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INVESTMENT STRATEGY BASED ON CORRELATION IN GLOBAL STOCK EXCHANGES

Dr. Manisha Sinha*

ABSTRACT

Predicting performance of stock markets has been a quest for all investors. An investor relies on his understanding of Global cues and expert advice and would plan the investment strategy. This requires an intense effort to watch the market trends and factors influencing the markets carefully and be proactive in trading as per the cues. Many predictive models have been used to assess the market using mathematical tools like Machine Learning and other techniques which are complex for a normal person to grasp. With the globalisation of the economy, the stock markets have become closely correlated. This paper examines if the correlation of the stock markets can be used to predict the stock prices and a no-effort trading policy that performs auto-trades, without any intervention by the trader, can be derived. The study uses stock indices data for 2020 to predict behaviour of BSE SENSEX and selected stocks in 2021. Using the correlation, it derives a trading strategy to beat the market in 2021 to generate value that is higher than the rise in stock prices over 2021. Lagged indices are used to take advantage of different operating hours of the stock markets. Correlation models, polynomial relationships and mathematical models are used to carry out the analysis.

Keywords: *Investment Strategy, Global Cues, Globalisation, Correlation, Trading Strategy.*

Introduction

The stock markets are dependent on many factors for their performance. Political and Global events, financial policies, growth of economy, performance of leading companies or sectors of economy, flow of funds from large investors, exchange rate fluctuations, natural calamities, are some of the factors that would determine how the stock market would preform on a particular day. A retail investor has very low visibility into the events and is generally at a loss to predict the movement of the stock market. Hence the trading strategy most investors employ is to listen to expert advice and monitor the movement of stocks continuously. Nowadays, many software tools and apps make this job simpler by sending alerts triggered by user set thresholds.

However, the investors are always looking for a no-effort investment tool that can predict the movement of the stocks and give them returns that are better than the market. In this paper we attempt to use correlation between leading Global stock exchanges to develop a mathematical model that could be used for investing in Bombay stock exchange.

Literature Review

(Junior et al., 2015) examine 83 stock market indices using correlation. The lagged values of stock market indices has been also considered for the analysis. They report that information flow between stock exchanges lagged by day is similar to same day correlation with them

(Nobi et al., 2014) examine relationships between Korean indices and Global indices over 2000-2012 time period and conclude that the relationships have become more correlated over time.

(Kumar Tiwari et al., 2013) explore the correlation between nine major Asian stock markets between 2005 and 2012 and conclude that the stock markets are highly integrated.

(Ni & Xu, 2021) attempt to predict the correlation between the global stock markets using Deppe Learning method and show that their model provides better results than existing methodologies.

* Associate Professor, Janki Devi Memorial College, University of Delhi, Delhi, India.

(Sinha, 2021) explores the correlation between Indian stock indices (BSE SENSEX) and major global stock indices, NASDQ, S&P500, FTSE 250, Nikkei225 and HSI from 1987 to 2020 with a view to examine if correlation is affected by the liberalisation of the Indian economy. The study concludes that correlation has improved post-liberalisation.

Objectives

- To develop a mathematical model determining correlation between BSE and global stock exchanges.
- To use this mathematical model to predict movement of key stocks on BSE.
- To devise a mathematical model for a hands-off investment strategy using the developed prediction of BSE for investing.

