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# Nexus of Assimilation between Indian and Chinese Bourses

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**Abstract**

*This paper examines the correlation between India's NIFTY 50 and China's Shanghai Stock Exchange (SSE) Composite subsequent to the Yuan's devaluation on June 11, 2015. The study employs statistical and economic approaches to assess three stages during a 12-year period from 2005-2006 to 2016-2017. The literature study rigorously analyzes stock market volatility and the merger of growing Asian markets with developed markets. The research presents two hypotheses to evaluate the long-term correlation and causality between the two indexes. Daily closing prices are analyzed during event windows established by the devaluation event. The findings indicate an inverse correlation between NIFTY 50 and SSE Composite during event periods, with Augmented Dickey-Fuller (ADF) tests validating stationarity and a co-integrated connection (I(1)). The Johansen Co-integration test demonstrates a long-term proportional relationship, but Granger Causality tests show both unidirectional and bidirectional causal relationships over time. The Vector Error Correction Model (VECM) research reveals a reciprocal connection, indicating that NIFTY 50 achieves equilibrium restoration more rapidly. The results enhance comprehension of the amalgamation of the Indian and Chinese stock markets.*

**Keywords:** *Event, Integration, Nexus, NIFTY, Shanghai Stock Exchange.*

## Introduction

The stock market of a country is a real-time barometer for the economy. Stock market is dynamic in nature because of its information absorption and quick reactions to the macro and some micro economic variables. Due to these reasons stock market become important to economists, researchers, investors, governments and policy makers. Indian stock market has been through many ups and downs individually and with other stock markets. Theoretically speaking, the events in developed and border sharing countries bring volatility into the domestic market. The rationale behind this statement, even though the stock markets are representing different countries are integrated. The events like political decision, economic policies, natural calamities and other factors in developed nations increases volatility by roping in to more unanticipated traders, who then trade in both cash and derivatives markets. Economic events make the market fluctuate by their inbuilt nature. This irrational behaviour has been analysed by researchers, statisticians and academicians. The analysts have concluded that events of developed nation destabilise markets. The perception remains intact that the developed nation's event makes its own domestic market more volatile and this volatility is transmitted to the neighbouring countries. There are number of studies examining the cross-border interlinkage and volatility.

## Literature Review

Research conducted by Chan et al. (1992) and DeFusco et al. (1996) indicates that throughout the 1980s and 1990s, several Asian rising stock markets, including the Philippines, Hong Kong, Korea, Singapore, Taiwan, Malaysia, and Thailand, exhibited very little indications of cointegration with the US market. Masih and Masih (1997, 1999, 2001) and Arshanapalli et al. (1995) found evidence that the main established markets in Asia and key developing markets in Asia (Hong Kong, Korea, Singapore, and Taiwan) were connected in a single vector. Chung and Liu (1994) state that there are two cointegrating vectors that connect the US stock market with the primary stock markets in the Asia-Pacific region. In the year 2000, Ghosh discovered a connection between the stock markets of the United States and Japan, as well as many other stock markets in the Asia-Pacific region, during the Asian financial crisis of 1997-1998. This

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connection is known as pairwise cointegration. Sheng and Tu (2000) could not uncover any indication of cointegration before the Asian financial crisis. However, they did see the presence of a cointegrating vector throughout the crisis, which indicated a relationship between the US and several Asian financial markets. The majority of the study outlined above is carried out using the local currency. Hung and Cheung (1995) gathered data in both the local currency and US dollars, but Masih and Masih (1999 & 2001) specifically used US dollars as the main currency. Based on the analysis of stock prices in US dollars, the authors discovered that five significant Asia-Pacific stock markets (Hong Kong, Korea, Malaysia, Singapore, and Taiwan) showed cointegration during the 1987 stock crisis, rather than before to it. Curiously, there was no observed cointegration over the whole data period when analysing stock values in relation to the local currency.

