Dragon's Entry in South Asia and its Impact on Financial Markets

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Abstract

This study examines the mean and volatility spillover effects from China to Pakistan, India and Sri Lankan stock markets for the period of July 1997 to June 2016 by using ARMA-GARCH (1,1) Model. The results provide the evidence that Chinese market shocks transmit to South Asian markets. The study contributes to literature in the sense that in last decade China has emerged as a potential economic partner to influence the South Asian region. The study suggests that in last three years' the effect of shocks on volatility has reduced significantly. It may be linked to infrastructure development by China in South Asian region and reduction of asymmetries of information. Hence, economic integration of China with Asia is playing a significant role in financial markets of the region. In nutshell economic linkages are translating into financial linkages.

Keywords: South Asian stock markets, Regional market, Economic integration, Spillovers
JEL classification: F36, G11, G15

1. Introduction

The South Asian region is one of the least economically integrated regions in the world. Regional trade remains well below its potential due to high transport costs, protectionist policies, and political tensions. The South Asian Association for Regional Cooperation (SAARC) agreements, the South Asian Preferential Trading Arrangement, and the South Asian Free Trade Arrangement, have failed to break down trade barriers. The political issues among heavy weights are major barriers in the way of broader regional trade expansion. SAARC countries generally rely on developed nations as export destinations and increasingly import from China. Historically India has been considered to have significant influence across South Asia due to its size, economic power, historical and cultural ties to the region. India and Nepal share an open border; India signed its first free trade agreement with Sri Lanka; India and Bhutan share "mutually beneficial economic inter-linkages"; and India has been a major economic partner to Bangladesh since its independence in 1971.

China's role in South Asia is limited despite of its long-standing ties to Pakistan. With the exception of China's economic relationship with Pakistan, China's growing influence in South

Asia is relatively recent phenomenon. In last two decade' China has become a significant economic partner to various countries throughout the region. Moreover, china is particularly focusing on strong ties with smaller states through trade, aid and investment. This increased involvement in South Asia is an indicator of higher economic integration of the china with regional states. China's economic policy is focused on trade and investment coupled with strategic cooperation with south Asian neighbors. One step in this dimension is to promote Asian connectivity, largely through its Silk Road "belt and road" vision. The China-Pakistan economic corridor is China's most recent economic commitment to Pakistan in infrastructure development and represents an intensification of a longstanding relationship. It may be a catalyst to increase current two-way trade volume of $16 billion between the two nations.

Similarly, Sri Lanka is also a classic case of rise of Chinese influence in South Asia. The Chinese assistance to Sri Lanka begins in 2009 and reveals presence of close relationship between the two countries. The agreement of "strategic cooperative partnership" in 2013 demonstrates the geopolitical influence of China's support to Sri Lanka. It is worth mentioning that Sri Lanka also features prominently in China's Maritime Silk Road project. So economic linkage is significantly increased in recent years. These linkages ultimately lead to spillover across countries. In earlier this year, Chinese equity market plunges and international market follows the suit. This indicates that volatility in China's market spillovers to global markets and south Asia is no exception. This study is an effort to explore mean and volatility transmission from China's equity market to South Asia equity markets that include India, Pakistan and Sri Lanka. It further compares the volatility spillover dynamics of last three years with volatility transmission in past. The recent economic linkage may have change its pattern as strategic partnership with South Asian markets may have reduced the asymmetric information.

The rest of the paper is organized as follows: Section II critically covers the literature on the subject. Section III provides data description and discusses the econometric model section IV reports and analyses the results, and section V concludes the study.

2. Literature Review

The degree of interdependence across different stock markets has long been studied. Past studies focus on the long term dependence and causality of the markets or short term relationship between returns across the markets (Hasan, Saleem and Abdullah, 2008, Hamid and Hasan, 2011

and Haroon et al, 2012). Information transmission among stock markets not only dependent on returns but also dependent on volatility (Liu and Pan, 1997; Ng, 2000 and Abbas, Khan and Shah, 2013). Financial markets of world are dependent on each other, so the volatility from one market is transmitted to other market. Singh, Kumar, and Pandey (2010) argue that if two markets are integrated then any shock of one market will affect mean and volatility of other market. The study reports regional markets have volatility spillovers in Asia and Europe.

Liu and Pan (1997) examine the mean and volatility spillovers from U.S. and Japanese markets to Hong Kong, Singapore, Taiwan and Thailand market. The results of the study indicate that U.S. market is more dominant in transmission of returns and volatilities to these Asian markets. Bekaert and Harvey (1997) investigate the mean and volatility spillovers in twenty emerging markets using international and regional factors and reports that volatility spillovers are different across emerging markets. However, financial liberalization has increased the correlation between local and international market returns and empirical results suggest that global integrated markets influence the volatility whereas local factors only affect the segmented markets.

