

# How Macroeconomics Variable affect the BSE PSU Index time series analysis from 2015 – 2025

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## I. Introduction

A Stock market index is an important parameter to measure the value of whole stock prices into one basket known as Index, for Study we use BSE PSU Index which include major PSUs companies price and help to understand company on a better view point

BSE PSU Index is the leading indices in India that includes 60 companies of India Public Sector Undertaking (PSUs) owned by Government, with total market capital of 62,00,000 lakh crores and CAGR of last 5 years 24.1% according to the report given by **BSE India ltd.** BSE PSU Index is the oldest index among the market created by the BSE on 01<sup>st</sup> April, 2001 with the base value of 1000 rupees, it was form from **BSE 500 Indices**

BSE PSU index is taken because it includes major companies of Public Undertaking and to analyse the price change of PSUs due to change in macroeconomic variable this was the perfect for analyse the effect, for this research we take the seven macroeconomic elements that are highly connected with the fluctuation of behaviour of consumer and companies behaviour, because at the end companies are operated under the Macroeconomic environment.

Seven variables that are taken into consideration – Inflation rate, Repo Rate, Exchange rate, Oil prices per barrel, Steel prices per tonne, Nominal GDP (Gross Domestic Product) and FDI Inflow from the duration between 2015 to 2025.

It may be tell us that the stock markets in India are highly based on demand and industrial conditions which means greater the demand of equity finance is led by higher and improved financial performance. Thus, the Indian economy has a bearing on the share prices, but its sound healthy if stock markets in the sense of a rising share price index is not able mirror or sign of improvement of healthy economy.

However, Shah and Thomas (1997) supported the idea that stock prices are a mirror which reflect the real economy, and are relatively insensitive to factors internal to the financial system, such as, market mechanisms.

Kanakaraj et al. (2008) had also examined the stock price trends and various macroeconomic variables between the time periods 1997-2007. They tried to explore upon and answer that if the financial market boom can be explained in the terms of macroeconomic fundamentals and concluded by recommending a strong relationship between the two.

The study of Ahmed (2008) also shows that the movement of stock prices is not only the outcome of the behaviour of key macroeconomic variables but it is also one of the causes of movement in other macro economy in dimension.

## II. Literature review

**1.1. Patel (2012) – Macroeconomic Determinants of Stock Market Performance in India** Patel on their research paper trying to unveiled that – Macroeconomics indicator effects the financial market prices? if affected how much it influences the money market and work as an indicator

For research Patel takes the data between 1991 to 2011. This period is also significant period for measures due to it covers between pre and post liberalisation of Stock market and it also covers the period pf Great Financial crises of 2008.

Patel takes Price of BSE Sensex for above timeline and takes number of macroeconomic variables such as inflation, money supply (M3), Exchange rate, Interest rates, industrial production in terms of economics performance and take the price of commodity (Oil and Steel)

Patel use Johansenn cointegration procedure to (VECM) was then used for short term adjustment and also use Granger causality test was run to test the signification of longterm effect.

Results found that Sensex has significant long term relationship with the macroeconomics variables, but it short run some fluctuations observed with variables like inflation (Negative) and industrial production (Positive) connection with the BSE Sensex.

### **1.2. Agrawalla & Tuteja (2007) – Causality between Stock Market Development and Economic Growth**

Author address does money market affects growth in economics or rather it is merely mirroring the already occurring things in the economy? This statement is important for policy formation, because if Stock market involved in the development or growth of country then financial market play significant role and need to see the behaviour of market

Used data for a span of 1993 to 2003, it was the revolution in the financial system of India because on this decades NSE (National stock Exchange) started its operations and BSE (Bombay Stock Exchange) introduce to general public and this year's change the financial market in Indian Economy.

Author uses the real GDP, market capitalisation and Level of Sensex was used to measure the role of money market in the Indian Economy and other variables of macroeconomics also taken into consideration

Author uses Granger causality test and vector autoregression model (VAR) model to find the influence of shocks in the financial markets of India

At the end author find out that there is a two-way relationship between stock market development and growth of Economy, two variables have a complex interaction and one opposed to one of them being totally independent variable and also find out that there is an opposite relationship between Stock market, growth and high investment levels effect

### **1.3.Naik & Padalkar (2012) – Effect of Macroeconomic Factors on Indian Stock Market Performance**

On this paper author focuses on the behaviour of Sensex between January 1994 to December 2011. Their primary goal is to analyse the behaviour of macroeconomics variable into Stock markets in development period

Paper took the six macroeconomics variables (Inflation, money supply (M3), real economy activity, treasury bill rate, exchange rate and FII inflow in India) FII inflow taken purposefully because it was used before in many research paper and it pays some role on the fluctuation on the Stock market

To analyse the market performance vector error correction model (VECM) to gain better i

Insight about the variables and for better analyses divide period into two parts first part Shows before crises period and second after crises period.

Findings found that FII inflows create a short-term impact among the other variables for

Short time of period and indicates that market becomes more sensitive to the global Investors sentiments and not purely depend on the strength of the economy.