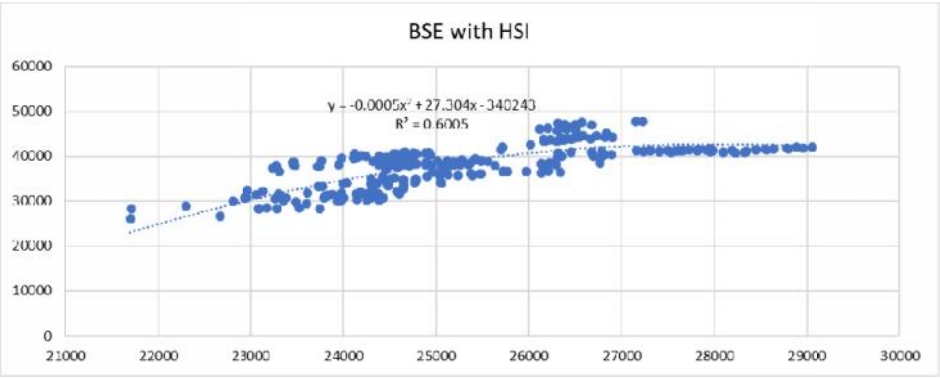
Research Methodology

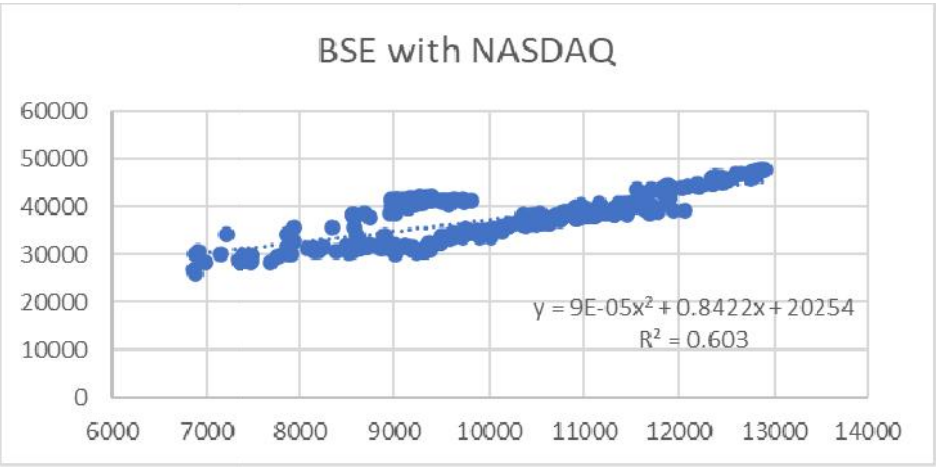
The study uses that daily stock indices from leading global stock exchanges for the year 2020.Using this data, the study develops mathematical models for correlation between these stock exchanges and BSE for the year 2020. The models are developed for NASDAQ, S&P500, FTSE 250, Nikkei 225 and HSI indices. The stock indices for NASDAQ, FTSE 250 and S&P 500 have been lagged by a day for this analysis.

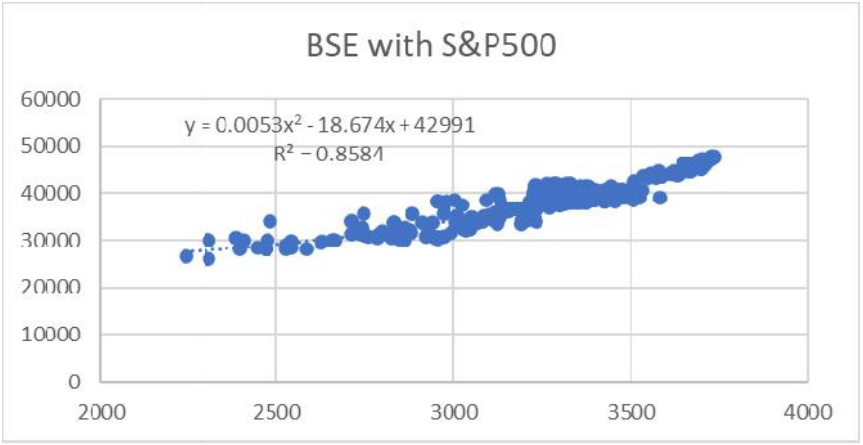
The stock exchange correlation models thus developed for year 2020, are used to predict movement of BSE in 2021. Further an investment strategy based on the predicted variations in BSE is employed to trade in leading stocks on BSE. The stocks considered for this purpose are SBI Sensex ETF, Reliance Industries (RIL), Hindustan Lever (HUL), Nestle, ITC and ICICI Bank. This trading strategy is used to sell or buy stocks during 2021. The performance of the developed trading model is then compared with the rise in stock value over 2021 and it is explored if this trading strategy could beat the observed changes in stock prices at the BSE during 2021.

