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Stock market linkages in Asia. Revisiting Granger causality evidences

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Abstract. *In this research, using the most recent daily stock index data of Japan, Singapore, South Korea, India and China, we revisit the financial integration in Asia. The study applies Granger causality and Impulse Response Function to analyse the pattern of equity market integration in the region. The findings of the study reveal that price convergence among Asian stock markets is still relatively weak. In general, causality is unidirectional and existing among most markets with short-lived impacts. The asymmetrical price behaviour of Asian markets has implications for the pricing efficiency of national markets and suggests many opportunities for global investors to optimize returns through market diversifications on a long-term perspective.*

Keywords: stock market integration; Granger causality, variance decompositions, impulse responses, portfolio diversifications.

JEL Classification: C58, D53, G12.

Introduction

Globalisation, Liberalization and deregulation of global capital markets and revolutionary changes in the form and character of financial transactions encourage economies to receive an increasing amount of capital inflows (Agenor, 2003, pp. 1089-1118). Analytical arguments claiming stock market integration hovers around the benefits of international risk diversification, domestic investment and growth, and enhanced macroeconomic efficiency. Additionally, financial liberalization contributes significantly to augment the global transmission of volatility and the risk of contagion across countries (Ben Rejeb and Boughrara, 2015, pp. 161-179).

Research investigating financial market integration is not a recent origin in economic literature. Earlier, empirical studies investigating stock market integration were mainly limited to developed markets. The focus, in many cases, was to demonstrate how the volatility of the U.S. stock market transmitted to other developed markets. The pioneering work of this kind is Grubel (1968, pp. 1299-1314) that brilliantly explained the benefits of international diversifications to global investors. Dumas and Solnic (1995, pp. 445-479), Brooks and Del Negro (2004), and Aggarwal and Kyaw (2005, pp. 393-406) produced further pieces of evidence on the financial market integration in developed world. Later, the researchers were very keen to examine the integration of emerging markets with the global markets. Studies like Bruner et al. (2008, pp. 89-103), Srivastava et al. (2015, pp. 1127-1142) and Boamah (2017, pp. 683-707) produce shreds of evidence on the effects of financial integration from developed markets to developing or emerging markets. The market segmentation tends to be more significant for emerging markets than for developed markets, which tend to decline over time (Korajczyk, 1996, pp. 267-289). Even though emerging market equity returns are highly volatile, they are only slightly correlated with equity returns in the developed world, making it possible to build low-risk portfolios. (Majid et al., 2008, pp. 201-225). Stock prices in specific emerging markets from east Asia are sensitive to Europe and U.S. stocks as the European and U.S. investors were actively investing in their stock markets (Tadaaki, 2016). Conversely, the closely linked markets of the developed and emerging world put a cap on the diversification potentials for global investors (Pretorious, 2002, pp. 84-105).

Now, there is a growing body of academic literature explaining the integration of stock markets at the regional level. The researchers have documented varying degree of integrations for different regions. The empirical works of Bley (2009, pp. 759-776), and Sehgal et al. (2016) reveal the diverging evidence of financial market integration in Europe. Similarly, Lahrech and Sylwester (2011, pp. 94-108), and Eyraud et al. (2017) examine the scope for global and regional financial integration in Latin America and quantifies the potential macroeconomic gains that such integration could bring to the region. Gilmore et al. (2004), Aggarwal and Kyaw (2005, pp. 393-406), and Lahrech and Sylwester (2013, pp. 1341-1357) find the evidence of increased financial integration and co-movement in NAFTA equity markets after the passage of the economic partnership. Other empirical works examining regional market integration include Yu and Hassan (2008, pp. 482-504) and Bakry and Almohamad (2018) for the MENA region.

Asian stock markets are increasingly integrating in recent years (Chien et al., 2015, pp. 84-98). Although the equity market integration for major Asian regions is not extensive in literature, there are a handful of studies have assessed regional stock integration of Asian countries. The dynamics of regional integration in Asian financial markets play a crucial role in asset allocation and risk management in the region (Saji, 2014, pp. 83-93; Sehgal et al., 2018, pp. 674-735). Trade linkages and stock market development promote Asia's regional stock market integration but not its global integration (Caporale et al., 2019). Park (2013) measured the degree to which volatility in equity and bond-market returns at regional and global levels spills over into emerging Asia. The improvements in the regulation of financial markets in Asia could make better the role of stock markets as stable and reliable sources of financing into the future (Lipinsky et al., 2014, pp. 201-225). However, the empirical studies like Ali et al. (2014, pp. 2762-2771), Singhania and Prakash (2014, pp. 154-169) and Saji (2021a, pp. 1651-1671) found weak or little evidence for the hypothesis of market integration. Saji (2021b) found significant relations among stock price decreases of some Asian markets after global financial crisis, while the long-run relations among price increases are almost absent during the period.

Cointegration is the basic methodology in most studies investigating the extent to which the markets in the Asian region are interdependent with each other (see Masih and Masih 2001, pp. 563-587; Srivastava et al., 2015, pp. 1127-1142). Other related studies like Janakiramanan and Lamba (1998, pp. 155-173) Yang et al. (2002, pp. 477-486), Zhang et al. (2004, pp. 447-458), Kim and Shamsuddin (2008, pp. 518-532), Karim and Karim (2012, pp. 21-41), and Hung (2019, pp. 21-40) employ Vector Auto Regression (VAR) techniques, including cointegration, Granger causality, impulse response analysis, and forecast error variance decomposition.