Ng (2000) investigates the transmission of shocks from U.S. and Japan to six Pacific Basin stock markets. In, Kim, Yoon and Viney (2001) examine information transmission in three Asian stock markets during Asian crisis. Jang and Sul (2002) investigate the interdependence among Asian markets before, after and during Asian Financial Crisis. Abbas, Khan and Shah (2013) study spillovers among Asian and developed markets. The results of this study presents the volatility transmission in both friendly (politically) and unfriendly countries. They argue that spillovers from one market to other market is not dependent on political factors rather than economic factors. Furthermore, the study reports the evidence of volatility transmission in Pakistan, China, India and Sir Lanka.

Johnson and Soenen (2002) study the stock market integration of twelve Asian stock markets with Japanese stock market by using Geweke contemporaneous feedback measures. Miyakoshi (2003) explores the mean and volatility spillovers from Japan and U.S. to seven Asian markets. Lee (2009) examines the volatility transmission among six Asian markets using Vector autoregressive GARCH model. The findings of these studies suggest significant effect of volatility spillover among these markets and report more regional influence than U.S. market. Beirne, Caporale, Schulze-Ghattas, and Spagnolo (2010) study mean and volatility spillover effects in forty-one emerging markets of Asia, Europe, Middle East and America by using tri-

variate VAR-GARCH. This study reports the dominance of global markets in Asia and suggest that regional spillovers dominate in Middle East and America.

Mensi, Hammoudeh, Reboredo and Nguyen (2014) investigate the information transmission of global factors on BRICS (Brazil, Russia, India, China and South Africa). Gilenko and Fedorova (2014) examine the volatility spillovers from international stock markets during, before and after crisis in BRIC countries. The results indicate that BRIC stock markets have asymmetric dependence regarding global market and this relationship does not change even after the recent global financial crisis. Furthermore, they suggest that financial integration exists between BRIC countries before and during crisis and provides the evidence that developed markets influence the BRIC stock markets decay over time and support the "decoupling" phenomenon. Delcoure and Singh (2016) examine the interaction and dependence of BRIC markets on its influential trading partners during the changing economic conditions. The findings of the study suggest that structural linkages are not the same after 2008 financial crisis between developed and emerging markets.

Historically, U.S. market dominates the Asian markets. In last decade level of financial market integration in South Asian region has increased due to liberalization of capital movements and regional economic influence. However, the influence Chinese market on this region is not much explored and South Asian markets offer bright prospects for Chinese. This study is an effort to explore the transmission of financial market shocks from China to the financial markets of South Asian region.

3. Data Description and Methodology

3.1. Data description

This study examines the mean and volatility spillover effect of stock market indices of China (SSE composite Index), India (Bombay stock exchange), Pakistan (Pakistan stock exchange) and Sri Lanka (Colombo stock exchange) using daily closing indices prices for the period of July 1997 to June 2016. Daily index return is calculated as,

$$\text{Daily index return } = \ln\left(\frac{P_t}{P_{t-t}}\right) \qquad (1)$$

Where, ln is natural logarithm, P_t is current day index price and P_{t-1} is previous day index price.

3.2. Methodology

To analyze mean spillover and volatility spillovers from China to South Asian markets, ARMA (1,1) and GARCH (1,1) model is used. The necessary conditions are fulfilled before using ARMA (1,1) and GARCH (1,1) model, firstly see the behavior of data and secondly stationarity of financial series by using descriptive statistics and unit root tests. Because, financial data must be stationary to apply regression otherwise results will be spurious and autoregressive moving average (ARMA) models also assume financial series must be stationary. Augmented Dickey-fuller test (ADF) and (ii) Phillips Perron test (PP) are applied to test unit root. If data is stationary means and variance must be constant over time (Gujarati, 2008). The assumption of ADF test is the variance of time series is constant and error term is independent (Dickey and fuller, 1979). The econometric equation of ADF test AR (1) is,

$$\Delta X_t = \alpha_0 + \alpha_1 + (\text{Ɋ} - 1)X_{t-1} + \sum \partial_{i\ \Delta h_{i=1}^{n}} t-1 + \varepsilon_t \qquad (2)$$

Where, X_t is the given series at time t, Ɋ, ∂ are the parameters, Δ is the operator for first difference and ε_t is error term.