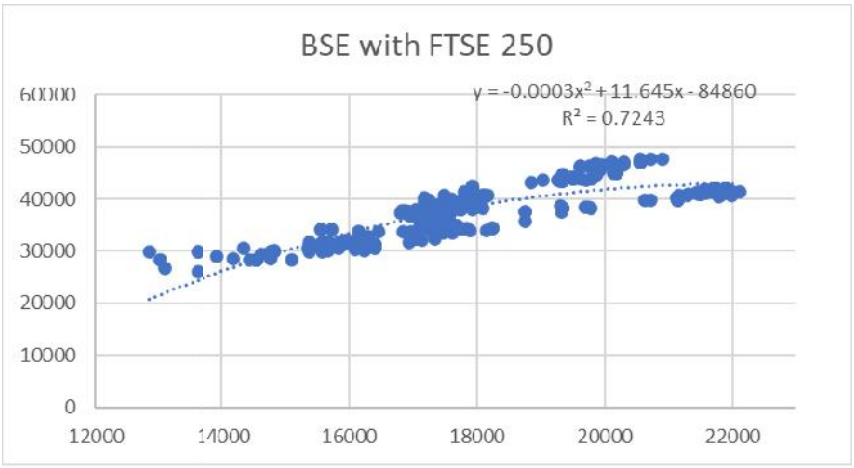
Stock Exchange Correlation during 2020

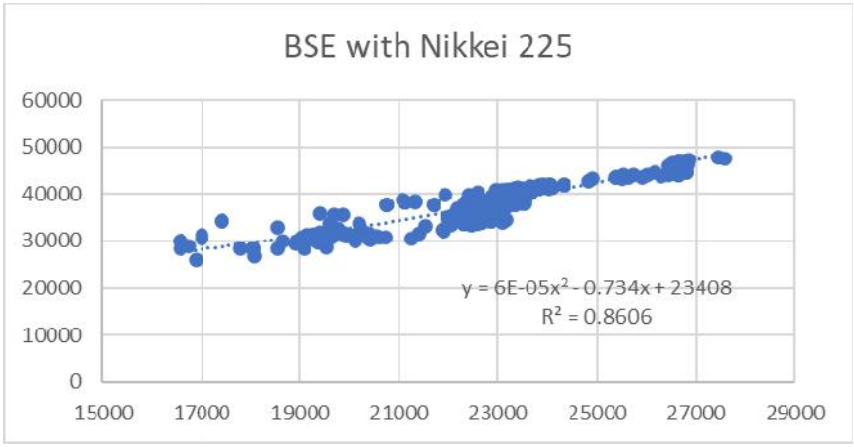
Data for different Stock indices is analysed for 2020and 2nd polynomial correlations established.











Following Equations depict the relationship between BSE and the Global Stock indices during year 2020

BSE = -0.0005**HSI**^{2} + 27.304**HS**I – 340243

BSE = 9E-05**NASDAQ**^{2} + 0.8422**NASDAQ** + 20254

BSE = 0.0053**SP50**0^2 - 18.674S**P500** + 42991

BSE = -0.0003**FTSE250**^{2} + 11.645**FTSE250** - 84860

BSE = 6E-05**Nikkei225**^{2} - 0.734**Nikkei225** + 23408

Predicting Stock Prices on BSE in 2021

The equations derived in the section above are used to predict the movement of selected stock prices on BSE in 2021, with an assumption that the relationship between stock indices would follow the 2020 trend in 2021 also.

An example of predicted value of BSE SENSEX during 2021 using the derived equations is given below;

Date	Stock Index on Date				
	NASDAQ	Nikkei225	HSI	FTSE250	SP500
29 Mar, 2021	13,139	29,385	28,338	21,436	3,971

Date	Predicted Value of BSE				
	NASDAQ	Nikkei225	HSI	FTSE250	SP500
	$y = 9E\text{-}05x^2 + 0.8422x + 20254$	$y = 6E\text{-}05x^2 - 0.734x + 23408$	$y = -0.0005x^2 + 27.304x - 340243$	$y = -0.0003x^2 + 11.645x - 84860$	$y = 0.0053x^2 - 18.674x + 42991$
29 Mar 2021	46,856	53,647	31,976	26,849	52,494

Similar analysis has been done for each day during 2021 and predicted value of BSE has been determined. The same prediction is applied to prices for the stocks in the study, viz, SBI Sensex ETF, Reliance Industries (RIL), Hindustan Lever (HUL), Nestle, ITC and ICICI Bank.