In terms of integration, previous studies offer mixed empirical evidence concerning long-run and short-run integration. Furthermore, many of them have focused on a specific region like ASEAN or SAARC while selecting the markets for study. Only limited studies have investigated the linkages between the leading stock markets of the Asian region. Thus, this topic of Asian stock market integration is still open for further examination. Hence, our research aims to investigate the relevance of stock market integration in the context of major Asian markets and to examine whether it affects the potentials of diversifying investment risks. Accordingly, the incremental relevance of our research is twofold. The first is the markets that have chosen for the study. Unlike previous studies, giving representation to the economically up-and-coming economies from Asia, we revisit the issue of stock market integration among significant markets of South and North-East Asia. Such kind of analysis expects to provide compelling insights on portfolio choices to global investors who favor the major stock markets of Asia as their destinations. Second is the use of high frequency data for a longer period, which is from September 1999 to October 2019. The period covered in the previous studies is not much extensive and covered relatively a short period of 5 to 10 years, mostly focusing the period of Asian crisis or global financial crisis. We examine the price integration in this research covering a more extended period of 20 years spanning over different episodes reflecting many attributes of the Asian economy. Our sample period takes in the capital market boom in the region before the global financial crisis, distressed investment conditions due to recessionary pressures, gradual recoveries during resilience and the period of regained momentum in the latter days. One can observe significant price shifts in the Asian stock market during those periods that provide a completed trading cycle covering books and busts. The findings based on the long time series analysis of price integration under a distinctive market setting goes clearly beyond the existing literature on the subject matter in the Asian region.

The rest of the paper is organized as follows. Next section describes the data selection and provides details on the methodological framework and estimation procedure pursued. Section 3 reports and discusses the empirical evidence before we conclude the research with the summary of our findings, policy implications and potentials for further research in Section 4.

Data and methodology

Data

The data include daily closing stock index values for five leading national equity markets from Asia-India, Singapore, Japan, South Korea and China has been collected for the period 1999-2019. BSE Sensex, FTSE Straits Times Index, JASDAQ Stock Index, KOSPI Composite Index and Shanghai Composite Index are proxy indices for respective countries. We obtain all the data from the websites of the respective markets. The Straits Times Index is available only from September 1999; otherwise, our time-series data would have been much longer than the current data. As local currency movements against the US dollar would have affected returns of the local equity indices. Therefore, to capture the most accurate market movements, all price indices are denominated in the local currency. We compute the daily percentage change of stock prices using the conventional method of log-transformation of price series.

Methodology

This research measures the co-movement of stock prices in the Asian region. The relationship between stock prices is either long term or short term, and our research aims to assess the dynamics of market integration in terms of prices. Precisely, we are looking into the direction of causal linkages among the five Asian equity markets. Accordingly, our empirical design based on the causality test proposed by Granger (1969, pp. 424-438).

Unit Root test

By definition, causality presupposes that the variables are at the same order of integration (Brooks, 2008). Hence, the first step is to examine each variable to find out its order of integration. The ADF test checks the number of unit roots (if any) in each of the return variables. ADF is a parametric method for controlling higher-order correlation by assuming that the series follows an AR (p) process (Dickey and Fuller 1979, 1981). Augmented Dickey-Fuller test procedure needs to run a regression of the first difference of the series against the series lagged once, lagged difference terms and a constant with a time trend such as:

$$\Delta Y_t = \lambda Y_{t\text{-}i} + \sum_{i=1}^{m} \beta_i \Delta Y_{t\text{-}i} + \emptyset_0 + \varepsilon_t \quad (1)$$

Where Δ is the first difference operator, $\mathbf{e_t}$ is an error term, and **m** is the number of lagged first differenced term and is determined such that $\mathbf{e_t}$ is approaching white noise.

Granger causality

We employ Granger causality test suggested by (Granger, 1969, pp. 424-438) to the test cross-covariance in prices among Asian stock markets. The Granger causality test in our research estimates short-run causality between stock price series and decides whether one price series (X) is useful in the prediction of the other (Y). If the values of X carry statistically significant information content about the future values of Y, then we infer that the time series X Granger-cause Y. Granger causality test for the stock price series involves as a first step estimation with the following equations:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{k} \alpha_1 \Delta Y_{t-i} + \sum_{i=1}^{k} \alpha_2 \Delta x_{t-i} + \varepsilon_{1t} \quad (2)$$

$$\Delta X_t = \beta_0 + \sum_{i=1}^{k} \beta_1 \Delta Y_{t-i} + \sum_{i=1}^{k} \beta_2 \Delta x_{t-i} + \varepsilon_{2t} \quad (3)$$

Where Y_t and X_t are stock price series, Y_{t-i} and X_{t-i} are the lagged variables vectors, matrices α and β are to be estimated, and ε_t is uncorrelated white-noise error terms. While applying Granger causality, we assume that Y and X are not cointegrated. If the α_2 is statistically different from zero for different lags, then we reject the absence of Granger causality and infer that X granger causes Y. If the $\beta_1$is statistically significant the direction of causality is from Yto X. If both terms are significant, then we can infer that there exists bidirectional causality between stock price series.

Results and discussions

Summary statistics

Table 1 explains the statistical moments of daily stock returns in percentage terms. For the whole sample period, the performance of Asian markets in terms of returns is positive. Indian stock market outperforms all the other markets, while the Singapore stock market supplies the lowest returns to its investors. During this period, the Chinese and South Korean markets produce more or less similar returns. The Japanese market delivers modest returns, slightly lower than that of Chinese and South Korean markets.

Table 1. *Summary statistics of Asian Stock returns*

Predictors	Mean	S.D	C.V	Skewness	Kurtosis
Sensex	1.076	6.467	6.041	-0.142	1.669
Strait	0.312	5.268	16.904	-0.532	3.053
Jasdaq	0.495	6.484	13.095	0.222	1.033
Kospi	0.549	6.314	11.492	-0.059	1.393
Shanghai	0.535	7.578	14.172	-0.090	1.425

Source: Author's compilations.

The return volatility heads higher in China, while the same is lower in Singapore. The fluctuations in stock return from Japanese, Indian, and Korean markers are at a nearly equal rate during this period. Also, in terms of risk-adjusted return (average stock return adjusted to standard deviation), we find the Indian stock market as the best performer, whereas the Singapore market posits last in the row. Skewness and kurtosis measures give insights about the underlying statistical distribution of stock returns. It is evident that skewness is negative for all markets except Japan, and kurtosis is positive for all five markets during the period. Their return distributions are almost symmetrical as in none of the cases we find the extreme skewness. However, both the skewness and the kurtosis measures about the Singapore stock market are significantly different from those of other markets. Thus, the regional markets in India, Japan, Korea and China reveal more or less a similar pattern of return distributions. Nevertheless, the more significant deviation of kurtosis measures from the standard value of 3, implying that stock returns differ significantly from the normal distribution. Alternatively, this reveals that in each stock market, there exist potentials for investors to gain from abnormal price behaviour.

