THE IMPACT OF MACROECONOMIC INDICATORS ON THEMATIC INDICES OF BSE IN INDIA

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RASHMI RAMDAS CHODANKAR

Seat Number: 38-2022

ABC ID: 176069067816

PRN: 201904759

Under the Supervision of

ASST. PROF. VISHAL KAMLAKAR GAONKAR

Commerce Discipline

GOA UNIVERSITY

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DECLARATION BY STUDENT

I hereby declare that the data presented in this Dissertation report entitled **"Impact of Macroeconomic Indicators on Thematic Indices of BSE in India"** is based on the results of investigations carried out by me in the commerce discipline at the Goa Business School, Goa University under the Supervision of Mr. Vishal Gaonkar and the same has not been submitted elsewhere for the award of a degree or diploma by me. Further, I understand that Goa University will be not be responsible for the correctness of observations / experimental or other findings given the dissertation.

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RChodankar

Date: 30/04/2024

Place: Goa University

Rashmi R. Chodankar

Seat no: 38-2022

Master of Commerce

Goa Business School

COMPLETION CERTIFICATE

This is to certify that the dissertation report **"Impact of Macroeconomic Indicators on Thematic Indices of BSE in India"** is a Bonafide work carried out by Ms. Rashmi Ramdas Chodankar under my supervision in partial fulfilment of the requirements for the award of the degree of Master of Commerce in the Commerce Discipline at the Goa Business School, Goa University.

Date: 30/04/2024

Asst. Prof. Vishal Gaonkar

Commerce

Prof. Jyoti Pawar

Dean

Goa Business School

Date: 30/04/2024

Place: Goa University

School Stamp

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
BSE	Bombay Stock Exchange
NSE	National Stock Exchange
SEBI	Securities & Exchange Board of India
CPSE	Central Pubic Sector Enterprises
PSU	Public Sector Undertakings
ER	Exchange rate
GDP	Gross Domestic Product
NDP	Net Domestic Product
CPI	Consumer Price Index (Inflation rate)
Crude	Crude oil Prices
FER	Foreign Exchange reserve
ARDL	Autoregressive distributed Lag

THE IMPACT OF MACROECONOMIC INDICATORS ON THEMATIC INDICES OF BSE IN INDIA

Abstract

Investors are influenced by the changes in the Macroeconomic indicators as the Macroeconomic indicators impacts the stock market returns differently according to the government policies and economic conditions of the country. This study focusses on the impact of macroeconomic indicators on the Thematic Indices of Bombay Stock Exchange by using quarterly data for the period of 2016 to 2023 and further examines the Long run and short run relationship between Macroeconomic Indicators and the Stock market returns of the Thematic Indices of BSE in India. The study finds a significant impact of Gross domestic product on S&P BSE manufacturing index and S&P BSE CPSE index by using the ordinary least Square method. It is observed that Crude oil Price and Inflation rate has a positive impact on all the Thematic Indices of Bombay Stock Exchange. The study found that there exists cointegration relationship between the variables by using ARDL bound test. Further The study finds that Foreign exchange reserve, gross domestic product and exchange rate has a negative relationship in the Long run on all the Thematic Indices of BSE in India and Crude oil Price and Inflation rate has a positive relationship in the long run. In the short run, the error correction term is negative and statistically significant of S&P BSE India manufacturing Index, S&P BSE India Infrastructure Index and S&P BSE CPSE Index which indicates that the system is correcting towards the long-run equilibrium.

Keywords: Macroeconomic Indicators, Thematic Indices, GDP, Crude oil, S&P BSE India manufacturing Index, S&P BSE India Infrastructure Index.

CHAPTER I: INTRODUCTION

1.1 Introduction to Stock Market in India

The Stock market is a financial exchange where buyers and sellers exchange shares of stock, which represent ownership in businesses. It is essential to the world economy because it makes it easier for capital to be allocated, which allows businesses to raise money for growth and development. The goal of investing in the stock market is to generate returns on one's capital through dividends and capital growth. In India, the two main stock exchanges are the National Stock Exchange (NSE) and the Bombay Stock Exchange (BSE), where the majority of stock market activity occurs. Since 1875, BSE has been in operation. In contrast, the NSE began trading in 1994 after being established in 1992. The settlement procedure, trading hours, and trading mechanism are all the same on both exchanges. In Spot trading, NSE holds a commanding market share.

An open electronic limit order book is used for trading at both exchanges, and a trading computer matches orders. The entire process is driven by orders; there are no market makers or specialists. Investors submit market orders, and the best limit orders are immediately matched. As a result, both suppliers and purchasers stay anonymous. By showing all buy and sell orders in the trading system, this promotes transparency. Orders in the trading system are placed by brokers who give retail clients access to internet trading. Institutional investors employ the direct market access option offered by brokers to place orders straight into the Stock market trading system. T+2 is the trading and settlement cycle that is followed by both stock exchanges. The overall responsibility of development, regulation and supervision of the stock market rests with the Securities & Exchange Board of India formed in 1992 as an independent authority. Since then, SEBI has consistently tried to lay down market rules in line with the best market practices. It enjoys vast powers of imposing penalties on market participants, in case of a breach.

1.2 Bombay Stock Exchange of India (BSE)

The Bombay Stock Exchange, situated in Mumbai, India, is among the oldest stock markets in Asia. Additionally known as BSE Limited, it was founded in 1875. India's financial market heavily relies on the BSE, a well-known stock exchange.

The BSE SENSEX, sometimes referred to as the S&P Bombay Stock Exchange Sensitive Index or just SENSEX, is a free-float market-weighted stock market index. It shows the results of the 30 biggest and most frequently traded stocks that are listed on the BSE. The SENSEX's base year was 1978–1979, and its base value was established on April 1st, 1979, at 100. DOLLEX-30, a dollar-linked equivalent of the SENSEX, was introduced by BSE on July 25, 2001 on the BSE platform. BSE is actively involved in a number of programs designed to raise investor awareness and education. It runs courses to inform investors about financial planning and the stock market. BSE serves a variety of investor needs through its many market divisions, which include the debt, equity, and derivatives markets.

The S&P BSE measures the performance of companies that are listed on the Bombay stock exchange across different sizes, sectors, themes, industries and strategies. The indices are designed to represent the segments of equities market in India.

The indices that represent the market are broad based, sectoral indices, Thematic indices, strategy indices.

The Broad-based indices covers large-cap, mid-cap and small cap companies. It acts as a market Indicators for the Indian stock market.

The Sector indices are the industry & sectors that are equity benchmarks for traded securities of Bombay stock exchange. The sectors of BSE are S&P BSE auto, S&P BSE oil and gas, S&P BSE metal, S&P BSE Power, S&P BSE capital goods, S&P BSE Bankex, S&P BSE Realty, S&P Consumer durables, S&P BSE Teck.

Thematic indices include S&P BSE PSU, S&P BSE CPSE, S&P BSE India Infrastructure Index, S&P BSE India Manufacturing Index, S&P BSE Diversified Revenue Growth Fund, S&P BSE Private Banks Index.

Strategy indices include S&P BSE IPO, S&P BSE SME IPO, S&P BSE DOLLEX, S&P BSE Sensex Futures Index, S&P BSE Arbitrage rate Index, S&P BSE 500 and Arbitrage Rate 50/50 Blend Index, S&P BSE SENSEX 2X Leverage Daily Index, S&P BSE SENSEX Inverse Daily Indices.

1.3 Study on Thematic Indices of BSE in India

Thematic Indices reflect the performance of the companies according to specific investment themes such as manufacturing, Infrastructure, Banking etc. It is a set of companies belonging to the same category of the business or a specific theme and is broader than the sectoral indices as it consists the companies of different sectors but of the same theme.

1.3.1 S&P BSE India Manufacturing Index

The S&P BSE India manufacturing Index is designed in such a way that it measures the performance of production and manufacturing companies within the S & P BSE Large Mid Cap. Subject to a 10% weight cap for individual stocks and a 30% weight cap for the common India Industry Classification Structure Macro-economic indicator, constituents are weighted based on float-adjusted market capitalization.

1.3.2 S&P BSE India Infrastructure Index

The S&P BSE India Infrastructure Index evaluates the performance of S&P BSE 500 Indian Infrastructure companies. A 10% cap on the weight of individual stocks and a 30% cap on the weight of individual infrastructure clusters apply to the float-adjusted market capitalization used to weight the constituents.

It has been designed to measure the performance of the top 30 Indian infrastructure companies that meet benchmarking and investing requirements, with the goal of providing liquid and

tradable exposure to this theme comprising of five Infrastructure namely energy, transportation, Utilities, Non-banking financial companies, telecommunications. In order to take corporate events like mergers, takeovers, delisting, or bankruptcies into account, the index is continuously reviewed. Index composition changes are implemented as soon as they become effective, together with any necessary weight modifications. Usually, two business days before the date of implementation, these changes are made public.

1.3.3 S&P BSE PSU Index

This index S&P BSE PSU plays the role of measuring the Performance of India's Public Sector Undertakings in the S&P BSE 500. Index constituents are weighted based on their float-adjusted market capitalization. No additions are made to the index between rebalancing.