Although currency numeraire is a contributing factor to the varying results drawn by various research about the integration of Asian stock markets, other factors such as data frequency, model specification, and sample time period may also play a role. The frequency at which data is collected, such as daily, weekly, or monthly, is unlikely to have significant impact on the cointegration study. This is supported by Hakkio and Rush (1991), who demonstrated that the frequency of data does not change the findings of cointegration while the sample period remains constant. In terms of model definition, several prior research often used multiple smaller subsystems (such as bivariate systems) to represent the connections between numerous marketplaces. This technique may overlook any indirect pathways of stock market connection and provide false patterns of stock market connections (Janakiramanan and Lamba, 1998). The study conducted by Hasapis et al. (1999) has shown that the exclusion of a significant causal variable in a system may greatly impact the conclusions made about cointegration and causation. Ultimately, the variation in results might be attributed to the use of distinct time intervals for sampling. Asian stock markets have potentially become more interconnected with each other and the global market due to factors such as extensive liberalisation of stock markets, enhanced economic integration within the region and globally, advancements in communication technology, and occurrences of stock market crashes. The occurrence of stock market collapses, such as the one in 1987, has been extensively debated for its impact on the interconnectedness of major international and Asian financial markets. This work enhances the existing body of knowledge by doing a thorough analysis of the integration of Asian stock markets. It utilises a 12-country VAR system, considering various currency denominations and different time periods surrounding the Asian financial crisis. This article examines the persistent characteristic of volatility in the Nifty 50, a significant benchmark index in the Indian stock market. The research, carried out by Vevek et al. (2022), uses sophisticated statistical techniques to examine volatility patterns within a certain timeframe. The study examines the several variables that contribute to the ongoing instability exhibited in the Nifty 50, offering significant insights for investors, regulators, and market players. The study conducted by Vevek et al. (2021) specifically examines the volatility of the Nifty, a prominent macroeconomic indicator in the Indian setting. The work uses empirical methodologies to construct a model that accurately represents the complex fluctuations of Nifty volatility. The study seeks to improve comprehension of the fundamental processes that cause volatility in the Indian stock market by analysing different economic variables and market situations. The results have tangible consequences for the implementation of risk management methods and the process of making financial decisions.

Within the extant literature on the integration of global stock markets, two basic schools of thought are prevalent. This work makes a valuable contribution to the existing body of research by conducting a thorough analysis of the integration of Indian and Chinese indices, both individually and as a collective entity, at a specific moment in time.

*Objective of the Study*

To examine the nexus of capital market integration between the Indian and Chinese stock markets.

*Hypotheses*

$H_{01}$: There is no long run relationship between the India's NIFTY 50 and China's Shanghai Stock Exchange (SSE) Composite.

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$H_{02}$: There is no causal relationship between the India's NIFTY 50 and China's Shanghai Stock Exchange (SSE) Composite.

## Materials and Methods

The study is empirical in nature and purpose of the study is to examine the co-movement and integration between the India's NIFTY 50 and the Chinese Shanghai Stock Exchange (SSE) Composite at the time of China announced the devaluation of its currency Yuan at 11th June 2015. The data for the examining the co-movement and integration between NIFTY 50 and SSE composite has been collected from the secondary sources. The data are in the form of daily closing price for both NIFTY 50 and Shanghai Stock Exchange (SSE) Composite.

The period of the study for examining the nexus of capital market integration between India and Chinese stock markets is 2005 - 2006 to 2016 - 2017, comprising 12 years. For this study the period for research into consideration was classified into three phases and each phase had six sub-divisions. These sub-divisions were known as 'Event Windows' and in total there were eighteen event windows. The event windows, their codes and explanation and number of observations are mentioned in the Table below:

| Phases | Code | Explanation of code | Event window | Observations |
|---|---|---|---|---|
| I | BFNIF | Before Fifteen Days NIFTY | Before devaluation of Chinese currency | 15 |
| | BFSSE | Before Fifteen Days SSE | | |
| | PFNIF | Post Fifteen Days NIFTY | Post devaluation of Chinese currency | 15 |
| | PFSSE | Post Fifteen Days SSE | | |
| | FNIF | Fifteen Days NIFTY | Before and after the devaluation of Chinese currency including event date | 31 |
| | FSSE | Fifteen Days SSE | | |
| II | BTNIF | Before Thirty Days NIFTY | Before devaluation of Chinese currency | 30 |
| | BTSSE | Before Thirty Days SSE | | |
| | PTNIF | Post Thirty Days NIFTY | Post devaluation of Chinese currency | 30 |
| | PTSSE | Post Thirty Days SSE | | |
| | TNIF | Thirty Days NIFTY | Before and after the devaluation of Chinese currency including event date | 61 |
| | TSSE | Thirty Days SSE | | |
| III | BNIF | Before Sixty Days NIFTY | Before devaluation of Chinese currency | 60 |
| | BSSE | Before Sixty Days SSE | | |
| | PNIF | Post Sixty Days NIFTY | Post devaluation of Chinese currency | 60 |
| | PSSE | Post Sixty Days SSE | | |
| | SNIF | Sixty Days NIFTY | Before and after the devaluation of Chinese currency including event date | 121 |
| | SSSE | Sixty Days SSE | | |

*Tools used for analyses*

The secondary data for the study were collected from the websites of NSE and Yahoo Finance. The iteration of the data were done using EViews 9.0 Student Light Version. Simple statistical tools like descriptive statistics and correlation were used to study the data collected. Econometrics Tools like Unit Root Test - Augmented Dickey Fuller Test (ADF), Johansen's Cointegration Test, Granger Causality, Vector Error Correction Method (VECM) models are used to analyse the Secondary Data.

