



Interdependence Between Indian and Global Stock Exchanges- A Measure of Liberalisation of Economy

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ABSTRACT

The Indian economy has seen swung from the balance of payment crises in 1991 to being the fastest growing economy in world, mainly due to the measures taken to open up and liberalise the economy. The liberalisation of economy has resulted in greater flow of capital to Indian stock markets and hence the impact of global events on Indian markets has become more pronounced. The foreign trade has also increased with the liberalisation of the economy.

This study analyses the correlation between Indian and some selected Global stock indices from 1987 and 2021 and concludes that the stock index correlation has markedly improved after liberalisation. Further it also analyses the flow of foreign capital into Indian stock markets and the changes in foreign trade. The study concludes that while the flow of foreign capital is aligned with the co-dependence of Indian and foreign markets, the changes in foreign trade do not exhibit this correlation. Hence the stock market correlation and flow of foreign capital could be considered as one of the indicators of the liberalisation of the economy.

KEYWORDS: *Indian Stock Market, Correlation, Foreign trade, FII inflows, liberalisation.*

Introduction

India had a balance of payment crises in 1991 when the foreign exchange reserves could meet only three weeks of the imports. Low ratings from Moody's did not allow the government to seek short term loans which ultimately resulted in the country using its gold reserves to tide over the crises. The balance of payment crises led to reforms resulting in liberalisation of the Indian economy.

Before liberalisation the Indian Rupee was non-convertible, and the key element of the national economic policy was import substitution. This made foreign trade extremely difficult. Foreign investment in Indian stock markets was negligible and thus the stock markets were largely insulated from the global trends.

The reforms undertaken in 1991 included abolishing the industrial licenses required in all except 18 industries, reducing licenses requirement for imports, removing limits on accumulation of capital and abolishing restrictions on foreign investments. This led to opening up of the Indian economy to the world. The foreign direct investment in India which was USD 97 million in 1991 rose to a staggering \$82 billion in 2021, making India the fifth largest recipient of FDI in the world.

The opening up of the economy, increase in foreign trade and foreign direct investment (FDI) in India also had an effect on the stock market. A committee headed by Dr C Rangarajan recommended investment by Foreign Institutional investors (FII) in its report in 1993. The government acted even before this committee submitted its report and the rules were formulated in September 1992.

This paper attempts to find out the correlation between the Indian stock markets with stock markets of other major economies and investigates if the measured correlation has changed from pre-liberalisation to post liberalisation years. Further it investigates if the change in correlation could be an indicator to the liberalisation of the economy

Literature Review

(Mohanasundaram & Karthikeyan, 2015) investigate the correlation of stock market interdependence between India, South Africa and the USA. The study finds out that a strong correlation exists between the stock market indices of South Africa, India and the USA.

(Junior et al., 2015) explore the dependencies between the International Stock Market Indices and concludes that high degree of information flow between indices lagged by one day coincides to same day correlation between them.

(Shezad et al., 2014) explore the relationship between stock markets of Pakistan and the world indices, between 2001 and 2013 and find out that KSE 100 index of Karachi Stock exchange, has no long-term relationship with Japan, Malaysia, Taiwan and China.

(Singhania & Prakash, 2014) find that Correlation between stock indices of SAARC economies are low which is in line with intra-regional trade being one of lowest as compared to other regional groups.

(Paramati et al., 2018) study relationship between bilateral trade linkages and stock market correlations of Australia and China using quarterly data from 1993 to 2015 and confirm that there is a significant long-run relationship among the variables.

(Anagnostopoulos et al., 2021) establish a link between the rise in cross-country stock market correlations over the past three decades, and the increase in foreign direct investment (FDI) positions over the same period.

There are many studies exploring the global relationship between stock market indices. Some of them (Singhania & Prakash, 2014; Paramati et al., 2018) also attempt to find a relationship between foreign trade and the co-dependence between stock market indices. However, there has been no study that analyses the impact of liberalisation on relationship between stock market indices. The present study attempts to examine this relationship.

