/102, Second Street, Venkatesa Nagar, Virugambakkam, Chennai 600 092, Tamil Nadu, India. **Email:** director@jpc.in.net | **Website:** www.jpc.in.net

This Page Intentionally Left Blank

Preface

In "Macroeconomic Factors Affecting Stock Price Volatility," we embark on an analytical journey to unravel the complex interplay between key macroeconomic indicators and their impact on stock market volatility. This book is tailored to provide readers with an in-depth understanding of how macroeconomic dynamics influence the stock markets, with a specific focus on the Indian financial landscape. Through meticulous research, we delve into various macroeconomic variables including the Index of Industrial Production (IIP), Consumer Price Index (CPI), crude oil prices, dollar price fluctuations, gold prices, and Foreign Institutional Investment (FII). Each of these factors is explored in relation to their influence on the Bombay Stock Exchange (BSE) Sensitive Index and the National Stock Exchange (NSE) Nifty.

The book is structured to guide readers from foundational concepts to more complex analyses. We begin with an introduction to the topic, followed by a comprehensive literature review that sets the stage for the subsequent empirical investigation. The data description section details the variables used in the study, clarifying the rationale behind their selection. In the methodology section, we employ robust statistical techniques such as correlation matrix analysis and econometric regression models to dissect the relationship between the selected macroeconomic variables and stock price volatility.

The latter part of the book presents an in-depth data analysis, offering insights into how each macroeconomic factor interacts with major stock indices like the Nifty50 and Sensex. The conclusion synthesizes these findings, providing a nuanced understanding of the multifaceted relationship between macroeconomic variables and stock market dynamics.

This book is not just an academic treatise but a practical guide for investors, economists, policymakers, and students, offering valuable insights into the nuances of stock market volatility in the context of prevailing economic conditions.

The comprehensive bibliography at the end provides a resource for further exploration, enabling readers to delve deeper into this fascinating and ever-relevant field of study.

Happy Reading!

Dr. S. Ranjith Kumar
Neha Banu

This Page Intentionally Left Blank

Abstract

This book presents a thorough investigation into the effects of key macroeconomic factors on stock price volatility, with a particular focus on the Indian stock market. By analyzing the relationship between major stock indices like BSE Sensitive Index and NSE Nifty and various macroeconomic variables such as the Index of Industrial Production, Consumer Price Index, crude oil prices, dollar price, gold prices, and Foreign Institutional Investment, the study offers a comprehensive understanding of the intricate dynamics at play. Utilizing robust statistical techniques, including correlation matrix analysis and econometric regression models, this work sheds light on how these economic indicators influence stock market behavior. The findings provide valuable insights for investors, economists, and policymakers, highlighting the intricate linkages between the economy and financial markets.

Keywords: *Macroeconomic Factors, Stock Price Volatility, Indian Stock Market, BSE Sensitive Index, NSE Nifty, Index of Industrial Production, Consumer Price Index, Crude Oil Prices, Dollar Price, Gold Prices, Foreign Institutional Investment, Econometric Regression Models, Stock Market Dynamics.*

This Page Intentionally Left Blank

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

Table of Contents

INTRODUCTION.....	3
LITERATURE REVIEW	4
DATA DESCRIPTION	10
TITLE OF STUDY.....	10
OBJECTIVE OF THE STUDY.....	10
Main Objective.....	10
SCOPE OF THE STUDY.....	11
NEED FOR THE STUDY	11
VARIABLE SELECTION AND DATA SOURCE	12
Indian Stock Market.....	13
BSE Sensitive Index and NSE Nifty	13
Explanatory Variables	14
Index of Industrial Production (IIP)	14
Consumer Price Index (CPI).....	14
Crude Oil (CO)	15
Dollar Price (DP).....	15
Gold Price (GP).....	16
Foreign Intuitional Investment (FII)	16
METHODOLOGY	16
SAMPLE SIZE AND PERIOD	17
STATISTICAL TECHNIQUE.....	17
Correlation matrix analysis	17
Econometric Regression Model	17
DATA ANALYSIS.....	18
Relationship of FII with Nifty50 and Sensex.....	23
Relationship of CPI with Nifty50 and Sensex	27
Relationship of CO with Nifty50 and Sensex.....	29

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

Relationship of GP with Nifty50 and Sensex..... 35

CONCLUSION..... 39

BIBLIOGRAPHY 40

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

INTRODUCTION

Stock Market is one of the most versatile sectors in the financial system and plays an important role in economic development. Stock Market is a hub where facilities are provided to the investors to purchase and sell their Shares, Bonds, and Debenture, etc. As a part of the process of economic liberalization, the stock market has been assigned an important place in financing the Indian corporate sector.

Indian capital market has undergone colossal changes since 1991 when the government has adopted liberalization and globalization policies. As a result, there is a growing importance of the stock market from an aggregate economy point of view. Nowadays the stock market has become the main driving force of the modern market-based economy and is one of the major sources of raising funds for Indian corporate, which helps in financial development and economic growth. The Indian stock market is one of the emerging markets in the world.

Thus, investigating the impact of macroeconomic factors on the stock market becomes one of the most important areas of finance. Many studies have been conducted to find out the influence that different factors can make on the stock market including macroeconomic variables. While talking about small economies, the stock market can play a vital role in organizing economic resources within the country as well as outside the country to achieve better economic conditions. As it is the market from which fund flows from individuals and corporations across the globe to the investors existing in an economy.

It is commonly believed that when macroeconomic variables fluctuate then it also increases or decreases the stock prices. As “Keshav Garg and Rosy Kalra(2018)” argue in their study that returns are influenced by the change in available prices and several other macroeconomic variables. However, certain economic variables have a strong or medium relationship with stock prices.

Volatility may be a statistical measure of the dispersion of returns for a given security or Market Index. Commonly, the higher the volatility greater the risk associated with security. Volatility estimation is vital for several reasons related to different people within the market. Developed markets still provide over a long period of your time with

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

higher returns constituting low volatility. The Indian market has started becoming informational more efficient compared to developed countries.

Volatility may be a symptom of a highly liquid stock exchange. The pricing of securities depends on the volatility of every asset. An increase in available market volatility brings an outsized stock price change of advances or declines. Investors interpret a rise in available market volatility as a rise within the risk of equity investment and consequently they shift their funds to less risky assets. It has an impression on business investment spending and the economic process through a variety of channels. Changes in the local or global economic and political environment influence the share price movements and show the state of the stock exchange to the overall public. The issues of return and volatility became increasingly important in recent times to the Indian investors, regulators, brokers, policymakers, dealers, and researchers.

The stock market is volatile and to determine the stock prices by investors is not an easy task. There are so many internal & external factors that influence stock prices. The present study is an attempt to explore the macroeconomic factors affecting the stock prices of NSE and BSE. The study considers yearly time series data of Inflation, Gold price, Dollar price, Index of industrial production, FII, and Crude Oil prices.

This current study explores the relationship between macroeconomic factors affecting volatility and its impact on the Indian stock market. The empirical study majorly will help the investors to understand different factors that influence stock prices. Besides, the stock markets are the barometers of any economy and they reflect a small change in the macroeconomic factor, it is very essential in understanding the basic macroeconomic factors affecting the volatility of the stock market.

The rest of the paper is divided into different sections as follows: The second section would cover the review of the literature for the current study. The third section describes the data description, section four discusses the data analysis and inferences of the topic covered and, finally, the fifth section would conclude the results with implications.