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*Contribution of the Present Study*

Understanding the influence and integration among the global markets has become a great interest to policy makers, institutional / individual / high net worth investors, academicians and market regulators. Study also provides idea related to efficiency of markets disequilibrium at the time of trigger event. Review relating to previous study depicts a picture with mixed results. Certain results show positive relations between international stock markets, others negative relations and there are few studies which have come up with no significant relations between the international stock markets. Also, the earlier study concentrates only on establishing a relation between international markets. In this study researcher attempted to identify an existence of integration among India and China as a long-short run.

## Results and Discussion

**Table - 1: Descriptive Statistics of Raw Data**

| Phases | Index | Obs. | Mean | Median | SD | Variance | Skewness | Kurtosis | J.B. |
|---|---|---|---|---|---|---|---|---|---|
| I | BFNIF | 15 | 8230.83 | 8236.45 | 164.05 | 376773 | -0.077 | 1.621 | 1.2 |
| | BFSSE | 15 | 4909.9 | 4910.9 | 177.58 | 441501 | -0.401 | 2.072 | 0.94 |
| | PFNIF | 15 | 8311.05 | 8368.5 | 162.18 | 368213 | -0.637 | 2.114 | 1.5 |
| | PFSSE | 15 | 4395.26 | 4478.36 | 440.72 | 2719285 | -0.083 | 1.784 | 0.94 |
| | FNIF | 31 | 8261.65 | 8319 | 170.64 | 873536 | -0.286 | 1.683 | 2.66 |
| | FSSE | 31 | 4669.15 | 4813.8 | 424.37 | 5402647 | -0.895 | 2.715 | 4.24 |
| II | BTNIF | 30 | 8246.81 | 8249.4 | 140.53 | 572702 | -0.24 | 1.895 | 1.81 |
| | BTSSE | 30 | 4629.7 | 4570.58 | 320.2 | 2973283 | 0.197 | 1.641 | 2.5 |
| | PTNIF | 30 | 8404.1 | 8421.45 | 164.09 | 780828 | -0.809 | 3.096 | 3.28 |
| | PTSSE | 30 | 4139.59 | 4021.86 | 418.09 | 5069093 | 0.793 | 2.564 | 3.38 |
| | TNIF | 61 | 8319.84 | 8360.55 | 175.12 | 1840034 | -0.253 | 2.193 | 2.31 |
| | TSSE | 61 | 4397.46 | 4378.31 | 451.78 | 12246578 | 0.055 | 1.912 | 3.04 |
| III | BNIF | 60 | 8395.1 | 8371.95 | 216.6 | 2768132 | 0.13 | 2.196 | 1.78 |
| | BSSE | 60 | 4293.07 | 4321.14 | 474.9 | 13306082 | -0.036 | 2.179 | 1.7 |
| | PNIF | 60 | 8314.44 | 8381.33 | 275.82 | 4488649 | -1.127 | 3.142 | 12.75 |
| | PSSE | 60 | 3838.41 | 3799.91 | 483.96 | 13819036 | 0.43 | 3.245 | 2 |
| | SNIF | 121 | 8351.7 | 8375.05 | 251.48 | 7589115 | -0.787 | 3.451 | 13.52 |
| | SSSE | 121 | 4074.84 | 3994.81 | 536.41 | 34528111 | 0.145 | 2.441 | 2 |

*Source: Estimation output form EViews 9.0*

Table - 1 shows the descriptive statistics of indices viz., NIFTY 50 and SSE Composite for the whole study period. The statistics reveal that mean of all three phases are with a positive sign. The Standard deviation (SD) of PTNIF was high (164.09) and if we compare PTNIF (30 days after the event) with BTNIF (30 days before the event) there was 116% increasing in SD of Nifty. In SSE Composite SD, compare PFSSE (15 days after the event) with BFSSE (15 days before the event) there was 248% increasing in SD. Then for PTSSE Vs BTSSE (before and post event of 30 days) was increased 130%. The indices daily composite points are positively skewed for TSSE, BTSSE, PTSSE, SSSE, BNIF and PSSE and others were negatively skewed. The negative skewness means the distribution with a long-left tail. This indicates that the investors have a chance of negative outcomes. The positively skewed distribution indicates that the investors have a chance of few gains. Value of Kurtosis is more than three only for PTNIF, SNIF, PNIF and PSSE. Generally, more than three valued kurtoses are named as leptokurtic and it infers that there is lesser risk of extreme outcomes. To check data are normally distributed, the Jarque-Berra (J.B.) test is adopted. The of JB test rejects the null hypotheses of the test of being normal.

