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Analysing the Impact of Global Stock Market Indices on NSE Nifty: A Correlation and Regression Study

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ABSTRACT

This research paper examines the relationship between global stock market indices, namely NSE Nifty the benchmark Index of India, Nikkei, Hang Seng, FTSE UK, and Dow Jones of USA, to understand their impact on the NSE Nifty index. The study focuses on conducting correlation analysis and regression analysis to assess the strength and direction of the relationships and determine the significance of the global indices in explaining the variations in NSE Nifty. The findings provide insights into the interdependencies and potential spillover effects of these indices on the Indian stock market. This research contributes to the existing literature on international financial markets and aids in portfolio management and risk assessment for investors.

Keywords: Global stock market indices, NSE Nifty, Correlation analysis, Regression analysis, Spillover effects, Portfolio management, Risk assessment.

INTRODUCTION

The global financial markets are interconnected, and changes in one market can affect others, leading to spillover effects. Understanding the relationships between global stock market indices and the NSE Nifty index is crucial for investors and policymakers. This paper aims to analyse the impact of global indices, including Nikkei, Hang Seng, FTSE UK, and Dow Jones of USA, on the NSE Nifty index using correlation analysis and regression analysis. By examining these relationships, this research provides valuable insights for portfolio management and risk assessment in the Indian stock market.

A robust and inclusive financial market is crucial for the development of an economy, especially in the case of a rapidly growing nation like India. To meet the capital requirements of the government and corporates, India needs to attract substantial investments. Capital markets play a vital role in facilitating the

transfer of funds from surplus holders to those in need. These markets bring together investors and corporates, fostering economic growth and ensuring the equitable distribution of benefits.

Among the various markets comprising the capital market, the stock market holds a prominent position. It serves as a platform for trading different types of securities within a controlled and secure environment. Buyers and sellers of stocks convene either physically or virtually to participate in the stock market. It acts as a venue where hundreds of thousands of market participants engage in buying and selling shares, ensuring fair pricing practices and transaction transparency. While earlier stock markets relied on paper share certificates, modern stock markets are computerized, operating electronically to facilitate seamless trading. India boasts one of the world's most technologically advanced stock exchanges, with computerized systems that automatically match investor orders with the best limit order, offering enhanced transparency by displaying all buy and sell orders.

The Indian stock market witnessed significant growth following the liberalization of the economy in the early 1990s. The subsequent economic reforms, globalization, and free movement of capital across borders have integrated the Indian financial market with global markets. Technological advancements have further enhanced market integration. However, this growth and integration have also led to increased market volatility. The Indian stock market experiences turbulence and roller coaster rides at times, with market fluctuations that cannot always be attributed solely to domestic economic events. To better understand the dynamics of the Indian stock market, it is essential to compare trends with other global markets and examine the relationships between them.

The Indian stock market plays a vital role in the country's economic development and serves as a crucial avenue for capital mobilization and investment. It is one of the largest and most vibrant stock markets in the world, providing opportunities for investors to participate in the growth of Indian companies and the broader economy. The Indian stock market operates through two major stock exchanges: the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE).

1 Benchmark Index - NSE Nifty:

The NSE Nifty is the benchmark index of the National Stock Exchange of India. It comprises the top 50 actively traded stocks listed on the NSE, representing various sectors of the Indian economy. The Nifty index is market capitalization-weighted, giving higher weightage to stocks with larger market capitalization. It

serves as a barometer of the overall market sentiment and is widely used by investors, analysts, and fund managers to track the performance of the Indian stock market.

1.1 Japanese Stock Market - Nikkei 225:

The Japanese stock market is represented by the Nikkei 225 index. It is the primary stock market index of the Tokyo Stock Exchange (TSE) and consists of 225 large-cap Japanese companies across different sectors. The Nikkei 225 index is price-weighted, meaning that higher-priced stocks have a greater impact on the index value. It is considered a key indicator of the Japanese equity market and reflects the overall performance of the country's major companies.

1.2 Hong Kong Stock Market - Hang Seng Index:

The Hang Seng Index (HSI) represents the stock market of Hong Kong. It is a market capitalization-weighted index comprising 50 constituent stocks listed on the Hong Kong Stock Exchange. The HSI includes companies from various sectors, with a focus on those that are actively traded and represent a significant portion of the market's total capitalization. The HSI is widely followed as an indicator of Hong Kong's stock market performance and is considered an important benchmark for investors.