LITERATURE REVIEW

1. **Sarika Keswani and Bharti Wadhwa(2019)- "Evaluating the Impact of Macroeconomic Variable on Indian Stock Market"** -- studied the causal

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

connection between the securities exchange returns and those macroeconomic factors in the NSE and BSE. Their theory showed that there is a strong relationship between disposable income, government policies, the exchange rate, and share price. The study also states that there is an unfavorable connection between the interest rate and inflation rate with stock prices.

2. **Edwin Prabu A, Indranil Bhattacharyya and ParthaRay(2019)-" Impact of Monetary Policy on the Indian Stock Market: Does the Devil lie in the detail?"** -- focuses on the impact of monetary policy on stock market prices depending on different sectors. The impact of monetary policy on banking and financial services stocks is significant. In terms of surprise policy announcements, the impact on the realty sector also turned out to be significant besides banking and financial services. On the contrary, the influence of monetary policy on sectors like media, metal, pharmaceuticals, information technology, or fast-moving consumer goods is insignificant.
3. **Sathyanarayana, S. And Gargesa, S. (2018) - "An Analytical Study of the Effect of Inflation on Stock Market Returns"** -- applied Pearson correlation coefficient for the collected data to find out the association between the inflation and stock returns. In the majority of the chosen indices, there is a negative coefficient with the dependent variable. For India, Austria, Belgium, Canada, Chile, China, France, Ireland they found a negative coefficient. However, Brazil Indonesia, Japanese, Mexico, Spanish, and Turkey reported a positive coefficient.
4. **S. Sathyanarayana, S. N. Harish, and SudhindraGargsha(2018) – "Volatility in Crude Oil Prices and its Impact on Indian Stock Market Evidence from BSE Sensex"**-- empirically study how crude oil prices affect the stock returns. Through the study, it is found that crude oil prices have a major impact on the performance of the Indian benchmark BSE Sensex index. The crude price has a positive coefficient which means that Sensex shares a direct relationship with the crude price.
5. **Keshav Garg and Rosy Kalra(2018)- "Impact of macroeconomic factors on Indian stock market"** -- has attempted to study how macroeconomic factors affect the Indian stock market using the six factors i.e. unemployment rate, average inflation

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

rate, gold prices, gross domestic product, exchange rate, and foreign exchange reserve. It is found that all the factors whether positively or negatively affect the movement in the stock market prices. Both the Unemployment rate and average inflation have an inverse relationship with the Sensex whereas all other factors show a positive relationship.

6. **Sameer Yadav (2017) - "Stock market volatility: A study of Indian stock market"**- empirically finds that investor reactions, due to psychological or sociological beliefs, exert a great influence on the market than good economic sense arguments. The study also states that speculation and arbitrage cause deviation in stock prices.
7. **A.K. Giri and Pooja Joshi (2017)-"The impact of macroeconomic indicators on Indian stock prices: An empirical analysis"**-- empirically study the long run and the short-run relationship between stock price and a set of variables affecting it. The study suggests that Economic growth, inflation, and exchange rate influence stock prices positively. However, the crude oil price influences the stock price negatively. This implies that the increase in oil price induces inflationary expectations in the mind of investors and hence stock prices are adversely affected. It also indicates that short-run and long-run unidirectional causality running from economic growth and FDI to stock prices in India.
8. **Aanchal (2017)-"Impact of Macroeconomic Variables on Indian Stock Market"**— The paper had explored the impact of macroeconomic factors on the Indian stock market. The study shows that all of the variables are having a unit root, i.e. there is no cause and effect relationship between the Indian stock market and the five variables studied (GDP, Inflation, Exports, Imports, and Investment). It is also found that there exists a positive correlation between the Indian stock market and the variables.
9. **NalinipravaTripathy(2016)- "A study on Dynamic relation between the gold price and –stock market price in India"** -- studied and found the nature of the causal relationship between Gold price and Stock market price(Nifty). The study uses the Unit root test, Correlation test, Granger causality test, and Johansson's co-integration test to evaluate their relationship. Through the study, it is found that there is no causal relationship between the Gold price and stock market price in

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

the short run. However, Gold prices and Stock market prices are co-integrated indicating a long-run equilibrium relationship between them and they move together. The CUSUM test also confirms that the long-run relationship exists between Gold and Stock market prices and exhibits the stability of co-efficient.

10. **Arpit Bhargava, Ankush Bhargava and SurbhiJain(2016)- "Factors affecting stock prices in India: A time series analysis"**-- studied to understand the relationship between macro variables such as Inflation, Index of Industrial Production(IIP), Money Supply, Oil prices, Exchange rates, Gold prices and Gross domestic product (GDP) and Stock Prices using time series regression. The study revealed that only Exchange Rate, Oil Prices, and Inflation have a significant impact on stock prices. Further, it was observed that Exchange Rate and Inflation are negatively related to Stock prices and Oil prices are positively related.
11. **Pooja Singh (2014)- "An Empirical relationship between selected Indian stock market indices and macroeconomic indicators"**— The research concluded that the Indian stock market has a significant influence on gold prices, inflation, money supply, exchange rates, and foreign institutional investments. It observes that the Indian Stock market improves with the increase in the inflow of foreign investment. Thus foreign capital is a valuable addition to the market as it has a significantly positive impact on the stock market. The gold prices are used as the best alternative for investment which hampers the stock prices of the share market. Also, there exists a causal relationship from the FII to the stock market. Apart from this, there is no causal relationship between the variables.
12. **Mrunal Joshi (2013) - "Factors affecting Indian stock market"** -- tried to explore the factors affecting stock prices. Descriptive research found that FII flow is one of the significant factors which may change the trend from bullish to bearish in case of negative flow and bearish to bullish trend in case of positive flow from outside the country.
13. **Kumar Saurabh(2012)- "Factors affecting the behavior of Indian stock market"**-- studied about the influence of macroeconomic fundamentals in explaining variations in the Indian stock market. Among the various factors which were

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

considered world gold prices and broad money supply were found to have a significant effect on stock prices.

14. **Sarbapriya Ray (2012)-"Testing Granger Causal Relationship between Macroeconomic Variables and Stock Price Behaviour: Evidence from India"** – the study investigated the intersections between stock price and the various factors which affect Indian stock market. By conducting the Granger causality test it is found that there is no causal association of stock prices with Interest rate and IIP. But there is unidirectional causality of the stock price with inflation, foreign direct investment, gross domestic product, exchange rate, and gross fixed capital formation. However, bi-directional causality of the stock price with foreign exchange reserve, money supply, crude oil price, and whole price index. The multiple regression results of the study indicate that oil price and gold prices have a significant negative effect on stock price, while the balance of trade, interest rate, foreign exchange reserve, gross domestic product, industrial production index, and money supply positively influence Indian stock price. On the other hand, the inflation rate, foreign direct investment, exchange rate, and wholesale price index do not appear to have any significant effect on the stock price.
15. **Seyed Mehdi Hosseini, Zamri Ahmad and Yew Wah Lai (2011) "The Role of Macroeconomic Variables on Stock Market Index in China and India"** – The paper studied about the relationship between stock market indices and four macroeconomics variables, namely crude oil price (COP), money supply (M2), industrial production (IP) and inflation rate (IR) in China and India. It is concluded that in the long run, the impact of the increase in crude oil price in China is positive but in India this effect is negative. In terms of money supply, the impact on the Indian stock market is negative, but for China, there is a positive impact. The effect of industrial production is negative only in China. Besides, the effect of an increase in inflation on these stock indices is positive in both countries. In the short run, the contemporaneous effect of crude oil prices is positive in India. This effect is negative and insignificant in China. The contemporaneous impact of money supply on current Chinese stock market indices is positive but for India, it is negative. In comparison, in India, the contemporaneous effect is negative but insignificant.

