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## Contents

1. **Quality of Life Among Elderly People in Chitwan District, Nepal** 1-15  
Jiwan Kumar Poudyal, Dhanendra Veer Shakya, Sumitra Parajuli,  
Govinda Prasad Dhungana
2. **Theoretical Investigation of the Thermodynamic Properties of Lead-free Ternary Alloys Sn-Sb-Bi and their Subsystems** 16-30  
Sanjay Kumar Sah, Indu Shekhar Jha, Ishwar Koirala
3. **Surface Tension of Liquids (Water, Chloroform and Acetone) by Capillary Rise Method** 31-36  
Dipak Raj Adhikari, Tek Bahadur Budha, Anup Basnet,  
Shesh Kant Adhikari, Shiva Pd. Baral
4. **Study of Fiber Yielding Plants of Devchuli Municipality Ward no.13, Nawalparasi** 37-45  
Pooja Pokharel and Manoj Kumar Lal Das
5. **Study of Quality and Damping Factor at First and Second Resonance of Closed Organ Pipe** 46-54  
S.K. Adhikari
6. **Ethnobotanical and Phytochemical Study of *Houttuynia cordata* Thunb: A Review** 55-62  
Hari Devi Sharma, Janardan Lamichhane, Smriti Gurung and Balkumari Oliya
7. **Impact of Mandatory Corporate Social Responsibility on Beneficiary Institutions Satisfaction in Nepal** 63-72  
Sudip Wagle
8. **University Students' Knowledge and Attitudes about Plagiarism: A Web-Based Cross-Sectional Study** 73-81  
Hari Prasad Upadhyay, Bijay Lal Pradhan, Prativa Sedain
9. **Social Biases and Equity Investment Decisions of Individual Investors: Behavior Finance Perspective** 82-96  
Mohan Prasad Sapkota, Shiva Bhandari
10. **Customers' Trust in E-payment : The Influence of Security and Privacy** 97-112  
Omkar Poudel1, Pradeep Acharya and Daya Simkhada
11. **ARIMA and Exponential Smoothing Model to Forecast Average Annual Precipitation in Bharatpur, Nepal** 113-125  
Sarad Chandra Kafle, Ekta Hooda
12. **Impact of Intellectual Capital on Firms' Performance: With Perspective of Commercial Banks in Chitwan** 126-135  
Udaya Kumar Shrestha

13. **Impact of GDP and Inflation on Stock Market in India:  
A Case Study of BSE Index** 136-148  
Satyendra Kushwaha, Sarad Chandra Kafle, Baburam Khanal
14. **Awareness of People on Functions of Local Government in Nepal** 149-161  
Lila Prasad Limbu
15. **Gender Based Knowledge on the Reservation System in Nepal** 162-171  
Purnima Shrestha
16. 'परमानन्द' महाकाव्यमा छन्दविधान 172-179  
दामोदर रिजाल
17. योद्धा उपन्यासमा वर्गपक्षधरता 180-191  
प्रभा मरहट्टा कोइराला
18. विश्वेश्वरप्रसाद कोइरालाको 'सान्नाती' कथामा प्रजाति 192-200  
राजेन्द्र गिरी