1.3 UK Stock Market - FTSE UK Index:

The UK stock market is represented by various indices, with the FTSE (Financial Times Stock Exchange) UK Index being one of the prominent ones. The FTSE UK Index includes companies listed on the London Stock Exchange and represents the performance of UK-based companies across different sectors. It is market capitalization-weighted, and the index composition is regularly reviewed to ensure it reflects the evolving market landscape. The FTSE UK Index serves as a key benchmark for investors tracking the UK stock market.

1.4 US Stock Market - Dow Jones Industrial Average (DJI):

The US stock market is one of the largest and most influential in the world. The Dow Jones Industrial Average (DJI) is a widely followed stock market index that represents the performance of 30 large, publicly traded companies in the United States. The DJI is price-weighted, meaning that higher-priced stocks have a greater impact on the index value. It is considered a barometer of the US stock market and serves as an indicator of overall market trends and sentiment.

Overall, these benchmark indices provide insights into the performance and trends of their respective stock markets. Investors and market participants closely

monitor these indices to assess market conditions, track economic developments, and make informed investment decisions.

LITERATURE REVIEW

Singh, A., & Mishra, N. (2020). This study examines the interdependence between NSE Nifty and global stock market indices, highlighting the importance of considering global factors in analyzing Nifty's performance. Aggarwal, S., & Garg, D. (2019) This research explores the impact of the global financial crisis on the Indian stock market, including NSE Nifty, providing insights into the relationship between global events and Nifty's performance. Kumar, A., & Pradhan, B. K. (2018). This study investigates the relationship between NSE Nifty and global stock markets, employing correlation and regression analysis to determine the impact of global factors on Nifty's movements. Jain, V., & Chandravanshi, R. S. (2017). This research examines the relationship between NSE Nifty and global stock indices, providing insights into the extent of co-movement and interdependence between Nifty and global markets. Patel, K., & Rao, S. (2016). This study compares the performance of NSE Nifty with global stock market indices, analyzing the degree of correlation and the impact of global factors on Nifty's movements. Sharma, R., & Yadav, N. (2015). This research investigates the impact of global stock market indices on the Indian stock market, including NSE Nifty, to understand the transmission of global shocks to the Indian market. Verma, P., & Rani, S. (2014). This study analyzes the co-movement of the Indian stock market, including NSE Nifty, with global stock markets, examining the extent of correlation and interdependence between them. Sharma, S., & Kumar, N. (2013). This research explores the linkages between the Indian stock market, including NSE Nifty, and global stock markets, shedding light on the transmission of information and the impact of global events on Nifty's performance. Mathur, R., & Tiwari, A. K. (2011) This study examines the inter-linkages between Nifty and Dow Jones, highlighting the transmission of information and co-movements between developed and emerging stock markets. Gupta, A., & Aggarwal, R. (2010). This research analyzes the relationship between global stock indices and Nifty, investigating the impact of global factors on Nifty's movements and the extent of co-movements between them. Mishra, R., & Mishra, S. (2009). This study explores the stock market integration and volatility spillover between Nifty and major Asian stock markets, shedding light on the interdependencies and transmission of shocks across markets. Daga, N., & Jha, R. (2008). This research empirically analyzes the linkages between the

Indian stock market, including Nifty, and global stock markets, providing insights into the co-movement and interdependencies between them.

OBJECTIVE OF THE STUDY

The primary objective of this research is to analyze the impact of global stock market indices, namely Nikkei, Hang Seng, FTSE UK, and Dow Jones of USA, on the NSE Nifty index.

RESEARCH METHODOLOGY

The research methodology involved collecting historical daily data for the NSE Bank Nifty, NSE Nifty, Nikkei 225, Hang Seng, FTSE UK, and Dow Jones indices from 4th January 2013 to 29th December 2022. Logarithmic returns were calculated using the closing price data. Correlation analysis was performed using R to examine the relationships between the variables, followed by multiple regression analysis with NSE Nifty as the dependent variable and other indices as independent variables. Stationarity testing was conducted, and R software was used for data analysis, modeling, and testing. The results were interpreted to understand the impact of global stock market indices on the NSE Nifty.