Objectives

1. To explore relationship between Indian stock markets and different stock markets around the world.
2. To examine changes in relationship between pre-liberalisation and post liberalisation period.
3. To examine if the changes in the relationship could be explained by the liberalisation of the economy.

Research Methodology

The present study covers a period of 34 years from 1987 to 2021. Analysis of 5 years of pre-liberalisation period (1987-1991) and post liberalisation period (1992-2020) in blocks of five years, has been carried out to measure the impact of liberalisation of economy on stock exchange correlation.

Secondary data of stock indices from 1987 to 2021 is used. The data is sourced from Yahoo Finance and Wall Street Journal. Data on foreign trade and foreign trade as percentage of GDP is sourced from Macrotrends.

For the purpose of analysis, stock index data from Bombay Stock Exchange is used. Comparison with leading Asian stock indexes like Hang Seng, Hong Kong (HSI) and Nikkei 225, Japan, has been made. Leading international stock exchanges including S&P500 (USA), NASDAQ (USA) and FTSE 250 (UK) indices are also used for analysis.

The data on variation of stock indices has been analysed from 1987 to 2021. Further the daily stock exchange index variance data has been consolidated on an annual basis from 1987 to 2021 and used for analysis. The indices are corrected to the currency exchange rate taking base year as 1987.

The opening up of the economy is measured by the percentage of foreign trade with respect to GDP. A calculated index of economic liberalisation thus achieved is analysed with respect to stock exchange correlation.

Correlation and linear & polynomial regression are used to analyse the various data sets.

Data Analysis and Interpretation

Analysis of changes in stock index over the years reveals that all stock exchanges have risen during this period. The BSE SENSEX has risen the most in current value of rupee terms, by as much as 100 times. The NASDAQ has risen by a factor of 37 and S&P by a factor of 16. HSI shows growth by a factor of 10 while Nikkei 225 has changed only 1.5 times.

For an accurate comparison of the data, currency exchange variation is also to be considered to arrive at real value of the growth in stock indexes. After correction for exchange rates, largest gains are seen in NASDAQ (x 37) while BSE SENSEX has risen by a factor of 19. Nikkei 225 is mostly flat and has risen only by a factor of 2 over 34 years.