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**Table - 2: Result of Correlation**

| | 15 days before the event | | | 15 days post the event | | | Overall result for 31 days | | |
|---|---|---|---|---|---|---|---|---|---|
| **P - I** | | BFNIF | BFSSE | | PFNIF | PFSSE | | FNIF | FSSE |
| | BFNIF | 1 | -0.853 | PFNIF | 1 | -0.865 | FNIF | 1 | -0.767 |
| | BFSSE | -0.853 | 1 | PFSSE | -0.865 | 1 | FSSE | -0.767 | 1 |
| | **30 days before the event** | | | **30 days post the event** | | | **Overall result for 61 days** | | |
| **P - II** | | BTNIF | BTSSE | | PTNIF | PTSSE | | TNIF | TSSE |
| | BTNIF | 1 | -0.284 | PTNIF | 1 | -0.715 | TNIF | 1 | -0.677 |
| | BTSSE | -0.284 | 1 | PTSSE | -0.715 | 1 | TSSE | -0.677 | 1 |
| | **60 days before the event** | | | **60 days post the event** | | | **Overall result for 121 days** | | |
| **P - III** | | BNIF | BSSE | | PNIF | PSSE | | NIF | SSE |
| | BNIF | 1 | -0.684 | PNIF | 1 | 0.396 | NIF | 1 | -0.021 |
| | BSSE | -0.684 | 1 | PSSE | 0.396 | 1 | SSE | -0.021 | 1 |

*Source: Estimation output form EViews 9.0*

Table - 2 shows the result of correlation for phase I, II and III. Each phase consists of three different event windows i.e. before, after and overall results for the event of devaluating the Chines currency Yuan. It can be inferred that there is very strong negative correlation between the NIFTY 50 and SSE Composite indices, before (-0.853) and after (-0.865) the event. Phase I's overall result is there existing strong negative correlation (-0.767). From Phase II we can also infer that there is weak negative correlation before (-0.284) the thirty days of event and there is strong negative correlation (-0.715) post thirty days of the event. There also exist strong negative correlation (-0.677) for overall result of Phase II. Phase III's result is there exists very strong correlation (-0.684) before sixty days of the event and later for post sixty days it represents moderate positive relation, then for overall result is there exist weak negative correlation between the NIFTY 50 and SSE Composite. The inference of correlation classifications such as very weak, weak, moderate, strong and very strong correlations was made according to **Evans (1996).** The correlation is a measurement of co-movements among the return of two Indices or markets **(Chandra, 2017).** The market where the NIFTY 50 has negative correlation or very less amount of correlation, investors can invest in that market to reduce the level of systematic risk.

**Table - 3: Result of Augmented Dickey Fuller (ADF) Test**

| Phases | Variables | Level | | 1st Difference | | Decision |
|---|---|---|---|---|---|---|
| | | Computed t-stat. | Prob. | Computed t-stat. | Prob. | |
| **I** | BFNIF | -1.557 | 0.109 | -2.956 | 0.007** | Non -Stationary at level and stationary at first difference for the raw data of both Nifty 50 and SSE Composite indices. |
| | BFSSE | 0.970 | 0.900 | -3.819 | 0.001** | |
| | PFNIF | 2.497 | 0.994 | -2.592 | 0.014** | |
| | PFSSE | -4.097 | 0.001** | -5.209 | 0.002** | |
| | FNIF | 0.131 | 0.716 | -4.794 | 0.000** | |
| | FSSE | -1.003 | 0.276 | -4.797 | 0.004** | |
| **II** | BTNIF | -0.416 | 0.525 | -5.617 | 0.000** | |
| | BTSSE | 1.144 | 0.931 | -3.945 | 0.000** | |
| | PTNIF | 0.844 | 0.888 | -3.667 | 0.001** | |
| | PTSSE | -1.717 | 0.081 | -4.329 | 0.000** | |
| | TNIF | -2.017 | 0.279 | -7.455 | 0.000** | |
| | TSSE | -0.728 | 0.397 | -6.308 | 0.000** | |
| **III** | BNIF | -1.020 | 0.273 | -7.071 | 0.000** | |
| | BSSE | 2.504 | 0.997 | -6.100 | 0.000** | |
| | PNIF | -0.281 | 0.581 | -6.706 | 0.000** | |
| | PSSE | -1.934 | 0.051 | -6.313 | 0.000** | |
| | SNIF | -0.842 | 0.349 | -10.014 | 0.000** | |
| | SSSE | -0.318 | 0.569 | -8.471 | 0.000** | |