1.3.4 S&P BSE CPSE Index

The S&P CPSE Index is measures the Performance of India's Central Public Sector Enterprises which is listed on the Bombay Stock Exchange. All the companies classified as CPSE by the Ministry of Public Sector Enterprises are eligible for the index. CPSE refers to any public sector undertaking where the Central Government or any other CPSE holding is equal to or greater than 51%. Public Sector Banks are not classified as CPSE.

CPSE companies with the following characteristics are not eligible for index inclusion:

Any company added to the Graded Surveillance Measure list will be dropped from the index effective at the open of Tuesday, following the first Monday of every month. The reference date for the list is the third Friday of every month.

1.4 Macroeconomic Indicators

The relation between macroeconomic indicators and stock prices is confirmed in the most academic works, although there is a lack of comprehensive assessment of dependence of macroeconomic indicators and stock market in regard to the time and changing macroeconomic processes. That is why the model of the impact of macroeconomic indicators on the stock market index, which enables to reveal a complex assessment of dependence of the relation between macroeconomic indicators and stock prices during the long and the short runs, becomes a logical prolongation of an existent academic analysis.(Pilinkus, 2011)

Macroeconomic indicators considered for the study are Inflation rate (Consumer Price Index), Real Gross Domestic Product (GDP), Exchange rates (USD Dollars), Crude Oil Prices (Brent), and foreign exchange reserves. Macroeconomic indicators are among the many indicators that stock market participants can use to predict whether to finance stock with a higher or lower return. These changes in macroeconomic variables have a major effect on stock market returns.

1.4.1 Gross Domestic Product

The Gross Domestic Product, or GDP, is the monetary value of all the goods and services produced inside the borders of a nation. It is calculated over a given period of time, usually a year or quarter, and the GDP growth rate is a crucial indicator of the country's economic health. The GDP can be calculated using the output, expenditure, or income of the nation. There are different types of GDP and they are nominal GDP, real GDP, actual GDP.

Nominal GDP is the value of all goods and services produced at current market prices which includes inflation and deflation that is the price prevailing in the year for which Gross domestic product is measured.

Real GDP is the value of all the goods and services at a base price value in which GDP is inflation adjusted. It is measured at constant prices.

Gross Domestic Product at Market Price is the money value of all final goods and services produced in the domestic territory of a country in a year. It includes consumption of fixed capital and net indirect taxes.

Gross Domestic Product at Factor Cost is the money value of all final goods and services produced in the domestic territory of a country in a year. It includes consumption of fixed capital and does not include net indirect taxes.

When depreciation is deducted from gross domestic product, Net Domestic Product is obtained.

*NDP = GDP – Depreciation

1.4.2 Exchange Rate

One of the main indicators of the state of the nation's economy is the exchange rate. It has a big impact on capital flows and trade. The value of a country's currency in relation to another currency is known as its exchange rate. The US dollar is typically used as the base currency and other currencies are used as the counter currency in exchange rates. The Indian rupee's exchange rate against the US dollar is also included in this analysis.

Exchange rate (also known as a foreign-exchange rate, forex rate, FX rate) between two currencies is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country’s currency in terms of another currency. For example, an interbank exchange rate of 91 Japanese yen (JPY, ¥) to the United States dollar (US$) means that ¥91 will be exchanged for each US$1 or that US$1 will be exchanged for each ¥91. Exchange rates are determined in the foreign exchange market, which is open to a wide range of different types of buyers and sellers where currency trading is continuous: 24 hours a day except weekends. The spot exchange rate refers to the current exchange rate. The forward exchange rate refers to an exchange rate that is quoted and traded today but for delivery and payment on a specific future date.

1.4.3 Foreign Exchange Reserves

Foreign Exchange reserves are valuable assets or foreign currencies which is held on reserve by a central bank. It is also known as forex reserves or FX reserve. It is a composition of euros, dollars, yen, and other important financial instruments. Countries build up these reserves to intervene in the foreign exchange market to influence the value of their own currency. Also, these reserves provide extra supply when a country starts running short of foreign currency, as they can use their reserves to pay for essential imports or to meet its international debt obligations. Also, when they are having a reserves, it helps to build the confidence in its country's economy, which enables to attract foreign investment.

1.4.4 Crude Oil Prices

Crude oil prices are vital to the country's economy because they represent a significant production input. India is one of the nations that imports crude oil and is heavily reliant on other nations to meet its needs. Every change in the price of oil on the global market automatically affects the economy of a nation and creates uncertainty in the stock market. Whether or not an economy is oil-based—that is, whether or not the nation is an oil exporter or an oil importer—determines how oil prices affect the stock market.

The returns of the Thematic Indices could be positively or negatively impacted by changes in crude oil prices. There is a negative association between stock prices and the returns of the Thematic Indices if rising oil prices also result in rising production costs, declining real economic activity, and declining predicted future cash flows. The financial risk associated with investing could rise as a result of rising oil prices and inflation. Conversely, a positive correlation exists if the rise in oil prices is accompanied by higher corporate earnings for the company. Thus, one of the systematic factors affecting stock market returns is the oil price.

1.4.5 Inflation Rate

The increase in the prices of goods and services in an economy is termed as inflation. It is measured using the consumer price index and Wholesale price index. The percentage change in the consumer price index over a specific period is termed as inflation rate. So, if the consumer price index goes up by 10% in a year, the inflation rate is 10%. In this study the inflation rate is proxied by the Consumer Price Index, which measures the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or change at yearly intervals. This proxy has also been used in studies such as those of Shan et al. (2001), Boyd et al. (2001) and Marques et al. (2013)(Ho & Odhiambo, 2020).

An economy is impacted by inflation in a number of ways, both positively and negatively. Inflation's negative effects include raising the opportunity cost of holding money, raising consumer anxiety about future inflation, discouraging savings and investment, and, if it happens quickly enough, leading to shortages of goods as people start stockpiling in anticipation of price increases. Benefits include making sure central banks have the ability to modify real interest rates in order to lessen recessions and promoting capital investment in non-monetary initiatives. Deflation is the reverse of inflation.

CHAPTER II: OBJECTIVES AND METHODOLOGY

2.1 Literature Review

(Madurapperuma, 2023) This study aims to examine the short- and long-term equilibrium relationship between All share price index (ASPI), macroeconomic variables and the economic crisis in Sri Lanka. Monthly time series data for inflation (CPI), industrial production (IP), an exchange rate (EX), an interest rate (TB), short-term interest rate (CD) and economic crisis were used from 2010 to 2021. The ADF test, the bound testing approach, the CUSUM test and the CUSUMQ test were used in this study. The findings show a long-run stable relationship between stock price, macroeconomic variables and political crisis (i.e., CPI, IP, ER, TB, CD and economic crisis). The results of the Johansen cointegration test suggest that there is at least one cointegrating equation, indicating that there is a long-run equilibrium relationship between macroeconomic variables and stock prices in Sri Lanka.

(Raza, 2023) This study aims to determine how changes in macroeconomic indicators and the housing prices index (HPI) are related. These factors can cause short-term and long-term changes in the housing market in Spain. The study used cointegrating regression, fully modified ordinary least squares and dynamic ordinary least squares methodologies. The models are trained using quarterly time series data for these parameters from 2010 to 2022. A comprehensive examination is conducted to explore the relationship between macroeconomic issues and fluctuations in the HPI. The results indicate statistically significant short-run effects ($p < 0.05$) of economic growth, inflation, Spanish stock indices, foreign trade and the interest rate on HPI. The inflation variables, Spain's stock indices, interest rate and monetary rate, have statistically significant long-run effects ($p < 0.05$) on HPI. The exchange rate, unemployment and money supply have no substantial impact on HPI in Spain.

(Verma & Bansal, 2021) In this paper the researcher examined the impact of macroeconomic variables on stock market performance using literature from across world. GDP, FDI, and FII all had the same impact on developing and developed countries. The remaining variables yielded results that differed by country. Another interesting fact discovered was that when the economy was in a state of crisis or decline, variables reversed their impact. In the case of sectoral indices, the influence of variables was found specific to sectors while other variables having an effect on all sectors.

(Parab & Reddy, 2020) This paper aims to analyse the relationship between select macroeconomic variables and stock market returns and thereafter examines the impact of select macroeconomic variables on stock market returns by using the Bai–Perron test and also investigates the causal relations. The study considers a period of 20 years, i.e. from April 1996 to March 2016. As the period of study is spread over two decades and includes the financial crisis in the year 2008 and other economic events, the study suspects the presence of structural breaks. The structural break presence may deteriorate the results. Therefore, the analyses are performed considering this aspect. The study evidenced a significant impact of macroeconomic variables on stock market returns, and such impact was found to be varying across structural periods.