### **1.4.Dhankar & Esq (2005) – Macroeconomic Variables and Stock Returns in India**

Dhankar studies primarily a econometrics study rather than theory one, it uses APT

(Arbitrage pricing method) in the Indian financial market. APT was primary introduced in the year 1976 and proposed that returns on the assets depend not on one exposure to risk, but few other factors that are systematic in nature

The data was used from the period of 1991 to 2002 and author used largely the data of BSE and NSE, not directly engaged into the data of macroeconomics variables. This method help authors to isolate lesser amount of the underlying factors that explains most of the variations of data

Variables are used for study are – (Difference between long term and short term bonds), fluctuation on the rupees compare to the dollars and inflation

For study author uses method of two-step regression method, divide among two methods first estimate the various variations in the data and secondly cross-sectional regression.

Study finds out that growth of industrial output and spread of the term across the two exchange was always significant and therefore influencing the stock market price

### **1.5.Tripathy (2011) – Causal Relationship between Macro-Economic Indicators and Stock Market in India**

Tripathi (2011) examined a fairly lengthy period from 1994 to 2011 to analyse deeply about the effect of macroeconomics variables relating to the shift in BSE Sensex.

It takes traditional monetary and real variables and factors such as the current account balance and foreign direct investment (FDI), was among the strengths of this study as its coverage was broader compared to the normal monetary and real variables, it also include variables like (WPI), the call money rate, FDI Inflow, Net outlays of foreign institute and exchange rate.

The study used model like ECM (Error correlation model), Bivariate and Multivariate

Granger causality test to observe the behaviour

Result found that FII impact the most on SENSEX Index in the short term and FDI inflow had no immediate or regular impact, deficit in current account had negative effect on the SENSEX

### **1.6. Naka, Mukherjee & Tufte (1998) – Macroeconomic Variables and the Indian Stock Market**

One of the first studies that were conducted to take a closure look at the effects of macroeconomic factors on the price level of stock in India

The study takes monthly data from 1979 to 1994, much before the liberalisation taken place in the India, due to this fact their work continuously used many times by the authors

The study takes Bombay stock exchange Index as a dependent variable and with the macroeconomics indicators

Study used Vector correlation method (VECM) in order to measure short run adjustment and other decomposition methods to learn the contribution made by each of the macroeconomic factors to stock returns variations over time

Study proves that there is no long-term dependency between the variables (Unchanged) and it shows stock market already have variables prior liberalisation that affects the market

### **1.7. Pal & Mittal (2011) – Impact of Macroeconomic Indicators on the Indian Capital Market**

The author study about the transmission of shocks in the monetary sector, Real sector and Stock market of India

The research was conducted between the period of 1995 to 2008, which included significant time periods including great financial depression, dot-com boom and housing bubble burst in the US

Study majorly deals with the two biggest Index in India and their behaviour with the apex institute of India RBI (Reserve Bank of India), they take variables as CPI, Short term Interests, Inflation and quarterly growth of GDP

Author run Unit root test, Abnormal Dickey fuller (ADF) test and Phillips perron test that indicates that the data series were non – stationery, Johansen cointegration to find out long term relationship and then error correction test

Result shows that there is difference between the Indices between the two major Index, Interest rate more effects NIFTY 50 then Sensex and Stock prices are negatively reflect with the inflation.

### **1.8.Kumar (2011) – The Relationship between Indian Stock Market and**

#### **Macroeconomic Variables**

Kumar on his study find out the long-term and short-term relationship with the macroeconomics variables and Indian stock market, with the help of BSE Sensex price from year 2000 to 2009

This year shows drastic changes for Indian Economy, on this particular decade IT Sector companies impact the Stock market and change the behaviour of Investors towards the financial market, Paper also shows global impact of drastic change happens in the Indian financial market

For study Kumar takes variables like inflation, Index of Industrial production, 10 years Government bond prices and Exchange rate. Study also takes accounts of US Federal reserve to shows the global impact

Kumar uses Structural vector autocorrelation (SVAR) model, the model helps to identify national and global financial trend and also shows how market react on short- and longterm shocks

Study shows that US Federal Reserve resulted in the deceleration of FII inflows into India with temporary delay in the funds create a negative effect on the SENSEX, Oil prices affect the Sensex negatively and exchange rate shows positive relationships with Sensex.

### **1.9. Sahu & Dhiman (2011) – Correlation and Causality between Stock Market and**

#### **Macro Economy**

On the studies author shows relationship between the macroeconomics variables and

India Stock market sectors under BSE index as a whole

Authors take the time period between April 2000 to March 2010, during this period there are lots of sectoral fluctuations shown by Sensex index (Sectors like IT, Banking and

Infrastructure) plays pivot role in Financial market growth

Author takes variables for the study – BSE Bankers, BSE IT and BSE Auto with macroeconomics indicators

On the study author uses (VAR) Vector auto-correlations and (AIC) Akaike information criterion was used to determine the optimum lag length

Study finds out that Banking index was very sensitive to changes in the interest rates and this understandable considering that the rate has a direct impact on the lending margin of banks, IT index are more responsive than any other index.