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*Source: Estimation output form EViews 9.0*

*Note: ** denotes 5% level of significance.*

From Table - 3, it is evident that in case of all the Phases, the selected data are found to be non-Stationary at level and it becomes stationary at first differencing for both NIFTY and SSE composite for phases (before and post period). The null hypothesis of unit root test, there is unit root (non-stationary) in the series. As the p-values are higher than 0.05 (5%) in level. So, the null hypothesis cannot be accepted. Then at the first difference the null hypothesis gets accepted as p-value is less than 0.05 (5%), i.e. the series of data are stationary at first difference.

If a non-stationary stochastic series are converted in stationary series by first differencing, it can be said as integrated of order one, I (1). Hence, it can be said that data relating to Nifty 50 and SSE Composite concerned are found to be non-stationary at level and stationary at first difference, the data series are found to be integrated at first order, I (1).

**Table 4 - Result of Johansen Co-integration Test**

| Phases | Event windows | Hypothesized No. of CE(s) | Trace Stat. | Prob. | Max-Eigen Stat. | Prob. | Results |
|---|---|---|---|---|---|---|---|
| I | Before 15 days | None | 15.699 | 0.047** | 15.555 | 0.031** | Cointegrated |
| | | At most 1 | 0.144 | 0.705 | 0.144 | 0.705 | |
| | After 15 days | None | 8.976 | 0.368 | 8.032 | 0.376 | Cointegrated |
| | | At most 1 | 0.945 | 0.331 | 0.945 | 0.331 | |
| | Overall 31 days | None | 5.847 | 0.714 | 5.814 | 0.637 | Cointegrated |
| | | At most 1 | 0.033 | 0.855 | 0.033 | 0.855 | |
| II | Before 30 days | None | 3.972 | 0.906 | 2.877 | 0.955 | Cointegrated |
| | | At most 1 | 1.095 | 0.295 | 1.095 | 0.295 | |
| | After 30 days | None | 18.004 | 0.021** | 12.684 | 0.088 | Cointegration |
| | | At most 1 | 5.320 | 0.221 | 5.320 | 0.221 | |
| | Overall 61 days | None | 6.485 | 0.638 | 6.068 | 0.605 | Cointegrated |
| | | At most 1 | 0.416 | 0.519 | 0.416 | 0.519 | |
| III | Before 60 days | None | 11.354 | 0.191 | 10.693 | 0.170 | Cointegrated |
| | | At most 1 | 0.662 | 0.416 | 0.662 | 0.416 | |
| | After 60 days | None | 12.731 | 0.125 | 12.073 | 0.108 | Cointegrated |
| | | At most 1 | 0.659 | 0.417 | 0.659 | 0.417 | |
| | Overall 121 days | None | 6.836 | 0.597 | 5.780 | 0.642 | Cointegrated |
| | | At most 1 | 1.056 | 0.304 | 1.056 | 0.304 | |

*Source: Estimation output form EViews 9.0*

*Note: ** denotes 5% level of significance.*

From Table - 4, it is evident that Phases - I, II and III, the null hypotheses of having no co-integration between the variables cannot be accepted. Thereby the alternate hypothesis that there exists the co-integration between two variables is accepted. The Trace and Max-Eigne statistic's results are same. Therefore, result of this cointegration table can be concluded that there exists a long run association between the variables of Phase - I, II and III. So, it also can be inferred that there exists co-integration or long run association between NIFTY 50 and SSE composite and they move together in long run or they have a long run association. Now both the indices share a common stochastic trend and both will grow proportionally.

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**Table - 5: Result of Granger Causality**