Phillips and Perron (1988) is a non-parametric technique which assumes error term is not independent and is heterogeneously distributed. The PP test is,

$$\Delta X_t = \Upsilon_0 + \Upsilon_1 Y_{t-1} + \Upsilon_2 T + \sum_{i=1}^{n} \varphi_i \Delta X_{t-i} + \epsilon_t \qquad (3)$$

Where, X is the given time series, T is the linear time trend term, ϒ and φ are the parameters, Δ is the operator for first-difference and ε_t is error term.

Liu and Pan (1997) and Bhar and Nikolova (2007) methodology is used to estimate the effect of information transmission from China to South Asian markets. Firstly, ARMA (1,1) and GARCH (1,1) model is applied on index return of China. The econometric equation is below,

$$r_{j,t} = \lambda_0 + \lambda_1 r_{j,t-1} + \lambda_2 v_{j,t} + \lambda_3\, \epsilon_{j,t-1} + \epsilon_{j,t},\ \epsilon_{j,t} \sim N(0, v_{j,t}) \qquad (4)$$

$$\mathrm{v_{j,t}} = \Psi_0 + \Psi_1 \mathrm{v_{j,t-1}} + \Psi_2 \epsilon_{\mathrm{j,t-1}}^2 \qquad (5)$$

Where, $r_{j,t}$ is the daily stock index return of index j for China at time t, and $\varepsilon_{j,t}$ is the residual (or unexpected return) which is normally distributed with mean zero, time varying conditional variance $v_{j,t}$ and subscript j is used for China. To adjust the possibility of serial correlation in mean equation index is structured by inclusion of ARMA (1,1) or MA (1) model.

Secondly mean and volatility spillover effects across South Asian markets are estimated by attaining the standardized residual and its square in the first stage and substituting them in to mean and volatility equations of other market indices as follows:

$$r_{m,t} = \lambda_0 + \lambda_1 r_{m,t-1} + \lambda_2 v_{m,t} + \lambda_3\, \epsilon_{m,t-1} + \Phi_1 \epsilon_{j,t} + \epsilon_{m,t},\ \epsilon_{m,t} \sim N(0, v_{j,t}) \quad (6)$$

$$v_{m,t} = \Psi_0 + \Psi_1 z_{j,t-1} + \Psi_2 \epsilon^2_{m,t-1} + \Psi_3\, \mathrm{DM} * e^2_{j,t} + \Phi_2\, e^2_{j,t} \quad (7)$$

Where, the subscript m is used in each equation refer to one of the South Asia market. $\varepsilon_{j,t}$ is the standardized residual series to capture the effect of China's index to each of the country from South Asian indices. To check the volatility spillover effect $e^2_{j,t}$ is the exogenous variable, which is the square of the standardized residual series and is included in conditional volatility equation. $e_{m,t}$ is calculated as ($\varepsilon_{j,t}$ / $v_{j,t}$ ^.05).

4. Results and discussion

The statistical behavior of all indices return including mean (average daily return), Standard deviation, Kurtosis, Skewness, Maximum loss in a day and Maximum return earned in a day is given in Table 1.

Table 1: Descriptive statistics for the period of 1997-2016

	China	Pakistan	India	Sri Lanka
Mean %	0.012	0.045	0.026	0.030
Standard Deviation%	1.349	1.265	1.296	0.927
Kurtosis	8.075	10.976	10.342	47.722
Skewness	-0.362	-0.442	-0.100	0.272
Minimum %	-9.256	-13.213	-11.809	-13.906
Maximum %	9.401	12.762	15.990	18.287

The above table shows that mean return for all indices are positive. The Chinese market has maximum standard deviation of 1.349% which reflects that Chinese market is more volatile and Sri Lankan market has standard deviation of 0.927 % which reflects that Sri Lankan market is less volatile in comparison to other South Asian markets. Skewness results show that indices returns of South Asian markets are negatively skewed, which indicate large negative returns (minimum extreme values). Whereas, the Sri Lanka market is positively skewed and specifies that higher positive returns (maximum extreme values) dominate in Sri Lanka. The values of the kurtosis are greater than 3 which mean distributions of the returns are leptokurtic indicating higher peaks than expected from normal distribution. Sri Lankan market is less volatile but the

maximum loss and maximum profit per day is also reported by the same market. The unit root test results of ADF and PP at level and 1st difference are given below in table 2.

Table 2: Augmented Dickey Fuller and Phillips Perron tests at level and at first difference

Series	ADF	ADF	PP	PP
	level	First difference	level	First difference
China	-1.965	-30.256	0.371	-84.854
Pakistan	2.175	-42.899	2.183	-79.819
India	-0.027	-81.480	-0.046	-81.468
Sri Lanka	-0.205	-28.719	-0.278	-76.807
1% Critical value	-3.431	-3.431	-3.431	-3.431
5% Critical value	-2.862	-2.862	-2.862	-2.862
10% Critical value	-2.567	-2.567	-2.567	-2.567

The Table 2 shows that ADF and PP tests statistic results at level are less than critical values, but the reported values at first difference show that data is stationary. However, rejection of null hypothesis in all series show that all series are stationary at first difference for all markets. In this study indices at first difference are used, hence stationarity condition for ARMA is fulfilled. The estimated results of mean spillover and volatility spillover effects as modelled by ARMA (1,1)-GARCH (1) from China to South Asian markets are reported in table 3.