### **1.10. Bhattacharya & Mukherjee (2002) – The Nature of Causal Relationship between Stock Market and Macroeconomic Aggregates**

Bhattacharya and Mukherjee investigates whether stock prices in India are good leading indicators of macroeconomics activity or but responsive, it helps to forecast and policy making in case of financial market and prices of stock

Author takes monthly data from April 1992 to March 2001, which consistent initial during economic liberalisation

For study authors take macroeconomic indicators with the BSE Sensitive index was taken as main variable

Author use bivariate causality regression between the stock index and each macroeconomics variables and uses final prediction error (FPE)

Study finds out that Stock market are not a very useful indicators to predict the movement of macroeconomics variables and there is no evidence that shows any relationship of stock market with the macroeconomics variables

### **1.11. Kirui, Wawire & Onchari (2014) – Macroeconomic Variables, Volatility and**

#### **Stock Market Returns**

Author used to study the two major financial markets of different nations Kenya and India, want to see the fluctuations and behaviour of both market in terms of macroeconomics variables

Author uses data from 2000 to 2012, In case of India Nifty 50 returns and for Kenya VIX returns during that time period, author interestingly uses both market returns to check the fluctuations and behaviour of both market on different macroeconomics conditions. Author uses ARCH/GARCH model returns and market uncertainty and uses mean and average variations between the both market

Study finds out VIX significantly shows more fluctuations then the Nifty, short term market fluctuations are highly depend on the global risk sentiments instead of local announcements of the macroeconomics conditions, variables like

interest rate shows higher level of impact and raises the volatility in the market, but not the returns in a consistent manner and lastly inflation have a negative relationship between both the market.

### **1.12. Ozbay (2009) – The Relationship between Stock Returns and Macro-Economic**

#### **Factors**

Author shows the relationship between the macroeconomics variables and stock market in various emerging economies with a specific interest in India. Author argues that there was a significant relationship between the equity market and Macroeconomic variables

Author mainly focuses on policy making in terms of equity market

It uses variable of BSE Sensex and Nifty 50 were taken for reference with the macroeconomic indicators included interest rates, money supply growth, GDP growth and exchange rate between dollar to rupees

Ozbay used literatures and summaries based on techniques as sign consistency (are relationships positive and negative across the studies author does) and significance frequency (How often result are statistically significant)

Findings find out that Interest rates shows positive relationship with the stock prices,

GDP growth shows positive relationship with the stock prices, exchange rate shows negative relationship with stock prices and Money supply shows positive degree of impact on the prices of stock, study also shows that liberalisation create positive impact among the stock market prices.

**1.13. Mittal & Pal (2011) – Indian Capital Market and Macro-Economic Variables** Author shows the macroeconomics variables that have been known to predict the price of stock returns in the developed market like India are equally applicable or not

Research shows timeline frame 1995 – 2010, which shows significant shift or transition between the market dominated by the retail investors and market dominated by the FIIs Author takes variables for study – Nifty 50 price dependent variable, Wholesale price index, call money rate, Industrial development index, money supply (M2) and the net FII inflow.

Comparative study shows influence of retails and wholesale inflation in generating a stock market returns by using both CPI and WPI

Author runs OLS (Ordinary least square method), author check homoskedasticity with the

ARCH model were estimated and it shows two sub-period pre 2003 and post 2003 Impact shows WPI was more related with stock returns than CPI which the author attributes to the higher content of manufacturing companies in the Nifty Index, FII inflow shows greater driver in delivering the explanation of short term changes in stock market.

**1.14. Mittal, R., & Pal, K. (2011). Impact of macroeconomic indicators on Indian capital markets. Journal of Risk Finance, 12(2), 84–97.**

Author more focused in the analysis as they analysed a small number of macroeconomic variables which they found very relevant in policy terms

They taken the data from the periods that include major financial crises of 2008, and also shows the recovery period of 2008-2009.

Author uses dependent variable BSE Sensex and Inflation was taken consideration as an explanatory variable, as well as call money, inflation, and exchange rate Author uses Pearson correlation method and multiple regression method with heteroskedasticity corrected standard errors to increase reliability of estimates Findings find out that strong positive relationship among the foreign exchange reserves with the performance of the stock market in the period of crises, increase in the reserves contribution to augment investors confidence, exchange rate depreciating and increase in exchange rates

### **1.15. Sahu (2015) – Macroeconomic Factors and Indian Stock Market**

Sahu shows relationship between the post financial crises 2008 and the macroeconomic variables and the stock prices of financial market in India

Study is based on the timeline between 2001 to 2014, this timeline help to know about the financial crises behaviour of financial market and after effects of financial crises in India For study author takes different variables – dependent variable BSE Sensex and macroeconomic indicators (Exchange rate, interest rate, repo rate and wholesale price index) Study uses TVAR model and chow test this helps to know about the up and down regime The study shows repo rate has a negative relationship with dependent variable, it also shows tighten monetary outcomes between 2010 to 2012 and exchange shocks were the most powerful one on the stock prices

**1.16. Singh (2010) – Macroeconomic Variables and Stock Prices in India** Study shows relationship between Oil prices with the stock market prices other than effect via inflation or current account

Study was between the timeline of 1990 to 2009 this year use as sensitive years for global crude oil price fluctuation and supply shock on the crude oil market

Variables using during the study was dependent variable, BSE Sensex was taken, Oil prices in rupees, exchange rate, Industrial production measurement (IIP) and wholesale price index (WPI)

Study uses vector autocorrelation (VAR) model, forecasting error variance and Cholesky decomposition with most exogenous (Oil price) to the most endogenous (the Sensex variable)

Result shows oil price predicted approx. 12 percentage in the change in Sensex movement over a 12 month of horizon which put oil as one of the most influential factors behind the industrial production, 10% in Oil prices resulted in an estimated percentage decreases of 3.5% in Sensex after two quarters.