| Phases | | Null Hypothesis | Obs. | F-Stat. | Prob. | Direction of Causality |
|---|---|---|---|---|---|---|
| I | Before 15 days | BFSSE- DNGC- BFNIF | 14 | 5.448 | 0.040** | Unidirectional SSE Granger Cause NIF |
| | | BFNIF - DNGC- BFSSE | | 0.664 | 0.433 | |
| | After 15 days | PFSSE - DNGC- PFNIF | 14 | 1.216 | 0.294 | Bidirectional |
| | | PFNIF - DNGC- PFSSE | | 2.038 | 0.181 | |
| | Overall 31 days | FSSE - DNGC- FNIF | 30 | 10.373 | 0.003** | Unidirectional SSE Granger Cause NIF |
| | | FNIF - DNGC- FSSE | | 0.059 | 0.810 | |
| II | Before 30 days | BTSSE - DNGC- BTNIF | 29 | 3.565 | 0.070 | Unidirectional SSE Granger Cause NIF |
| | | BTNIF - DNGC- BTSSE | | 1.016 | 0.323 | |
| | After 30 days | PTSSE - DNGC- PTNIF | 29 | 0.383 | 0.541 | Bidirectional |
| | | PTNIF - DNGC- PTSSE | | 1.810 | 0.190 | |
| | Overall 61 days | TSSE - DNGC- TNIF | 60 | 6.640 | 0.013** | Unidirectional SSE Granger Cause NIF |
| | | TNIF - DNGC- TSSE | | 0.190 | 0.664 | |
| III | Before 60 days | BSSE - DNGC- BNIF | 59 | 6.923 | 0.011** | Unidirectional SSE Granger Cause NIF |
| | | BNIF - DNGC- BSSE | | 0.744 | 0.392 | |
| | After 60 days | PSSE - DNGC- PNIF | 59 | 2.961 | 0.091 | Unidirectional SSE Granger Cause NIF |
| | | PNIF - DNGC- PSSE | | 0.556 | 0.459 | |
| | Overall 121 days | SSE - DNGC- NIF | 120 | 0.001 | 0.980 | Bidirectional |
| | | NIF - DNGC- SSE | | 0.708 | 0.402 | |

*Source: Estimation output form EViews 9.0*

*Note: ** denotes 5% level of significance. D*oes Not Granger Cause (DNGC)

The results reported in Table - 5 furnishes information about Granger Causality Test, i.e., the cause-and-effect relationship between the NIFTY and SSE Composite. The results reveal that there exists a causal relationship either unidirectional or bidirectional between the NIFTY and SSE Composite for selected event periods. Out of nine event window periods of events study, there exists unidirectional causality in six cases. Among these six cases, SSE Composite Granger causes NIFTY 50 before the event and phase - III, SSE Composite Granger Causes NIFTY 50 after the event. In other three cases it is found to have a unidirectional causality. The existence of unidirectional causality, from SSE Composite to NIFTY 50 indices implies any changes in NIFTY 50 index is caused by the corresponding changes in SSE Composite index. Bi-directional causality indicates a feedback relationship between SSE Composite and NIFTY 50. From the presence of such a relationship, it can be inferred that the SSE Composite (NIFTY 50) price may contain additional information for the prediction of process in the NIFTY 50 (SSE Composite).

**Table - 6: Lag Selection (Akike Information Criterion)**

| Phases | Phase - I | Phase - II | Phase - III |
|---|---|---|---|
| Lags Adopted | 1 | 1 | 1 |

*Source: Estimation output form EViews 9.0*

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**Table - 7: Results of Vector Error Correction Method (VECM) depicting the Error Correction Term (ECT)**

| Phases | | ECT | SD Error | t-Stat. | Prob. |
|---|---|---|---|---|---|
| I | **Before 15 days** | -0.170 | 0.741 | -0.229 | 0.826 |
| | **After 15 days** | -0.690 | 0.263 | -2.624 | 0.039** |
| | **Overall 31 days** | -0.304 | 0.159 | -1.916 | 0.069 |
| II | **Before 30 days** | -0.094 | 0.061 | -1.536 | 0.140 |
| | **After 30 days** | -0.170 | 0.082 | -2.065 | 0.051 |
| | **Overall 61 days** | -0.234 | 0.098 | -2.390 | 0.021** |
| III | **Before 60 days** | -0.170 | 0.082 | -2.076 | 0.043** |
| | **After 60 days** | -0.065 | 0.040 | -1.607 | 0.114 |
| | **Overall 121 days** | -0.070 | 0.036 | -1.922 | 0.057 |

*Source: Estimation output form EViews 9.0*

*Note: ** denotes 5% level of significance.*

From the Table - 6 it is pertinent to note that the results revealed by Granger Causality test are highly dependent on the number of lagged terms introduced in the model **(Gujarati, 2012).** Because of this, results arrived at may not be conclusive. The lag selected in this case is one (1) using AIC and SIC by use of optimal lag length criteria. Hence, these results are further put to test using VECM. The results of VECM are given in Table - 7 and Table - 8.

It is evident form the Table - 7 that the ECT happens to be negative and significant in case of six event window. This proves that there exist a bidirectional causality or feedback relationship between NIFTY and SSE Composite in this case. This means that NIFTY informationally efficient and reacts more quickly to SSE Composite Index Hence, in this case, it is found a contemporaneous and bidirectional relationship between the SSE Composite and NIFTY 50. It also transfers of information happens in both the markets simultaneously.