DATA ANALYSIS AND INTERPRETATION

Descriptive analysis

	BNReturn	NSEReturn	NikkeiReturn	HSReturn	FTSEReturn	DJIReturn
nobs	1894	1894	1894	1894	1894	1894
NAs	0	0	0	0	0	0
Minimum	-0.171541	-0.086669	-0.075974	-0.080208	-0.115117	-0.138418
Maximum	0.226256	0.129569	0.099294	0.086928	0.094376	0.107643
1 Quartile	-0.007008	-0.004804	-0.006225	-0.007005	-0.004588	
3 Quartile	0.008778	0.00701	0.007374	0.006531	0.005492	
Mean	0.00064	0.000582	0.000471	-0.000087	0.000107	0.000477
Median	0.000926	0.000711	0.000748	0.000289	0.000585	0.000788
Sum	1.212429	1.101757	0.892593	-0.165044	0.201827	0.903081
SE Mean	0.000417	0.00028	0.000328	0.000321	0.000254	
LCL Mean	-0.000178	0.000033	-0.000172	-0.000717	-0.000391	
UCL Mean	0.001458	0.00113	0.001115	0.000543	0.000604	
Variance	0.000329	0.000148	0.000204	0.000195	0.000122	0.000152
Stdev	0.01815	0.012168	0.014274	0.013972	0.011033	0.012349
Skewness	0.352331	0.074605	-0.117937	0.002712	-0.592386	-1.060865
Kurtosis	20.126938	13.016618	4.781624	4.47142	14.813277	21.007248

The provided data consists of descriptive statistics for the logarithmic returns of different indices, namely BNReturn (Bank Nifty), NSEReturn (NSE Nifty), NikkeiReturn (Nikkei 225), HSReturn (Hang Seng), FTSEReturn (FTSE UK),

and DJIReturn (Dow Jones). The statistics provide information about the distribution and characteristics of the returns. Based on the descriptive statistics provided, we can draw some comparisons among the indices:

Volatility:

The indices with relatively higher volatility, as indicated by their higher standard deviations, are BNReturn (Bank Nifty), NSEReturn (NSE Nifty), and NikkeiReturn (Nikkei 225).

On the other hand, FTSEReturn (FTSE UK) exhibits relatively lower volatility compared to the other indices.

Skewness:

BNReturn (Bank Nifty) and FTSEReturn (FTSE UK) have slightly positive skewness, indicating slightly longer tails on the right side of their return distributions. NikkeiReturn (Nikkei 225) and DJIReturn (Dow Jones) have slightly negative skewness, implying slightly longer tails on the left side of their return distributions. NSEReturn (NSE Nifty) and HSReturn (Hang Seng) have skewness values close to zero, suggesting nearly symmetrical distributions.

Kurtosis:

DJIReturn (Dow Jones) exhibits the highest kurtosis, indicating a distribution with a higher degree of peakedness and heavier tails.BNReturn (Bank Nifty) and NSEReturn (NSE Nifty) also show relatively high kurtosis values, suggesting moderately peaked distributions with heavier tails. NikkeiReturn (Nikkei 225) and HSReturn (Hang Seng) have moderate kurtosis values, indicating moderate peakedness and lighter tails. FTSEReturn (FTSE UK) has a relatively lower kurtosis compared to the other indices, suggesting a distribution with lower peakedness and lighter tails.

Correlation Analysis

	BN	**NSE**	**Nikkei**	**HS**	**FTSE**	**DJI**
BN	1	0.889427	0.274769	0.392843	0.406504	0.330554
NSE	0.889427	1	0.35588	0.474393	0.498932	0.386628
Nikkei	0.274769	0.35588	1	0.493042	0.371331	0.280102
HS	0.392843	0.474393	0.493042	1	0.4438	0.276737
FTSE	0.406504	0.498932	0.371331	0.4438	1	0.611859
DJI	0.330554	0.386628	0.280102	0.276737	0.611859	1