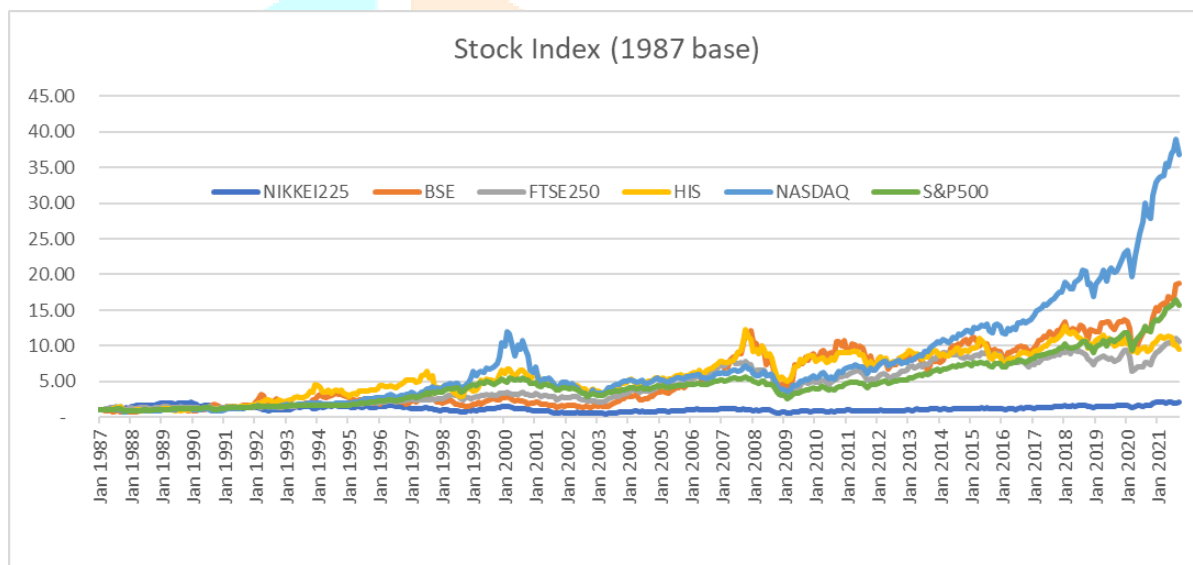


Figure 1 Stock Index Variation (1987 base)

Correlation between Stock Indices

The correlation between the stock indices of the stock exchanges over the complete period of study is shown in Table 1. For this analysis, real stock exchange indices are used, which have been corrected to the exchange rate for January 1987.

Table 1 Correlation between Stock Indices 1987-2021

	BSE	NIKKEI225	FTSE250	HSI	NASDAQ	S&P500
BSE	1.00					
NIKKEI225	0.20	1.00				
FTSE250	0.94	0.10	1.00			
HSI	0.92	-0.00	0.94	1.00		
NASDAQ	0.84	0.36	0.81	0.77	1.00	
S&P500	0.88	0.23	0.89	0.85	0.98	1.00

As seen from the data, there is a good correlation between all stock exchanges except Nikkei 225. The BSE SENSEX is maximally correlated to FTSE 250, but the correlation to other stock exchanges except Nikkei 225 is also significant. The correlation between BSE SENSEX and Nikkei 225 is only 0.20.

The correlation between BSE SENSEX with various stock indexes can be approximated by the polynomial expression as below, where “y” represents BSE SENSEX and “x” represents the respective stock index.

With Nikkei 225

$$y = 4E-18x^6 - 1E-13x^5 + 1E-09x^4 - 9E-06x^3 + 0.0265x^2 - 39.303x + 44219$$

With FTSE 250

$$y = -0.0001x^2 + 3.2025x + 1269$$

With HSI

$$y = -0.0003x^2 + 5.6379x + 2812.5$$

With NASDAQ

$$y = 0.0002x^2 - 0.4604x + 1500.4$$

With S&P 500

$$y = 4E-05x^2 + 0.0447x + 625.32$$

Due to a good correlation between the stock indices, a lower polynomial (2nd order) equation approximates the relation between BSE and major indices. However, Nikkei 225 is an outlier and even a 6th order polynomial is not sufficient to mark the correlation. In the initial pre-liberalisation period Nikkei 225 exhibits very loose correlation with BSE SENSEX which improves in later years.