**1.17. Rao & Bhole (1990) – Inflation and Equity Returns in India**

Rao and Bhole put together one of the first really deep dives into how Indian stocks and rising prices (inflation) danced together. They looked at a huge chunk of history—from the early 50s all the way to 1986—to see if stocks actually protected people's money. The idea they were testing was pretty simple: if the cost of living goes up, do stock profits go up just as much so you don't actually lose any "buying power"? To get the full picture, they looked at the raw profit numbers and the "real world" value of those profits, using two different ways to track price hikes. They even tried to separate inflation into what people *expected* to happen based on the past versus the surprises that caught everyone off guard.

They also looked into a theory that maybe inflation isn't the direct villain. Instead, they wondered if inflation just slows down the whole economy—like factory production—which then drags stocks down as a side effect. When they finished crunching the numbers, the news wasn't great for investors. It turned out that Indian stocks didn't really keep up with rising prices. When inflation got high, the actual value of what investors made ended up being less than zero. While they did find that the general health of the economy played a part, the big takeaway was that, during those years, stocks weren't the reliable "safety net" against inflation that everyone hoped they'd be.

**1.18. Asmy, Rohilina, Hassama & Fouad (2010) – Effects of Macroeconomic Variables on the Malaysian Stock Market**

Back in 2010, Asmy and the team wanted to see how the stock market and the overall economy actually talk to each other. They used India as a prime example, specifically looking at how things changed before and after the 1997 Asian financial crisis hit. It was basically a "before and after" look at how a massive global shock shifts the way markets behave.

The Variables For the Indian side of things, they kept an eye on the Nifty 50 (the big stock index) and compared it against four main economic pulse points: Inflation (rising costs), Money supply (how much cash is flowing through the system), Exchange rates (the value of the Rupee), Short-term interest rates

To figure this out, they split their data into two buckets: the years leading up to 1997 and the years after. They used some specialized math to look at long-term trends as well as "short-term hiccups." Their main goal was to find the "speed of recovery"—basically, how fast the market bounces back to its steady state after a surprise. They figured if the market recovered faster in the later years, it meant it was getting smarter and more efficient at handling economic news.

The results for India were pretty eye-opening. After the 1997 crisis, the market started reacting to economic news about twice as fast as it used to. It's like the market "leveled up" and learned to process information much more quickly. They

also found that having more money in the system generally led to higher stock returns in both periods. However, exchange rates became a much bigger headache after 1997. As India opened its doors more to global trade, the stock market became more sensitive—and a bit more vulnerable—to the swings of the currency.

### 1.19. Shahzad et al. (2016) – Relationship between Developed Stock Markets,

#### Macroeconomic Variables, and the Pakistani Stock Market

Shahzad and his team wanted to look at the bigger picture by comparing different countries, with a special focus on India between 2001 and 2014. The core question was pretty relatable: since India is so connected to the rest of the world now, is the stock market more sensitive to global drama than to its own local economic health?

To get the full story, I looked at the **Nifty 50** as the main pulse of the stock market. On the domestic side, I tracked things like the **repo rate** (the central bank's interest rate), **inflation (CPI)**, **factory output (IIP)**, and the **Rupee/Dollar exchange rate**. To see how the rest of the world was chiming in, I also included the **S&P 500** from the US, the **MSCI Emerging Markets Index**, and the price of **crude oil**.

Instead of just looking at the overall averages, I used a method called **quantile regression**.

Think of this as looking at the market through two different lenses: how it behaves during a "bad " (bear) market versus a "good" (bull) market. I also used a "bootstrapping" technique— basically a statistical safety net—to make sure the results were solid even if the data was a bit messy or didn't follow a perfect pattern. Results

The results showed that the market has a bit of a split personality. When things were down in the dumps (the bear market), the Nifty was mostly reacting to **global factors**. It's like when everyone is panicked, they stop looking at local news and start obsessing over what's happening worldwide. However, when the market was booming (the bull market), **local factors**—especially how much factories were producing and how much money was in the system—mattered much more. Essentially, the market cares about global news when it's scared, but focuses on home-grown growth when it's feeling confident.

### 1.20. Maysami & Koh (2000) – A Vector Error Correction Model of the Singapore Stock Market

When we set out to compare the Indian and Singaporean stock markets, we wanted to do more than just scratch the surface. A big part of this study was actually a warning to other researchers: if you only look at two things at a time, you're probably going to see a "fake" connection. We pushed for a much broader view that looks at how several economic factors move together at once. By comparing India's BSE Sensex with Singapore's market, we were able to see if these two very different but growing economies actually followed the same rulebook when things got messy.