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

16. **Karam Pal and Ruhee Mitta (2011)-"Impact of macroeconomic indicators on Indian capital markets"**--examined the relationship between the Indian capital markets and key macroeconomic variables such as interest rates, inflation rate, exchange rates and gross domestic savings (GDS) of the Indian economy in long run. It shows that the rate of inflation has a significant impact on both the BSE Sensex and the S&P CNX Nifty. Interest rates, on the other hand, have a significant impact on S&P CNX Nifty only. However, in the case of the foreign exchange rate, a significant impact is seen only on BSE Sensex. The changing GDS is observed as insignificantly associated with both the BSE Sensex and the S&P CNX Nifty.
17. **Shahid Ahmed, 2008," Aggregate Economics Variables and Stock Markets in India," International Research Journal of Finance and Economics, Issue 14 (2008)** -- The paper discussed the causal relationship between stock prices and the key macro variables. Time series analysis is being done over quarterly data from March 1995 to March 2007. A long-run relationship is being found in between stock prices and FDI, stock prices and money supply and the stock market and IIP. Paper discussed the lead-lag relationship between the macro variable and stock prices.
18. **Brooks, Ajay Patel, and Tie Su (2003)- "How equity market responds to unanticipated events"** -- in their paper talk about publicly available information including macroeconomic information, that can be used to predict stock prices and the impact of unanticipated events over stock prices. According to the author the market's response to unanticipated events that take place when the market is closed as there is time to digest the information before trading day opens, the reaction is immediate in price, volume-selling pressure, and bid-ask spreads. The daytime events induce wider bid-ask spreads and longer duration of wider spreads compared with overnight events.
19. **Debarata Mukhopadhyay and Nityananda Sarkar, 2003, "Stock Return and Macroeconomic Fundamentals in Model Specification Framework: Evidence from Indian Stock Market,"**-- The paper discussed the influence of macroeconomic variables as real economic activities like wholesale price index, short term rate, consumer price index, IIP, inflation, money supply, interest rate,

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

domestic oil prices, foreign exchange rate, international oil price, foreign capital market activity, FDI, FII, world industrial output, and world interest rate. Monthly data is being analyzed and also the seasonal effect is being considered in the study.

20. **Basabi Bhattacharya and Jayadeep Mukherjee, "The Nature of the Causal Relationship Between Stock Market and Macroeconomic Aggregates in India: an Empirical Analysis,"**--The objective of the paper is to determine the lead-lag relation between Indian stock market and the five key macroeconomic variables with a question: Can the Indian stock market act as a barometer for the Indian Economy? The key variables which are being considered as broad money supply, national income, IIP, interest rate, and inflation.

DATA DESCRIPTION

TITLE OF STUDY

"Macroeconomic factors affecting stock price volatility- A study on the Indian stock market"

OBJECTIVE OF THE STUDY

Main Objective

The main objective is to investigate the relationship between Indian stock market and six macroeconomic variables namely Index of Industrial Production (IIP), Inflation (CPI), Dollar Price (DP), Foreign Institutional Investment (FII), Crude Oil Prices (CO), Gold Price (GP). S & P Sensex (BSE) and Nifty 50 (NSE) have been considered for representing the Indian stock market.

Other Objective

1. Studying the impact of Macroeconomic variables on the Indian stock market.

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

2. Examining the existence of a correlation between stock prices & macroeconomic variables & the extent to which they are correlated.

There are many factors (both macro and microeconomic) that affect the stock price. In the study, while considering one factor for analysing the data all other factors are assumed as constant

SCOPE OF THE STUDY

The current study unravels the linkage between stock market & macroeconomic variables in the Indian context using techniques like Regression and Pearson's Correlation Coefficient. A time span of 10 years has been chosen for this study from 2010 to 2019 uses yearly data to portray the relationship.

The present study focuses on factors that affect stock volatility such as Inflation, Gold price, Dollar prices, Index of industrial production, FII, Crude Oil prices. It is an empirical study that observes the changes happening in stock prices because of certain factors.

Not only the domestic economic variables have been considered but the linkage with the external world through the exchange rate movement has also been included in the analysis.

NEED FOR THE STUDY

The stock market is an important part of the economy of a country. The stock market plays a pivotal role in the growth of the industry and commerce of the country that eventually affects the economy of the country to a great extent. The stock market is seen as a very significant component of the financial sector of any economy. Furthermore, it plays a vital role in the mobilization of capital in many of the emerging economies.

The need for this study stems from the vital role of the Indian Stock Market in the economy for the following reasons:

- Indian stock market plays an important role in collecting money and encouraging investments, so this study was designed to explore the influences of some factors on stock market prices in BSE.

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

- This study will be useful for the investors who might be able to identify some basic economic variables that they should focus on while investing in the stock market and will have the advantage to make their own suitable investment decisions.
- Many different kinds of investors would find this study as an assistant, especially, individual investors, portfolio managers, institutional investors, and foreign investors.
- Big businesses also depend on the stock market for floating their share & Initial public offering thus might consider factors that affect the stock market.

If the investors know the degree of impact of various factors that lead to volatility in prices of stocks then they can make a better investment decision. This study helps investors about the factors and their impact better.

VARIABLE SELECTION AND DATA SOURCE

The Bombay Stock Exchange - Sensitive Index (SENSEX) and the National Stock Exchange - Nifty 50 has been considered as a proxy of the Indian Stock Market and used to obtain a measure of the market price movement of Indian securities. To address the objectives of this research 6 variables and both Indices have been considered. Consumer price index has been used as a proxy to inflation in the Indian economy and Dollar price to show the effect of the external world on the Indian stock market. To test the common perception that Foreign Institutional Investment has been a driver to the stock market in India we have included FII as another crucial variable. Also, any slight fluctuation in crude oil and gold prices can have both indirect & direct influence on the economy of the country. Thus these 2 variables have also been included to analyse their effect on the stock market. Industrial Production Index of all commodities is considered as a proxy to GDP growth rate. The empirical investigation is carried out using yearly data from 2010 to 2019 which covers 10 yearly observations. The data of BSE SENSEX has been extracted from the BSE website and data of NSE NIFTY has been extracted from Money Control's website. The database of the Industrial Production Index has been extracted from the RBI website. Inflation.com was considered for data of the Consumer price

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

index. CDSL India website has been referred for FII. For the Gold price, data from Bank bazaar's website is being considered. For data on crude oil prices, the Index Mundi website was used. Lastly, Wikipedia was considered for data of Dollar price.

Table 1: Description of Variables

Name of variables	Symbol used	Proxy used
Index of Industrial Production	IIP	General Index of Industrial Production Rate
Foreign Institutional investors	FII	Yearly Net Investments in Rs. Crores
Inflation	CPI	Consumer Price Index
Crude Oil Prices	CO	Average INR Per Barrel of the year
Dollar Price	DP	Monthly Average Rupees per unit of US \$
Gold Price	GP	Mumbai Average Price Rupees per 10gms.
BSE Index - S&P Sensex	SENSEX	Closing Price of the year
NSE Index - Nifty 50	NIFTY	Closing Price of the year

Indian Stock Market

BSE Sensitive Index and NSE Nifty

The stock market is a market in which shares are issued and traded either through exchanges or over-the-counter markets. The Indian stock exchanges hold a place of prominence not only in Asia but also at the global stage. Till the decade of the 1980s, there was no scale to measure the ups and downs in the Indian stock markets. In 1986, the BSE came out with a stock index (i.e., the SENSEX) that subsequently became the barometer of the Indian stock markets.