Unit Root test results

Most macroeconomic series, including stock prices, are trended and therefore, in most cases are non-stationary (Asteriou and Hall, 2011). The main problem with non-stationary or trended data is that the standard regression procedures can quickly produce misleading results. Hence, causality tests assume stationary or the presence of random behaviour of the series, the study checked the order of integration at first with ADF estimates, which we reported in Table 2.

Table 2. *Unit root test results*

Level	(with trend and intercept)		First Difference (with trend and intercept)	
Variables	Test Statistic	P-value	Test Statistic	P-value
Sensex	-2.8868	0.1687	-8.3393	0.0000*
Strait	-3.3143	0.0639	-9.6152	0.0000*
Nasdaq	-2.0734	0.5598	-9.0755	0.0000*
Kospi	-2.3984	0.3794	-15.7250	0.0000*
Shanghai	-4.0806	0.0067*	-5.9082	0.0000*

*Significant at one per cent level.
Source: Author's compilations.

The results of the Augmented Dickey-Fuller (ADF) unit root test indicate that each of series in their level form is non-stationary with the presence of a deterministic trend and an intercept. However, first differencing the series removes the non-stationary components in all cases, and we reject the null hypothesis of non-stationary at 1% significance level, suggesting that all our variables are first-order integrated. We treat the variables as I(1) process and now proceed with the causality analysis.

Granger causality

The stock market integration often implies that bidirectional causality exists between the return series. The underlying principle of causality is that the persistence of the dependent returns structure in markets. For this reason, the study now tests the presence of short-run causality between return series. Causality in econometric refers more to the ability of one variable to predict the other. We use the relatively simple test of causality suggested by Granger (1969, pp. 424-438) to investigate the direction of causality between the return series. Table 3 reports the causality test results.

Table 3. *Granger causality test results*

Direction of Causality	F	P-value	Direction of Causality	F	P-value
Sensex causes Strait	4.338	0.014**	Shanghai causes Kospi	5.342	0.005*
Sensex causes Shanghai	0.102	0.902	Shanghai causes Jasdaq	0.962	0.580
Sensex causes Kospi	3.776	0.024**	Kospi causes Sensex	6.898	0.001*
Sensex causes Jasdaq	0.472	0.624	Kospi causes Strait	0.560	0.571
Strait causes Sensex	5.776	0.003*	Kospi causes Shanghai	1.086	0.339
Strait causes Shanghai	0.253	0.776	Kospi causes Jasdaq	4.730	0.009*
Strait causes Kospi	0.867	0.422	Jasdaq causes Sensex	0.590	0.555
Strait causes Jasdaq	3.281	0.039**	Jasdaq causes Strait	1.4601	0.234
Shanghai causes Sensex	9.305	0.000*	Jasdaq causes Shanghai	0.5444	0.580
Shanghai causes Strait	3.799	0.023**	Jasdaq causes Kospi	0.6398	0.528

*Significant at one per cent level.
**Significant at five per cent level.
Source: Author's compilations.

For the stock return data of Indian and Singapore markets, the null hypothesis that Sensex does not Granger-cause Strait and Strait does not Granger-cause Sensex have consistently rejected at 5% significance level. Similarly, the null hypothesis that Sensex does not Granger-cause Kospi and Kospi do not Granger-cause Sensex have rejected at the same level. The results of causality tests on the remaining return series produce mixed results. While Chinese market, Shanghai, causes other Asian markets (except Japan), at 1% or 5% significance level, the research could not produce the evidence of reverse causality at any level among them. We can observe only unidirectional causality running from Strait to Jasdaq and Kospi to Jasdaq, while the Japanese stock returns are neither influencing nor influenced by the price movements in major developed Asian market of China. A close observation reveals that the price movements in none of the Asian markets affect the Chinese stock market despite the latter emerge out as the predictors of Asian stock returns. This finding designates an asymmetry among stock market performance in the Asian continent that ultimately signals the weak integration with the scope of profit-making using arbitrage strategies for the investors of Asian stock markets.

Impulse responses of Asian stock return series

Additionally, Impulse Response Function (IRF) and Variance Decomposition can explain the full dynamics of the VAR system. Impulse responses trace out the responsiveness of the dependent return series in the VAR to shocks to each of the return series. Figure 1 to Figure 10 provide the impulse responses of the five stock return series for the one unit SD innovation in their own as well as other return series during the period of observation. With a positive innovation in Singapore, Chinese and South Korean return series, the response of Sensex is positive and significant during the period of analysis (Figure 1, Figure 2 and Figure 3). However, the response is slightly higher and last up to 4 days towards Chinese returns (two days more than that of other two series) beyond which, the shock works its way out of the system.

Figure 1. *Impulse responses of Sensex to Cholesky One S.D Strait Innovations and Strait to Cholesky One S.D Sensex Innovations*