## Impact of GDP and Inflation on Stock Market in India: A Case Study of BSE Index

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### Abstract

*Stock market is affected by various factors. Among them, gross domestic product and inflation are the major variables. This research paper focuses how GDP and inflation affect the Indian stock market. Objective of this study is to examine the association between real GDP, inflation, and the performance of the Indian stock market. This research studies the impact of GDP and Inflation on volatility between the Bombay Stock Exchange (BSE) and macroeconomic variables. The analysis uses a multiple regression equation model to examine how these factors interact. The data collected consists of annual records of Real GDP and the inflation rate spanning from 1980 to 2021. The result shows that there is the strong positive correlation between GDP and BSE index. Similarly, there is the moderate negative correlation between Inflation and BSE index. The regression model provides the very strong impact of independent variables on the BSE index where independent variables are explaining 88.5% variation in BSE Index. Also, BSE increases 17.08% with a one percentage point GDP growth, where as one percentage increase in Inflation makes 2.17% decrease in BSE. The study found the microeconomic variable GDP and Inflation used in regression analysis are good explanatory variables. The regression model developed in this study is important in explaining the relationship between the dependent and independent variables. Stock market performance is typically shaped by various macroeconomic factors, including interest rates, remittances, foreign direct investment, per capita income, and dividends. However, the current research only employs two explanatory variables to analyze stock prices. Therefore, there is an opportunity for further investigation to elucidate how these additional explanatory variables impact stock prices. Findings of the research help the concerned stakeholders for making policy and aware them in the investment plans.*

**Keywords:** *Bombay stock exchange, correlation analysis, inflation, real gross domestic product, regression analysis.*

### 1. Introduction

The stock market plays a pivotal role in the functioning of a free-market economy by facilitating the accumulation of capital for companies through the issuance of various financial instruments, including stocks, debentures, and corporate bonds. These instruments enable investors to partake in a company's financial prosperity, realize gains from capital appreciation, and receive income in the form of dividends. Within

the stock market, shares are both issued and traded, with fluctuations influenced by the rational and irrational actions of market participants. Investors engage in stock market activities with the objective of augmenting their wealth over an extended investment horizon. Despite perceived risks associated with stock market investments, extensive research has corroborated that prudent allocation of funds into well-selected stocks over a time frame typically ranging from five to ten years can yield returns surpassing inflation rates, thereby rendering it a superior investment avenue when contrasted with alternative platforms (Kotak Securities, 2012).

India boasts nearly 23 stock exchanges, with the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE) being prominent national-level entities. BSE, founded in 1875 AD, stands as Asia's inaugural stock market and is home to over 5000 listed companies. BSE has introduced the Sensex, a benchmark comprising 30 stocks. Various factors impact the stock market, with gross domestic product (GDP) and inflation representing significant determinants (Khatri, 2019).

Gross Domestic Product (GDP) serves as a comprehensive monetary measure of the total economic value generated within a nation's geographical boundaries. It encompasses the aggregate value of all goods and services produced by entrepreneurial leaders and companies within the nation (IMF, 2022).

Inflation signifies the gradual rise in the price levels of goods and services over time, leading to a decrease in the purchasing power of a currency. The inflation rate quantifies the pace at which prices escalate, resulting in a reduction in the value of money due to the inverse relationship between the general price level and currency purchasing power (KC & Thapa, 2021). The correlation between economic growth and inflation has been a focal point of extensive research in macroeconomics. In economic terms, inflation signifies an increase in price levels and economic expansion, typically expressed as a percentage of GDP (Munawar, & Mahaputra, 2022).

The younger generation displays a pronounced interest in the stock market, given its ability to reflect a nation's economic status (Ganti, 2023). The stock market is subject to the influence of factors such as GDP and inflation. Many novice investors enter the market without adequate knowledge, often relying on broker tips, which can impact market dynamics (Islam & Ahona, 2021). This study endeavors to fill a critical research gap by examining multiple facets of the Indian economy. Its objectives encompass elucidating the intricate relationship between India's GDP growth and stock market performance, scrutinizing the effect of inflation on the Bombay Stock Exchange and various stock indices, analyzing the sway of these factors on investor sentiment and trading behaviors, exploring sector-specific sensitivities, and ultimately assessing broader implications that can offer invaluable insights to stakeholders and decision-makers (Oseni, & Nwosa, 2011).

This research exploring the influence of GDP and inflation on the BSE India stock market holds significance for investors, policymakers, and scholars alike. It aids investors in risk

management and decision-making, assists policymakers in crafting effective economic policies, provides insights into portfolio diversification techniques, and enhances comprehension of economic indicators and cross-national comparisons. Additionally, it contributes to the advancement of finance and economics as academic disciplines.