Trading Strategy for 2021

Once the movement in stock prices has been predicted using methods detailed above, a trading strategy is developed for the investors.

The strategy is developed to trade shares such that traded amount of shares is 20 times the percentage movement in share prices.

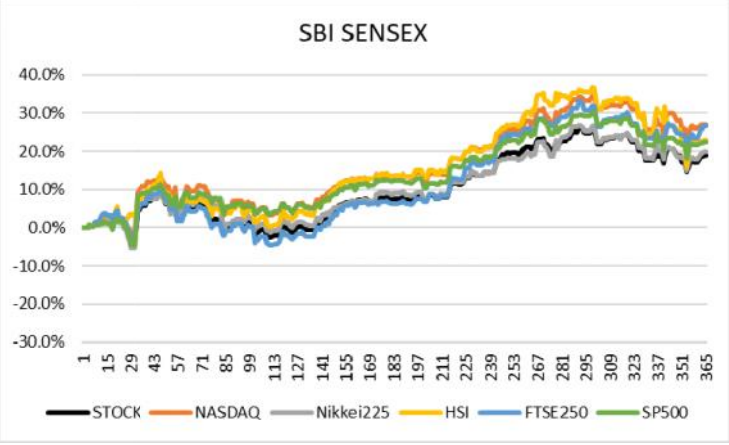
If predicted stock price for the day falls from the day before, buy stock as per following:

Number of Shares to be Bought= Predicted drop (%) in share price from day before ***X*** shares held on previous day ***X*** 20+ all shares that could be bought from cash in hand

If predicted stock price for the day increases from the day before, sell shares as per following

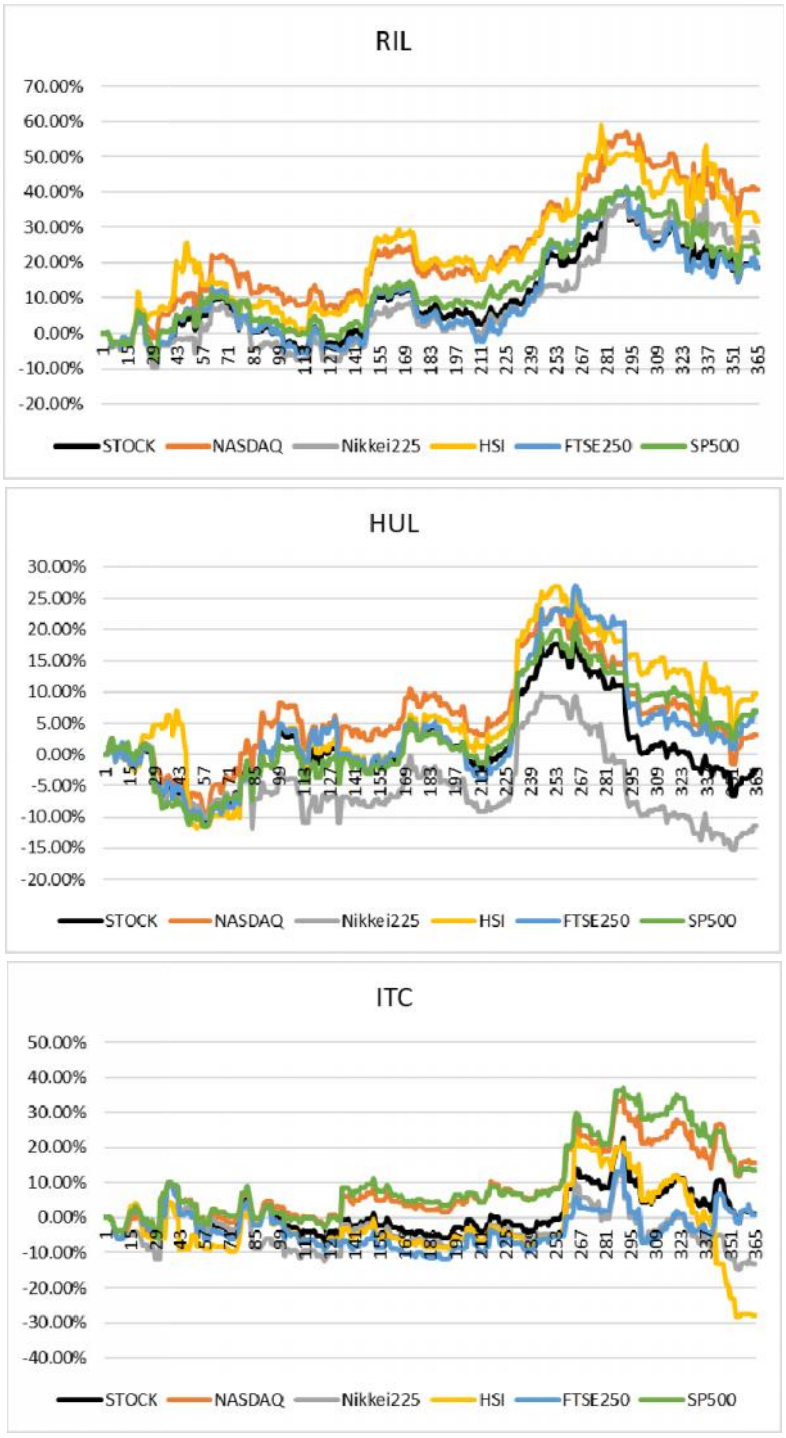
Number of shares to be sold= Predicted rise (%) in share price from day before ***X*** shares held on previous day ***X*** 20