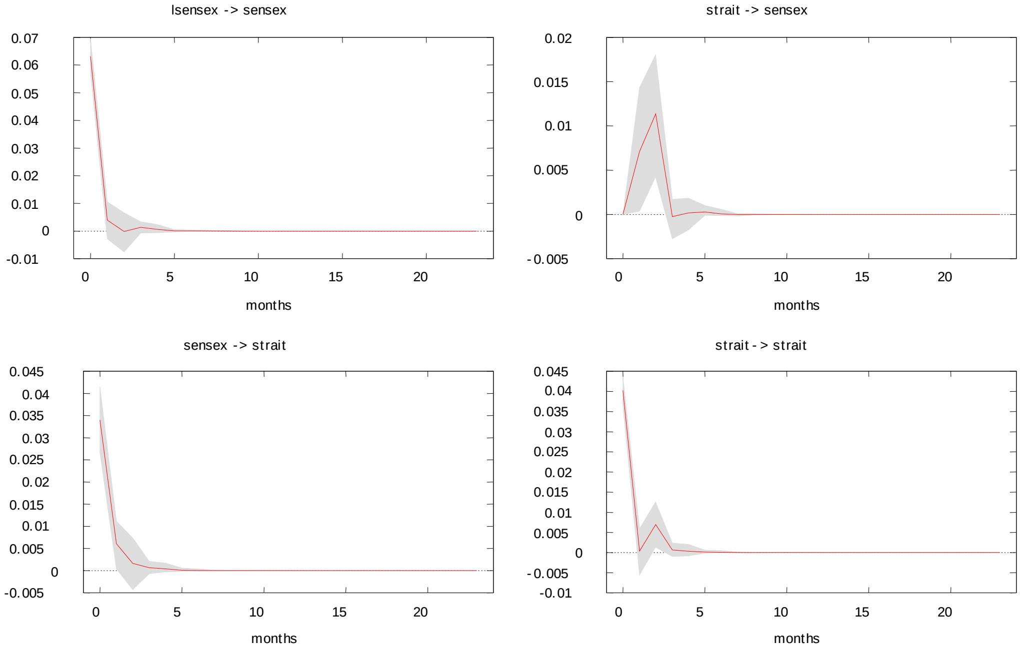


Figure 2. *Impulse responses of Sensex to Cholesky One S.D Shanghai Innovations and Shanghai to Cholesky One S.D Sensex Innovations*

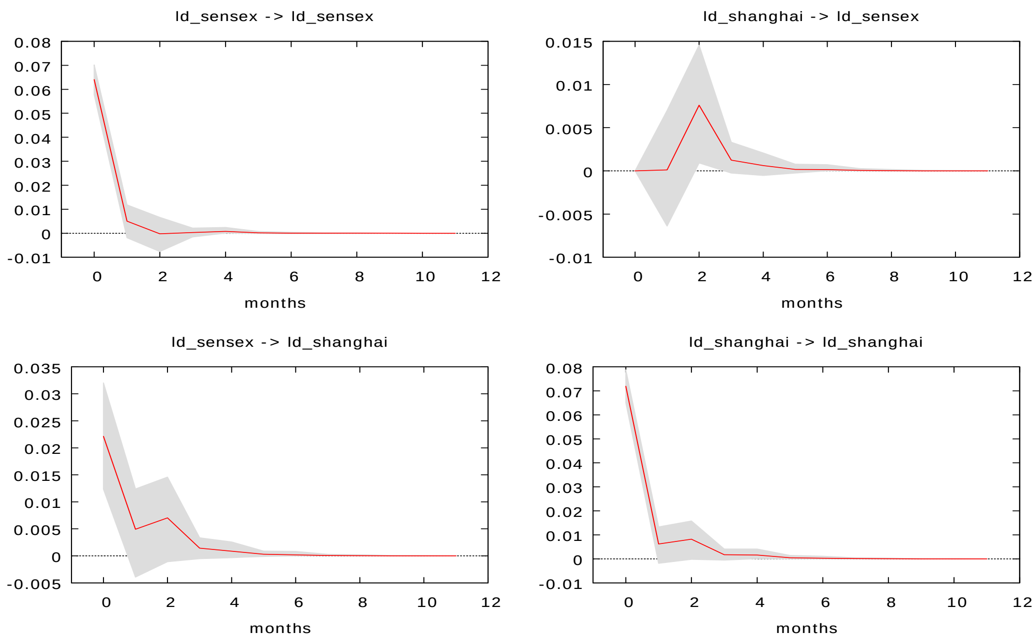


Figure 3. *Impulse responses of Sensex to Cholesky One S.D Kospi Innovations and Kospi to Cholesky One S.D Sensex Innovations*

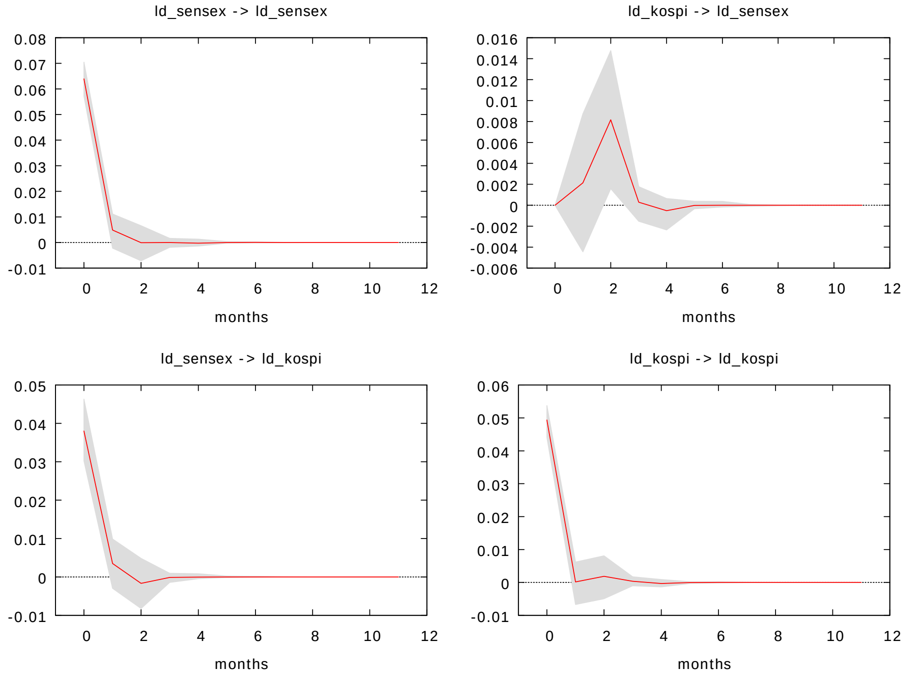


Figure 4. *Impulse responses of Sensex to Cholesky One S.D Jasdaq Innovations and Jasdaq to Cholesky One S.D Sensex Innovations*