The primary aim of this study is to gain a deeper understanding of the complex interplay between various economic variables and their impact on the dynamics of the Indian Stock Market, with a particular focus on the Bombay Stock Exchange. Specifically, this research aims to conduct empirical analyses to investigate how GDP and inflation affect the performance of the Bombay Stock Exchange and to examine the relationship between India's GDP and inflation in the context of its stock market.

It's important to note that this research is confined to assessing the impact of GDP and inflation on the stock market in India, and its findings should not be extrapolated to other countries. The study also concentrates solely on two macroeconomic factors, excluding potential influences from other variables such as interest rates, remittances, foreign direct investment, per capita income, dividends, among others. Furthermore, this study excludes analysis of individual sector indices, such as banking, hospitality, manufacturing, and others.

## **2. Literature review**

Numerous researchers have delved into the realm of stock markets, examining the influence of various macroeconomic variables, including inflation, GDP, interest rates, and the Consumer Price Index, on stock prices. Several relevant studies in this domain are summarized below.

Ratanapakorn and Sharma (2007) conducted an analysis of the US stock market spanning from 1975 to 1999, revealing significant correlations between macroeconomic determinants and price indices. Their findings demonstrated a positive association between inflation, short-term interest rates, and exchange rates, but a negative correlation between stock prices and long-term interest rates. Granger causality analysis was employed to underscore the long-term impact of macroeconomic factors on stock prices, with the study indicating that stock prices are substantially influenced by their historical values, accounting for approximately 87% of the variance even over a 24-month period.

Sharma and Mahendru (2010) investigated the historical connections between the BSE and macroeconomic variables, such as inflation, exchange rates, foreign exchange reserves, and the price of gold. Employing multiple regression analysis, they identified a beneficial relationship between the price of gold and exchange rates, while foreign exchange reserves and inflation had a comparatively muted impact on stock prices.

Reddy (2012) explored the relationship between inflation rates, interest rates, real GDP, and stock prices from 1997 to 2009, employing a stock exchange index as a proxy for stock prices. Regression analysis revealed that the explanatory variables accounted for 95.6% of the variance in stock prices. The results indicated that decreasing inflation and interest rates were associated with rising stock prices, while an increase in real GDP

positively influenced stock prices.

Ihsan and Anjum (2013) examined the relationship between interest rates, the consumer price index, inflation rate, and GDP in Pakistan from 2000 to 2011 using regression analysis. Their analysis underscored the significance of the consumer price index and interest rates as factors influencing GDP and inflation.

Kanahalli (2014) conducted an investigation into how the Indian stock market, particularly the BSE Sensex, is impacted by various macroeconomic factors. The study employed monthly data spanning from April 2010 to June 2014 and utilized multiple regression techniques to assess the influence of these variables on the BSE Sensex. The results indicated that the combined effects of the independent variables significantly affected the Sensex.

Ali (2014) constructed a model to investigate the connection between the stock market and interest rates in Pakistan. The study employed regression and descriptive analyses using monthly closing stock prices from the Karachi Stock Exchange and interest rate data from the previous ten years. The findings highlighted the dependence of Pakistan's stock market performance on political situations and identified factors with both positive and negative impacts on stock markets.

Algarini (2020) aimed to identify long-term and short-term equilibrium relationships between stock market values and macroeconomic variables, including GDP, FDI, inflation rate, and interest rate, using annual time series data from 1993 to 2018. The study's results indicated long-term relationships between market value and macroeconomic variables, particularly GDP, but no short-term relationships between stock market values and other variables. The study emphasized the importance of monetary policies and economic activity measurement on the stock market index in Saudi Arabia.

