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Association Regarding S&P BSE Market and Specific Financial Parameters: A Statistical Analysis

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Abstract

The present investigation investigates the relationship between the S&P BSE market and particular financial characteristics through statistical analysis. The Indian stock market is crucial element of the nation's financial framework, functions via two primary stocks provides: the Bombay Stock Exchange and National Stock Exchange. It examines money supply, Interest Rate (IR), Consumer Price Index (CPI), Exchange Rate and Inflation on BSE S&P index of India. The Statistical Package for Social Sciences (SPSS) is utilized to execute Correlation Matrix, Regression analysis and Descriptive Statistics. These analyses include assessing Variance Inflation Factor (VIF), Goodness of Fit, Durbin-Watson d-statistics, Determination Coefficient and Goodness Fit. The analysis findings suggest that the S&P BSE value exhibits a positive correlation with every variable that is independent, except for interest Rate. Conversely, Interest Rate has a negative connection with other variables. The connection among Consumer Price Index and money supply are rising, meaning that the consumer price index rises in response to an increase in the money supply. There is a negative connection between money supply and interest rate, indicating that a rise in the money supply causes interest rates to fall. The VIF of every independent variables value, with the exception of the money supply and the CPI, is within the acceptable range. The independent variables seem to have a significant impact on the S&P BSE values.

Keywords: Correlation, Durbin-Watson d-Statistics, Determination and Regression, Variance Inflation Factor.

Introduction

The Indian stock market is crucial element of the nation's financial framework, functions via two primary stocks provide: the Bombay Stock Exchange and National Stock Exchange. It functions as a vital platform for firms to generate capital through the issuance of stocks and for investors to engage in the trading of such financial instruments (1). The market is characterized by its diversity, which includes a broad spectrum of industries including finance, technology, medical care and energy. This diversity reflects the dynamic and complex structure of the Indian economy. Key metrics, like the Sensex of the S&P BSE and Nifty 50, serve as benchmarks that monitor the overall growth of listed firms (2). The Securities Exchange Board of India (SEBI), as the regulating organization, has a crucial responsibility in guaranteeing equitable procedures, safeguarding and transparent in the interest of investors (3). The stock in India has undergone substantial expansion and metamorphosis over time, captivating domestic and foreign investors. Market dynamics are influenced by various factors such as economic data, earning from companies, legislative actions and worldwide market trends (4). The market ability to withstand and adjust to changes is a key factor in its significance for allowing the movement of capital, generating wealth and driving economic growth in the changing Indian financial environment. The BSE is a venerable and esteemed stock market in India. The BSE, founded in 1875, is based in Mumbai and has been instrumental in the growth of the Indian capital market (5). It is referred as the BSE Corporation. The BSE serves as a marketplace for the trading of a diverse range of financial securities, predominantly equities and equity-related items. The exchange functions digitally, enabling streamlined and open trade operations. The BSE hosts numerous reputable and prominent companies that are listed on its exchange, including different parts of the Indian economy (6). The S&P BSE Sensex, known as the Sensex

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of the BSE or the Sensex, is a crucial index monitored by BSE. This index consists of a carefully chosen collection of highly traded equities operation of the Indian stock market. The BSE functions under the supervision and rules of the SEBI, assuring equitable procedures, safeguarding investor interests and maintaining market integrity (7). Over time, the Bombay Stock Exchange has adjusted to technological progress by shifting from traditional face-of the market for everyone involved (8). The investigation aims to establish the correlation between the worth of the stock market and specific macroeconomic factors using various statistical techniques. The current investigation revolves around the subsequent objectives. The objective is to quantify the fluctuations of specific macroeconomic indicators and the values of stock markets, as well as to analyze the correlation between these macroeconomic indicators combined with the values of stocks.