(Olokoyo et al., 2020) In this paper the researcher examines the long-run impact of macroeconomic indicators such as interest rate, foreign capital flows, exchange rate, GDP growth, inflation and trade on stock market performance (market capitalization) in Nigeria. This study employed the Johansen cointegration procedure and Vector Error Correction Model analysis. Results from the empirical analysis confirm that the macroeconomic variables are cointegrated with stock market performance in the long run. We perform a VECM estimation and our results reveal that interest rate (INT), inflation (INFL) and trade (TRD) bear a negative

relationship with market capitalization (MCAP) while exchange rate (EXR), GDP growth rate (GDPG) and foreign capital flows (FKF) bear a positive relationship.

(Raju & Marathe, 2020) This study analyses the relationship between Crude oil Prices and Macro-economic variables in BRICS countries using Quarterly data from March 31, 1999 to December 31, 2019 and an Autoregressive Distributed lag model has been developed to study the long term relationship between Crude oil and Macro-economic variable. The study found out that the long term relationship exists between the variables. We have also identified that all the countries react differently to the fluctuations in Oil prices. But interestingly China and India share some commonalities in terms of reacting to the changes in Crude Oil prices. Additionally, we have also found that fluctuations in the Oil price effect Trade Openness in every country under study except Russia.

(Ho & Odhiambo, 2020) The purpose of this paper is to examine the macroeconomic drivers of stock market development in Hong Kong during the period 1992Q4-2016Q3. Specifically, it investigates the impact of banking sector development, economic growth, inflation rate, exchange rate, trade openness and stock market liquidity on stock market development. This paper uses quarterly time-series data covering the period 1992Q4-2016Q3, which have been obtained from various reliable sources. The study uses the autoregressive distributed lag bounds testing procedure to identify both the long- and short-run macroeconomic drivers of stock market development in Hong Kong. We find that banking sector development and economic growth have positive impacts on stock market development, whereas the inflation rate and the exchange rate have negative impacts on stock market development both in the long and short run. In addition, the results show that trade openness has a positive long-run impact but a negative short-run impact on stock market development.

(Szczygielski & Brümmer, 2020) This study investigates the impact of the macroeconomic environment on South African industrial sector returns. Using standardized coefficients derived from time-series factor models, the authors quantify the impact of macroeconomic influences on industrial sector returns. The authors analyze the structure of the resultant residual correlation matrices to establish the level of factor omission and apply a factor analytic augmentation to arrive at a specification that is free of omitted systematic (common) factors. The authors find that global influences are the most important drivers of returns and that industrial sectors are highly integrated with the global economy. The authors show that specifications that comprise only macroeconomic factors and proxies for omitted factors in the form of residual market factors are likely to be underspecified. This study demonstrates that a factor analytic augmentation is an effective approach to ensuring an adequately specified model.

(S. Pal & Garg, 2019) In this paper the researcher analyses the sensitivity of a series of Indian stock indices for the astonishing component of monetary and macroeconomic policy with the data set from 1 April 2004 to 31 July 2016. The immediate impact is assessed with event analysis and the dynamic effect is analysed with the Vector Autoregression (VAR) model. The result of the event analysis indicates that the monetary policy surprise significantly affects the stock market and is more prominent than that of other macroeconomic surprises.

(Banda et al., 2019) This paper aims to address the absence of research on the relationship between macroeconomic variables (aggregate economic output, inflation, interest rates and exchange rates) and industrial shares in developing countries. The Industrial Index (INDI 25) on the Johannesburg Stock Exchange (JSE) was analysed using data from 1995 to 2017. The results show that inflation has a significant positive relationship with stock prices. However, a

negative relationship was found between interest rates and stock prices. In this period, exchange rates had a positive effect on industrial shares, but no relationship was identified between industrial shares and the gross domestic product (GDP).

(Jana et al., 2019) The purpose of this paper is to estimate and evaluate the impact of macroeconomic fundamentals on stock prices of selected food and drink industry stocks during the period of 2005–2015, which saw the global financial crisis and its aftermath. The paper employed correlation analysis and the Johansen cointegration test with the vector error correction mechanism for EU companies operating in the food and drink industry. The paper tested the effects of GDP, inflation and interest rates (IR) on the stock prices of companies from Austria, Croatia, Cyprus, Denmark, Finland, Germany, Ireland, Italy, Lithuania, Poland, Spain and the UK. Based on the results, the authors can see that GDP has a generally positive effect on stock price development. In contrast, the relationship between stock prices and inflation and IR is negative in most cases.

(Mohan et al., 2019) This paper uses statistical analyses to quantify the effects of five major macroeconomic indicators, namely crude oil price, 30-year mortgage interest rate (IR), Consumer Price Index (CPI), Dow Jones Industrial Average (DJIA), and unemployment rate (UR), on housing prices over time. Housing price is measured as housing price index (HPI) and is treated as a variable affecting itself. Actual housing sale prices in the Town of Amherst, New York State, USA, 1999-2008, and time-series data of the macroeconomic indicators, 2000-2017, were used in a vector autoregression statistical model to examine the data that show the greatest statistical significance and exert maximum quantitative effects of macroeconomic indicators on housing prices. The analyses concluded that the 30-year IR and HPI have statistically significant effects on housing prices. IR has the highest effect, contributing 5.0 per

cent of variance in the first month to 8.5 per cent in the twelfth. The UR has the next greatest influence followed by DJIA and CPI. The disturbance from HPI itself causes the greatest variability in future prices: up to 92.7 per cent in variance 1 month ahead and approximately 74.5 per cent 12 months ahead. This result indicates that current changes in house prices heavily influence people's expectation of future prices. The total effect of the error variance of the macroeconomic indicators ranged from 7.3 per cent in the first month to 25.5 per cent in the twelfth.

(Jambotkar & Raju, 2018) This paper examines the existence of Correlation between the macroeconomic indicators and returns of sector indices in National Stock Exchange (NSE) and has analysed the impact of Macroeconomic aggregates namely the Bank Interest Rate, Exchange Rate, Inflation (WPI), Crude oil prices and the Foreign Exchange Reserves of India on the selected NSE Sectoral Indices Series. The study considers the monthly time series data for the period of 10 years from January 2007 to December 2016 and was analysed through the application of econometric techniques like Unit Root test, Ordinary least square model (OLS) and Correlation. The results stated that the combined effects of the macroeconomic variables on each of the Sector Indices were significant but the selected Macro factors had less explanatory powers. Finally, the analyses concluded a high strength of the relationship among all the selected sectors on account of close linkages among the various sectors which serves as an important tool for the investor to diversify their portfolio.

(Megaravalli & Sampagnaro, 2018) In this paper researcher, examined the long-run and the short-run relationship between India, China and Japanese stock markets and key macroeconomic variables such as exchange rates and inflation (proxied by consumer price index) of ASIAN 3 economies (India, China and Japan). This study employs Granger causality test and Johansen cointegration to determine whether selected macroeconomic variables are

cointegrated with stock markets of India, China and Japan. The findings of pooled estimated results of ASIAN 3 countries show that exchange rate has a positive and significant long-run effect on stock markets while the inflation has a negative and insignificant long-run effect. In the short run, there is no statistically significant relationship between macroeconomic variables and stock markets.

(I. Khan, 2018) This study contributes by determining the effect of various macroeconomic variables on stock prices of Pakistan by analysing the monthly data from May 2000 to August 2016. All the variables are stationary at first difference thus ideal ARDL approach of bound testing is applied to check the short term and long term cointegration of the macroeconomic variables on stock prices. The findings suggest that stock prices of Karachi Stock Exchange in long term are significantly affected by money supply, exchange rate, and interest rate. In short term all the variables are insignificant except exchange rate which is negatively cointegrated with stock prices. The central bank shall be vigilant while changing the money supply in market because too much increase in money supply could effect investment as well as stock market.

(Barnor, 2014) The purpose of this research was to examine the relationships between selected macroeconomic variables and their effect on the stock market returns on the Ghana stock market. The research questions addressed whether macroeconomic variables had significant effect on stock market returns in Ghana within the specified period. The target sample was all 36 listed firms on the Ghana stock market. Time-series data analysis was used to determine whether there was a statistically significant relationship between stock market returns and inflation rate, exchange rate, interest rate, and money supply. The findings revealed that interest rates and money supply had a significant negative effect on stock market returns; however,

exchange rates had a significant positive effect on stock market returns. Moreover, inflation rate did not significantly affect stock market returns in Ghana.

(Ho, 2014) The purpose of this paper is to examine the macroeconomic determinants of stock market development in South Africa during the period 1975–2015. It examines the impact of banking sector development, economic growth, inflation rate, real interest rate and trade openness on the development of the South African stock market. The author employs autoregressive distributed lag bounds testing procedure that allows the author to empirically investigate both the short- and long-run relationships between the stock market development and its determinants in the context of South Africa. In addition, the author also conducts a sensitivity analysis by accounting for the presence of structural breaks in the underlying series to check for the robustness of the estimation. This paper confirms the findings by other studies that banking sector development and economic growth promote stock market development, while inflation rate and real interest rate inhibit stock market development. In addition, this paper finds an interesting result in the fact that trade openness has a negative impact on stock market development, which is different from the findings of many other studies.