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

The NIFTY 50 index is the National Stock Exchange of India's benchmark broad-based stock market index for the Indian equity market. NIFTY 50 stands for National Index Fifty and represents the weighted average of 50 Indian company stocks in 17 sectors. It is one of the two main stock indices used in India, the other being the BSE Sensex. There are currently two major stock exchanges in India, The Bombay Stock exchange (BSE) and The National Stock Exchange (NSE). This study considers both Indices for representing the Indian stock market.

Explanatory Variables

Index of Industrial Production (IIP)

Industrial Production Index is used as a proxy to measure the growth rate in the real sector. Industrial production presents a measure of overall economic activity in the economy and affects stock prices through its influence on expected future cash flows. Thus, it is expected that an increase in the industrial production index is positively related to stock price. The IIP and stock prices are positively related because the increase in IIP increases the production of the industrial sector that leads to an increase in the profit of industries and corporations. As dividend increases, it increases share prices, therefore, it is expected to have a positive relationship between IIP and share price according to economic theory.

Consumer Price Index (CPI)

Inflation is measured by changes in the Consumer Price Index (CPI) and Wholesale Price Index (WPI). This study considers CPI as a proxy of Inflation. The high rate of inflation increases the cost of living and a shift of resources from investments to consumption. This leads to a fall in demand for market instruments which lead to a reduction in the volume of stock traded. A high rate of inflation increases the cost of living and a shift of resources from investments to consumption. This leads to a fall in demand for market instruments which lead to a reduction in the volume of stock traded. Also, the monetary policy responds to the increase in the rate of inflation with economic tightening policies. Inflation is ultimately translated into nominal interest rate and an increase in nominal interest rates increases discount rate which results in a reduction of the present value of cash flows. High Inflation affects corporate profits, which in turn causes dividends to diminish thereby lower stock prices. When inflation begins to move upward, it likely

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

leads to tight monetary policies which increase the discount rate. It indicates that the cost of borrowing increases which in turn leads to investment reduction in the stock market. So, it is said that an increase in inflation is negatively related to equity prices.

Crude Oil (CO)

Crude oil is an indispensable input for production and therefore, the price of oil is included as a proxy for real economic activity. India is largely an importer of crude oil and consequently, oil price takes part an imperative role in the Indian economy. Any key movement in oil prices leads to uncertainties in the stock market which could persuade investors to suspend or delay their investments. Moreover, the increase in oil prices results in higher transportation, production, and heating costs which harm corporate earnings. Rising fuel prices also raise alarm about inflation and diminish consumers' discretionary spending. Therefore, the financial risk of investments increases when there is a wide fluctuation in oil prices. Therefore, for oil-importing countries like India, an increase in oil price will lead to an increase in production costs and hence to decreased future cash flow, leading to a negative impact on the stock market. Therefore, an increase in the price of oil in the international market means lower real economic activity in all sectors which will cause the stock price to fall.

Dollar Price (DP)

The next macroeconomic variable used in this study has been the exchange rate/dollar price, which represents the bilateral nominal rate of exchange of the Indian Rupee (Rs.) against one unit of foreign currency. US Dollar (\$) has been taken to be the foreign currency against which the Indian Rupee exchange rate is considered. This is because the US Dollar has remained to be the most dominating foreign currency used for trading and investment throughout this study. Generally, a depreciating currency causes a decline in stock prices because of expectations of inflation. On average, export-oriented companies are adversely affected by a stronger domestic currency while import-oriented firms benefit from it. Though these arguments suggest a linkage between exchange rates and stock prices, the empirical evidence supporting such a linkage was weak at best. Also, at the micro-level, exchange rate changes influence the value of a portfolio of domestic and multinational firms and it is predicted that a negative relationship exists between the strength of the home currency and the aggregate stock prices index.

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

Gold Price (GP)

Gold is a substitute investment avenue for Indian investors. As the gold price rises, Indian investors tend to invest less in stocks, causing stock prices to fall. Therefore, a negative relationship is expected between the gold price and stock price. Thus, this very important macroeconomic variable has also been included in this study.

Foreign Intuitional Investment (FII)

FII includes an investor or investment fund that is from or registered in a country outside of the one in which it is currently investing. Institutional investors consist of hedge funds, insurance companies, pension funds, and mutual funds. The term is used most commonly in India to refer to outside companies investing in the financial markets of India. International institutional investors must register with the Securities and Exchange Board of India to participate in the market. FII is allowed to enter into our country only through stock exchanges either in the form of equity or debt. Thus, it makes an impact on the rise or fall of SENSEX since FII is allowed to be purchased or sold daily. The daily transaction of FII is the reason behind the volatility in the stock market movement to a greater extent. It has been observed that Sensex increases when there are positive inflows of FIIs & decreases when there are negative FII inflows.

METHODOLOGY

To accomplish the predetermined set of objectives of this research, a different set of techniques and tests have been adopted. Inferential statistics technique is used to inference the results by using different ways of inferential statistics like Correlation matrix analysis which finds any strength of association between Indian Stock Exchange indices and selected macroeconomic variables. Then the second type of inferential statistics is used which is linear regression analysis which creates a mathematical model that can be used to predict the impact of a change of Indian stock exchange indices based upon the values of macroeconomic variables. In other words, we use the model to predict the value of Y when we know the value of X. Here, we used the p-value to check the individual significance of the macroeconomic variables. For the analysis of the data, SPSS software was used.

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

SAMPLE SIZE AND PERIOD

In this study, the data of both indices and macroeconomic factors are taken from 2010 to 2019.

STATISTICAL TECHNIQUE

We use Pearson's Correlation Coefficient and Regression technique in this study.

Correlation matrix analysis

Correlation is a term that refers to the strength of a relationship between two variables. A strong, or high, correlation means that two or more variables have a strong relationship with each other while a weak, or low, correlation means that the variables are hardly related. Correlation coefficients can range from -1.00 to +1.00. The value of -1.00 represents a perfect negative correlation while a value of +1.00 represents a perfect positive correlation. A value of zero means that there is no relationship between two variables.

Here, the study used Karl Pearson r , type of correlation coefficient, which is also referred to as linear or product-moment correlation. This analysis assumes that the two variables being analyzed are measured on at least interval scales. The coefficient is calculated by taking the covariance of the two variables and dividing it by the product of their standard deviations. It is used to show the strength and the relationship between stock exchange indices and macroeconomic variables.

Econometric Regression Model

The term regression was introduced by Francis Galton. Linear regression analysis is an inferential statistical technique that is used to learn more about the relationship between an independent variable (referred to as X) and dependent variable (referred to as Y). So, the regression equation $Y_i = \beta_0 + \beta_1 X_i + U_i$ where Y_i is the dependent variable, X_i is the independent variable, β_0 is the constant (or intercept), β_1 is the slope of the regression line which represent the strength and direction of the relationship between the independent and dependent variables and U_i is a random error term. Here, in our study, we carried out this method to see and interpret the effect of macroeconomic variables on stock exchange indices.

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

DATA ANALYSIS

Table 2 presents the data of all variables considered in the study. It shows the closing value of macroeconomic variables i.e., IIP, CPI, FII, Crude oil, Gold price, and Dollar price from 2010 to 2019. It also shows the year-end value of Sensex and Nifty, the Indian stock market indices.