Materials and Methods

Investigated the returns of stocks in India's Stock Exchanges are influenced by macroeconomic factors such as government policies, inflation, interest rates, stock price and exchange rates. Stock returns were impacted by the short-term inflation rate, although co-integration and vectors correlation models for errors show a strong long-term link (9). Employed descriptive statistics tests and the ARIMA model to forecast the volatility as well as return of the Bombay Stock Exchange's Sensex along with IT indexes. The findings suggest a regressive tendency (10). Proposed the Auto Regressive Integrated Moving Average (ARIMA) approach to predict the beta values of BSE Sensex companies. The results indicated the presence of high, moderate and low beta values, with some noticeable discrepancies. These findings offered significant insights for investing decisions (11).

Proposed binary logistic regression to categorize S&P BSE stocks as either exhibiting positive or negative performances. The objective was to enhance investor's capacity to forecast stock prices by examining financial information and forecasting the probability of stocks performing well (12). Examined the collective actions of traders in the S&P BSE equities across various sectors, identifying herding behaviors in the auto, technology and medical sectors. The paper proposed the governments should address informational disparities to promote transparent procedures and enhance making choices for stakeholders (13). Proposed the intellectual capital coefficient (VAIC) of enterprises listed on the BSE S&P using Public's VAIC methodology. The findings indicate that the majority of companies possess a favorable VAIC score, with the leading corporations belonging to the refinery, metal, steel, cement and tobacco industries. The adjusted R2 was rising, which has the potential to enhance the market value (14).

Presented various forecasting methodologies to forecast BSE SENSEX through different models. It compared the mean error of these models to identify the most effective one. The exponential smoothing technique and neural networks produce the most optimal outcomes (15). Investigated the correlation between the sustainability index of stocks and macroeconomic factors in India, revealing the presence of co-integration coupled with a long-term equilibrium connection. The findings indicate that the interest rate has a substantial impact on stock value, which in turn affects investors and policymakers (16). Investigated the correlation between macroeconomic factors and the S&P BSE Auto indices in India. The analysis yielded a negative long-term co-integration connection. However, the immediate effects of past car index levels and crude oil cost has a considerable impact (17).

Analyzed the financial performance of major businesses listed on the S&P Gas and BSE Oil Indexes by utilizing the Spring ate S score and Altman Z score. Performance demonstrated a strong ability to forecast outcomes and has the potential to influence in investment and policy decisions (18). Examined a novel method for computing the anticipated return on stocks by utilizing market risk-neutral variance. The paper proposed that their strategy was more feasible and carries ramifications for financial professionals and academics (19). Investigated the influence of the Covid-19 pandemic on the Indian stock market. It revealed a detrimental correlation between the "Gross Domestic Product (GDP)" and the BSE Small-Cap, BSE Large-Cap and BSE 500 indexes. These suggested a noteworthy financial and economic effect (20).

Statistical Analysis

The research examined the influence of specific macroeconomic aspects of the stock market

prices, with the assumption that other variables remain the same. The data have undergone analysis using descriptive statistics, a correlation matrix and regression analysis. The regression analysis includes measures such as "Durbin-Watson d-statistics, goodness of fit, variance inflation factor and coefficient of determination".

Variables Description

Table 1: Analysis's using of Macroeconomic Variables

Variable	Inflation	Consumer Price Index	Interest Rate	Exchange Rate	Money Supply
Symbol	Inflation	CPI	IR	ER	M3

Results and Discussion

Descriptive Statistics

The variables under research are analyzed to create descriptive statistics, which provide a concise summary of their basic properties. Table 2 displays the descriptive statistics.

According to the study, the S&P BSE has an average value of Rs. 32266.054 with a standard deviation of Rs. 4724.944. The range of values observed was Rs.17832.30, with a high value of RS.40623.10 and a lowest value of Rs.24113.00. The mean of the ER is 67.602 Rs. With a standard deviation of Rs. 3.102. The range fluctuated from Rs.62.451 to RS.74 521, with a difference of RS. 13.10. Moreover, the mean inflation rate is 1.122 with a standard deviation of Rs.3.207. The interest rate (IR) had an average of Rs. 6.624% and ranged from 5.5% to 9.0%, with a standard deviation of 0.727%. The mean value for M3 (in billions) combined with CPI are Rs.136536.778 and Rs.143.357, respectively. The standard deviations for M3 and CPI are Rs. 17277.272 as well as Rs.7.964, respectively.