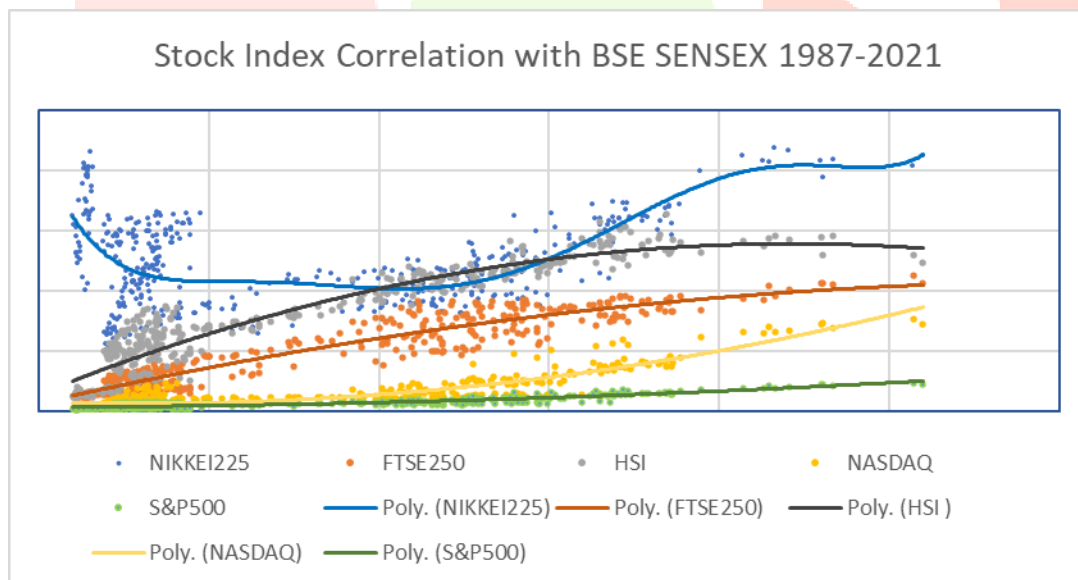


Figure 2 Stock Index Correlation with BSE SENSEX, 1987-2021

Stock exchange Correlation between Pre-liberalisation and Post Liberalisation Period

Correlation of BSE SENSEX with different stock indices has been analysed between pre-liberalisation (1987-1991) and post liberalisation period.

Table 2 Stock exchange Correlation between Pre-liberalisation and Post Liberalisation Period

	NIKKEI225	FTSE250	HSI	NASDAQ	S&P500
1987-1991	-0.22	0.34	0.65	0.46	0.68
1992-1996	0.23	0.08	0.12	-0.13	-0.19
1997-2001	0.90	0.24	0.67	0.40	0.09
2002-2006	0.95	0.98	0.97	0.86	0.90
2007-2011	0.60	0.68	0.93	0.79	0.67
2012-2016	0.68	0.63	0.65	0.74	0.75
2017-2020	0.70	0.58	0.53	0.45	0.61

There is a marked improvement in correlation between BSE and other stock indices in the immediate post-liberalisation period, which indicates that BSE SENSEX is more aligned to the global trends. This is due to the flow of FDI in and out of the markets which has been easier post-liberalisation. Interestingly the BSE SENSEX remains closely aligned to the US stock exchanges rather than the FTSE 250.

The analysis of data brings out a good correlation between BSE SENSEX and other indices from 1997 onwards. The correlation is poor in the pre-liberalisation years and in the immediate five years following liberalisation as the reforms take time to be effective. From 2007 onwards, the Indian economy has grown at a sharper rate. The performance of the BSE SENSEX has followed the growth in Indian economy and the index has risen at a higher rate than other indices. This has led to a lower correlation between the SENSEX and other indices post 2007. However, the correlation is still better than pre-liberalisation years.

A further study can be done to analyse the rate of growth of the national economies and its impact on correlation of respective indices.

FII Inflows and Stock Index Correlation

The correlation of stock indices is closely linked to the flow of capital into Indian stock exchanges.

On examining the FII Inflows from 1998 to 2020 and the co-dependence of stock exchanges, a good correlation is found between the two (Table 3). Generally, the stock indices are more closely aligned during the years of high FII inflows. Only during the volatile years around stock market crash of 2008, we see a lower correlation between FII inflows and stock indices co-dependence.

Table 3 Correlation between FII inflows and Stock Indices co-dependence

	NIKKEI225	FTSE250	HSI	NASDAQ	S&P500
1998-2001	-0.96	-0.07	0.25	0.25	0.30
2002-2006	0.81	0.87	0.87	0.47	0.61
2007-2011	-0.03	0.06	-0.05	-0.07	-0.19
2012-2016	0.66	0.02	0.51	0.65	0.55
2016-2020	0.89	0.51	0.63	0.65	0.80

Analysis of Stock Index Correlation with Foreign Trade

It is evident from the study of correlation between stock indices and the BSE SENSEX, that the markets are more aligned post-liberalisation. This is an indicator of the opening of the economy and free flow of capital across borders.

The ratio of foreign trade to the total GDP can also be considered as one of the measures of an open economy which allows free movement of goods and currency across borders. An analysis of the foreign trade and

with variation in stock indices has been carried out to explore this hypothesis. For this analysis, correlation between the two sets of data has been detailed in Table 4.