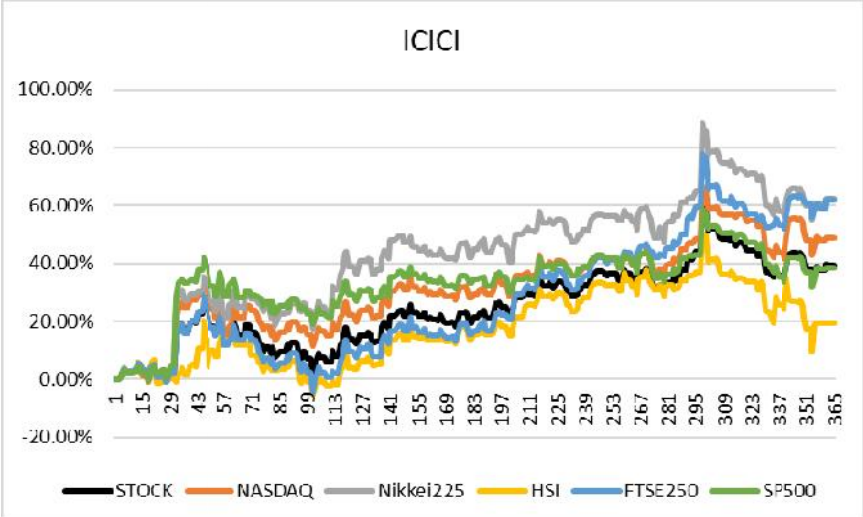
This investment strategy is fixed on the first day of 2021 and remains constant through the year. An investor can write a simple algorithm to trade based on the strategy and need to investigate performance of his portfolio till the end of the year. This would be a totally hand-off automatic investment tool that requires no intervention from the investor during the year. The total value of investment is mapped based on the rise in BSE SENSEX (if no trading was done during the year) in comparison to the trades done using the methodology used in the study