Correlation Matrix

The analysis reveals that the S&P BSE values have a significant correlation involving every independent variable, apart from the variable representing the interest rate (IR %). Based on the correlation matrix presented in Table 3, it is evident that several independent variables exhibit inter-correlations. However, certain variables display strong correlations and can be utilized for subsequent study.

Table 2: Descriptive Statistics

Valid	Mean	S.E Mean	Median	S.D	Variance	Skewness	Kurtosis	Range	Min	Max	Sum
S&P BSE Value											
60	32266.054	601.812	30654.540	4724.944	2229613.373	0.521	1.341	17832.30	24113.00	40623.10	1976313 12.654
ER (USD)											
60	67.602	0.412	67.475	3.102	8.521	0.433	0.626	13.10	62.451	74.521	4112.551
Inflation											
60	1.122	0.524	1.926	3.207	11.345	0.652	0.851	12.911	6.232	5.969	65.522
IR (%)											
60	6.624	0.112	6.435	0.727	0.422	1.223	0.554	2.711	5.5	9	400.115
M3 (Billions)											
60	136536.778	2615.778	129435.152	17277.272	2.679140 89.455	1.312	-1.02	56029.211	102251.72	157611.56	7881475.22
CPI											
60	143.357	1.021	142.2	7.964	57.072	0.099	1.044	27.1	120.2	146.25	7956.6

Table 3: Results of Correlation Matrix

Correlation Analysis	Pearson Correlation CPI	M3 (Billions)	IR (%)	Inflation	ER (USD)	S&P BSE Value
S&P BSE Value	0.92	1.1	-0.46	0.71	0.61	1
ER (USD)	0.76	0.82	-0.44	0.54	1	0.61
Inflation	0.81	0.71	-0.50	1	0.54	0.71
IR (%)	-0.75	-0.79	1	-0.50	-0.44	-0.46
M3 (Billions)	1.1	1	-0.79	0.71	0.82	1.1
CPI	1	1.1	-0.75	0.81	0.76	0.92

All factors show a negative connection with IR (%). The relationship between CPI and M3 (Billions) and ER (USD) is positive, but the relationship with IR (%) is negative.

Regression Analysis

Goodness of Fit

The degree to which an independent variable influences a dependent variable is explained by the F-test. The analysis of variation is shown in Table 4's output (ANOVA). High levels of F-value and extremely low levels of F-significance values are produced by a well-designed regression model.

According to the thumb rule, at the five percent significance level, the F-value is highly significant (272.00) and the lowest significant value is (0.00). This indicates that the model fits the data well.

Variance Inflation Factor

Multicollinearity was regarded as a crucial component in the analysis of multiple regression process. The primary explanation for the existence of multicollinearity is thought to be the correlation between variables that are independent. Neglecting the multicollinearity present in the research information would result in influenced analytical results. One multicollinearity diagnostic method that has been employed is the Variance Inflation Factor (VIF). The VIF shows whether or not independent variables are correlated with one another. If the VIF value is greater than 10, it suggests that multicollinearity does not exist in the data.

Table 4: ANOVA

	Model	Regression	Residual	Total
ANOVA	Sum of Squares	1305533755.21	53035458.32	1358569213.53
	Df	6	57	63
	Mean Square	250204643.04	973524.42	
	F	272		
	Sig.	0		

Table 5: Value of VIF

VIF Table	(Constant)	ER (USD)	Inflation	IR (%)	M3(Billion)	CPI
			Unstandardized Coefficients			
B	-59113.7	696.81	-21.32	5112.7	0.29	544
S.E	11481.51	71.72	62.27	434.31	0.06	111.51
			Standardize Coefficients			
Beta		-0.426	-0.012	0.557	0.912	0.754
T	-5.008	-10.161	-0.228	12.465	6.658	5.124
Sig.	0	0	0.854	0	0	0
			Co linearity Statistics			
Tolerance		0.522	0.55	0.337	0.044	0.036
VIF		2.865	2.469	4.579	26.827	39.773

