Journal of Academic Research in Economics

Volume 11 Number 1 March 2019

ISSN 2066-0855

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CO-MOVEMENTS BETWEEN THE US AND EMERGING AND FRONTIER ASIAN STOCK MARKETS: A POST SUBPRIME CRISIS ANALYSIS

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Abstract

This paper examines the co-movements between the US stock market and emerging and frontier Asian stock markets during the post US Subprime crisis period. It also analyses whether the US stock market Granger causes the emerging and frontier stock markets from Asia. Analysing eight stock market indices which includes SHCOMP (China), KSE100 (Pakistan), Nifty 50 (India), JCI (Indonesia), PCOMP (Philippines), SET (Thailand), NASDAQ (USA), VN (Vietnam) for a period from 1st February 2009 to 31stmarch 2017, we find the absence of cointegration among US and the selected markets. This shows that the markets considered are not moving in tandem over the long-run. However, we find that the US stock market Granger causes all the seven emerging and frontier Asian markets considered for the study indicating their co-movement over the short-run.

Keywords: US Subprime Crisis, Stock Market Integration, Johansen Cointegration Test, Granger Causality Test, Emerging and Frontier Asian Equity Markets

JEL classification codes: F15, G15

1. INTRODUCTION

Capital markets around the globe have grown rapidly in recent years due to the development of new investment avenues, increased foreign investments, technological advancements, and growing economic activities. The interrelationship among the economies are increased attributing to globalization and liberalization of stock markets and rapid growth in information technology (Dhanaraj & Gopalaswamy, 2013). Such stronger integration of markets are empirically proved to be leading to the growth in real investment and decline in capital cost (Chari & Henry, 2008).

The October crash of 1987 and the Asian Financial crisis of 1997 led to several studies analysing the inter-dependency among stock markets around the globe. The empirical evidences provide that most of the markets follow the trends in US equity markets. This behaviour was evidently visible in the market crash of 1987, where the collapse of New York Equity market had spread to the equity market across the globe. Its impact was seen on a greater intensity in European and Asian equity markets (Aggarwal & Rivoli, 1989).

It is also noticed that after the Asian financial crisis of 1997, there happened an increase in the co-movements among Indian, United States and Singapore stock markets (Mukherjee & Bose, 2008). With this background, the objective of this study is to analyse the interrelationships among the US stock market and Asian Emerging and Frontier stock markets (which includes India, China, Indonesia, Pakistan, Philippine, Thailand, Vietnam) post – US Subprime crisis 2008, given it has resulted in the worst recession, market crash and financial and banking crisis since the Great depression of 1930 (Jaffee, 2008).

2. REVIEW OF LITERATURE

It is known that United States of America is the largest economy of the world and many economies including Indian economy depends on it especially in the areas of business. It was found that any major events in United States of America would have an impact on interrelationships between stock markets (Dhanaraj, Gopalaswamy, & Babu M.S., 2008). The level of interrelationships among Indian equity market and other major stock markets of the world and the consequences of such relationships firmly bolster the view that, there is a generous coordination amongst Indian and international stock markets (Srikanth & Aparna, 2012). Indian stock market is often found to be exhibiting a solid positive relationship and perfect price correlation with the developed stock markets worldwide (Srikanth & Aparna, 2012). In contrast, the correlation between Indian stock market and its Asian counterpart's viz. Japan, Indonesia, Taiwan, Hong Kong, China, South Korea, and Malaysia are neither exclusive nor exhaustive. The literature emphasizes that Indian stock market is not sensitive to the Asian stock markets over the long-run in general, and developed stock markets in particular probably attributing to the differences in macroeconomic factors. (Rajwani & Mukherjee, 2013). However, a correlation

analysis of Bombay Stock Exchange with selected international stock exchanges reveal that there is a highly positive correlation between BSE Sensex and New York Stock Exchange's S&P 500 Index, NASDAQ Composite Index, London Stock Exchange's FTSE, Japan Stock Exchange's Nikkei and Chinese Stock Exchange's SSE Composite Index (Chougala & Srivatsa, 2012). It shows that the correlation between Bombay Stock Exchange and developed/European markets are firmly connected with each other.

Similarly, Asian stock markets are found to be giving more importance to data related to the US stock market as it is the indicator of country's economic condition (Nguyen & Ngo, 2014; Mandaviya, 2014). Among the Asian markets, Malaysia is found to be exhibiting the most grounded connection with the US market developments whereas Philippines has the weakest relationship (Agrawal & Rivoli, 1989).