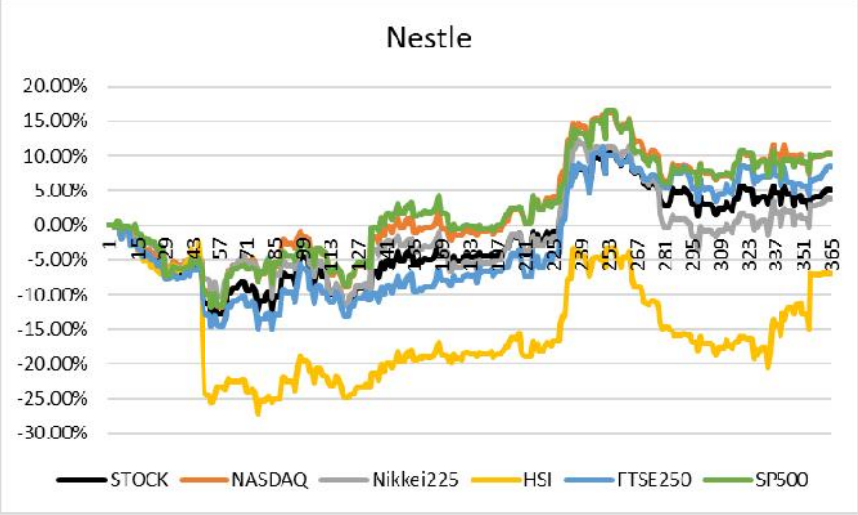


As seen from the figure, the value of investment based on the rise in SBI SENSEX ETF (black curve) is less than the value of investment using a trading strategy based on the methodology used in this study. The highest value in this case is realised if the trading strategy is based on predicted values using NASDAQ (Orange curve)

Similar Analysis has been done for all Stocks in the Study







Performance at End of 2021

During 2021, the BSE SENSEX rose significantly and hence the value of stocks held would also rise even if no trading was done. If the number of shares were held at fixed number throughout the year, the expected rise in value is as below. An investor would have gained 13.42% if he held an equal value in the stocks and did not trade at all during 2021.

	RIL	SBI Sensex	ITC	ICICI	HUL	Nestle	AVG
Stock price gain	18.70%	18.78%	1.01%	39.47%	-2.59%	5.18%	13.42%

However, if the investor has equal investment in the 7 stocks at the beginning of the year and used the investment strategy in the study, valuation of his holdings would be like the table below. This valuation is reached by a totally hands-off automatic investment strategy outlined in this study and the investor is not required to peep into his portfolio during the year at all.

	RIL	SBI Sensex	ITC	ICICI	HUL	Nestle	AVG
Stock price gain	18.70%	18.78%	1.01%	39.47%	-2.59%	5.18%	13.42%
NASDAQ	40.73%	26.87%	15.49%	48.98%	3.09%	10.41%	24.26%
Nikkei225	26.19%	19.76%	-13.39%	62.19%	-11.43%	3.86%	14.53%
HSI	31.62%	22.84%	-27.97%	19.48%	9.69%	-6.88%	8.13%
FTSE250	18.20%	26.46%	0.70%	61.96%	6.70%	8.39%	20.40%
SP500	22.68%	22.34%	13.46%	38.56%	7.15%	10.26%	19.07%

The table shows that the investors would have beaten the gains in the stock market by 1.1% (Nikkei225) to 11% (NASDAQ) using the Automatic investment strategy. Only in the case of HSI the performance of the investment strategy yields returns that are below the market.

Conclusion and Suggestions

It is evident from the study that as globalisation increases, and economies become interlinked, the correlation between global stock exchanges can be a useful tool for a passive and automatic investment strategy. The difference in opening and closing hours of the global exchanges can be used by a smart investor to predict the movement in the national stock exchange. The strategy is very useful for a passive investor who may be busy in work and home affairs and not able to follow the market closely. For him an algorithm that is developed at the beginning of the year and executes trade every day without manual intervention and in the end beats the return from the market substantially, is a dream come true.

The study uses a fixed relationship between the stock exchanges which has been derived a year earlier (2020) than the actual trading period (2021). The results could be improved if a sliding window analysis is done to use data for 365 days before the actual trading date to establish the correlation. Using a sliding window analysis, would make this algorithm more complex but would yield much better results.

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