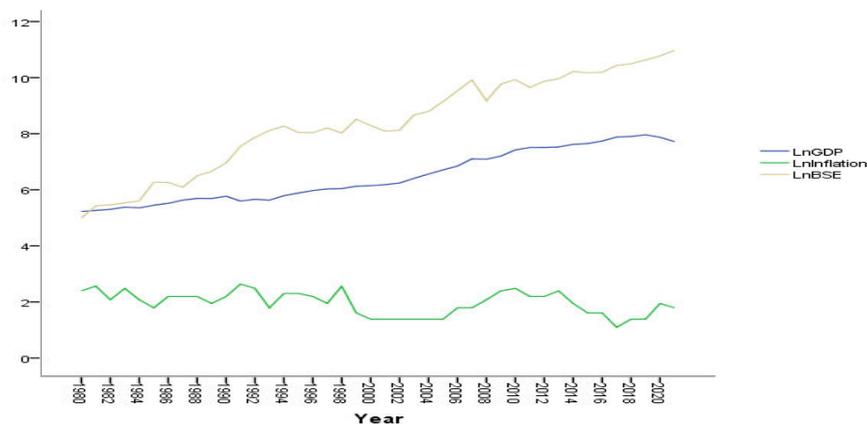
In conclusion, the review of relevant literature on the impact of macroeconomic variables on stock markets reveals a lack of consensus among studies. Divergent findings may be attributed to variations in methodologies, the selection of variables, time periods studied, and analytical tools employed. Nevertheless, the collective body of literature suggests a significant influence of fundamental macroeconomic variables such as GDP, inflation, and interest rates on stock prices.

### **3. Research methodology**

This study is based on Correlational Research Design to achieve the goal of this research, and the researcher has utilized the time series data of last 42 years from reliable online sources. Information regarding inflation, GDP and Stock Market data are collected from the website of the [macro-trends.com](http://macro-trends.com) (Macrotrends, 2017) and [bseindia.com](http://bseindia.com) (BSE, 2021). To analyze the relationship between GDP, inflation and BSE index a Trial Version of SPSS 22 version software is used. Correlation, regression, coefficient of variation are the statistical tools used to find out the relationship between the variables and to draw meaningful inferences. Also, ANOVA is used to test the significance of regression equation.

This research has leveraged GDP and inflation as key determinants to elucidate their impact on the behavior of the BSE. The selection of these microeconomic variables is grounded in a well-established theoretical framework supported by a substantial body of research, which has consistently demonstrated their robust influence on stock indices. The stock market, being a complex financial ecosystem, is inherently sensitive to the economic conditions of a nation, and GDP and inflation are paramount factors in this regard. Several key studies have underscored the pivotal role of these variables in shaping stock prices. For instance, Reddy (2012) investigation revealed that a decrease in interest and inflation rates corresponded with an upsurge in stock prices, while an increase in GDP exerted a favorable influence. Similarly, Karunanayake et al. (2012) delved into the interplay between stock market returns and GDP growth rates across four Anglo-Saxon economies, uncovering cross-mean spillovers from GDP growth to stock market returns, particularly from the robust U.S. economic growth to its stock market. Also, examination of inflation's impact on stock market performance in Nigeria yielded by Daferighe et. al. (2012) have delved valuable insights, highlighting a negative relationship between measures of stock market performance and inflation. This implies that stock market investments are perceived as a reliable hedge against inflation in context of developing country like Nigeria. Therefore, it is also valid for Nepal as well which can be tested using statistical techniques. Lastly, Igoni et al. (2020) made a significant contribution by establishing a symbiotic connection between stock market capitalization and GDP in the Nigerian economy, with interest rates emerging as a significant driver of market capitalization activities. These collective findings affirm the critical relevance of GDP and inflation as pivotal determinants influencing stock market dynamics, further emphasizing their significance in both academic research and investment decision-making.