(Sireesha, 2013) This paper attempts to investigate the impact of select macroeconomic factors upon the movements of the Indian stock market index, Nifty along with gold and silver prices by using linear regression technique. The behavior of nominal and real returns at various levels of inflation, GDP, IIP and Money Supply is studied. The interdependence of the returns on stock, gold and silver is also identified.

(Naik & Padhi, 2012) In this paper the researcher investigates the relationships between the Indian stock market index (BSE Sensex) and five macroeconomic variables, namely, industrial

production index, wholesale price index, money supply, treasury bills rates and exchange rates over the period 1994–2011. Johansen's co-integration and vector error correction model have been applied to explore the long-run equilibrium relationship between stock market index and macroeconomic variables. The analysis reveals that macroeconomic variables and the stock market index are co-integrated and, hence, a long-run equilibrium relationship exists between them. It is observed that the stock prices positively relate to the money supply and industrial production but negatively relate to inflation. The exchange rate and the short-term interest rate are found to be insignificant in determining stock prices. In the Granger causality sense, macroeconomic variable causes the stock prices in the long-run but not in the short-run. There is bidirectional causality exists between industrial production and stock prices whereas, unidirectional causality from money supply to stock price, stock price to inflation and interest rates to stock prices are found.

(Pilinkus, 2011) The current paper attempts to introduce the concepts of stock market and macroeconomic indicators, then to present a model of the impact of macroeconomic indicators on stock market index, and to define what macroeconomic indicators are related with stock market index in the short and long runs. The study investigates ten macroeconomic indicators and the main Baltic stock market indices. The data are monthly and extend from the January of 2000 to the December of 2008. Empirical research has been conducted with the Baltic States: Lithuania, Latvia, and Estonia. With the reference to the results of performed analysis the interpretations of the relationships between macroeconomic indicators and stock market index from the viewpoint of investors have been formed.

(Hussainey, 2009) The purpose of this paper is to investigate the effects of macroeconomic indicators (the interest rate and the industrial production) on Vietnamese stock prices. The

paper examines how US macroeconomic indicators affect Vietnamese stock prices. The authors use monthly time series data covering the period from January 2001 to April 2008. The methodology introduced by Naseh and Strauss and Canova and de Nicolo to investigate the linkage between stock prices and macroeconomic indicators. This paper provides the first empirical evidence that there are statistically significant associations among the domestic production sector, money markets, and stock prices in Viet Nam. Another novel finding is that the US macroeconomic fundamentals significantly affect Vietnamese stock prices. Finally, the results show that the influence of the US real sector is stronger than that of the money market.

(Kyereboah-coleman, 2008) This study aims at examining how macroeconomic indicators affect the performance of stock markets by using the Ghana Stock Exchange as a case study. Quarterly time series data covering the period 1991-2005 were used. Cointegration and the error correction model techniques are employed to ascertain both short- and long-run relationships. Findings of the study reveal that lending rates from deposit money banks have an adverse effect on stock market performance and particularly serve as major hindrance to business growth in Ghana. Again, while inflation rate is found to have a negative effect on stock market performance, the results indicate that it takes time for this to take effect due to the presence of a lag period; and that investors benefit from exchange-rate losses as a result of domestic currency depreciation.

(Erdem et al., 2007) Price volatility spillovers in ISE indexes were analyzed based on monthly data from January 1991 to January 2004 for exchange rate, interest rate, inflation, industrial production and M1 money supply. The Exponential Generalized Autoregressive Conditional Heteroscedasticity model was used to test univariate volatility spillovers for macroeconomic variables. It was found that there exists unidirectional strong volatility spillover from inflation,

interest rate to all stock price indexes. There are spillovers from M1 money supply to financial index, and from exchange rate to both IMKB 100 and industrial indexes. There is no volatility spillover from industrial production to any index.

(K. Pal & Mittal, 2008) The purpose of this paper is to examine the long-run relationship between the Indian capital markets and key macroeconomic variables such as interest rates, inflation rate, exchange rates and gross domestic savings (GDS) of Indian economy. Quarterly time series data spanning the period from January 1995 to December 2008 has been used. The unit root test, the co-integration test and error correction mechanism (ECM) have been applied to derive the long run and short-term statistical dynamics. The findings of the study establish that there is co-integration between macroeconomic variables and Indian stock indices which is indicative of a long-run relationship. The ECM 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 case of foreign exchange rate, 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.

(M. N. Khan & Zaman, n.d.)In this paper the researcher found the relationship between macroeconomic variables and stock prices in Karachi Stock Exchange, Pakistan. This study considers annual data of macroeconomic variables from 1998 to 2009. Macroeconomic variables are gross domestic product, exports, consumer price index, money supply M2, exchange rate, foreign direct investment and oil prices. All variables are stationary at zero lag checked through Augmented Dickey Fuller test. By using multiple regression analysis with Fixed Effects Model results show that gross domestic product and exchange rate positively

affect stock prices while consumer price index negatively affects stock prices. The results of export, money supply M2, foreign direct investment and oil prices were insignificant.

(Shahani & Vashisth, n.d.) The present study makes an attempt to investigate the impact of India's macroeconomic variables on the India's flagship Stock Index: the NSE Nifty. The variables include money supply, industrial production , rupee –dollar foreign exchange rate, Oil Price and Yield on Government Bonds, NSE Nifty. Analysis has carried out for a ten year period April 2008 to March 2018. For other macro variables we have taken closing value of their respective indices. The study employs Dynamic OLS technique, co-integration technique, an error corrective mechanism, Augmented Dickey Fuller for detection of unit root of variables and Causality tests between Nifty and each of the macroeconomic variables under study. The Dynamic OLS was carried out at optimal AIC Lag Identification criteria with maximum limit set at '3' lags and '3' leads. The Dynamic OLS was subject to parsimonious adjustment and the results showed that only three variables, CPI, Forex and Oil were having a co-integrating relation with the dependent variable NSE Nifty Prices. The Parsimonious ECM relation to determine the equilibrium link between short and long run and the results showed that lagged error term was significant and also negative with a figure of 0.51 thereby showing 51 % backward movement towards equilibrium in one period.

(Alexander & Al-malkawi, n.d.) The aim of the paper is to investigate the association between selected macroeconomic variables like crude price, exchange rate, index of industrial production, inflation, interest rate, repo rate, gold price and the auto index of the National Stock Exchange (NSE) of India during a time when the automotive sector in India witnessed the sharpest dip in sales. The study adopts Autoregressive Distributed Lag (ARDL) co-integration approach and performs suitable diagnostic tests. Results indicate that, exchange rate has a

significant negative relationship with Nifty auto index in the long run. Additionally, crude price, index of industrial production and repo rates are statistically significant determinants of Nifty auto index. On the contrary, first lag of crude price is found to be a possible predictor of the index in the short run. The study provides important implications for researchers, corporations, portfolio managers, investors, and government.

2.2 Research Gap

It has been observed, from the existing literature that the researchers have studied on the impact of Macroeconomic Indicators on major Broad market indices, Sector indices of BSE and NSE in India. This study will be focusing on Thematic indices of Bombay Stock Exchange. This research will fill this existing gap of impact of Macroeconomic Indicators on Thematic indices of BSE in India.

2.3 Research Questions

What is the impact of macroeconomic indicators and stock market returns of thematic indices of BSE?

What is the long run and short run relationship between macroeconomic indicators and Thematic indices of BSE?

2.4 Objectives

To study the impact of selected Macroeconomic Indicators on returns of selected Thematic indices of BSE.

To Analyze the long run and short run relationship between macroeconomic indicators and stock market returns.

2.5 Hypothesis

Null Hypothesis

There is no impact on macroeconomic indicators on stock market returns.

There is no long run and short run relationship between macroeconomic indicators and thematic indices of BSE.

Alternative Hypothesis

There is impact on macroeconomic indicators on stock market returns.

There is long run and short run relationship between macroeconomic indicators and thematic indices of BSE.

2.6 Scope of the Study

The study is based on impact of macroeconomic indicators on selected thematic indices of Bombay stock exchange in India. The study states that whether there is influence of macroeconomic indicators namely real gross domestic product, crude oil prices, foreign exchange reserve, exchange rate, inflation rate has influence on the movement of stock market indices. This study may help different groups of people who are interested to invest in stock market, to know the performance of the Thematic Indices of Bombay stock exchange. Different groups of people like Portfolio Managers, Foreign Investors, Mutual Funds, Institutional Investors, Policy Makers as well as individual investors. They will have an advantage to make their own investment decision. It may also help the investors in constructing a portfolio of Thematic Indices.

2.7 Research Methodology

The Study is completely based on Secondary data.

2.7.2 Period of the Study: This study employs time series data of quarterly frequency from 2016 to 2023 to study the impact of macroeconomic indicators on Thematic indices of BSE in India and to analyse the long run and short run relationship between macroeconomic indicators and Thematic indices of BSE in India.