Table 3: Mean and Volatility spillovers from China to South Asian indices estimated from ARMA (1,1)-GARCH (1,1) on daily stock return for the period of 1997-2016

	China	Pakistan	India	Sri Lanka
λ_0	-0.004	-0.004	0.058	-0.100
	(0.844)	(0.926)	(0.089)	(0.118)
λ_1	0.407	1.055	-0.210	0.036
	(0.246)	(0.036)	(0.721)	(0.746)
λ_2	0.012	0.001	0.008	0.086
	(0.449)	(0.932)	(0.591)	(0.010)
λ_3	-0.447	-1.027	0.228	0.234
	(0.203)	(0.041)	(0.698)	(0.046)
Φ_1		0.042	0.109	0.028
		(0.000)	(0.000)	(0.051)
Ψ_0	0.013	0.016	0.002	0.682
	(0.000)	(0.000)	(0.244)	(0.000)
Ψ_1	0.952	0.898	0.946	0.535
	(0.000)	(0.000)	(0.000)	(0.000)
Ψ_2	0.041	0.084	0.047	0.129
	(0.000)	(0.000)	(0.000)	(0.000)
Ψ_3		-0.012	-0.004	-0.024
		(0.000)	(0.000)	(0.000)
Φ_2		0.017	0.012	-0.014
		(0.000)	(0.000)	(0.001)

Note: *The numbers in the parentheses are p-values*

The results of Table 3 indicate that ARCH and GARCH coefficients are statistically significant. The significance of ARCH effect indicates that past price behavior influences the volatility of the markets small shocks create less volatility and large shocks create high volatility. GARCH term is significant indicating that the persistence of volatility within the market. The ARCH and GARCH coefficient is near to one for China, Pakistan and India which suggest the persistence of volatility is long term in these markets. The coefficients of Φ_1 and Φ_2 are also significant, which reports the presence of mean spillover and volatility spillover from Chinese market to South Asian markets. The magnitude of the coefficients related to volatility spillover is higher for Pakistani stock market. The coefficient of time dummy indicates that in last three-years volatility spillover is reduced. Indicating that impact of shocks in Chinese market is decreased with the increase in interaction.

The Chinese market influence return of Pakistan and Sri Lankan market. Positive shocks increase returns and negative shocks decrease returns in these markets. The similar influence on return of Indian market is also observed. So far as volatility spillover is concerned, it is evident that shock in Chinese market increases volatility in Pakistani and Indian markets. The coefficient of Chinese market shock is positive indicating that positive and negative both news has same effect whereas in case of Sri Lankan market different behavior is observed where volatility reduces on arrival of unexpected information from Chinese market. It is possibility that news of the shock is positive due to series of recent agreements signed during last few years. However, the matter may also be investigated by using EGARCH model to explain the asymmetric behavior under good and bad news.

5. Conclusion

This study examines the mean and volatility spillover effects from China to South Asian markets for the period of July 1997 to June 2016 by using ARMA-GARCH (1,1) Model. Historically U.S. have been influencing this region. This region has potential of economic integration but due to protectionist policies and political tensions the regional trade agreement failed to break down the trade barriers. During said period China has emerged as a potential economic partner of the South Asian zone and its significance presence is visible due to a leading role in infrastructural developments. The results provide the evidence that Chinese market shocks transmit to South Asian markets. The coefficient of Chinese market influence on returns of South Asian markets is positive, which indicates that positive shocks increase returns and negative

shocks decrease returns in these markets. The coefficient of volatility spillover is significant and positive in Pakistani and Indian markets that indicate that positive and negative news has same effect and results in increases volatility in Pakistani and Indian markets. The magnitude of the coefficients related to volatility spillover is higher for Pakistani stock market. Whereas, different behavior is observed for Sri Lankan market as volatility reduces on arrival of unexpected information from Chinese market. In last three years' the effect of shocks on volatility of Pakistani market is significantly different from previous years and lower volatility shock are observed. Hence, economic integration of China with Asia is playing a significant role in financial markets of the region. The same pattern is observed for other markets. These dynamics provide the evidence that each market of the region is influenced by Chinese market in some direction and economic linkages are transforming into financial linkages.

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