To keep things consistent across both countries, we tracked a few heavy hitters: **The BSE Sensex** (as the main scoreboard for India), **Inflation and Interest Rates** (to see the cost of living and borrowing), **Exchange Rates** (how the currency was holding up), **Industrial Production** (how much stuff was actually being made), **Money Supply** (how much cash was flowing through the economy).

We didn't want to just *assume* that these things were connected in the long run, so we used a specific statistical "reality check" called the Johansen cointegration method. This involved some deep dives into things like trace statistics and eigenvalue tests—which is really just a fancy way of making sure the relationships we found were real and not just a coincidence. We also used a "correction" model to see how the markets behave when they get knocked off balance and how long it takes them to get back to their normal state.

It turns out, India and Singapore are more alike than you might think. In both countries, stock prices took a hit whenever interest rates went up, inflation climbed, or the local currency lost value. On the flip side, whenever factories produced more or there was more money circulating, the markets cheered up. The one big difference? India was a lot slower to "bounce back" than Singapore. When a big economic change happened, it took longer for the Indian stock market to absorb that info and correct its price. We think that's because, at the time, the Indian market just wasn't as "deep" or efficient as Singapore's, so it took a little longer for the news to really sink in.

### III. Research Gap

From above all 22 literatures review we have able to find the research Gap – **Any of the research paper from above shows how macroeconomics variable affects the BSE PSU Index**

### IV. Objectives

**Objectives to specifically work on BSE PSU Index –**

- 3.1.** As PSUs are the major contributor on India corporate world, and it also combine contribute to 3% of total GDP of India
- 3.2.** This pattern helps to understand the behaviour of Macroeconomic variable influence the Index, if yes how much influence the Index
- 3.3.** This patterns also help to predict the future price of Index
- 3.4.** We include the pandemic period, so it also helps to understand how pandemic period affects the macroeconomic variables and how it recovers back from pandemic period to normal cycle
- 3.5.** It also helps in the future policy formation to handle the negative shocks efficiently and make market stable in the time of pandemic.

### V. Variables and Methodology

The study uses eight variables measured at monthly frequency from January 2015 to December 2025, giving 129 observations in total. One is the dependent variable — the BSE PSU Index closing price. The other seven are macroeconomic conditions treated as potential explanatory factors. The choice of the PSU Index rather than the Sensex or Nifty 50 is deliberate: state-owned enterprises are more directly exposed to government policy, commodity cycles, and fiscal conditions, which makes the macro-equity linkages easier to isolate.

#### *Variables*

- 4.1. The DV is the BSE PSU Index “opening price INR” month wise** – Official website of BSE Ltd
  - 4.2. Inflation is measured as the year-on-year percentage change in the CPI** - taken from the RBI DBIE database.
  - 4.3. Foreign direct investment inflow represents net monthly FDI received by India in INR crore** - sourced from DPIIT releases.
  - 4.4. Nominal GDP is the quarterly national income estimate at current prices** - taken from the NSO
  - 4.5. Crude oil price is the Indian Basket price per barrel INR** – Taken from ONGC official website
  - 4.6. Steel price is the monthly domestic hot-rolled coil benchmark in INR per tonne** – taken from the report of Joint Plant Committee under the Ministry of Steel and SAIL official website
  - 4.7. The USD/INR exchange rate is the monthly average RBI reference rate** – taken from DBIE
  - 4.8. The repo rate is the RBI's overnight lending rate** – taken from official monetary policy statements by RBI
- Abbreviation – **DV** Direct variable, **CPI** Consumer price Index, **NSO** National Statistical office

## Methodology

Covers research design, data sources, data preparation, hypotheses ( $H_0$  and  $H_1$ ), the Pearson correlation formula and t-test procedure, Cohen's (1988) strength benchmarks.

## VI. Analysis and Conclusion

### Descriptive Overview of the Data

The study examines monthly data for 129 observations from January 2015 to December 2025. The dataset covers the **BSE PSU Index opening price as the dependent variable and seven macroeconomic indicators as independent variables: rate of inflation, f(FDI) inflow, nominal GDP, crude oil price, steel price, USD/INR exchange rate, and the (RBI) repo rate.** The repo rate analysis shows a reduction sample of 111 observations due to **missing values during the COVID-19 period** when the rate was held in an undisclosed by the authorities.

Over the study period, the BSE PSU Index moved roughly **8,200 points in January 2015 to 20,568 points as per data by December 2025**, with a sharp decreases to **4,460 points in March 2020 as per data** during the pandemic and a strong recovery after pandemic period ends as per data. **Nominal GDP grew from INR 9.83 lakh crore approx. as per data to INR 35.59 lakh crore approx. as per data.** **FDI inflows, available from April 2015, climbed steadily from INR 61,436 crore to INR 3.20 lakh crore as per data.** The USD/INR exchange rate depreciated from 62.29 to 90.00 over the same timeline as per data. Inflation fluctuated between 0.04% and 7.82%, while the repo rate trended downward from 6.75% in 2015 to a low of 3.80% in 2020 before rising again to 6.50% by late 2023.

### Hypotheses

Following hypothesis taken for research paper -

$H_0$ : Macroeconomic variables don't have a statistically significant relationship with the BSE PSU Index price.