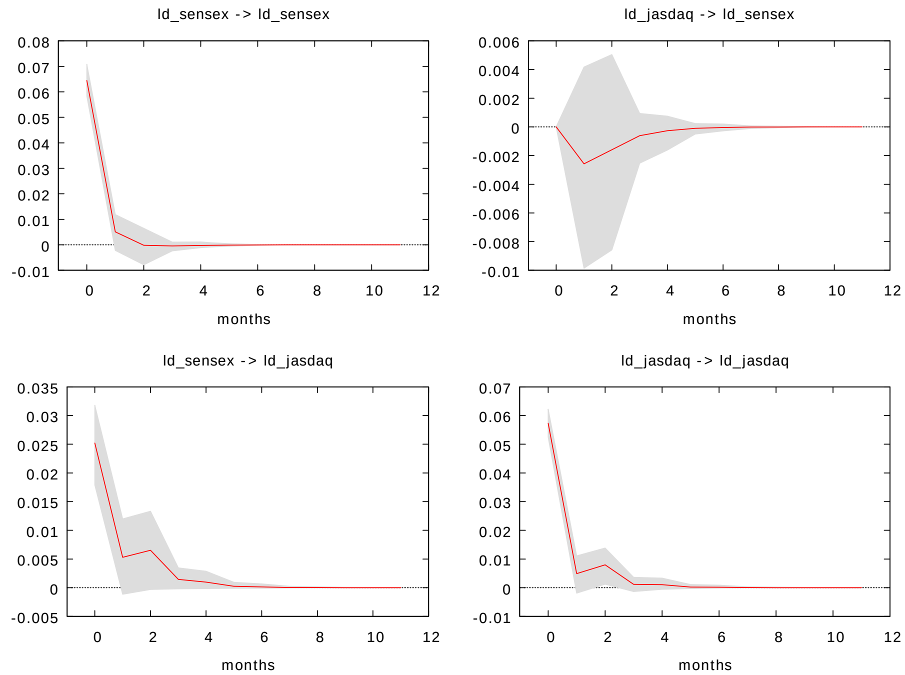


Figure 5. *Impulse responses of Strait to Cholesky One S.D Shanghai Innovations and Shanghai to Cholesky One S.D Strait Innovations*

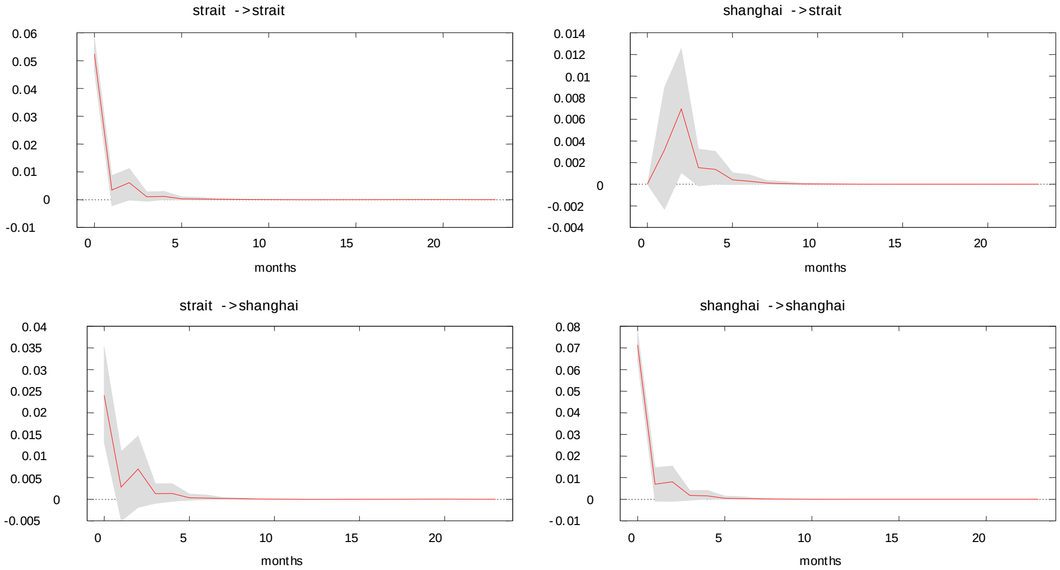


Figure 6. *Impulse responses of Strait to Cholesky One S.D Kospi Innovations and Kospi to Cholesky One S.D Strait Innovations*

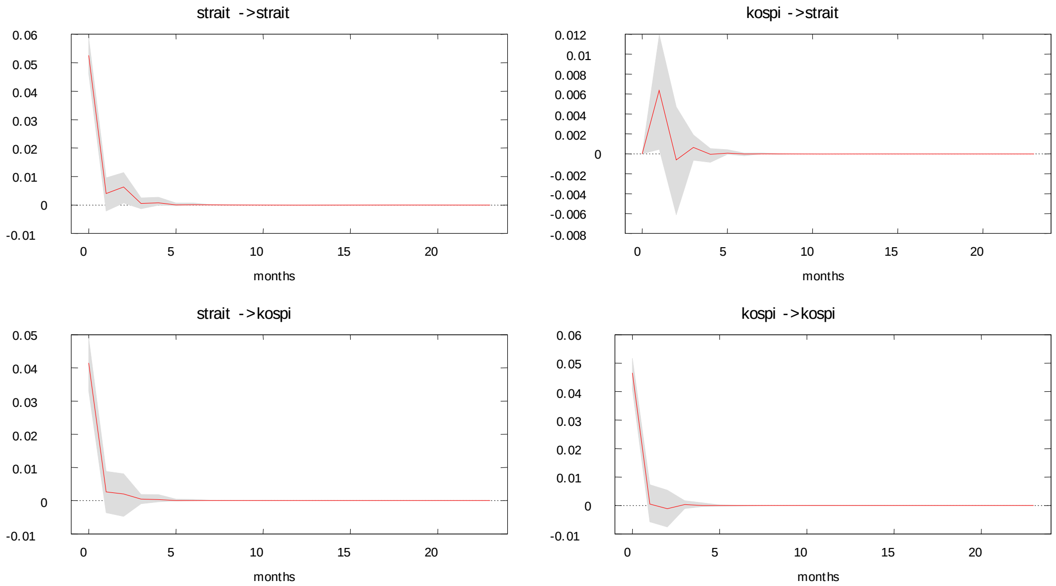


Figure 7. *Impulse responses of Strait to Cholesky One S.D Jasdaq Innovations and Jasdaq to Cholesky One S.D Strait Innovations*