The correlation analysis conducted on the data reveals the following findings: Bank Nifty (BN) and NSE Nifty (NSE) exhibit a strong positive correlation of 0.889, indicating a significant relationship. The correlations between BN and other indices (Nikkei, Hang Seng, FTSE, and Dow Jones) range from 0.275 to 0.407, suggesting a moderate positive relationship. Similarly, NSE Nifty shows a strong positive correlation with BN (0.889) and moderate positive correlations with other indices (0.356 to 0.499). Nikkei shows weaker positive correlations with other indices (0.274 to 0.493), while Hang Seng and FTSE UK exhibit moderate positive correlations with all other indices (0.393 to 0.494 and 0.407 to 0.612, respectively). Dow Jones shows moderate positive correlations with all other indices (0.331 to 0.612). Overall, the findings indicate a significant positive relationship between Bank Nifty and NSE Nifty, and moderate positive relationships among the other indices.

Regression Analysis

In the research study, a multiple regression model was developed to analyze the relationship between the NSE (dependent variable) and the Nikkei (x1), HSReturn (x2), FTSE (x3), and DJI (x4) indices (independent variables). The model can be expressed as:

$y = \beta0 + \beta1x1 + \beta2x2 + \beta3x3 + \beta4x4 + \varepsilon$

where:

y represents the NSE index.

x1 represents the Nikkei index.

x2 represents the HSReturn index.

x3 represents the FTSE index.

x4 represents the DJI index.

β0 is the intercept term.

β1, β2, β3, and β4 are the regression coefficients for x1, x2, x3, and x4, respectively.

ε is the error term.

The regression model allows for investigating the impact of the independent variables (Nikkei, HSReturn, FTSE, and DJI) on the NSE index. The coefficients (β1, β2, β3, and β4) estimate the relationship between each independent variable and the NSE index. The intercept term (β0) represents the expected value of the NSE index when all independent variables are zero.

By analyzing the regression model, can examine the significance and magnitude of the coefficients, assess the overall goodness-of-fit of the model, and draw

conclusions about the influence of the Nikkei, HSReturn, FTSE, and DJI indices on the NSE index.

Output of the Regression analysis

	Min	1Q	Median	3Q	Max
Residuals	-0.065672	-0.004910	0.000274	0.005346	0.087957

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	0.0004809	0.0002271	2.118	0.034339	*
x1 (Nikkei)	0.0715336	0.0186736	3.831	0.000132	***
x2 (HSReturn)	0.2437738	0.0197149	12.365	< 0.0000000000000002	***
x3 (FTSE)	0.2974726	0.0280711	10.597	< 0.0000000000000002	***
x4 (DJI)	0.1188459	0.0232838	5.104	0.000000365	***

Residual standard error: 0.009867 on 1889 degrees of freedom

Multiple R-squared: 0.3439, Adjusted R-squared: 0.3425

F-statistic: 247.5 on 4 and 1889 DF, p-value: < 0.00000000000000022

symbols represent the level of statistical significance, with "**" indicating $p < 0.001$, and "*" indicating $p < 0.05$.

The multiple regression analysis was conducted to examine the relationship between the NSE index (y) and the Nikkei index (x1), HSReturn index (x2), FTSE index (x3), and DJI index (x4). The analysis produced the following results:

The estimated coefficients indicate the impact of each independent variable on the NSE index. The intercept term (β0) is 0.0004809 with a standard error of 0.0002271. The coefficient for x1 (Nikkei index) is 0.0715336, x2 (HSReturn index) is 0.2437738, x3 (FTSE index) is 0.2974726, and x4 (DJI index) is 0.1188459. All coefficients are statistically significant ($p < 0.05$), indicating a significant relationship between the indices and the NSE index.

The residuals provide information about the distribution of errors in the regression model. The minimum residual is -0.065672, the first quartile is -0.004910, the median is 0.000274, the third quartile is 0.005346, and the maximum residual is 0.087957. These values represent the deviations between the predicted NSE index values and the actual NSE index values.

The overall model performance is assessed through the R-squared value. The multiple R-squared is 0.3439, indicating that approximately 34.39% of the

variation in the NSE index can be explained by the independent variables. The adjusted R-squared is 0.3425, accounting for the number of predictors and degrees of freedom in the model. The F-statistic, with a value of 247.5 and a p-value of < 0.00000000000000022, suggests that the regression model is statistically significant, indicating that at least one of the independent variables has a significant impact on the NSE index. The residual standard error is 0.009867, representing the average deviation of the observed NSE index values from the predicted values.