$H_1$ : Macroeconomic variables have a statistically significant relationship with the BSE PSU Index price.

### Correlation Analysis

#### Method

Pearsons's product-moment correlation coefficient was used to see how the BSE PSU Index and each macroeconomic variable are related. The **PCC** coefficient shows how strong and in what direction the relationship is. It goes from -1 which is a negative relationship, to +1, which is a perfect positive relationship. To figure out if the results are important a two-tailed t-test was used with a 5 percent significance level. For each pair we tested to see if the relationship is not linear which means the **PCC** is zero. We did this to find out if the **PCC** is really not zero. The BSE PSU Index and each macroeconomic variable were looked at to rectify weather there is a relationship.

**Abbreviation – PCC (Pearson correlation coefficient)**

#### **Results Summary**

Table shows the Pearson correlation coefficients, p-values, and sample sizes for all seven variable pairs. Every variable provides a statistically significant result, that leads to a rejection of  **$H_0$**  in each case.

| PEARSON CORRELATION: BSE PSU Index vs Macroeconomic Variables   |         |         |     |               |
|-----------------------------------------------------------------|---------|---------|-----|---------------|
| H0: $r = 0$   H1: $r \neq 0$   $\alpha = 0.05$ (two-tailed)     |         |         |     |               |
| Variable                                                        | r       | p-value | n   | Decision      |
| Inflation Rate (%)                                              | -0.3252 | < 0.001 | 129 | Reject H0 *** |
| FDI Inflow (INR Cr)                                             | 0.8877  | < 0.001 | 129 | Reject H0 *** |
| Nominal GDP (INR Cr)                                            | 0.8853  | < 0.001 | 129 | Reject H0 *** |
| Oil Price (INR/bbl)                                             | 0.6948  | < 0.001 | 129 | Reject H0 *** |
| Steel Price (INR/t)                                             | 0.8078  | < 0.001 | 129 | Reject H0 *** |
| USD/INR Exchange Rate                                           | 0.7447  | < 0.001 | 129 | Reject H0 *** |
| Repo Rate (%)                                                   | 0.2400  | 0.0101  | 114 | Reject H0 *   |
| Significance: *** p<0.001 ** p<0.01 * p<0.05 ns not significant |         |         |     |               |

### Variable-by-Variable Interpretation

#### FDI Inflow

The strongest relationship in the dataset is between FDI and the BSE Public Sector Undertakings Index. This relationship is very strong. It tells us something. **As FDI inflow into India went up over the decade the Public Sector Undertakings Index also went up.** This makes sense because State-owned enterprises, like those, in energy and defence get a lot of attention from investors. These investors like to put their money into these kinds of companies which's probably why FDI Inflow and the BSE Public Sector Undertakings Index are so closely related FDI inflow and the BSE Public Sector Undertakings Index move together.

#### Nominal GDP

The correlation between nominal GDP and the Bombay stock exchange (BSE) PSUs Index ( $r = 0.885$ ,  $p < 0.001$ ) is almost identical in magnitude to the Foreign Direct Investment (FDI) result. GDP and FDI are themselves closely related — rising (GDP) tends to attract Foreign Direct Investment (FDI), and vice versa — so some degree of fluctuation shows between these two variables is expected. From an economic standpoint, the result confirms that PSU stock valuations are largely pro-cyclical: they expand when the economy of country grows and contract during slowdowns, as observed during the COVID-19 period.

#### Steel Price

Steel prices show a strong positive correlation with the Bombay Stock Exchange (BSE) PSU Index ( $r = 0.808$ ,  $p < 0.001$ ). This is not surprising given the composition of the BSE PSU Stocks basket, which includes major steel producers such as SAIL and NMDC. When steel prices rise, earnings prospects for these companies improve directly, which pushes their market valuations upward. The steel price variable is essentially a sector-level demand signal shows within the dependent variable's own constituent companies.

#### USD/INR Exchange Rate

The USD/INR exchange rate and the Bombay Stock Exchange (BSE) PSU Index are connected in a way. This connection has a strong relationship with a value of 0.745. At first this might see strange because when there is fall in rupee's value, prices in the stock market are affected. This is because goods and services we import become more expensive and companies have to pay more for services and taxes which eventually creates debts that're in dollars. Companies that are owned by the State and work with energy sector and other commodities he makes more money they make is often tied to the price of these commodities, in dollars. So when the rupee loses its value these companies can actually make money

in India. The way these government companies make their money is probably the reason why the exchange rate and the Bombay Stock Exchange PSU Index are connected in a way. The Bombay Stock Exchange PSU Index and the exchange rate are related because of the nature of the government company's revenues.