#### 4. Analysis and results



**Figure 1. Trend of LnGDP, LnInflation, LnBSE**

After the data collection and processing for data analysis, SPSS is used for data analysis. To carry regression, the requirements of regression analysis like linearity, Normality and heteroscedasticity are checked. At first linearity is checked and then model is fitted

then Normality of errors, collinearity between independent variables are checked.

Graphical presentation of variables under study in trend line shows there is linear relationship between GDP, Inflation and BSE index, after taking natural log for them. Also this shows that GDP is in uptrend and Inflation is fluctuating. It means when GDP rises then BSE index also rises (Figure 1).

#### 4.1 Correlation analysis

Correlation analysis examines the strength and direction of the relationship between two or more variables. It quantifies the degree of relationship between the variables. The simple correlation coefficient is a number between -1 and +1 and denoted by “r”. This study have objective to determine the effect of microeconomic variables in to BSE, such a study begin with correlation analysis (Kafle, 2019).

**Table 1. Model summary of correlation analysis**

		Ln(GDP)	Ln(Inflation)	Ln(BSE)
Ln(GDP)	Pearson Correlation	1	-0.402**	0.939**
	Sig. (2-tailed)		0.008	<0.001
	N	42	42	42
Ln(Inflation)	Pearson Correlation	-0.402**	1	-0.422**
	Sig. (2-tailed)	0.008		0.005
	N	42	42	42
Ln(BSE)	Pearson Correlation	0.939**	-0.422**	1
	Sig. (2-tailed)	<0.001	0.005	
	N	42	42	42

\*\* Correlation is significant at the 0.01 level (2-tailed)

Correlation analysis is carried after taking natural logarithm on each variables under study. Findings shows that there is moderate degree of negative correlation between GDP and Inflation and it is significant ( $r = -0.402$  and  $P < 0.05$ ). Also, analysis shows there is strongly positive correlation coefficient between BSE index and GDP which represent that when GDP increases BSE index also increases, and it is significant ( $r = 0.939$  and  $p < 0.05$ ). Also BSE and GDP have strong positive significant relationship ( $r = 0.939$  and  $P < 0.05$ ). The microeconomic variable taken here as independent variable have significant impact on dependent variable BSE.

#### 4.2 Linearity

To use a regression equation for prediction of dependent variable using independent variable, one of requisites is linearity that is there should be linear relationship between dependent and independent variables. To check this scattered diagram is used which shows a linear relationship between dependent variable BSE and independent variables Inflation and GDP (Figure 2).