The speed of convergence or ECT provides information about not only the causality but also the direction of causality. The magnitude of ECT provides the information as to which market's event influence the other. If the ECT, in the case of SSE Composite on Nifty 50 is greater in absolute term that that of the Nifty 50 on SSE Composite, indicates that when the co-integrated series is in disequilibrium in the short run, it is the Nifty 50 which makes greater adjustment to re-establish the equilibrium.

From the table we can find that there are six unidirectional causalities between SSE Composite and NIFTY 50. This implies that the information first reflects in SSE Composite which then is mirrored in the NIFTY 50 index.

Before it is having long run but not significant but after the devaluation of chines currency their ware effect in phase - I and II after 60 days that effect fades off.

VECM also furnish further information regarding short run association between the co-integrating vectors. The Wald statistic furnishes the information relating to short run association between the vectors of the selected companies. Table - 8 Furnishes the results of VECM relating to short run association between the vectors.

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**Table - 8: Result of Vector Error Correction Method (VECM) depicting other Statistics of Vector Error Correction Method (VECM)**

| Phases | | Wald stat. Chi-square | Prob. | LM Test Stat. | Prob. | ARCH Test Stat. | Prob. |
|---|---|---|---|---|---|---|---|
| Column 1 | Column 2 | Column 3 | Column 4 | Column 5 | Column 6 | Column 7 | Column 8 |
| I | Before 15 days | 2.085 | 0.353 | 2.116 | 0.347 | 7.075 | 0.008** |
| | After 15 days | 2.348 | 0.309 | 5.070 | 0.240 | 0.319 | 0.572 |
| | Overall 31 days | 0.713 | 0.700 | 2.198 | 0.333 | 0.971 | 0.325 |
| II | Before 30 days | 0.101 | 0.951 | 0.173 | 0.677 | 1.874 | 0.171 |
| | After 30 days | 0.771 | 0.680 | 0.161 | 0.688 | 1.211 | 0.271 |
| | Overall 61 days | 0.713 | 0.700 | 0.000 | 0.996 | 0.013 | 0.910 |
| III | Before 60 days | 0.224 | 0.894 | 4.111 | 0.128 | 4.111 | 0.128 |
| | After 60 days | 1.501 | 0.472 | 5.828 | 0.054 | 0.012 | 0.913 |
| | Overall 121 days | 1.707 | 0.426 | 0.865 | 0.649 | 0.154 | 0.695 |

*Source: Estimation output form EViews 9.0*

*Note: ** denotes 5% level of significance.*

In Table - 8 Columns 3 and 4 explains the Wald Statistics and its null hypothesis is there is no short run association between the vectors. The Wald Statistics tested using the combination of differenced values and one lagged difference value of SSE Composite on NIFTY'S differenced value. Form the Wald Statistics Chi-square and p-value results we can conclude that there is no significant difference, so we cannot reject the null hypothesis. Therefore, from results we can infer that there are no short run association between the SSE Composite and NIFTY 50 for the chosen event windows.

If a model to be perfect fit it should be free from the Serial Correlation and the ARCH effect. So, the Columns 5 and 6 represents the Serial Correlation and the Columns 7 and 8 represents the ARCH effects in the event windows of Table - 8.

The first fitness test is to check for the absence of Serial Correlation. The null hypothesis in this test is that there is no Serial Correlation. Column 6 represents the p-value of Serial Correlation and the null hypothesis cannot be rejected, thus making the series free from Serial Correlation.

Then the next test run is to check the absence of heteroscedasticity. This is done using the BPG test statistic for ARCH effects. The null hypothesis is there is no ARCH effect in the series. Column 8 represents the p-values of ARCH effect and the model is free from any ARCH effects. Hence, it can be said that the VECM is best suitable for obtaining information about the long run and short run association between the co-integrating vectors. The models adopted for the test are found to be perfect as these models are free from serial correlation and ARCH effect.

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## Conclusion

this study delves into the intricate dynamics of the Indian and Chinese stock markets, exploring their co-movements, integration, and causal relationships. The comprehensive analysis covers three distinct phases surrounding the significant event of China's currency devaluation in 2015. The research contributes to the existing literature by offering a detailed examination of the interplay between these two major Asian markets. The literature review establishes a foundation by reviewing previous studies on the integration of various global stock markets, providing context for the current investigation. The study employs rigorous econometric tools, including the Augmented Dickey-Fuller Test, Johansen's Cointegration Test, Granger Causality, and Vector Error Correction Method (VECM), to analyze daily closing prices of NIFTY 50 and SSE Composite. The choice of lag selection using AIC and SIC criteria enhances the robustness of the results. The findings suggest a significant negative correlation between the NIFTY 50 and SSE Composite, indicating a synchronized movement between these indices. The cointegration tests reveal a long-term association, emphasizing a shared stochastic trend and proportional growth. Granger Causality tests provide insights into the direction of influence, with unidirectional and bidirectional causality identified in different event windows. Furthermore, the Vector Error Correction Method (VECM) adds depth to the analysis by examining short-run associations and providing information about the speed of convergence. The results imply bidirectional causality, indicating an efficient flow of information between the Indian and Chinese markets.