### Oil Price

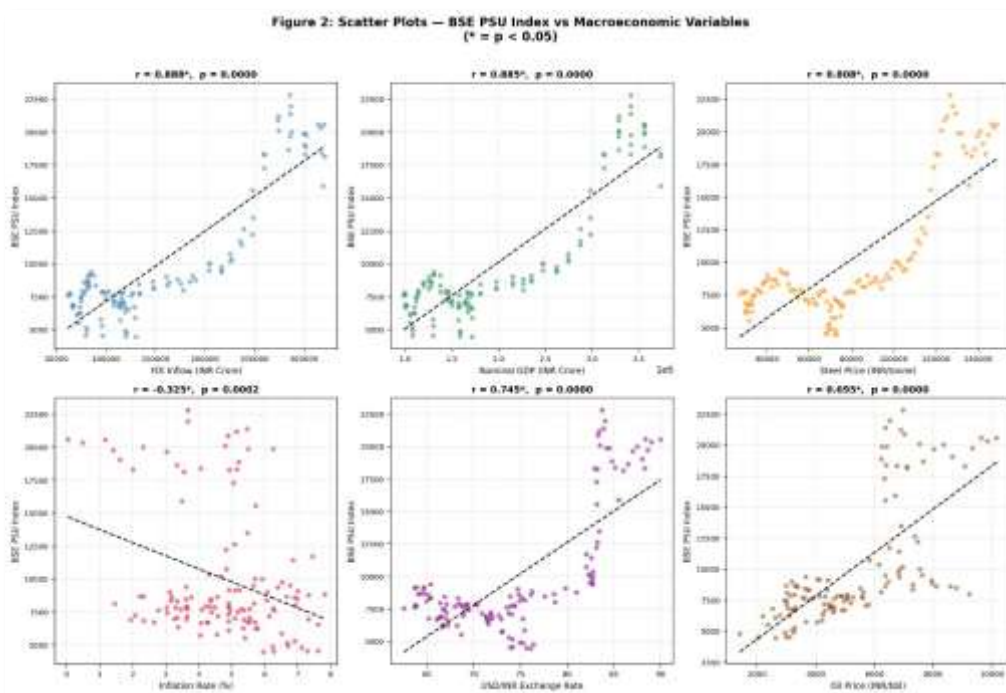
Oil prices and the BSE PSU Index are connected in a way. The connection between oil prices and the BSE PSU Index is pretty strong. Oil companies like ONGC and Oil India are a part of the BSE PSU Index. When oil prices go up these companies make money from each barrel of oil they sell, which makes them more profitable. The connection between oil prices and the BSE PSU Index is not extremely strong. This is because some oil companies that refine and make petrochemicals have to pay more for the oil they use when prices go up. So the increase, in oil prices not help these companies much. Oil prices and the BSE PSU Index are still connected, It is not a perfect connection.

### Repo Rate

The repo rate has a connection with the BSE PSU Index. This connection is positive which is a little surprising. Normally when interest rates are increasing the price of stocks goes down. This is because high interest rates make it more expensive to take money from Commercial Banks, which can affect the future cashflow of companies. The connection we see here is probably because of how a monetary policy works and the time period we are looking is from 2015 to 2018 interest rates were relatively high. The price of PSU stocks was going up. Then in year 2020, when interest rates were going down due to COVID-19 pandemic caused the market to crash. This means that the effect of the repo rate on the market was overshadowed by large economic events.

### Inflation Rate

The only thing that has a connection with the market is inflation. When inflation is high it reduces the value of the money, operational cost for companies that required a lot of capital to operate will eventually increase and which describes that interest rates will increase soon. All these things can decrease the price of Stock. The relationship between the inflation and the market is moderate, not very strong. This might be because sometime the economy is growing faster when inflation is moderate which can help to balance out the negative shocks of inflation, on the price of stock