The short-run and long-run interrelationships of Indian stock market in comparison with other global financial markets have shown that Indian stock market is exceptionally connected with equity markets of developed countries (Taneja, 2012). This gives an alert to the investors that it is not advantageous to invest in the stock markets which are correlated and having same pattern of movements as they are not favourable for diversification (Meric, Kimb, Gong, & Meric, 2012; Kasibhatla, Stewart, Sen, & Malindretos, 2006; Arsyad, 2015).

On the other hand, the weak causal relationships exisying between other Asian emerging and developed stock markets proposes the scope for international portfolio diversification among Asian stock markets (Worthington, Katsuura, & Higgs, 2003). However, empirical evidences provide that the instabilities in the stock market of Japan impacts stock markets in India, Malaysia, and Thailand, and the volatility in Japanese forex market affects the stock return movements in India, South Korea, and Malaysia (Chaudhuri & Koo, 2001).

Therefore, the literature provides ample evidences of interrelationships among the stock markets across the globe before and during the subprime crisis. However, the studies are found lacking in examining the interrelationships among the markets during the post-crisis period. There are only limited studies examining the relationship between the US stock market and emerging and frontier Asian markets after the subprime crisis. Given this, the present study attempts to fill this gap.

3. DATA AND METHODOLOGY

This study intends to examine the cointegration among the US and Asian emerging and frontier markets during the post US Subprime crisis period. It employs daily closing values of eight stock market indices viz. SHCOMP (China), NIFTY50 (India), JCI (Indonesia), KSE100 (Pakistan), PCOMP (Philippines), SET (Thailand), NASDAQ (the USA), and VN (Vietnam) for a period from 1st February 2009 to 31st March 2017. All the data are sourced from Bloomberg. Augmented Dicky- Fuller

test and Phillips -Perron test are used to test the stationary properties of the data. Johansen cointegration test and Granger causality test are used to explore the long-term (cointegration) and short-term relationship between the US stock market and the selected emerging and frontier markets from Asia during the post subprime crisis period.

4. EMPIRICAL FINDINGS AND DISCUSSIONS

Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test are employed to test the presence of unit root in the data selected for the study. The results are presented in Table 1. It shows that all the indices are non-stationary at their level form, but stationary at first difference rejecting the null hypothesis of unit root at 1% significance level. This satisfies the basic condition of Johansen cointegration test that the data should be stationary at their first difference.

Table 1. *Results of unit root test using ADF test and PP test*

		ADF Test		**PP Test**	
Country	**Index**	**Level**	**1st Difference**	**Level**	**1st Difference**
China	SHCOMP	-1.998715	-20.47385***	-2.112815	-35.03191***
India	Nifty50	-1.594169	-34.38479***	-1.556833	-34.28783***
Indonesia	JCI	-2.338385	-25.11568***	-2.316547	-35.28973***
USA	NASDAQ	-0.538995	-25.15575***	-0.533483	-40.05117***
Pakistan	KSE100	-1.187008	-32.63743***	1.223566	-32.66340***
Philippines	PCOMP	-1.802305	-34.87860***	-1.806339	-34.80256***
Thailand	SET	-2.098080	-36.04226***	-2.092712	-36.03107***
Vietnam	VN	-1.776666	-32.91687***	-1.794572	-32.90789***

***The null hypothesis is rejected at 1% significance level

Table 2 presents the results of Johansen cointegration test. Panel A provides the results of unrestricted cointegration rank test using trace statistics and Panel B provides the same using maximum Eigenvalue statistics. Both the tests test the null

hypothesis that there is no cointegration between the US stock market and emerging and frontier Asian stock markets.

The trace statistics as well as maximum Eigenvalue statistics shows that there is no cointegrating equation between the US stock markets and emerging and frontier Asian stock markets during the post US subprime crisis period. This indicates that the Asian emerging and frontier stock markets are not moving in tandem with the US stock market post the US subprime crisis unlike the scenario before and during the crisis. This suggests the global investors to have better portfolio diversification strategies as the movements in the US stock market are proved to be not affecting the markets considered for the study over the long-run.

Table 2. *Results of Johansen Cointegration Test*

Panel A: The results of Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.025891	129.2100	159.5297	0.6400
At most 1	0.018646	92.77437	125.6154	0.8071
At most 2	0.014726	66.63055	95.75366	0.8242
At most 3	0.013885	46.02468	69.81889	0.7965
At most 4	0.010466	26.60396	47.85613	0.8688
At most 5	0.005038	11.98999	29.79707	0.9322
At most 6	0.003574	4.973992	15.49471	0.8116
At most 7	8.92E-07	0.001239	3.841466	0.9713
Panel B: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.025891	36.43567	52.36261	0.7156
At most 1	0.018646	26.14383	46.23142	0.9415
At most 2	0.014726	20.60587	40.07757	0.9575
At most 3	0.013885	19.42072	33.87687	0.7955
At most 4	0.010466	14.61397	27.58434	0.7781
At most 5	0.005038	7.015998	21.13162	0.9533
At most 6	0.003574	4.972753	14.26460	0.7453
At most 7	8.92E-07	0.001239	3.841466	0.9713