Despite the complexity and volatility observed during specific event windows, the study contributes valuable insights into the interdependence and integration of these markets. The findings have implications for policymakers, investors, and market participants seeking to navigate the interconnected landscape of global financial markets. The study enhances our understanding of the intricate relationships between major Asian stock markets, shedding light on how they respond to critical events and evolve over time.

### Author's Contribution

S. Vevek, research scholar, conceived the research idea, designed the study methodology, and was primarily responsible for writing the manuscript. M. Selvam, the research supervisor, provided continuous guidance throughout the study, including the development of the research framework, data analysis, and interpretation of results. S. Ganapathy, the co-guide, played a pivotal role in refining the research approach, reviewing the manuscript, and offering valuable insights during the research process. All authors contributed significantly to the final manuscript and have approved its content.

## References

Arshanapalli, B., Doukas, J., & Lang, L. H. P. (1995). Pre and post-October 1987 stock market linkages between U.S. and Asian markets. Pacific-Basin Finance Journal, 3(1), 57-73. https://doi.org/10.1016/0927-538X(94)00025-3

Chan, K. (1992). A Further Analysis of the lead-lag relationship between the cash market and stock index futures market. Review of Financial Studies, 5(1), 123-152. https://doi.org/10.1093/rfs/5.1.123

Chung, P. J., & Liu, D. J. (1994). Common stochastic trends in pacific rim stock markets. The Quarterly Review of Economics and Finance, 34(3), 241-259. https://doi.org/10.1016/1062-9769(94)90026-4

DeFusco, R. A., Geppert, J. M., & Tsetsekos, G. P. (1996). Long-run diversification potential in emerging stock markets. Financial Review, 31(2), 343-363. https://doi.org/10.1111/J.1540-6288.1996.TB00876.X

Ghosh, M. (2000). Cointegration tests and spatial integration of rice markets in India. Indian Journal of Agricultural Economics, 55(4), 616-626.

Hakkio, C. S., & Rush, M. (1991). Cointegration: How short is the long run? Journal of International Money and Finance, 10(4), 571-581. https://doi.org/10.1016/0261-5606(91)90008-8

Hung, B. W.S., & Cheung, Y.L. (1995). Interdependence of Asian emerging equity markets. Journal of Business Finance & Accounting, 22(2), 281-288. https://doi.org/10.1111/J.1468-5957.1995.TB00684.X

Janakiramanan, S., & Lamba, A. S. (1998). An empirical examination of linkages between Pacific-Basin stock markets. Journal of International Financial Markets, Institutions and Money, 8(2), 155-173. https://doi.org/10.1016/S1042-4431(98)00029-8

Masih, A. M. M., & Masih, R. (1997). A comparative analysis of the propagation of stock market fluctuations in alternative models of dynamic causal linkages. Applied Financial Economics, 7(1), 59-74. https://doi.org/10.1080/096031097333853.

Vevek, S., & Selvam, D. M. (2021). Modelling on volatility of Indian macroeconomic indicator-Nifty. Empirical Economics Letters, 20(3), 79-92.

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https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5628
Masih, A. M. M., & Masih, R. (1999). Are Asian stock market fluctuations due mainly to intra-regional contagion effects? Evidence based on Asian emerging stock markets. Pacific-Basin Finance Journal, 7(3-4), 251-282. https://doi.org/10.1016/S0927-538X(99)00013-X

Vevek, S., Selvam, M., & Sivaprakkash, S. (2022). The persistence of volatility in nifty 50. Indian Journal of Research in Capital Markets, 9(2-3), 8-18.

Masih, R., & Masih, A. M. M. (2001). Long and short term dynamic causal transmission amongst international stock markets. Journal of International Money and Finance, 20(4), 563-587. https://doi.org/10.1016/S0261-5606(01)00012-2

Sheng, H. C., & Tu, A. H. (2000). A study of cointegration and variance decomposition among national equity indices before and during the period of the Asian financial crisis. Journal of Multinational Financial Management, 10(3-4), 345-365. https://doi.org/10.1016/S1042-444X(00)00034-7