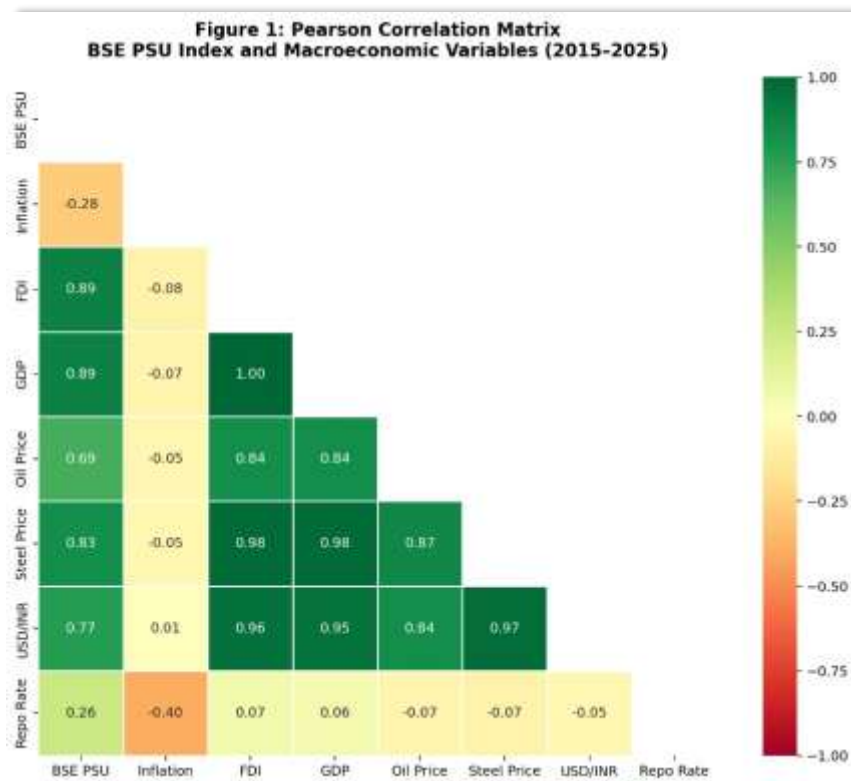
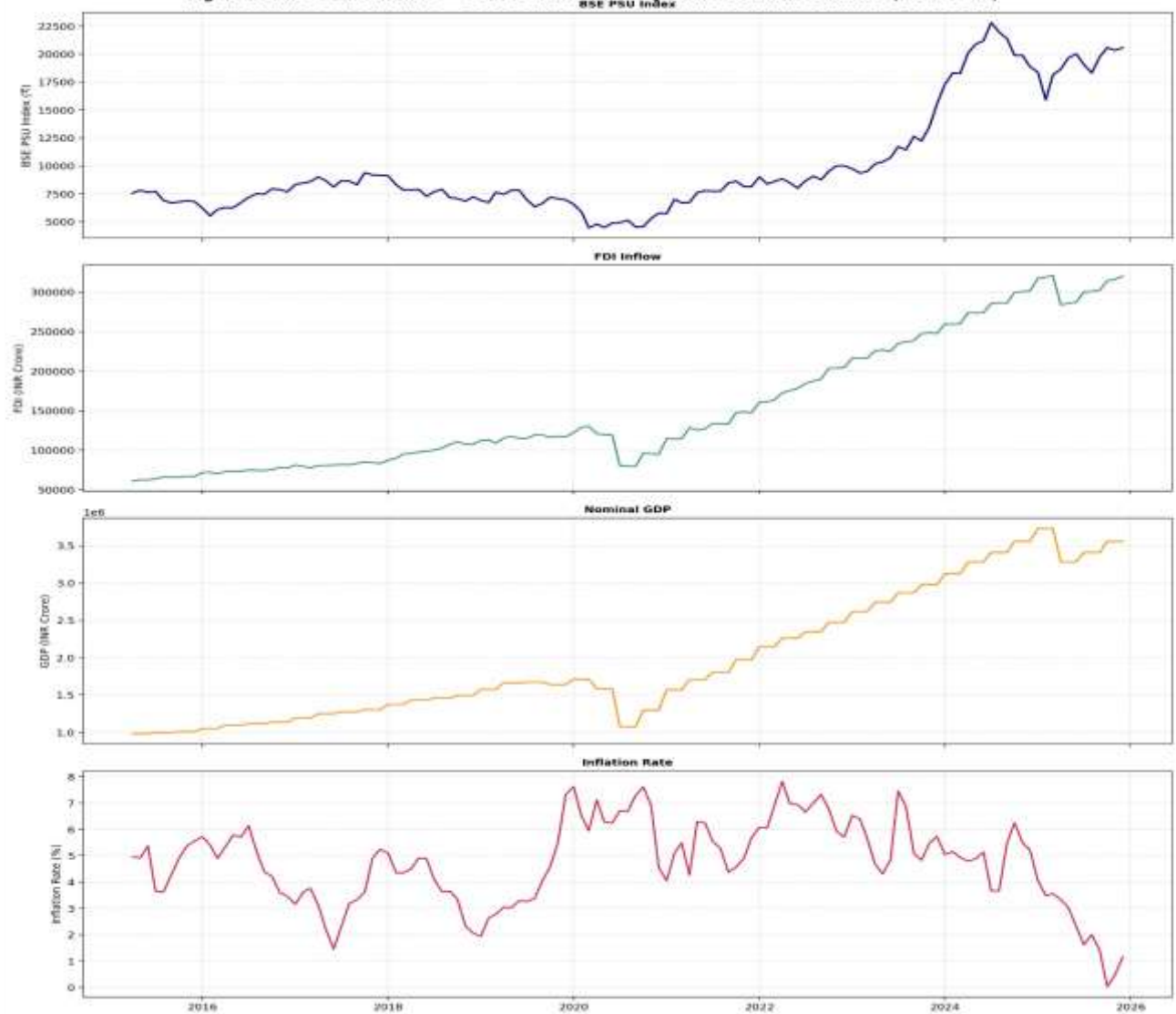


**Figure 3: Time-Series Trends — BSE PSU Index and Key Macroeconomic Variables (2015-2025)**



## Discussion

The correlation results finds that the macroeconomic variables have an impact on BSE PSU

Index prices. The findings point to a real connection between macroeconomic variables and BSE PSU Index prices — all seven variables returned very low p-values, so we can reasonably dismiss the idea that these relationships are just noise.

FDI, GDP, steel prices, and oil prices all move in the similar direction as the index, which makes sense given how closely they track PSU company health. Exchange rate and repo rate show a weaker but still present relationship. Inflation goes the other way, which is expected — higher inflation erodes earnings and compresses valuations.

Two things this analysis can't tell us: first, it only looks at linear relationships, and that's not always the full picture. Second, correlation doesn't settle the question of direction. The working assumption is that macro variables are influencing the index, but the causality could run the other way, or both could be reacting to something else entirely.

Granger causality tests and regression methods would help untangle that — results are suggestive, not conclusive.

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