Table 1: Year-end value of Macroeconomic variables and Indices

YEAR	SENSEX	NIFTY50	IIP	FII	CPI	CO	DP	GP
2010	20509.09	6134.50	152.9	1,79,674.60	218.056	168	45.58	18,500.00
2011	15454.92	4624.30	165.5	39,352.80	224.939	213.8117	47.92	26,400.00
2012	19426.71	5905.10	170.3	1,63,350.10	229.594	222.50	53.21	31,050.00
2013	21170.68	6304.00	103.3	62,287.90	232.957	222.20	60.50	29,600.00
2014	27499.42	8282.70	106.7	2,56,211.85	236.736	205	61.14	28,006.50
2015	26117.54	7946.35	111	63,662.21	237.017	117.8	65.47	26,343.50
2016	26626.46	8185.80	114.7	-23079.12	240.008	100	67.072	28,623.50
2017	34056.83	10530.70	120	200048.12	245.12	123.6	64.4549	29,667.50
2018	36068.33	10862.55	125.3	-80917.23	251.107	156.7	69.9229	31,438.00
2019	41253.74	12168.45	130.1	135993.59	255.657	144.2	70.4059	35220.00

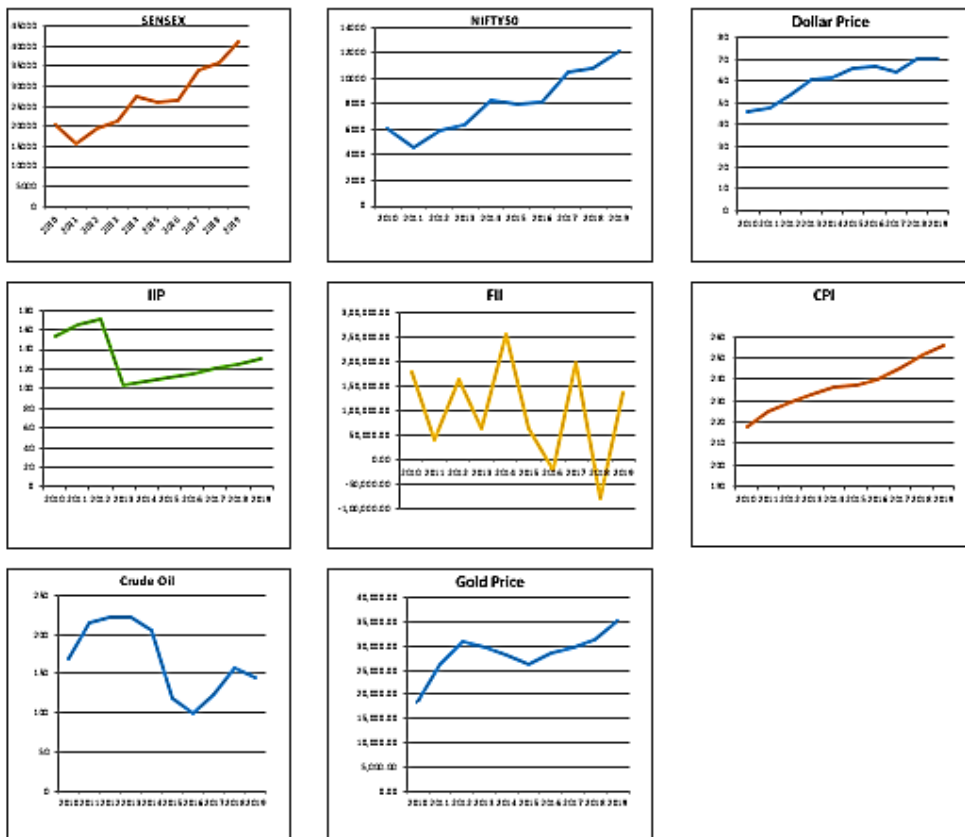
From the above table and the graphs below, there are certain conclusions which can be made.

1. There has been a continuous increase in SENSEX with certain declining values in the year 2010-11 driven by strong economic growth experienced by the country during this period. NIFTY 50 has shown similar trends which we exhibited by SENSEX. Also, in 2010-11 the graph shows a little slump.
2. IIP has shown an increase from the year 2009 with a sudden decline in the year 2012. After this, there is slow growth during that period. From the data of FII, it can be concluded that Net flow of FII has seen many ups and downs from 2009 to 2019. FII flow slumped to negative in the year 2016 (Because of many

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

announcements like Demonetization, Donald Trump Victory, etc) and 2018(due to weak corporate earnings, general elections of 2019)

3. Increased growth can be seen in the Consumer Price Index i.e., Inflation and Dollar prices.
4. There was a curve seen from the year 2009 to 2013, thereafter a steep decline was seen in Crude oil prices. Crude oil prices fell sharply in the fourth quarter of 2014 as robust global production exceeded demand. The year 2016 had led to a decrease in crude oil prices as well.
5. Gold prices have seen an increase during these 10 years with a slight decline in values from 2012 to 2015.



Relationship of IIP with Nifty 50 and Sensex

Correlation model:

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

Table 2

Correlations			
		IIP	NIFTY
IIP	Pearson Correlation	1	-.460
	Sig. (2-tailed)		.181
	N	10	10
NIFTY	Pearson Correlation	-.460	1
	Sig. (2-tailed)	.181	
	N	10	10

Table 3

Correlations			
		IIP	SENSE X
IIP	Pearson Correlation	1	-.449
	Sig. (2-tailed)		.193
	N	10	10
SENSE X	Pearson Correlation	-.449	1
	Sig. (2-tailed)	.193	
	N	10	10

Interpretation:

From the above tables, it is found that the correlation between IIP and both indices i.e., Nifty50 and Sensex is -0.460 and -0.449 respectively. This shows that there is a negative relationship between IIP and the indices. This means that whenever IIP increases, there will be a decrease in the indices. The value may go up or down by 46% in NIFTY and 44.9% in SENSEX. But when we look at significance value it is more than 0.01, which states that there isn't any significant relation between IIP and the indices.

Regression Model:

Table 4

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

Variables Entered/Removed			
Mode	Variables Entered	Variables Removed	Method
1	IIP	.	Enter
a. Dependent Variable: NIFTY and SENSEX			
b. All requested variables entered.			

Table 5

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
NIFTY	.460	.212	.113	2309.62181
SENSEX	.449	.202	.102	7755.50215
a. Predictors: (Constant), IIP				

Table 6

ANOVA						
Model		Sum of Squares	Df	Mean Square	F	Sig.
NIFTY	Regression	11468370.400	1	11468370.400	2.150	.181
	Residual	42674823.417	8	5334352.927		
	Total	54143193.817	9			
SENSEX	Regression	121614331.967	1	121614331.967	2.022	.193
	Residual	481182509.395	8	60147813.674		
	Total	602796841.362	9			

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

a. Dependent Variable: NIFTY and SENSEX
b. Predictors: (Constant), IIP

Table 7

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
NIFTY	(Constant)	14094.663	4156.868		3.391	.009
	IIP	-46.163	31.483	-.460	-1.466	.181
SENSEX	(Constant)	46357.651	13958.388		3.321	.011
	IIP	-150.325	105.718	-.449	-1.422	.193
a. Dependent Variable: NIFTY and SENSEX						

Interpretation:

It can be observed from Table 6 that IIP establishes a relationship with nearly 21.2 percent ($R^2=0.212$) in the NIFTY 50 and 20.2% ($R^2=0.202$) in the SENSEX of Indian stock market in each year. This means whatever changes in the market capitalization of both stock exchanges for the period under study the IIP is responsible for up to 21.2% in NSE and 20.2% in BSE. From this, it can be deduced that other factors have indirectly affected the indices. But, it can be observed from Table 8 that the p-value is way more than 0.05 i.e., 0.181 and 0.193 which proves that there is no significant impact of IIP on the NSE Nifty50 and BSE Sensex. So it can be concluded that the changes in IIP during this period didn't have any impact on both NIFTY 50 and SENSEX.