Overall, the regression analysis reveals that the Nikkei, HSReturn, FTSE, and DJI indices have significant influences on the NSE index. The positive coefficients indicate a positive relationship, suggesting that an increase in the values of these indices is associated with an increase in the NSE index. These findings provide valuable insights into the interdependencies and relationships between global stock market indices and the NSE index.

FINDINGS

Volatility: Bank Nifty (BNReturn), NSE Nifty (NSEReturn), and Nikkei 225 (NikkeiReturn) exhibit relatively higher volatility compared to the other indices. FTSE UK (FTSEReturn) shows relatively lower volatility. Skewness: Bank Nifty and FTSE UK have slightly positive skewness, while Nikkei 225 and Dow Jones (DJIReturn) have slightly negative skewness. NSE Nifty and Hang Seng (HSReturn) show skewness values close to zero. Kurtosis: Dow Jones exhibits the highest kurtosis, indicating a distribution with a higher degree of peakedness and heavier tails. Bank Nifty and NSE Nifty also have relatively high kurtosis values. Nikkei 225 and Hang Seng have moderate kurtosis, while FTSE UK has a relatively lower kurtosis. The correlation analysis reveals several major findings and comparisons among the indices. Bank Nifty (BN) and NSE Nifty (NSE) exhibit a strong positive correlation of 0.889, indicating a significant relationship. Bank Nifty also shows moderate positive correlations with other indices, ranging from 0.275 to 0.407. NSE Nifty demonstrates moderate positive correlations with other indices, ranging from 0.356 to 0.499. On the other hand, the Nikkei index shows weaker positive correlations, ranging from 0.274 to 0.493. Hang Seng (HS) and FTSE UK exhibit moderate positive correlations with all other indices, ranging from 0.393 to 0.494 and 0.407 to 0.612, respectively. Dow Jones (DJI) also shows moderate positive correlations with all other indices, ranging from 0.331 to 0.612. These findings suggest varying levels of interdependence and co-movement among the indices, with Bank Nifty and NSE Nifty demonstrating a

particularly strong relationship. Based on the regression analysis, it was found that among the selected independent variables (Nikkei, HSReturn, FTSE, and DJI), HSReturn had the highest impact on NSE Nifty returns. The coefficient for HSReturn was the largest and statistically significant, indicating a strong positive relationship. This implies that changes in the Hang Seng index have a substantial influence on NSE Nifty returns. The other variables, namely FTSE, Nikkei, and DJI, also contributed significantly but to a lesser extent compared to HSReturn. Therefore, it can be concluded that the Hang Seng index has the most prominent impact on NSE Nifty, followed by the other indices in the analysis.

CONCLUSION AND FUTURE SCOPE

Bank Nifty, NSE Nifty, and Nikkei 225 exhibit higher volatility compared to the other indices, while FTSE UK shows lower volatility. The skewness values indicate slightly positive skewness for Bank Nifty and FTSE UK, slightly negative skewness for Nikkei 225 and Dow Jones, and skewness close to zero for NSE Nifty and Hang Seng. Dow Jones exhibits the highest kurtosis, suggesting a distribution with a higher degree of peakedness and heavier tails. Bank Nifty and NSE Nifty also have relatively high kurtosis values.

In terms of correlations, Bank Nifty and NSE Nifty show a strong positive correlation, indicating a significant relationship. Nikkei, Hang Seng, and FTSE UK exhibit moderate positive correlations with other indices, while Dow Jones shows moderate positive correlations as well. The regression analysis reveals that HSReturn has the highest impact on NSE Nifty returns among the selected independent variables.

Based on these findings, it is suggested that investors closely monitor the Hang Seng index as it has a significant influence on NSE Nifty returns. Additionally, considering the higher volatility of Bank Nifty, NSE Nifty, and Nikkei 225, investors should be cautious while making investment decisions related to these indices.

Future research could explore more advanced modeling techniques, such as time-series analysis or machine learning algorithms, to gain deeper insights into the relationship between global stock market indices and NSE Nifty. Furthermore, incorporating additional variables or considering different time periods can provide a more comprehensive understanding of the dynamics between these indices.

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