Table 4 Correlation between foreign trade AND correlation indexes of BSE SENSEX with different stock indices

	NIKKEI225	FTSE250	HSI	NASDAQ	S&P500
1987-1991	-0.22	-0.48	-0.88	-0.65	-0.61
1992-1996	0.63	-0.81	-0.66	-0.43	-0.40
1997-2001	0.93	0.54	0.34	0.96	0.60
2002-2006	0.24	0.64	0.56	0.19	0.74
2007-2011	0.06	0.20	-0.90	-0.89	-0.46
2012-2016	0.26	0.73	0.24	-0.00	-0.16
2017-2020	-0.51	-0.38	-0.12	-0.27	-0.46

The data displays random coefficients of correlations, indicating that co-dependency between stock indices is not related to the foreign trade of goods and services. This indicates that movement of goods and services across borders is not directly linked to movement of capital. The stock exchanges are more closely aligned to movement of capital than to the movement of goods and services.

Conclusion and Suggestions

Analysis of stock exchange data indicates a good correlation between BSE SENSEX and major stock indices during the period of the study. The correlation has significantly improved after liberalisation of the economy, thus the index of correlation of BSE SENSEX with other stock exchanges could be considered as one of the indicators of the liberalisation of the economy.

Apart from the correlation index of Indian stock exchange with global indices, the change in foreign trade also indicates the state of liberalisation of the economy. The data analysis does not indicate a close relationship between foreign trade and correlation between BSE SENSEX and other stock indices.

However, FII inflows affect the correlation between BSE SENSEX and other stock exchanges in a more significant way. Though liberalisation results in increased flow of trade and capital across borders, the present study shows that the co-dependence of stock indices is more affected by flow of capital than the trade.

Based on a good correlation between stock indices, a good investment strategy can be framed based on movement in foreign stock exchanges. Since there is a time difference in working hours of different stock exchanges, an investor can use the trends in other stock exchanges to plot his strategy for the Indian stock market. Further study can be made in this area to judge if a mathematical investment strategy without human intervention, based on foreign stock exchange movement could bring a good return to the investor.

REFERENCES

- Anagnostopoulos, A., Atesagaoglu, O., Faraglia, E., & Giannitsarou, C. (2021). Cross-Country Stock Market Comovement: A Macro Perspective. *CEPR Discussion Papers*.
- Junior, L., Mullokandov, A., & Kenett, D. (2015). Dependency Relations among International Stock Market Indices. *Journal of Risk and Financial Management*, 8(2), 227–265. <https://doi.org/10.3390/jrfm8020227>
- Mohanasundaram, T., & Karthikeyan, P. (2015). Cointegration and stock market interdependence: Evidence from South africa, India and the USA. *South African Journal of Economic and Management Sciences*, 18(4), 475–485. <https://doi.org/10.17159/2222-3436/2015/v18n4a3>
- Paramati, S. R., Zakari, A., Jalle, M., Kale, S., & Begari, P. (2018). The dynamic impact of bilateral trade linkages on stock market correlations of Australia and China. *Applied Economics Letters*, 25(3), 141–145. <https://doi.org/10.1080/13504851.2017.1305067>
- Shezad, A., Jan, F. A., Gulzar, S., & Ansari, M. A. (2014). A study on Co-integration of Pakistani Stock Market with selected Asian Stock Markets. *Journal of Management Info*, 1(4), 18–24. <https://doi.org/10.31580/jmi.v4i1.23>
- Singhania, M., & Prakash, S. (2014). Volatility and cross correlations of stock markets in SAARC nations. *South Asian Journal of Global Business Research*, 3(2), 154–169. <https://doi.org/10.1108/sajgbr-04-2012-0056>
- Macrotrends, <https://www.macrotrends.net/>
- CDSL India, <https://www.cdslindia.com>
- Reserve Bank of India, <https://www.rbi.org.in>