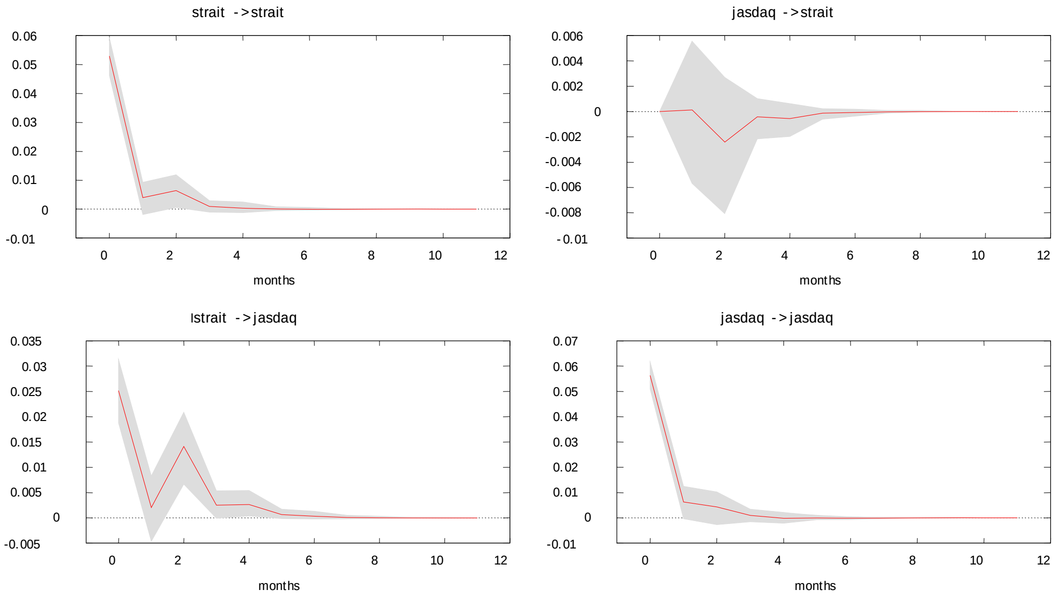


Figure 8. *Impulse responses of Kospi to Cholesky One S.D Shanghai Innovations and Shanghai to Cholesky One S.D Kospi Innovations*

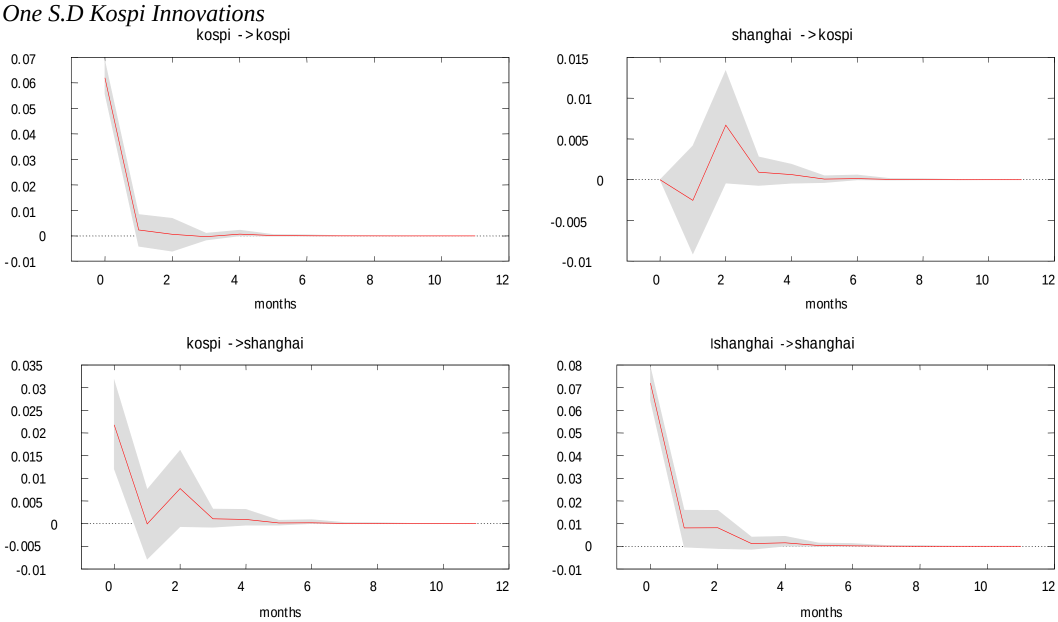


Figure 9. *Impulse responses of Jasdaq to Cholesky One S.D Kospi Innovations and Kospi to Cholesky One S.D Jasdaq Innovations*