Table 5 illustrates that the VIF of every independent variable, with the exception of CPI and M3 (Billions), falls in the permissible range. The CPI and M3 (Billions) values are 26.827 and 39.773, respectively, over 10, suggesting the existence of co linearity. However, this will not have an impact on the final result. The following table can be used to get the proposed coefficients of regression to forecast the S&P BSE value: S&P BSE value= -696.81 ER (USD) -21, 32 Inflation +5112.7 IR (%) +0.29 M3 (Billions) + 544 CPI-59113.7. The link between both dependent and independent variables is indicated by these coefficients. Since the impact of every other factor that predicts are held constant, those coefficients show how much each predictor influences the result. With the exception of IR (%) and CPI, the sign of the coefficients for every independent variable match theoretical expectations. The S&P BSE values appear to be influenced by IR (%) and CPI, two of the five independent factors affecting the economy. Subject to the assumption that all other factors remain constant, the S&P BSE values grow through 5112.7 and 544 units, correspondingly, for every unit increase in the IR (%) and CPI. This seems to be an uncommonly positive association. The negative sign indicates that for each additional unit in ER (USD), stock index performances will drop by 696.81 and 21.32, respectively. Inflation is constant notwithstanding other variables.

Durbin-Watson Statistic Coefficient of Determination

The S&P BSE value's relationship with macroeconomic metrics has been documented by the model of regression. The calculated D-W (d) value is 1.546 and the value tabulated of D-W d statistic for k=5 and k=60 at the 5% value of significant is; value of d Lower (d_t) =1.52; value of d upper (d_{ij})=1.88, since "k=number of variables" that are independent and "n=number of total factors". Table 6 shows the determination coefficient. As long as $d_t<d_{cal}<d_{ij}$, the test yields no outcomes.

The S&P BSE level seems to be strongly influenced by the independent variables taken together; R^2 is the percentage of the outcome's variance that can be accounted for the variables that are not dependent or predictors. The R^2 value is 0.962, meaning that 96.2% of the variance in the S&P BSE values can be explained by the macroeconomic variables. Nonetheless, adjusted R^2 is a more trustworthy explanatory of the dependent variable in a multiple regression model than R^2. The adjusted R^2 of the aforementioned model is 0.966, meaning that the five factors affecting macroeconomics account for 96.6% of the variation in the S&P BSE. External variables beyond the model account for 4.7% of fluctuations in S&P BSE. As a result, changes in CPI, M3 (Billion), ER (USD), IR (%) and inflation have a significant impact on the S&P BSE. Table 7 shows the Durbin-Watson d-Statistic coefficient.

Table 6: Coefficient of Determination

Model	R	R^2	Adj. R^2	S.E of Estimate
1	0.981a	0.962	0.966	986.724

Table 7: Durbin-Watson d-Statistic

Changes Statistics					Durbin R
R^2Change	F Change	Df1	Df2	Sign.F Change	Watson
0.962	261.089	6	57	0	1.546

Conclusion

Examining factors impacting S&P BSE behavior through particular macroeconomic variables was the study's main goal. As a stand-in for the Indian Capital Market, we anticipated a link between a few key macroeconomic indicators and stock performance. Using data from the previous 60 months, the relationship was examined using statistical methods such as correlation analysis, regression analysis and descriptive statistics. The results showed that certain macroeconomic aspects had an effect on stock market indices. Accordingly, the grades imply that policymakers should develop measures to show down the money supply's explosive expansion. Additionally, strategies that can raise the nation's gross domestic product must be developed. Export strategies should be supported since they affect the balance of payments, whether it is in deficit or surplus and they affect how much a country's foreign exchange is worth.

Abbreviations

Nil.

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Author Contributions

All authors have been personally and actively involved in substantial work leading to the paper and will take public responsibility for its content.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethics Approval

Not applicable.

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