Granger causality tests are employed to identify the short-run relationship between the selected emerging and frontier Asian stock markets and the US stock market. The results are presented in Table 3. Panel A exhibits the result of Granger causality test between the US stock market and Chinese stock market. It provides

that though the Chinese stock market is not influencing the US stock market, the former is getting influenced by the latter over the short-run rejecting the null hypothesis at 1% level of significance. Panel B provides the result of Granger causality test between the US stock market and Indian stock market. Unlike the Chinese stock market, it shows that the Indian stock market Granger causes the US stock market at 10% significance level. This can be possibly attributed to the increased economic interlinkages between India and the US on the account of outsourcing in the IT sector. However, similar to the Chinese market, Indian stock market is also found be high significantly caused by the movements in the US stock market.

Table 3. *Results of Granger Causality Tests*

Null Hypothesis	F-Statistic	Prob.
Panel A: Between the US stock market and Chinese stock market		
SHCOMP does not Granger Cause NASDAQ	1.01511	0.3983
NASDAQ does not Granger Cause SHCOMP	5.10787	0.0004
Panel B: Between the US stock market and Indian stock market		
NIFTY50 does not Granger Cause NASDAQ	2.14049	0.0736
NASDAQ does not Granger Cause NIFTY50	15.5869	2.00E-12
Panel C: Between the US stock market and Indonesian stock market		
JCI does not Granger Cause NASDAQ	3.06427	0.0158
NASDAQ does not Granger Cause JCI	20.6514	2.00E-16
Panel D: Between the US stock market and Pakistan stock market		
KSE100 does not Granger Cause NASDAQ	2.08750	0.0802
NASDAQ does not Granger Cause KSE100	7.73026	4.00E-06
Panel E: Between the US stock market and Philippines stock market		
PCOMP does not Granger Cause NASDAQ	2.76928	0.0261
NASDAQ does not Granger Cause PCOMP	20.8447	1.00E-16
Panel F: Between the US stock market and Thailand stock market		
SET does not Granger Cause NASDAQ	1.84093	0.1185
NASDAQ does not Granger Cause SET	8.03352	2.00E-06
Panel G: Between the US stock market and Vietnam stock market		
VN does not Granger Cause NASDAQ	1.63838	0.1468
NASDAQ does not Granger Cause VN	7.57905	5.00E-07

Panel C through Panel G present the results of Granger causality tests between the US stock market and Indonesian stock market, Pakistan stock market, Philippines stock market, Thailand stock market, and Vietnam stock market respectively. The results reveal that all these stock markets are getting influenced by the US stock market at 1% significance level. On the other hand, Indonesian stock market and Philippines stock market are found to be Granger causing the US stock

market at 5% level of significance and Pakistan stock market at 10% level of significance. However, similar to Chinese stock market, Thailand and Vietnam stock markets are not influencing the US stock market. Thus it can be concluded that all the emerging and frontier Asian stock markets considered for the study are influenced by the movements in the US stock market during the post subprime crisis as well. This indicates that any downside movements in the US stock market will lead to a similar movement in the emerging and frontier Asian stock markets. Similarly, India, Indonesia, Pakistan, and Philippines are found to be affecting the US stock market during the post subprime crisis period. Therefore, it is suggested that the policymakers need to be more attentive to the movements in the US stock market.

5. CONCLUSION

The present study analyses the long-run and short-run relationships of emerging and frontier Asian stock markets with the US stock market during the post US Subprime crisis period. The study considered eight stock indices which include SHCOMP (China), KSE100 (Pakistan), NIFTY50 (India), JCI (Indonesia), PCOMP (Philippines), SET (Thailand), NASDAQ (USA), VN (Vietnam).

The empirical results prove that the markets considered for the study are not exhibiting any cointegrating relationships over the long-run. This suggests that the global investors can consider these countries while deciding their long-term portfolio diversification strategies. However, the study reveals that all the developing and frontier Asian stock markets considered for the study are Granger caused by the movements in the US market. This indicates that the Asian stock markets are largely influenced by the US stock market over the short-run. Therefore, it cautions the investors to study the ebbs and flows in the US stock market while formulating their short-term investment strategies to have better returns with the given level of risk. Policy makers are also suggested to consider the movements in US stock market before making any policy decision concerning the emerging and frontier Asian stock markets.

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