2.7.3 Variables of the Study: Macroeconomic indicators considered for the study are Inflation rate, Gross Domestic Product (GDP), Exchange rate, Crude Oil Prices, Foreign exchange reserve and stock market returns of S&P BSE India manufacturing Index, S&P BSE India Infrastructure Index, S&P BSE PSU Index and S&P BSE CPSE Index.

2.7.4 Sample Size

The sample data considered for the study are only four thematic indices from six thematic indices listed on the Bombay stock exchange. The macroeconomic indicators considered for the study are crude oil prices, foreign exchange reserves, exchange rate, inflation rate, and gross domestic product. The sample size accounts for around 4 quarters closing index prices of thematic indices of BSE and macroeconomic indicators (8 years× 4 quarters).

2.7.5 Statistical Software

The analysis undertaken for the study were done on Eviews-12 software.

2.7.6 Sources of Data Collection

The data for thematic indices has obtained from CMIE prowess IQ and macroeconomic data has been extracted from CMIE economic outlook

2.7.7 Statistical Tools and Techniques

The statistic technique used in the study are Descriptive statistics, correlation matrix, Augmented Dickey Fuller Unit Root Test, Ordinary least square method, Autoregressive distributed lag bound Test.

The returns from the stocks have been computed using formula Ln (Po/P1), where Po is the price at the end of the period and P1 signifies price at the beginning of the period. The returns are converted into log form for normality purpose(Parab & Reddy, 2020).

Descriptive Statistics

Descriptive statistics are a set of techniques used to summarize and describe the main features of a dataset. These statistics provide a concise overview of the essential characteristics of the data, helping researchers, analysts, and decision-makers understand the information at a glance. The primary goal of descriptive statistics is to organize, simplify, and present data in a meaningful way.

Correlation Matrix

A correlation matrix is a table that displays the correlation coefficients between many variables. Each cell in the table represents the correlation between two variables. The correlation coefficient is a measure of the strength and direction of a linear relationship between two variables. The values range from -1 to 1, where 1 indicates a perfect positive linear relationship, -1 indicates a perfect negative linear relationship and 0 indicates no linear relationship.

Multiple Regression Technique

Multiple regression is a statistical technique used to examine the relationship between a dependent variable and two or more independent variables. It extends the simple linear

regression model, which involves only one independent variable, to a more complex model that consider multiple predictors.

Unit Root Test

A unit root test is a statistical method used to determine whether a time series variable is non-stationary and possesses a unit root. A unit root implies that a time series variable has a stochastic or random trend and does not revert to a constant mean over time. Unit root tests are often applied in the field of econometrics and time series analysis.

One of the most common unit root tests is the Dickey-Fuller test, specifically the Augmented Dickey-Fuller (ADF) test. The null hypothesis of the test is that a unit root is present in the time series data, indicating non-stationarity. The alternative hypothesis is that the unit root is absent, suggesting stationarity.

Autoregressive Distributed Lag (ARDL)

In econometrics, the Autoregressive Distributed Lag (ARDL) model is a statistical technique for examining the long-term correlations between variables. It is especially helpful when working with time series data and examining the short- and long-term dynamic interactions between factors. It can be used when the time series data have different order of integration that is some variables are stationary at level and some variables are stationary at first difference. Then in order to find the long run interactions between the variables the ARDL cointegration or bound test is used. To obtain the short run interactions between the variables, error correction model is estimated.

Economic model formulated for the impact of macroeconomic indicators on Thematic Indices of BSE: $\boldsymbol{LnTIR_t = \beta_0 + \beta_1(LnCrude)_t + \beta_2(LnER)_t + \beta_3(LnFER)_t + \beta_4(LnGDP)_t + \beta_5(LnCPI)_t + \varepsilon_t}$**.....(1)**

Where in Equation (1)

TIR=Thematic Index returns of BSE

Crude= Crude oil Prices

ER= Exchange rate

FER = Foreign Exchange reserve

GDP = Gross Domestic Product

CPI = Consumer Price Index (Inflation rate)

As the variables are stationary at level and at first difference the study uses the ARDL bounds testing procedure proposed by Pesaran et al. (1996), Pesaran and Shin (1999), and Pesaran et al. (2001).This procedure is chosen on account of its favourable properties. Firstly, it does not impose the restrictive assumption that all the variables must be integrated of the same order. Instead, it can be applied to the time series which are integrated of order 0, 1 or a mixture of both. Secondly, unlike other cointegration tests which are sensitive to the sample size, the ARDL bounds test is suitable even when the sample size is small (Pesaran et al.,1996; Pesaran and Shin, 1999; Pesaran et al.,2001) (Ho & Odhiambo, 2020).

The Equation (1) in ARDL form is formulated as:

$$\Delta \boldsymbol{LnTIR_t = \beta_0 + \beta_1(LnTIR)_{t-1} + \beta_2(LnCrude)_{t-1} + \beta_3(LnER)_{t-1} + \beta_4(LnFER)_{t-1} + \beta_5(LnGDP)_{t-1} + \beta_6(LnCPI)_{t-1} \sum_{i=1}^{n} \beta_7 \Delta (LnTIR)_{t-1} + \sum_{i=1}^{n} \beta_8 \Delta (LnCrude)_{t-1} + \sum_{i=1}^{n} \beta_9 \Delta (LnER)_{t-1} + \sum_{i=1}^{n} \beta_{10} \Delta (FER)_{t-1} + \sum_{i=1}^{n} \beta_{11} \Delta (LnGDP)_{t-1} + \sum_{i=1}^{n} \beta_{12} \Delta (LnCPI)_{t-1} + \varepsilon_t}$$

In the ARDL equation the coefficients with first lagged variables show long term cointegration relationship while difference operator show short term dynamics(I. Khan, 2018). In this study, the maximum number of lags in the model is chosen based on the Akaike Information Criterion.

2.9 Chapterisation Scheme

Chapter I: Introduction to the Study

Chapter I includes Introduction to stock market in India, Theoretical background of Bombay Stock Exchange, Study on the selected Thematic Indices of Bombay Stock Exchange and Theoretical concepts of Macroeconomic Indicators considered for the study.

Chapter II: Objectives and Methodology

Chapter II includes Literature review, Research Gap, Research Questions, Objectives of the study, Hypothesis of the Study, Scope of the Study, Research Methodology, Nature of the Data, Study Period, Variables selected for the study, Sample size, Statistical Software used in the study, Sources of Data Collection, Statistical Tools and Techniques and Chapterisation Scheme.

Chapter III: Analysis and Interpretation

This Chapter deal with Descriptive statistic of Macroeconomic Indicators, Descriptive Statistics of Thematic Indices, Unit root test of Macroeconomic Indicators and Thematic Indices, Correlation Matrix, Ordinary Least Square method and Autoregressive Distributed Lag Model.

Chapter IV: Findings, Conclusion and Suggestion

This Chapter deals with the findings of the study, Conclusion, Limitation of the Study and Suggestions.

CHAPTER III: ANALYSIS OF DATA AND INTERPRETATION OF DATA

Table 3.1 Descriptive Statistics of Thematic Indices of BSE in India

	S&P BSE India Infrastructure Index	S&P BSE India Manufacturing Index	S&P BSE CPSE Index	S&P BSE PSU Index
Mean	3.2534	3.1072	2.6262	2.5801
Median	4.0494	3.3270	5.2540	4.8925
Maximum	27.977	20.5902	24.8768	24.1816
Minimum	-41.9732	-29.5265	-40.3408	-44.4378
Std. Deviation	13.3113	8.8945	12.3949	13.2377
Skewness	-1.044417	-1.344438	-1.141497	-1.358572
Kurtosis	5.432006	7.019881	5.690130	6.115035
Jarque-Bera	13.70385	31.18599	16.59847	22.78176
Probability	0.001057	0.000000	0.000249	0.000011

Source: Authors Compilation

Descriptive Statistics describes the nature of the data. Table 3.1 is the descriptive Statistics of the Selected Thematic indices of BSE in India namely S&P BSE India Infrastructure index, S&P BSE India Manufacturing index, S&P BSE CPSE index and S&P BSE PSU index. Mean indicates the average performance of the indices. The mean value of S&P BSE India Infrastructure index, S&P BSE India Manufacturing index, S&P BSE CPSE index and S&P BSE PSU index is 3.25, 3.10, 2.62 and 2.58 respectively. The standard deviation shows high deviations from the mean. Skewness indicates that the data is positively skewed or negatively skewed. In this, the data is seen to be negatively skewed. The data is found to be leptokurtic for all the variables as the kurtosis value is more than 3. The Jarque Bera values are significant for all the Indices. This indicates that all the Thematic Indices are not normally distributed.