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

Relationship of FII with Nifty50 and Sensex

Correlation model:

Table 8

Correlations			
		FII	NIFTY
FII	Pearson Correlation	1	-.045
	Sig. (2-tailed)		.903
	N	10	10
NIFTY	Pearson Correlation	-.045	1
	Sig. (2-tailed)	.903	
	N	10	10

Table 10

Correlations			
		SENSEX	FII
SENSEX	Pearson Correlation	1	-.044
	Sig. (2-tailed)		.904
	N	10	10

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

FII	Pearson Correlation	-.044	1
	Sig. (2-tailed)	.904	
	N	10	10

Interpretation:

From the above tables, it is found that the correlation between FII and both indices i.e., Nifty50 and Sensex is -0.45 and -0.44 respectively. This shows that there is a negative relationship between FII and the indices. This means that whenever FII increases, there will be a decrease in the indices. The value may go up or down by 45% in NIFTY and 44% in SENSEX. But when we look at significance value it is more than 0.01, which states that there isn't any significant relation between FII and the indices.

Regression Model:

Table 9

Variables Entered/Removed			
Model	Variables Entered	Variables Removed	Method
1	FII	.	Enter
a. Dependent Variable: NIFTY and SENSEX			

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

b. All requested variables entered.

Table 10

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
NIFTY	.045	.002	-.123	2598.94088
SENSEX	.044	.002	-.123	8671.96955
a. Predictors: (Constant), FII				

Table 11

ANOVA						
Model		Sum of Squares	Df	Mean Square	F	Sig.
NIFTY	Regression	107244.092	1	107244.092	.016	.903
	Residual	54035949.725	8	6754493.716		
	Total	54143193.817	9			
SENSEX	Regression	1172394.452	1	1172394.452	.016	.904
	Residual	601624446.910	8	75203055.864		

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

	Total	602796841.362	9			
a. Dependent Variable: NIFTY and SENSEX						
b. Predictors: (Constant), FII						

Table 12

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
NIFTY	Constant	8197.461	1159.239		7.071	.000
	FII	-.001	.008	-.045	-.126	.903
SENSEX	Constant	27158.980	3868.071		7.021	.000
	FII	-.003	.027	-.044	-.125	.904
a. Dependent Variable: NIFTY and SENSEX						

Interpretation:

It can be observed from Table 12 that FII establishes a relationship of only 0.2% ($R^2=0.002$) in both NIFTY 50 and SENSEX of the Indian stock market in each year. The impact of FII during the period is very less. Also, it can be observed from Table 14 that the p-value is way more than 0.05 i.e., 0.903 and 0.904 which also proves that there is no

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

significant impact of FII on the NSE Nifty50 and BSE Sensex. So it can be concluded that the changes in FII during this period didn't have any impact on both NIFTY 50 and SENSEX.

Relationship of CPI with Nifty50 and Sensex

Correlation Model:

Table 13

Correlations			
		NIFTY	CPI
NIFTY	Pearson Correlation	1	.928**
	Sig. (2-tailed)		.000
	N	10	10
CPI	Pearson Correlation	.928**	1
	Sig. (2-tailed)	.000	
	N	10	10
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 14

Correlations			
		CPI	SENSEX
CPI	Pearson Correlation	1	.926**
	Sig. (2-tailed)		.000
	N	10	10
SENSEX	Pearson Correlation	.926**	1
	Sig. (2-tailed)	.000	
	N	10	10
**. Correlation is significant at the 0.01 level (2-tailed).			

Interpretation:

From the above tables, it is found that the correlation between CPI and both indices i.e., NIFTY 50 and SENSEX is 0.928 and 0.926. This shows that there is a strong positive relationship between CPI and both indices. It shows that there is a strong impact of the Consumer Price Index on stock market indices. This positive correlation reveals the fact that the CPI is an important factor in enhancing the market capitalization of both NSE

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

and BSE. Also, since the significance value is 0.000 which is less than 0.01 we can deduce that there is a relation between CPI and the indices.

Regression Model:

Table 15

Variables Entered/Removed			
Mode	Variables Entered	Variables Removed	Method
1	CPI	.	Enter
a. Dependent Variable: NIFTY and SENSEX			
b. All requested variables entered.			

Table 16

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
NIFTY	.928	.861	.844	970.24623
SENSEX	.926	.858	.840	3275.02148
X				
a. Predictors: (Constant), CPI				

Table 17

ANOVA						
Model		Sum of Squares	Df	Mean Square	F	Sig.
NIFTY	Regression	46612171.827	1	46612171.827	49.515	.000
	Residual	7531021.990	8	941377.749		
	Total	54143193.817	9			
SENSEX	Regression	516990715.833	1	516990715.833	48.201	.000
	Residual	85806125.529	8	10725765.691		

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

	Total	602796841.36 2	9			
a. Dependent Variable: NIFTY and SENSEX						
b. Predictors: (Constant), CPI						

Table 18

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
NIFTY	(Constant)	-37929.100	6547.714		-5.793	.000
	CPI	197.520	28.070	.928	7.037	.000
SENSEX	(Constan)	-126456.785	22101.507		-5.722	.000
	CPI	657.813	94.749	.926	6.943	.000
a. Dependent Variable: NIFTY and SENSEX						

Interpretation:

It can be observed from Table 18 that variable CPI, establishes a relationship of nearly 86.1% ($R^2=0.861$) in the NSE NIFTY 50 and about 85.8% ($R^2=0.858$) in BSE SENSEX of Indian stock market in each year. This means whatever changes in the market capitalization of NSE and BSE for the period under study the CPI are responsible for up to 86.1% and 85.8%. From this, it can be deduced that CPI is an important factor that affects the stock market indices.

Also, it can be observed in Table 20 that the p-value is less than 0.05 i.e., 0.000 in both NIFTY and SENSEX, and hence this shows that there is a significant impact of CPI on both indices. So we can conclude that CPI has a positive impact on the Indian stock market during this period.

Relationship of CO with Nifty50 and Sensex

Correlation model:

Table 19

Correlations		
	NIFTY	CO

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

NIFTY	Pearson Correlation	1	-.592
	Sig. (2-tailed)		.071
	N	10	10
CO	Pearson Correlation	-.592	1
	Sig. (2-tailed)	.071	
	N	10	10

Table 20

Correlations			
		CO	SENSEX
CO	Pearson Correlation	1	-.566
	Sig. (2-tailed)		.088
	N	10	10
SENSEX	Pearson Correlation	-.566	1
	Sig. (2-tailed)	.088	
	N	10	10

Interpretation:

From the above tables, it is found that the correlation between Crude Oil prices and both indices i.e., Nifty50 and Sensex is -0.592 and -0.566 respectively. This shows that there is a negative relationship between Crude Oil Prices and the indices. This means that whenever CO increases, there will be a decrease in the indices. The value may go up or down by 59.2% in NIFTY and 56.6% in SENSEX. But when we look at significance value it is more than 0.01, which states that there isn't any significant relation between FII and the indices.