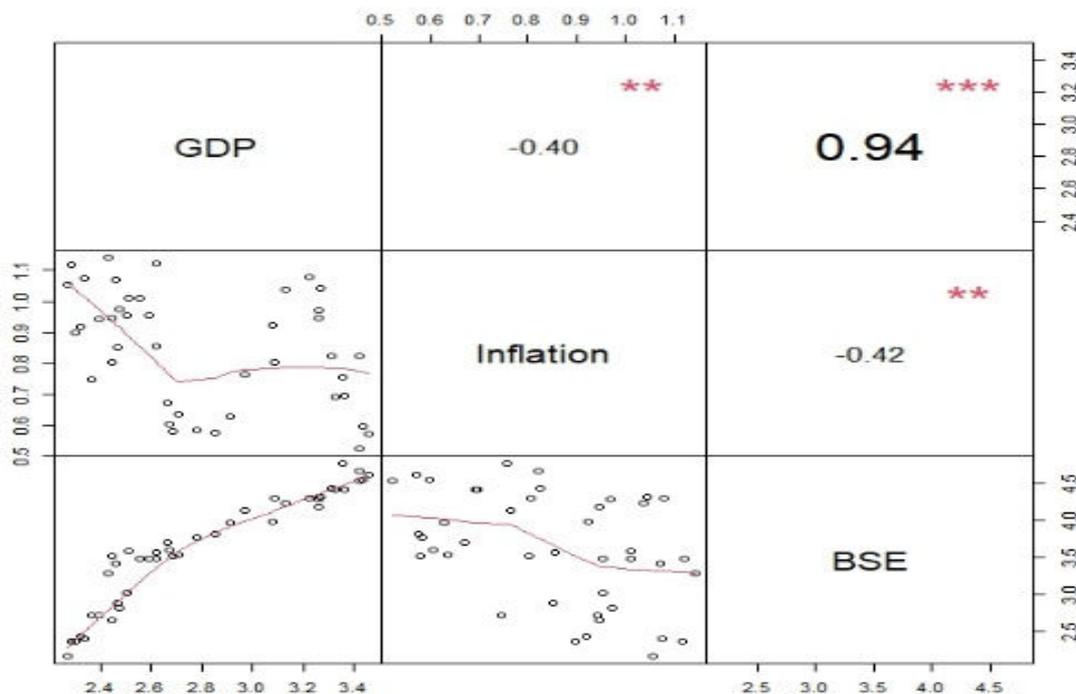


Figure 2. Scatter plot for linearity

### 4.3 ANOVA

Analysis of Variance (ANOVA) is developed by R.A Fisher in 1910 AD. In regression analysis ANOVA is used to check the significance or regression model (Kafle, 2019). In this study dependent variable is BSE and independent variables are GDP and Inflation. Once the model found significant further model explanation be useful so ANOVA is conducted for the significance of regression model with the null hypothesis of the regression model is not significant.

**Table 2. ANOVA table for regression analysis**

Model	Sum of squares	df	Mean square	F	Sig.
Regression	106.759	2	53.380	150.014	<0.001
Residual	13.877	39	0.356		
Total	120.637	41			

ANOVA for regression analysis indicates that the p-value for testing the regression model is below 0.01, signifying that the model is significant at a 1% level of significance. So, the model can be used for prediction of BSE index using GDP and Inflation. Hence it can be concluded that the model is fit for BSE prediction.

### 4.4 Regression analysis

Regression analysis is carried with two objectives: first is to find the effect of independent variable on dependent variable, the second is to determine the value of dependent

variable with the help of known value of independent variables (Kafle, 2019). Based on the number of independent variables used in regression model it is categorized into two types: Bivariate Regression (Simple Regression) and Multiple Regression. Bivariate regression is designed for a situation in which there are just two variables one is dependent variable and another is independent variable. Multiple regression is designed for a situation in which there are more than two variables one is dependent variable and remaining two are independent variables. Multiple regression analysis is utilized in this study to examine the impact of the independent variables on dependent variable. The proposed multiple regression model is:

$$\text{Ln(BSE)} = \alpha + \beta_1 \times \text{Ln(GDP)} + \beta_2 \times \text{Ln(Inflation)} + e \quad \dots(1)$$

Where,  $\alpha$  is constant called intercept, where as  $\beta_1$  and  $\beta_2$  are regression coefficients. Also  $e$  is known as error term which is the difference between actual and predicted value of dependent variable.

**Table 3. Model of regression analysis**

R	R square	Adjusted R square	Std. error of the estimate
0.941	0.885	0.879	0.59652

Regression analysis shows the coefficient of determination(R- Square) is 0.885 which means 88.5% variation in dependent variable BSE is explained by independent variables GDP and Inflation. It means Inflation and GDP are predicting BSE index 88.5% and 11.5% are predicted by other variables which are not studied here. Furthermore, the analysis shows a high degree relationship ( $R = 0.941$ ) between the BSE and joint effect of GDP and Inflation on BSE. The standard error of estimate provides an indication of how closely the estimated values derived from the regression line align with the actual values. This measure allows us to assess the reliability of our estimates. The calculated model in this study has standard error of estimate is 0.596, implies that in an average there is 0.596 unit difference between actual and estimated BSE. Which is very small value showing the strength of developed model.

#### 4.5 Histogram

While plotting residuals of regression model in histogram, the diagram shows the errors are normally distributed. Which shows the one more requirement for linear regression model is satisfied.