Table 3.2 Descriptive Statistics of Macroeconomic Indicators selected for the study

	Crude Oil Prices	Exchange rate	Inflation rate (CPI)	Real Gross Domestic Product	Foreign exchange reserve
Mean	2.041800	0.729671	1.206284	1.352162	2.942878
Median	3.847229	0.627783	1.439172	2.463363	3.592930
Maximum	38.02054	4.723588	3.343693	20.16198	8.591784
Minimum	-54.09787	-3.89462	-1.01652	-33.68512	-5.358655
Std. Deviation	17.80090	1.984825	1.097349	9.081905	3.107206
Skewness	-0.671156	0.109209	-0.13117	-1.827420	-0.483517
Kurtosis	4.782708	2.836081	2.096790	8.650652	3.092516
Jarque-Bera	6.639795	0.099434	1.179487	60.38363	1.258285
Probability	0.036157	0.951499	0.554470	0.000000	0.533049

Source: Authors Compilation

Table 3.2 shows the descriptive statistics of the selected macroeconomic indicators for the study namely Crude oil prices, exchange rate, Inflation rate (CPI), gross domestic product (GDP) and Foreign exchange reserve. Mean is showing the average performance of the macroeconomic indicators. The mean value of Crude oil prices, exchange rate, Inflation rate (CPI), real gross domestic product (GDP), and foreign exchange reserve is 2.0418, 0.7296, 1.206, 1.352 and 2.9428 respectively. Standard deviation of all the variables shows high deviations from the mean except for inflation rate which is low from the mean. All the variables are negatively skewed except Exchange rate is positively skewed. Indicators like Crude oil Price, Real Gross domestic product, are found to be leptokurtic as the kurtosis values are more than 3, other indicators like exchange rate, inflation rate are platykurtic as the kurtosis value is less than 3 and foreign exchange reserve is mesokurtic. Jarque Bera values indicates that exchange rate, foreign exchange reserve and inflation rate is normally distributed whereas, crude oil price and GDP are not normally distributed.

Table 3.3: Unit root test of Thematic indices of BSE (Augmented Dicky fuller)

Null Hypothesis	t-Statistics	Test Critical Values			P-value	Decision
		1% level	5% level	10% level		
S&P BSE India Infrastructure Index has a unit root	-4.893146	-3.661661	-2.96041	-2.61916	0.0004	Reject
S&P BSE India Manufacturing Index has a unit root	-6.627511	-3.661661	-2.96041	-2.61916	0.0000	Reject
S&P BSE CPSE Index has a unit root	-12.20838	-3.670170	-2.96397	-2.62100	0.0000	Reject
S&P BSE PSU Index has unit root	-11.95912	-3.670170	-2.96397	-2.62100	0.0000	Reject

Source: Authors Compilation

Table 3.4 Unit root Test of Macroeconomic indicators (Augmented Dicky fuller)

Null Hypothesis	t-Statistics	Test Critical Values			P-value	Decision
		1% level	5% level	10% level		
Crude Oil Prices has a unit root.	-5.838226	-3.661661	-2.96041	-2.61916	0.0000	Reject
Real Gross Domestic Product has a unit root.	-7.865629	-3.679322	-2.96776	2.622989	0.0000	Reject
Exchange rate (USD Dollar) has a unit root.	-4.147828	-3.661661	-2.96041	-2.61916	0.0030	Reject
Inflation rate (Consumer Price Index) has a unit root.	-4.829247	-3.752946	-2.99806	-2.63875	0.0009	Reject
Foreign exchange reserve	-5.185191	-3.661661	-2.96041	-2.61916	0.0002	Reject

Source: Authors Compilation

Table 3.3 and Table 3.4 Shows the stationarity of the times series data of Stock market returns of thematic indices and macroeconomic indicators selected for the study. This test is used to check the stationarity or non-stationarity of the data. All the macroeconomic indicators are stationary at level except inflation is stationary at first difference. S&P BSE India manufacturing index, S&P BSE India infrastructure index data is stationary at level and S&P BSE PSU, S&P BSE CPSE index data is stationary at first difference. Since all the variables data is stationary at level and at first difference the results reject the null hypothesis. As the variables are stationary at level and at first difference the study satisfies the condition to use Autoregressive distributed lag bounds to examine the short and long run relationship.

Table 3.5 Correlation Matrix

	Crude	**ER**	**GDP**	**CPI**	**FER**	**CPSE**	**Infrastructure**	**manufacturing**	**PSU**
Crude oil prices	1	-0.4560	0.4463	0.1436	0.2640	0.1436	0.1705	0.0293	0.2117
Exchange rate		1	-0.4122	0.1481	-0.0066	-0.1020	-0.1747	-0.0457	-0.1018
Gross domestic product			1	-0.2086	-0.0981	-0.205	-0.1205	-0.2747	-0.1401
Inflation rate (CPI)				1	0.1298	0.1510	0.1093	0.20653	0.1414
Foreign exchange reserve					1	-0.2046	-0.2290	-0.2296	-0.1944
S&P BSE CPSE index						1	0.9398	0.8180	0.9736
infrastructure index							1	0.8528	0.9606
manufacturing index								1	0.8181
S&P BSE PSU index									1

Source: Authors Compilation

The above Table 3.5 shows the correlation between all the macroeconomic indicators and selected Thematic indices of BSE in India. It shows correlation with each other and with themselves. It has been observed that there is positive or negative correlation between the variables.

Negative Correlation

Exchange rate shows a negative correlation with crude oil price. GDP shows a negative correlation with exchange rate. Inflation shows a negative correlation with GDP. Foreign exchange reserves show a negative correlation with exchange rate and gross domestic product. Exchange rate, foreign exchange reserve and GDP shows a negative correlation with all the thematic indices of BSE. So, in this negative correlation any increase in one variable will lead to a decrease in other variable and vice versa which means that there is inverse relationship between the variables.

Positive Correlation

GDP, Inflation rate, foreign exchange reserve and all the thematic indices shows a positive relationship with crude oil price. Inflation rate shows a positive relation with exchange rate. Foreign exchange reserve and all the thematic indices shows a positive relation with inflation rate. Infrastructure index, manufacturing index and PSU index shows a positive relation with CPSE index. Manufacturing index and PSU index shows a positive relation with infrastructure index. PSU index shows a positive relation with PSU index. So, in this positive correlation if there in increase in the one variable then there will be increase in the value of the other variable and vice versa.

Table 3.6 Multicollinearity

Variable	Centered VIF Value
Crude oil Prices	1.7491
Exchange rate	1.405
Foreign exchange reserve	1.152
Gross domestic product	1.509
Inflation rate	1.164

Source: Authors Compilation

As the test of multicollinearity shows the Centered VIF of Macroeconomic indicators namely crude oil price, exchange rate, foreign exchange reserves, gross domestic product and inflation rate is 1.749, 1.4058, 1.1528, 1.5028, 1.1643 which is less than 10 for all the variables. Hence there is no presence of multicollinearity in the model.

Table 3.7 Multiple Regression Model of S&P BSE India Manufacturing Index (OLS)

Dependent variable: S&P BSE INDIA MANUFACTURING INDEX				
Method: Least square				
Model		**R-squared**	**Adjusted R-squared**	**Durbin Watson stat.**
Ln S&P BSE INDIA MANUFACTURING INDEX		0.2473	0.1026	2.1983
variable	**coefficient**	**Std. Error**	**t-statistic**	**Prob***
c	5.472765	2.803253	1.952291	0.0618
Crude	0.116161	0.112434	1.033149	0.3110
ER	-0.657264	0.904018	-0.727047	0.4737
FER	-1.015708	0.522925	-1.942357	0.0630
GDP	-0.433705	0.204716	-2.118572	0.0438
CPI	1.204079	1.488037	0.809173	0.4258

Source: Authors Compilation

The above Table 3.7 generated coefficients of the constant, crude oil price, exchange rate, inflation rate, foreign exchange reserve and gross domestic product. It shows that gross domestic product has significant influence on the stock market returns as their p-value is 0.04 less than 5% level of significance. The coefficient for gross domestic product are -0.433. A 1%

change in gross domestic product would lead to -43.3% change in the returns in this manufacturing industry. The results revealed that gross domestic product will move the returns of in opposite direction. R-squared value indicates that 24.73% of the variation in stock returns is explained by the factors considered in this study implying that remaining of the variation in the returns is caused by the variables outside the preview of this study. The value of Durbin Watson statistics is 2.192 which is greater than 1.50 which means that there is no problem of autocorrelation in the model. Also, there is no problem of multicollinearity and heteroskedasticity in the model.

Table 3.8 Multiple regression model of S&P BSE CPSE Index (Ordinary Least Square)

Dependent variable: S&P BSE CPSE INDEX				
Method: Least square				
Model	**R-squared**		**Adjusted R-squared**	**Durbin Watson stat.**
S&P BSE CPSE INDEX	0.2404		0.0943	1.4524
variable	**coefficient**	**Std. Error**	**t-statistic**	**Prob***
c	6.707215	3.924522	1.709053	0.0994
crude oil prices	0.253991	0.157406	1.613608	0.1187
exchange rate	-0.819511	1.265615	-0.647520	0.5230
foreign exchange reserve	-1.414632	0.732089	-1.932323	0.0643
Gross domestic Product	-0.604278	0.286599	-2.108441	0.0448
Inflation rate	0.811206	2.083234	0.389397	0.7002

Source: Authors Compilation

The above table 3.8 shows the regression for macroeconomic indicators considered for the study and S&P BSE CPSE returns. This model does not have a problem of multicollinearity, heteroskedasticity and autocorrelation. It was found that the probability value of gross domestic product is 0.04 which is less than 0.05 level of significance as a result gross domestic product has a significant impact on the returns of S&P BSE CPSE index. In case of other variables that

is crude oil price, exchange rate and inflation rate there is no significant impact on the returns of S&P BSE CPSE index. R-square value shows the fitness of the model. The value of R-square is 0.24 which indicates the variation of the model.