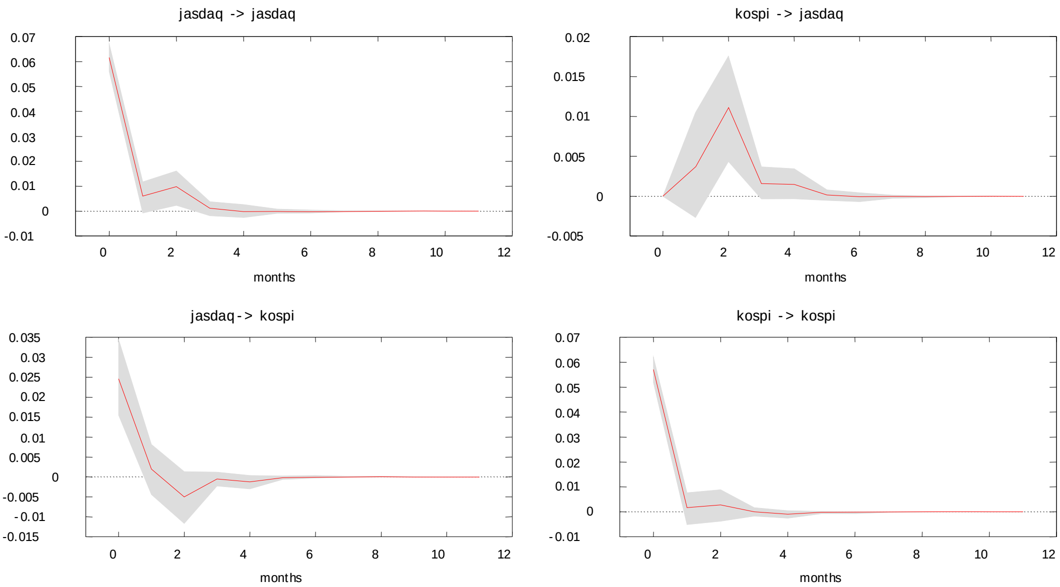
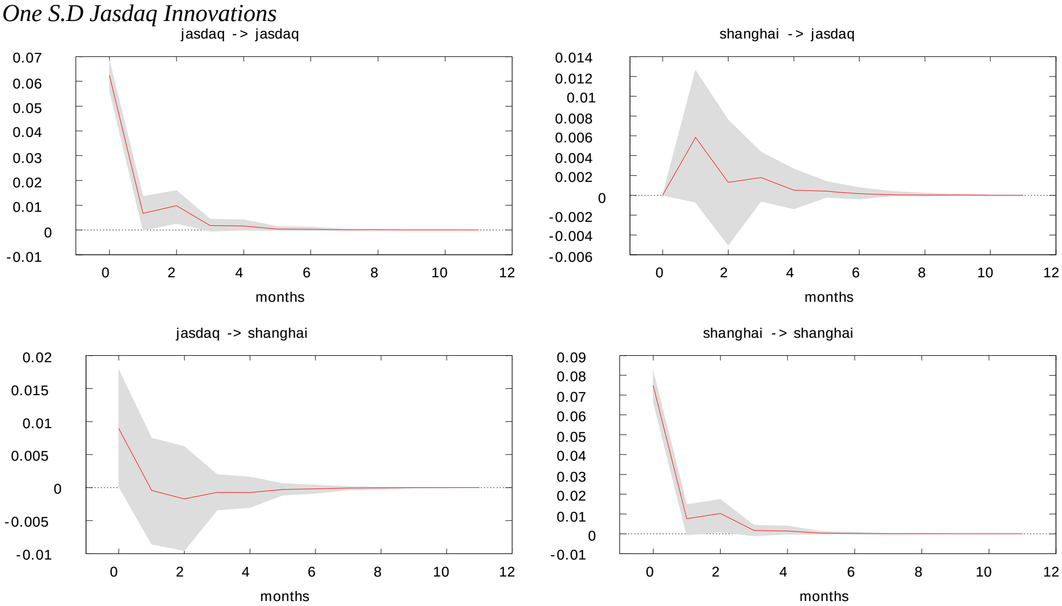


Figure 10. *Impulse responses of Jasdaq to Cholesky One S.D Shanghai Innovations and Shanghai to Cholesky One S.D Jasdaq Innovations*



Moreover, Impulse Response Functions confirm that the Indian stock return response to its shock is both significant and positive. The innovations of Singapore stock returns to Chinese and Indian stock returns are positive, and the effect of the shock dies down, after 2 to 3 days. A one standard deviation impulse in the Korean return's innovation has a positive and significant effect on Indian and Japanese stock returns. However, its effect is short-term and last mostly up to the 3rd day. Beyond that, the shock appears to have worked its way out of the system. With a positive innovation in Singapore stock returns, the response of Japanese stock prices is partially negative. The effects start after a lag of one day and fade off after the third day. The responses of stock returns to their shock are both significant and positive throughout the period.

Variance decompositions

The study adopts variance decomposition to investigate further the price interactions between the Asian stock markets. Variance decompositions offer a slightly different method for examining VAR system dynamics. They differentiate the reaction of the stock prices in a specific market towards their shocks and the price shocks in other Asian markets. The variables follow Cholesky factorization, and we report the results in Table 4. The columns in the table explain the percentage of forecast variance of a return series due to its innovation and innovation in the VAR system. However, both impulse responses and variance decompositions are notoriously difficult to interpret accurately (Brooks 2008).