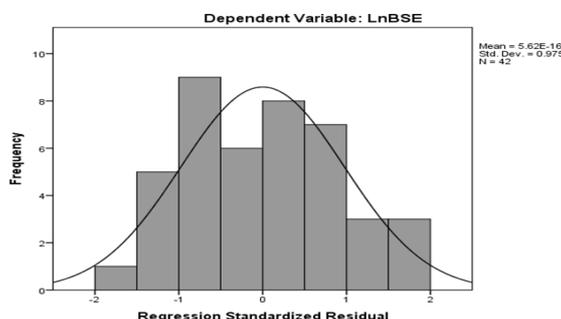


Figure 3. Histogram for normality

#### 4.6 Regression model

While carrying a multiple regression analysis, coefficients are tested with the hypothesis that the independent variable is a significant contributor for the model. If the coefficient is found significant then the corresponding independent variable is significant explanatory variable (Adhikari & Pandey, 2017). Also collinearity determine whether there is high degree of correlation between independent variables and due to their relation they can predict dependent variable or not correctly or not. With these assumption test for regression coefficients and collinearity is carried.

**Table 4. Regression Model, test of regression coefficient and collinearity test**

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
	B	Std. error	Beta			Tolerance	VIF
(Constant)	-2.267	1.006		-2.254	0.03		
Ln (GDP)	1.708	0.110	0.918	15.478	<0.001	0.843	1.187
Ln (Inflation)	-0.217	0.241	-0.053	-0.901	0.373	0.843	1.187

Regression analysis shows that there is absence of collinearity between independent variables ( $VIF < 5$ ). This is third assumption of multiple linear regression, finally absence of multicollinearity between independent variable shows the regression model is good to predict BSE based on GDP and Inflation is good to use.

The regression analysis shows the regression model is as:

$$\text{Ln(BSE)} = -2.267 + 1.708 \times \text{Ln(GDP)} - 0.217 \times \text{Ln(Inflation)} + e \dots(2)$$

In the obtained regression model  $\text{Ln(BSE)}$  represents the natural logarithmic value of the Bombay Stock Exchange (BSE) index. The model seeks to establish a mathematical relationship between the natural logarithmic value of the BSE index and two independent variables: the natural logarithmic value of the Gross Domestic Product (GDP) denoted as  $\text{Ln(GDP)}$ , and the natural logarithmic value of the Inflation rate, denoted as  $\text{Ln(Inflation)}$  (Equation ii).

In the context of academic discourse, the results of my research paper reveal important findings. The coefficients associated with each independent variable, specifically 1.708 for the natural logarithm of GDP and -0.217 for the natural logarithm of inflation, represent the estimated influence of these variables on the natural logarithmic value of the BSE index. To elucidate further, the coefficient of 1.708 for  $\text{Ln(GDP)}$  implies that a one percent increase in GDP is anticipated to lead to an approximate 17.08% rise in the BSE index, assuming all other factors remain constant. Conversely, the coefficient of -0.217 for  $\text{Ln(Inflation)}$  suggests that a one percent increase in the inflation rate is expected to result in approximately a 2.17% decline in the BSE index, under the assumption of other variables remaining unchanged.

It is noteworthy that both independent variables,  $\text{Ln(GDP)}$  and  $\text{Ln(Inflation)}$ , are found significant explanatory factors for the dependent variable  $\text{Ln(BSE)}$ , as evidenced by their regression coefficients having p-values below the 0.05 threshold, assuming a

significance level of 5%. Furthermore, the regression model defined in Equation (i) satisfies that all the assumptions of the linear regression model, and the ANOVA test demonstrates the model's significance at the 5% level.