Table 3.9 Multiple regression model of S&P BSE India Infrastructure Index (OLS)

Dependent variable: S&P BSE INDIA INFRASTRUCTURE INDEX				
Method: Least square				
Model	**R-squared**		**Adjusted R-squared**	**Durbin Watson stat.**
Ln S&P BSE INDIA INFRASTRUCTURE INDEX	0.2248		0.0757	1.692
variable	**coefficient**	**Std. Error**	**t-statistic**	**Prob***
c	8.125046	4.257674	1.908330	0.0674
Ln crude oil prices	0.255019	0.170768	1.493365	0.1474
Ln exchange rate	-1.231407	1.373053	-0.896839	0.3780
Ln foreign exchange reserve	-1.560766	0.794236	-1.965116	0.0602
Ln Gross domestic Product	-0.545664	0.310929	-1.754948	0.0910
Ln Inflation rate	0.694044	2.260080	0.307088	0.7612

Source: Authors Compilation

In this study closing prices of S&P BSE India infrastructure index has been regressed on the macroeconomic indicators i.e. Crude oil prices, exchange rate, inflation rate, gross domestic product and foreign exchange reserve. It is found that there is no significant impact of macroeconomic indicators on S&P BSE India Infrastructure Index as the P-value of all the variables is greater than 0.05 level of significance. Exchange rate, foreign exchange reserve and Gross domestic product is negatively affecting the index returns and Crude oil Price and Inflation rate has a positive impact on the S&P BSE India Infrastructure Index. The model is does not have a problem of Heteroskedasticity, Multicollinearity and Autocorrelation.

Table 3.10 Multiple regression model of S&P BSE PSU Index (Ordinary Least Square)

Dependent variable: S&P BSE PSU INDEX				
Method: Least square				
Model	**R-squared**		**Adjusted R-squared**	**Durbin Watson stat.**
Ln S&P BSE PSU INDEX	0.2317		0.0840	1.6922
variable	**coefficient**	**Std. Error**	**t-statistic**	**Prob***
c	6.712150	4.307930	1.558092	0.1313
Ln crude oil prices	0.326225	0.232880	1.400834	0.1731
Ln exchange rate	-0.485734	1.086703	-0.446979	0.6586
Ln foreign exchange reserve	-1.516838	1.193416	-1.271005	0.2150
Ln Gross domestic Product	-0.567946	0.397425	-1.429065	0.1649
Ln Inflation rate	0.653400	1.784561	0.366141	0.7172

Source: Authors Compilation

The above table 3.10 shows the results of the OLS model. In the model the dependent variable is S&P BSE PSU index returns and independent variables are foreign exchange reserve, crude oil price, exchange rate, inflation rate and gross domestic product. In this model there is no multicollinearity and autocorrelation but there was the problem of heteroskedasticity. The heteroskedasticity has been removed by using the hac test. The above table shows the probability values of all the macroeconomic indicators are more than 0.05 significance level. So, in this model there is no significant impact of macroeconomic indicators on the S&P BSE PSU index returns. Crude oil price and inflation rate has a positive impact on the S&P BSE PSU Index and all the other macroeconomic indicators has a negative impact on the S&P BSE PSU Index returns.

ARDL Bounds Test

Table 3.11.1Bounds Test Results

Estimated Model: LS&P BSE CPSE Index = F (LCRUDE, LER, LFER, LGDP, LCPI)				
F statistic = 5.2673				
Critical Values				
Significance				
Upper Bound I (1)	10%	5%	2.5%	1%
	3	3.38	3.73	4.15

Source: Authors Compilation

Null hypothesis: No levels relationship

The bounds test results are provided in Table 3.11.1 above. As the F statistic value 5.2673 which is greater than the critical value for I (1) regressors, the null hypothesis is rejected. Thus, it suggests a co-integrating relationship between the variables.

Table 3.11.2 ARDL Long run results of S&P BSE CPSE index

variable	coefficient	t-statistics	P-value
c	3.3998	0.5241	0.6052
Ln crude oil prices	0.3673	1.6415	0.1143
Ln exchange rate	-1.6027	-0.9249	0.3646
Ln foreign exchange reserve	-1.9447	-1.4961	0.1482
Ln Gross domestic Product	-1.3624	-1.8697	0.074
Ln inflation rate	6.0148	0.5241	0.1964

Source: Authors Compilation

The long run results indicate that LER (−1.6027), LFER (−1.9447), LGDP (-1.362) have a negative influence on S&P BSE CPSE index. At the same time, LCRUDE (0.3673) and LCPI (6.0148) is having a positive influence on the movement of S&P BSE CPSE index.

All the variables are insignificant as the p-value is greater than 0.05 level of significant.

Table 3.11.3 ARDL Short run results of S&P BSE CPSE index.

Variable	Coefficient	t-statistics	p-value
CPSE Index (-1) *	-0.792266	0.541753	0.5932
Crude oil Prices	0.291072	1.678737	0.1067
Exchange rate	-1.291072	1.678737	0.1067
GDP	-1.079427	-0.883302	0.3862
Foreign exchange reserve	-1.540741	-2.008686	0.0138
Inflation rate (-1)	4.765335	1.403840	0.1737
D (Inflation rate)	0.720842	0.344331	0.7337
CointEq (-1)	-0.792266	-6.818378	0.0000

Source: Authors Compilation

After examining long run relationship between the variables, the study examines the ARDL short run model with the error correction term between macroeconomic indicators and S&P BSE CPSE Index. In the short run Inflation rate and Crude oil Prices has a positive impact on the S&P BSE CPSE Index. Foreign exchange reserve is negatively significant on the index returns. It was found that the error correction term met all the three criteria as it is negative coefficient, statistically significant and less than 1.

In addition, the error correction term in econometrics is an important output that represents how quickly the market resorts to long run equilibrium from short run disturbances to S&P BSE Thematic index. A statistically significant and negative ECT coefficient indicates that the system is correcting towards the long-run equilibrium. In the estimation, the size of the error correction term of 0.79. This implies that about 79% of any movements into disequilibrium between long run and short run equilibrium is corrected for within one period. This highlights that the adjustment speed in the model is relatively quick.

Table 3.12.1 Bounds Test Results

Estimated Model: LS&P BSE India manufacturing index = F (LCRUDE, LER, LFER, LGDP, LCPI)				
F statistic = 7.7227				
Critical Values				
Significance levels				
Upper Bound I (1)	10%	5%	2.5%	1%
	3	3.38	3.73	4.15

Source: Authors Compilation

Null hypothesis: no levels relationship

The bounds test results are provided in Table 3.12.1 above. As the F statistic value 7.7227 is greater than upper bound value I (1), the null hypothesis is rejected. Therefore, the bound test shows that there is a co-integrating relationship between the variables.

Table 3.12.2 ARDL Long run results of S&P BSE India manufacturing index

variable	coefficient	t-statistics	P-value
c	4.4242	1.7392	0.0948
Ln crude oil prices	0.1091	1.1470	0.3347
Ln exchange rate	-0.7401	-0.9844	0.1254
Ln foreign exchange reserve	-0.7706	-1.5880	0.1254
Ln Gross domestic Product	-0.2410	-0.9863	0.3338
Ln inflation rate	1.2602	1.0217	0.3171

Source: Authors Compilation

The long run results indicate that LER (−0.7401), LFER (−0.7707), LGDP (-0.2410) have a negative influence on S&P BSE India manufacturing index. At the same time, LCRUDE (0.1091) and LCPI (1.2602) is having a positive influence on the movement of S&P BSE India manufacturing index. In the model all the macroeconomic indicators are insignificant as the P-value is more than 5% level of significance.

Table 3.12.3 ARDL Short run results of S&P BSE India manufacturing index

Variable	Coefficient	t-statistics	p-value
C	5.5316	1.8877	0.0712
Ln S&P BSE Manufacturing index	-1.2502	-4.3756	0.0002
Exchange rate**	-0.9253	-0.9386	0.3572
Crude oil Prices	0.1364	1.1237	0.2722
Foreign exchange reserve	-0.9635	-1.7821	0.0874
GDP**	-0.3014	-1.1532	0.2602
Inflation rate**	1.5756	0.9838	0.3350
CointEq (-1)	-1.250286	-8.22039	0.0000

Source: Authors Compilation

The above table shows the short run cointegration between dependent and independent variables from estimated ARDL. Cointegration equation values as can be seen in above table of exchange rate, foreign exchange reserve and Gross Domestic product are negatively cointegrated as there is short run cointegration relationship between the variables. In the model the error correction criteria term is a negative coefficient and it is statistically significant. As a result the deviations from equilibrium in the previous period lead to adjustments in the current period that brings the variable closer to its equilibrium value.