Table 4. *Variance decomposition of returns*

Sensex								
Period	Own	Strait	Own	Shanghai	Own	Kospi	Own	Jasdaq
2	58.2833	41.7167	99.9997	0.0003	99.9586	0.0414	99.8414	0.1586
3	57.5217	42.4783	98.6192	1.3808	98.8460	1.1540	99.7806	0.2194
4	58.1838	41.8162	98.5823	1.4177	98.1346	1.8654	99.7717	0.2283
5	58.1810	41.8190	98.5738	1.4262	98.0490	1.9510	99.7700	0.2300
6	58.1794	41.8206	98.5732	1.4268	98.0474	1.9526	99.7697	0.2303
Strait								
Period	Own	Sensex	Own	Shanghai	Own	Kospi	Own	Jasdaq
2	83.7880	16.2120	99.6422	0.3578	98.5662	1.4338	99.9995	0.0005
3	83.2955	16.7045	97.9577	2.0423	98.5737	1.4263	99.7953	0.2047
4	82.6846	17.3154	97.8785	2.1215	98.5595	1.4405	99.7890	0.2110
5	82.6474	17.3526	97.8154	2.1846	98.5597	1.4403	99.7787	0.2213
6	82.6331	17.3669	97.8099	2.1901	98.5595	1.4405	99.7780	0.2220
Shanghai								
Period	Own	Sensex	Own	Strait	Own	Kospi	Own	Jasdaq
2	91.3564	8.6436	89.8228	10.1772	91.6002	8.3998	98.5882	1.4118
3	91.0280	8.9720	89.7850	10.2150	91.6960	8.3040	98.5988	1.4012
4	90.3592	9.6408	89.1465	10.8535	90.8561	9.1439	98.5735	1.4265
5	90.3325	9.6675	89.1267	10.8733	90.8413	9.1587	98.5652	1.4348
6	90.3249	9.6751	89.1036	10.8964	90.8308	9.1692	98.5561	1.4439
Kospi								
Period	Own	Sensex	Own	Strait	Own	Shanghai	Own	Jasdaq
2	59.9287	40.0713	55.7488	44.2512	99.8322	0.1678	84.3130	15.6870
3	59.8526	40.1474	55.6534	44.3466	98.6926	1.3074	84.2387	15.7613
4	60.0290	39.9710	55.6101	44.3899	98.6716	1.3284	83.7264	16.2736
5	60.9718	39.0282	55.6085	44.3915	98.6618	1.3382	83.7215	16.2785
6	61.1125	38.8875	55.6069	44.3931	98.6617	1.3383	83.6928	16.3072
Jasdaq								
Period	Own	Sensex	Own	Strait	Own	Shanghai	Own	Kospi
2	98.7557	1.2443	83.3859	16.6141	99.1430	0.8570	99.6440	0.3560
3	95.7064	4.2936	83.4680	16.5320	99.1217	0.8783	96.6360	3.3640
4	95.7069	4.2931	79.4545	20.5455	99.0440	0.9560	96.5781	3.4219
5	95.7065	4.2935	79.3326	20.6674	99.0380	0.9620	96.5265	3.4735
6	95.7045	4.2955	79.1944	20.8056	99.0337	0.9663	96.5259	3.4741

Source: Author's compilations.

The result of Variance Decompositions substantiates the findings and inferences made by the Impulse Response graphs of specific stock return series to the price variations in other stock markets in the sample. The analysis shows that domestic stock returns of each Asian country respond rightly to its innovations, but the effects alleviate over time. Even though the shocks of innovations in domestic stock returns tend to be low at the immediate lag, the effect is improving over time. Regarding Indian stock returns, Singapore is the major source of variations from external markets. When Indian stock returns explain, about 58 per cent of its forecast error variance, Strait index return explains almost 42 per cent of the variations in the Sensex return. The shocks of innovations in Chinese and Korean markets are within a range of 1 to 2 per cent, while the Japanese market affects the least on Indian stock returns. Indian stock returns explain about 16 per cent variations in Singapore stock returns, which is significantly lower than the effect in reverse direction. Strait index return has a more or less similar dependence on the South Korean and Chinese markets. Indian, South Korean and Singapore stock returns each explain about 10 per cent of the variance in Chinese stock returns, the influence of the Japanese market is marginal. Singapore and Indian markets account for the bulk variations in the South Korean market, while the influence of the Japanese market is about 10 per cent. Finally, for the Japanese stock returns, only the Singapore market plays a significant role, and its effect is within the range of 16 to 20 per cent.

Interestingly, the Singapore return series is most dominant for the variations in Indian and Korean stock returns. The Japanese market is also under the significant influence of Singapore stock returns. For Singapore and South Korean market, the price movement in Indian market does matter while Chinese and Japanese markets are somewhat decoupled from the price variations in other Asian markets. Such kind of observations, are somewhat against the claim of Caporole et al. (2019) regarding the role of stock market development in Asia in promoting their integration in the region.

Conclusion

This research examined the evidence of the financial integration among select Asian markets during the period 1999-2019. The causality analysis offers significant evidence on the nature and degree of integration among five prominent stock markets from the Asian continent. Empirical evidence produced in this study challenges the findings of previous research on the active financial integration among Asian markets. In many cases, the causality is unidirectional and is short-lived. Illustratively, the Indian market is integrated with other Asian markets (except Jasdaq), despite such price relationship showed a short-term trend. The Chinese market is almost decoupled from the other markets, but it appeared to be a strong predictor of stock price movement in the Asian region. The price movement in Korean and Singapore markets have somewhat influenced the Japanese stock returns, while there was no evidence of reverse causality.

To repeat, there are significant differences in the response of stock markets across the sample, and in most cases, the integration is of short-term nature and only in exceptional cases; the analysis finds the evidence of long-run causality among markets. The lack of strong long-term integration between the markets may be due to 'national idiosyncrasies such as heterogeneous taxation structures, and differing investment cultures and macroeconomic policies between nations, which imply that most Asian markets operate largely independently of one another. The asymmetrical price behaviour among Asian markets has implications for the pricing efficiency of national markets and suggests many opportunities for global investors to optimize returns through market diversifications on a long-term perspective. Thus, our findings agree with the observations of Yang et al. (2003); and Sehgal et al. (2018, pp. 674-735) concerning the critical role of Asian financial markets in asset allocation and risk management for global investors.

The findings of this research deserve significance in many policy responses toward wealth management. From a strategic perspective, the loosely integrated stock markets can contribute to the profit potentials as they deviate significantly from the long-run equilibrium path. From the perspective of the portfolio diversification, investors can make gains from arbitraging in the long run. Thus, the present state of equity market integration in Asia still provides scope for global investors to diversify their risks by investing across markets in the region. However, the lack of evidence of strong causality among Asian markets impels their partial integration creating a woe that might seem like the reduced role of domestic investors in market capitalization.

The findings and implications of this research are limited to the stock market integration of five Asian markets only. Other markets from the region may have a significantly different relationship with each other. Moreover, the level and nature of integration might be different at varying economic episodes. Hence, further study considering more number of Asian markets should investigate the critical role of the economic regime and sample periods for having a better analysis of financial market integration. The research uses only the benchmark stock indices of the selected economies. Further research might also be extended to the price behaviour of stocks from mid-cap and small-cap segment, where the foreign investments are momentous today. These are undoubtedly valuable lines of future studies and can enhance the validity and significance of the research on stock market integration.

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