Additionally, it is pertinent to mention that the independent variables collectively account for 88.5% of the variation observed in Ln(BSE). In particular, both GDP and inflation are considered significant explanatory variables ( $P < 0.05$ ). Notably, GDP exerts a more substantial influence, with a one percentage point increase leading to a 17.08% upswing in the BSE index, whereas a one percentage point increase in inflation is associated with a 2.17% change in the BSE index. This disparity underscores the greater explanatory power of GDP compared to inflation in elucidating the behavior of the BSE index.

The findings of this study exhibit certain similarities with those of Ratanapakorn and Sharma (2014) as well as Reddy (2012). In accordance with the observations made by Ratanapakorn and Sharma pertaining to the presence of substantial correlations between macroeconomic variables and stock prices within the US market, Karki (2017) identified a high degree of association between the Stock index and microeconomic variables, specifically GDP and inflation. Reddy (2012), in a study encompassing the years 1997 to 2009, established that a noteworthy 95.6% of independent variables accounted for the variations in dependent variables, thereby reinforcing the relevance of macroeconomic factors.

In a similar vein, Usman and Adejare (2013) conducted an examination of data from the Nigerian Stock Market spanning from 1970 to 2010, revealing that inflation contributed to approximately 18.9% of capital market volatility. In contrast, the present research demonstrates that independent variables, GDP and Inflation, collectively account for 88.5% of the variation in BSE. However, in the context of BSE, the degree of influence on the stock index appears somewhat less than that reported in Reddy's (2012) study, suggesting the potential necessity of incorporating additional microeconomic variables into the model for a more comprehensive explanation.

It is noteworthy that real GDP, inflation, and money supply exert favorable impacts on the stock market, while interest rates yield adverse effects. Importantly, this study is centered on the Indian stock market. Within this context, both the stock market and RGDP exhibit robust positive associations, although a relatively weak negative relationship is discernible between inflation and the stock market. The significance of macroeconomic factors in investment decisions within the stock market domain cannot be overstated. A flourishing economy characterized by elevated GDP and subdued inflation typically bodes well for stock market performance. Nevertheless, it is imperative for investors to remain attuned to the distinct risks associated with each macroeconomic factor.

## **5. Conclusion and recommendation**

This research paper has significantly enhanced comprehension of the intricate dynamics between economic growth, development, and their nexus with the stock market. By

meticulously examining macroeconomic data spanning a comprehensive 42-year period from 1980 to 2021, this study has embarked on a rigorous exploration of the enduring associations among GDP, inflation, and the stock market. Our comprehensive analysis has unveiled a robust overarching relationship among these variables, with an impressive 88.5% of the variation in the dependent variable being elucidated by the independent variables.

Notably, this investigation has unveiled a stark dichotomy in the impact of GDP and inflation on the BSE index. The t-test results have unequivocally established a statistically significant positive relationship between GDP and the BSE index, underscoring the salient role of economic growth in propelling stock market performance. Conversely, the analysis has uncovered a statistically insignificant relationship between inflation and the BSE index, shedding light on the nuanced and moderate negative influence exerted by inflation on stock market behavior.

In essence, the enduring findings affirm the enduring and distinctive influence of the Indian BSE index on GDP and inflation. This alignment with the prevailing hypotheses underscores the robustness and validity of our research outcomes, offering invaluable insights for policymakers, investors, and scholars alike as they navigate the intricate landscape of economic growth, development, and the stock market.

Based on the findings of this research, it is suggested that future studies broaden their scope by considering additional independent variables to comprehensively assess the multifaceted dynamics of stock market behavior. Given the substantial influence of GDP and inflation on the BSE index, governmental intervention is essential; policymakers should focus on implementing measures to stabilize inflation rates and stimulate economic growth. In particular, awareness programs and training for novice investors, coupled with the integration of digital technology, can enhance market participation and mitigate risks. Moreover, the overwhelming 88.5% dependence of the Indian Stock Market (BSE) on GDP and inflation necessitates immediate government action, as evidenced by the index's negative trajectory when these variables approach zero, highlighting the urgency of addressing economic stability and inflation control issues.

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