Regression Model:

Table 21

Variables Entered/Removed

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

Model	Variables Entered	Variables Removed	Method
1	CO	.	Enter
a. Dependent Variable: SENSEX			
b. All requested variables entered.			

Table 22

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
NIFTY	.592	.351	.270	2096.17772
SENSEX	.566	.321	.236	7154.47777
a. Predictors: (Constant), CO				

Table 23

ANOVA						
Model		Sum of Squares	Df	Mean Square	F	Sig.
NIFTY	Regression	18991505.481	1	18991505.481	4.322	.071
	Residual	35151688.336	8	4393961.042		
	Total	54143193.817	9			
SENSEX	Regression	193304424.286	1	193304424.286	3.776	.088
	Residual	409492417.076	8	51186552.135		
	Total	602796841.362	9			
a. Dependent Variable: SENSEX and NIFTY						
b. Predictors: (Constant), CO						

Table 24

Coefficients

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
NIFTY	(Constant)	13361.250	2618.639		5.102	.001
	CO	-31.466	15.135	-.592	-2.079	.071
SENSEX	(Constant)	43621.435	8937.695		4.881	.001
	CO	-100.388	51.658	-.566	-1.943	.088
a. Dependent Variable: SENSEX and NIFTY						

Interpretation:

It can be observed from Table 24 that Crude Oil establishes a relationship with nearly 35.1% ($R^2=0.351$) in the NIFTY 50 and 32.1% ($R^2=0.321$) in the SENSEX of Indian stock market in each year. This means whatever changes in the market capitalization of both stock exchanges for the period under study the IIP is responsible for up to 35.1% in NSE and 32.1% in BSE. From this, it can be deduced that other factors have indirectly affected the indices. But, it can be observed from Table 26 that the p-value is more than 0.05 i.e., 0.071 and 0.088 which proves that there is no significant impact of Crude Oil prices on the NSE Nifty50 and BSE Sensex. So it can be concluded that the changes in CO during this period didn't have any significant impact on both NIFTY 50 and S

Relationship of DP with Nifty50 and Sensex

Correlation Model:

Table 25

Correlations

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

		NIFTY	DP
NIFTY	Pearson Correlation	1	.925**
	Sig. (2-tailed)		.000
	N	10	10
DP	Pearson Correlation	.925**	1
	Sig. (2-tailed)	.000	
	N	10	10
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 26

Correlations			
		DP	SENSEX
DP	Pearson Correlation	1	.913**
	Sig. (2-tailed)		.000
	N	10	10
SENSEX	Pearson Correlation	.913**	1
	Sig. (2-tailed)	.000	
	N	10	10
**. Correlation is significant at the 0.01 level (2-tailed).			

Interpretation:

From the above tables, it is found that the correlation between Dollar prices and both indices i.e., NIFTY 50 and SENSEX is 0.925 and 0.913. This shows that there is a fairly strong positive relationship between the Dollar price and both indices. It shows that there is a strong impact of Exchange rates (Dollar price) on stock market indices. This positive correlation reveals the fact that the DP is an important factor in enhancing the market capitalization of both NSE and BSE. Also, since the significance value is 0.000

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

which is less than 0.01 we can deduce that there is a significant relation between DP and the indices.

Regression model:

Table 27

Variables Entered/Removed			
Model	Variables Entered	Variables Removed	Method
1	DP	.	Enter
a. Dependent Variable: NIFTY			
b. All requested variables entered.			

Table 28

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
NIFTY	.925	.856	.838	986.57447
SENSEX	.913	.834	.813	3536.40648
a. Predictors: (Constant), DP				

Table 29

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
NIFTY	Regression	46356560.325	1	46356560.325	47.627	.000
	Residual	7786633.493	8	973329.187		
	Total	54143193.817	9			
SENSEX	Regression	502747474.831	1	502747474.831	40.200	.000
	Residual	100049366.531	8	12506170.816		
	Total	602796841.362	9			
a. Dependent Variable: NIFTY and SENSEX						
b. Predictors: (Constant), DP						

Table 30

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
NIFTY	(Constant)	-6608.746	2153.243		-3.069	.015
	DP	252.333	36.564	.925	6.901	.000
SENSEX	(Constant)	-21602.314	7718.364		-2.799	.023
	DP	830.986	131.063	.913	6.340	.000
a. Dependent Variable: NIFTY						

Interpretation:

It can be observed from Table 30 that variable Dollar Price, develops a relationship of practically 85.6% ($R^2=0.856$) in the NSE NIFTY 50 and about 83.4% ($R^2=0.83.4$) in BSE SENSEX of Indian stock exchange every year. This suggests whatever alterations in the market capitalization of NSE and BSE for the period under scrutiny, the DP are liable for up to 85.6% and 83.4%. From this, it might be inferred that the Dollar price or Exchange rate is a critical factor that impacts the stock exchange indices. Likewise, it tends to be found in Table 32 that the p-value is under 0.05 i.e., 0.000 in both NIFTY and SENSEX, and henceforth this shows there is a significant effect of Dollar Price on both indices. So we can infer that DP positively affects the Indian securities exchange during this period.

Relationship of GP with Nifty50 and Sensex

Correlation model:

Table 31

Correlations			
		GP	NIFTY
GP	Pearson Correlation	1	.632*

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

	Sig. (2-tailed)		.050
	N	10	10
NIFTY	Pearson Correlation	.632*	1
	Sig. (2-tailed)	.050	
	N	10	10
*. Correlation is significant at the 0.05 level (2-tailed).			

Table 32

Correlations			
		SENSEX	GP
SENSEX	Pearson Correlation	1	.630
	Sig. (2-tailed)		.051
	N	10	10
GP	Pearson Correlation	.630	1
	Sig. (2-tailed)	.051	
	N	10	10

Interpretation:

From the above tables, it is discovered that the relationship between Gold Price and both indices i.e., NIFTY 50 and SENSEX is 0.632 and 0.630. This shows there is a moderate connection between the Gold price and both indices. It shows that there is a reasonably positive effect of Gold price on stock exchange indices. This positive correlation uncovers the way that the GP is a significant factor in upgrading the market capitalization of both NSE and BSE. Additionally, since the significance value is 0.050 in NIFTY 50 which is significant at a 5% level we can find that there is a significant relationship between GP and the indices. Though, the significance value is 0.051 in SENSEX which fails the 5% significance level by a margin.

Regression model:

Table 33

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

Variables Entered/Removed			
Mode	Variables Entered	Variables Removed	Method
1	GP	.	Enter
a. Dependent Variable: SENSEX and NIFTY			
b. All requested variables entered.			

Table 34

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
NIFTY	.632	.400	.325	2015.81567
SENSEX	.630	.397	.322	6739.09393
a. Predictors: (Constant), GP				

Table 35

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
NIFTY	Regression	21635091.235	1	21635091.235	5.324	.050
	Residual	32508102.582	8	4063512.823		
	Total	54143193.817	9			
SENSEX	Regression	239473744.851	1	239473744.851	5.273	.051
	Residual	363323096.511	8	45415387.064		
	Total	602796841.362	9			
a. Dependent Variable: SENSEX and NIFTY						
b. Predictors: (Constant), GP						

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

Table 38

Model		Coefficients				
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
NIFTY	(Constant)	745.410	3248.110		.229	.824
	GP	.278	.121	.632	2.307	.050
SENSEX	(Constant)	2368.313	10858.790		.218	.833
	GP	.926	.403	.630	2.296	.051

a. Dependent Variable: SENSEX and NIFTY

Interpretation:

It tends to be seen from Table 36 that variable Gold Price, sets up a relationship of almost 40% ($R^2=0.400$) in the NSE NIFTY 50 and about 39.7% ($R^2=0.397$) in BSE SENSEX of Indian stock exchange in every year. This implies whatever adjustments in the market capitalization of NSE and BSE for the period under examination the Gold prices are liable for up to 40% and 39.7%. From this, it very well may be concluded that the Gold price is additionally a factor that respectably influences the stock exchange indices. Additionally, it tends to be seen in Table 38 that the p-value is 0.05 in NIFTY which implies that the relationship is significant while the p-value is 0.051 in SENSEX which fails by an edge to be critical. So we can reason that GP positively affects NIFTY yet not on SENSEX during this period.