Table 3.13.1 Bounds test results

Estimated Model: LS&P BSE India infrastructure = F (LCRUDE, LER, LFER, LGDP, LCPI)				
F statistic = 7.7227				
Critical Values				
Significance levels				
Upper Bound I (1)	10%	5%	2.5%	1%
	3	3.38	3.73	4.15

Source: Authors Compilation

Null hypothesis: no levels relationship

The bounds test results are provided in Table 3.13.1 above. As the F statistic value 5.3340 which is greater than the critical value for I (1) regressors, the null hypothesis is rejected. Thus, there exists a co-integrating relationship between the variables.

Table 3.13.2 ARDL Long run results of S&P BSE India Infrastructure index

variable	coefficient	t-statistics	P-value
c	2.256	0.3840	0.7044
Ln crude oil prices	0.3641	1.7841	0.087
Ln exchange rate	-2.3006	-1.4119	0.1390
Ln foreign exchange reserve	-1.6967	-1.532	0.1390
Ln Gross domestic Product	-1.2415	-1.958	0.0624
Ln inflation rate	6.0148	1.5588	0.1964

Source: Authors Compilation

The long run results indicate that exchange rate, foreign exchange reserve, gross domestic product have a negative influence on S&P BSE India infrastructure index. At the same time, crude oil prices and inflation rate is having a positive influence on the movement of S&P BSE India infrastructure index. In model all the variables are insignificant as the p-value is greater than 5% level of significance.

Table 3.13.3 ARDL Short run results of S&P BSE India Infrastructure index

Variable	Coefficient	t-statistics	p-value
C	2.032	0.3843	0.7042
Infrastructure index	-0.900	-3.470	0.0021
Crude oil Prices	0.327	1.720	0.0989
Exchange rate	-2.072	-1.299	0.2065
Foreign exchange reserve	-1.528	-1.910	0.0686
GDP	-1.118	-2.607	0.0158
Inflation rate (-1)	6.2577	1.7320	0.0967
D (Inflation rate)	0.5710	0.2515	0.0967
CointEq(-1)	-0.9007	-6.861	0.0000

Source: Authors Compilation

The above table 3.10.3 shows the short run cointegration between dependent and independent variables from estimated ARDL. The short run cointegration shows that all the variables are insignificant except Gross domestic product which shows that it has a negatively Significant relationship with S&P BSE India Infrastructure Index returns. The Error correction term criteria is a negative coefficient, statistically significant and is less than 1 which means that the model is adjusted towards the long run equilibrium. It shows that when the variables drift away from the equilibrium level by 1 per cent in the short run, they will adjust 0.90 per cent in a year.

Table 3.14.1 Bounds test results of S&P BSE PSU index

Estimated Model: LS&P BSE PSU index = F (LCRUDE, LER, LFER, LGDP, LCPI)				
F statistic = 5.4558				
Critical Values				
Significance levels				
Upper Bound I (1)	10%	5%	2.5%	1%
	3	3.38	3.73	4.15

Source: Authors Compilation

Null hypothesis: no levels relationship

The bounds test results are provided in Table 3.13 above. As the F statistic value 5.4558 which is greater than the critical value for I (1) regressors, the null hypothesis is rejected. Thus, there exists a co-integrating relationship between the variables.

Table 3.14.2ARDL Long run results of PSU index

variable	coefficient	t-statistics	P-value
c	2.2477	0.3830	0.7034
Ln crude oil prices	0.4204	1.9579	0.0625
Ln exchange rate	-1.2787	-0.7621	0.4398
Ln foreign exchange reserve	-1.6365	-1.4856	0.0848
Ln Gross domestic Product	-1.1081	-1.8012	0.0848
Ln inflation rate	5.4594	1.2828	0.2123

Source: Authors Compilation

The long run results indicate that exchange rate (-1.2787), foreign exchange reserve (-1.6365), gross domestic product (-1.1081) have a negative influence on S&P BSE PSU index. At the same time, crude oil prices (0.4204) and inflation rate (5.4594) is having a positive influence on the movement of S&P BSE India infrastructure index. All the variables are insignificant as the probability value is more than 5% level of significance.

Table 3.14.3 ARDL Short run results of S&P BSE PSU index

Variable	Coefficient	t-statistics	p-value
C	2.0799	0.3855	0.7034
PSU Index (-1) *	-0.9253	-3.7874	0.0010
Crude oil Prices	0.3890	2.0823	0.0486
Exchange rate	-1.183	-0.7561	0.0457
GDP	-1.025	-2.3053	0.0812
Foreign exchange reserve	-1.515	-1.8238	0.0305
Inflation rate (-1)	5.0518	1.3690	0.1842
D (Inflation rate)	0.51364	0.2222	0.7008
CointEq (-1)	0.92534	-6.939	0.0000

Source: Authors Compilation

The above table shows the short run cointegration between dependent and independent variables from estimated ARDL. The short run results shows that Crude oil price has positive significant relationship with the S&P BSE PSU Index returns and Exchange rate, Foreign Exchange reserves has a negative significant relationship with the S&P BSE PSU Index. The Error correction term shows that it is statistically significant and it is less than 1 which implies the speed of the adjustment.

CHAPTER IV: FINDINGS AND CONCLUSION

4.1 Findings and Conclusion

The study finds the impact of macroeconomic indicators on selected four thematic indices of Bombay Stock exchange in India and Long run and short run effect of macroeconomic indicators on index returns of thematic indices of BSE in India from 2016 to 2023. The study performs the test of descriptive statistics, which describes the data of five macroeconomic indicators namely Crude oil price, Foreign exchange reserve, inflation rate, exchange rate and gross domestic product and thematic indices of BSE namely S&P BSE India infrastructure index, S&P BSE India manufacturing index, S&P BSE PSU index, S&P BSE CPSE index. The Augmented Dicky fuller unit root test has been performed to check the stationarity of the data. The test result shows that all the macroeconomic variables are stationary at level except inflation rate is stationary at first difference and thematic indices namely S&P BSE India manufacturing index, S&P BSE India infrastructure index is stationary at level and S&P BSE CPSE index, S&P BSE PSU index is stationary at first difference. As the results are stationary at level and at first difference, the study satisfies the condition to apply Autoregressive distributive lag bound to examine the short run and long run effect. The correlation matrix states whether the variables are positively correlated or negatively correlated. The Ordinary least square method is applied, to study the impact of macroeconomic indicators on stock market returns of Thematic indices. The results states that gross domestic product has a significant influence on S&P BSE India manufacturing index returns and S&P BSE CPSE index returns indicating inverse relationship between these two variables. There is no problem of multicollinearity, Autocorrelation and heteroskedasticity in the models except in S&P BSE PSU index model there was problem of heteroskedasticity which has been eliminated by applying Hac test. There is no significant impact of macroeconomic indicators of S&P BSE

PSU index returns and S&P BSE India Infrastructure Index but there exists inverse relationship between exchange rate, foreign exchange reserve and gross domestic product. The ARDL Bound Test results of all the four indices shows that the F-Statistics is greater than the upper bound value, which means that there exists cointegration between the variables. In the Long run it is found that the Crude oil Price and Inflation rate have a positive relationship between selected Thematic Indices and other variables have a negative relationship with Thematic Indices of Bombay Stock Exchange in India. In the Short run, it is been observed that Inflation rate and Crude oil prices have a positive relationship with S&P BSE CPSE index returns and S&P BSE India Manufacturing Index returns. Foreign exchange reserve is negatively significant on S&P BSE CPSE Index returns. Gross Domestic Product is negatively significant on S&P BSE India Infrastructure Index returns. Crude oil Price and Exchange rate has a positive significant relationship between S&P BSE PSU index. The error correction term is negative and statistically significant for S&P BSE India Infrastructure Index, S&P BSE India Manufacturing Index, S&P BSE CPSE Index which indicates that system is correcting towards long run equilibrium.

4.2 Limitation of the Study

The time span for the study is only for 8 years, from 2016 to 2023 which is a short period. The period of the study was selected according to the Thematic Indices of BSE as S&P BSE India Infrastructure was launched in May 2014, S&P BSE CPSE index was launched in September 2014 and S&P BSE India manufacturing index was launched in May 2015. The study considers the index returns of all the Thematic Indices of BSE in India. The data has been considered from January 2016 to December 2023.

The study mainly focuses on selected Thematic Indices of Bombay stock exchange which may not represent the entire stock market performance. The study is limited to only five

macroeconomic indicators. The result of the study might not be accurate due to the limited variables considered for the study and all the variables are in quarterly time series which might not be reliable.

4.3 Suggestions

There is scope for further researchers to consider the remaining two Thematic Indices of BSE namely S&P BSE Diversified financials revenue growth fund index as it is launched in April 2018 and S&P BSE Private Banks index as it is launched in August 2018 on Bombay stock exchange. So, the future researchers have a scope for more comprehensive results by considering more macroeconomic indicators, more time period, and on various market indices. The research findings will be beneficial for future investors.

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