FINDINGS

1. The findings of the study show that:
2. The correlation of IIP with Nifty and Sensex was -0.46 and - 0.449 which states that there is a negative correlation. But correlation is not significant at the 0.01 significance level. The impact which IIP has on both indices is 21.2% and 20.2% but p-value states that IIP is not a significant factor.
3. The correlation of FII with Nifty and Sensex was -0.45 and - 0.44 which states that there is a negative correlation. But correlation is not significant at the 0.01 significance level. The impact which FII has on both indices is 0.2% which proves it's not an important factor.

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

4. The correlation of CPI with Nifty and Sensex was 0.928 and 0.926 which states that there is a strong positive correlation, significant at 0.01 significance level. There is a strong impact of CPI on both indices that is 86.1% and 85.8% with p-value satisfying it to be a significant factor.
5. The correlation of Crude Oil with Nifty and Sensex was -0.592 and -0.566 which states that there is a negative correlation. But correlation is not significant at the 0.01 significance level. The impact which Crude oil has on both indices is 35.1% and 32.1% but p-value states that Crude Oil is not a significant factor.
6. The correlation of Dollar price with Nifty and Sensex was -0.925 and -0.913 which states that there is a strong positive correlation, significant at 0.01 significance level. There is a strong impact of Dollar price on both indices that is 85.6% and 83.4%. The p-value is significant at a 5% significance level, which proves it is a significant factor.
7. The correlation of Gold price with Nifty and Sensex was -0.632 and -0.63 which states that there is a moderately positive correlation. The extent to which it is correlated is significant with Nifty but not with Sensex.
8. Gold prices impact nearly 40% on Nifty and 39.7% on Sensex. The p-value 0.05 in Nifty proves it is a significant factor for volatility in Nifty but not in Sensex as the p-value is 0.051.

CONCLUSION

In this paper, the study performed necessary analyses to answer the research question of whether some of the identified macroeconomic factors can influence the Indian stock market. The macroeconomic variables are represented by the Index of Industrial Production, Consumer Price Index, Foreign Institutional investment, Exchange rate (dollar price), Gold price, and Crude oil prices. Indian stock market is represented by NSE NIFTY and BSE SENSEX. Yearly data for a period of 10 years (from 2010 – 2019) was considered. The paper employed regression analysis and correlation analysis to examine such relationships. The results are interesting and useful in understanding the Indian stock market pricing mechanism.

Based on overall analysis it can be concluded that three out of six variables are relatively more significant and likely to influence the Indian stock market. These factors are the Consumer price index, Dollar price, and Gold price (Gold price is not significant in the case of SENSEX). There is a positive relation of CPI, DP, and Gold prices with both

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

indices. Whereas IIP, FII, CO shows a negative relation with the Indices. The result has been concluded on the bases of the correlation and regression. This simply concludes that in the long term the Indian stock market is driven by both domestic macroeconomic factors and global factors.

The results of this analysis should not be treated as conclusive for an investment. Apart from understanding the Indian stock market based on the contributions of the significant variables, there remain other important issues that affect the return generating process. These issues are the cost of equity capital, asset valuation, industry analysis, a firm's management, and operational efficiency analysis, economic environment, government policies, and so on. Any investor should consider all relevant sources of information when making an investment decision.

BIBLIOGRAPHY

1. <https://www.ijeat.org/wp-content/uploads/papers/v8i6/F8972088619.pdf>
2. https://www.iimcal.ac.in/sites/all/files/pdfs/wps_822.pdf
3. https://www.researchgate.net/publication/329513806_An_Analytical_Study_of_the_Effect_of_Inflation_on_Stock_Market>Returns
4. <http://www.informaticsjournals.com/index.php/sdmimd/article/view/19997>

**MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY –
A STUDY ON INDIAN STOCK MARKET**

5. <https://ksom.ac.in/wp-content/uploads/2018/06/134-135-Keshav-Garg-Rosy-Kalra.pdf>
6. https://www.academia.edu/35579974/STOCK_MARKET_VOLATILITY_A_STUDY_OF_INDIAN_STOCK_MARKET
7. <https://content.sciendo.com/view/journals/sbe/12/1/article-p61.xml>
8. https://pdfs.semanticscholar.org/b286/6596cde23d5af34fba8c8f903d8765b24686.pdf?_ga=2.81022423.1120733688.1592480429-496496907.1583660886
9. https://www.researchgate.net/publication/306262190_A_Study_on_Dynamic_Relationship_between_Gold_Price_and_Stock_Market_Price_in_India
10. <http://www.iosrjournals.org/iosr-jef/papers/Vol7-Issue4/Version-1/G0704016871.pdf>
11. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.683.8942&rep=rep1&type=pdf>
12. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2238539#:~:text=From%20the%20study%20it%20has,movement%20in%20Indian%20stock%20market.
13. https://www.researchgate.net/publication/315769748_FACTORS_AFFECTING_BEHAVIOR_OF_INDIAN_STOCK_MARKET
14. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.477.2779&rep=rep1&type=pdf>
15. https://pdfs.semanticscholar.org/f99e/1ab10b271653d8988ce427c36e1f8435fc0a.pdf?_ga=2.114573959.1644149479.1592808834-496496907.1583660886
16. https://www.researchgate.net/publication/235252307_Impact_of_macro_economic_indicators_on_Indian_capital_markets
17. <https://poseidon01.ssrn.com/delivery.php?ID=023099073005080087072116024004097010059084032079043034119006115068000098122097123024106107048020103097110122002115073113088115014018078077010019120098070098003076056011080099121076093064002086097000064123092075086113088096074116091093108091097086019&EXT=pdf>
18. https://www.jstor.org/stable/10.1086/344115?seq=1#metadata_info_tab_contents
19. <https://www.isical.ac.in/~eru/erudp/2003-05.pdf>
20. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.467.4248&rep=rep1&type=pdf>
21. https://www.moneycontrol.com/stocks/hist_index_result.php?indian_indices=9
22. <https://www.bseindia.com/indices/IndexArchiveData.html>
23. <https://www.rbi.org.in/scripts/PublicationsView.aspx?id=19019>

MACROECONOMIC FACTORS AFFECTING STOCK PRICE VOLATILITY – A STUDY ON INDIAN STOCK MARKET

24. https://inflationdata.com/Inflation/Consumer_Price_Index/HistoricalCPI.aspx?reloaded=true
25. <https://www.bankbazaar.com/gold-rate/gold-rate-trend-in-india.html>
26. <https://www.cdslindia.com/publications/FIIFPIYrWiseInvstmntDtls.aspx>
27. https://en.wikipedia.org/wiki/Exchange_rate_history_of_the_Indian_rupee
28. <https://www.indexmundi.com/commodities/?commodity=petroleum-price-index&months=120>