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Determinants of Stock Market Co-Movements between Pakistan and Asian Emerging Economies

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Abstract: This study analyzes the determinants of stock market co-movement between Pakistan and Asian emerging economies for the period 2001 to 2015. Augmented Dickey and Fuller (ADF) and Philips-Perron (PP) tests are applied to check co-integration between their stock markets. Results of this study reveal that there is long-term integration between the stock market of Pakistan and the stock markets of China, India, Indonesia, Korea, Malaysia and Thailand. This study reports the driving forces of the co-movement between the Pakistan and Asian emerging markets where co-integration is found. Results of the panel data reveal that there are significant underlying forces of integration between Pakistan and each Asian emerging stock market. The findings of this study have significant implications for policy makers in Pakistan who are designing strategies for macroeconomic harmonization and stability of the country's economy against financial shocks.

Keywords: stock market co-movement; portfolio diversification; economic integration; financial crisis

1. Introduction

The consequences of the financial crisis (2007–2010) resulted in unexpected and immediate deterioration of wealth. The after-effects of the global financial storm are still evident and nearly all countries continue to suffer as a result. The World Bank has currently advised the G 20 nations of the occurrence of an extremely critical and damaging economic meltdown in the near future. As latest literature proposes, examining the tendency of one country to be affected by the global financial storm helps prevent future crisis. This feature has attracted the attention of academicians and practitioners towards the identification of the integration and determination of fundamentals that might describe how stock markets of different countries are correlated to each other (Pretorius 2002). Such rise of interests and inspirations can be described for several reasons, but the most appropriate of all includes the quest for likely benefits of risk management, especially portfolio diversification (Forbes and Chinn 2004).

There has been a substantial increase in economic and financial linkages among economies. The main causes of these strong linkages between global economies are technological advances, removal of statutory controls, market liberalization and the growth of several emerging markets. These factors have contributed to more interlinked economies, which in turn are said to have given rise to a higher degree of stock market co-movement (Johnson and Soenen 2003). The integration of emerging stock markets remains an open question that has not been adequately addressed. Modern research in stock market integration has not focused enough on the determinants of stock market co-movement. It has been found that very few studies have attempted to uncover the determinants of stock market co-movement.

1.1. Stock Market Co-Movement

Stock market co-movement refers to a tendency of two or more stock markets to move simultaneously, so that their price movements are positively correlated. National stock markets are considered to be integrated if securities with similar risk features are priced the same, even if the securities are traded in different stock markets (Marashdeh and Shrestha 2010). Put differently, stock market integration is a situation where financial securities have similarity in return patterns.

1.2. Theoretical Framework

The overarching theory of research study is the Theory of Stock Market Co-movement. This theory primarily focuses on two leading approaches (Forbes and Rigobon 2002). One is called 'theories of non-contingent crisis' (fundamental approach) and the second is termed 'theories of contingent crisis' (behavioral approach).

1.2.1. Theories of Non-Contingent Crisis

This theory assumes that transmission mechanism after a crisis is not significantly dissimilar to those before the crisis. According to the theory of non-contingent crisis, excessive co-movements of two different markets are due to the continuation of crisis linkages. This is often termed as fundamental approach. Excessive co-movements, in this case, is the repercussion of strong bilateral trade, financial links and economic interdependence (Forbes and Rigobon 2002).

According to the fundamental approach, the latest literature classifies fundamental driving forces of co-movements between stock markets as macroeconomic (bilateral trade, interest rate, inflation rate, industrial production growth, absolute changes in the bilateral exchange rate, volatility in the bilateral exchange rate), and financial (national equity market size, volatility across the world stock market).

International Capital Goods Trade Hypothesis

The hypothesis states that economies as well as stock markets of two countries are anticipated to be highly integrated due to their strong bilateral trade relationship. The stronger the bilateral trade relationship, the higher the level of co-movement between stock markets will be. Thus, the extent of bilateral trade between two different countries is expected to explain co-movement between the stock markets of these countries.

Discounted Cash Flow Model (Convergence of Macroeconomic Variables)

The discounted cash flow model states that similarities in the macroeconomic variables of the two different countries will lead to similarities in the performance of their stock markets. Put differently, convergence of macroeconomic variables will lead to convergence in stock market performance. On the contrary, divergence of macroeconomic variables, in the form of larger differentials, will lead todivergence in stock market performance. For example, larger differentials in interest rate, growth rate and inflation rates will cause a lower level of co-movement.

Flow Oriented Hypothesis of Exchange Rate Determination

The greater the volatility in the exchange rate, the greater will be the uncertainty in the economy as well as in the integration of stock markets. Consequently, volatility in the exchange rate must show a negative association with the co-movements of stock markets. Similarly, a larger exchange rate change will bring more benefit to the country with the depreciating currency. Therefore, the rate of change in the exchange rate must show a negative association with stock market co-movement.

1.3. Research Gap

The following research gaps are dealt with in this study:

(1)   The integration of Asian emerging markets remains an open question that has not been adequately addressed (Dhanaraj et al. 2017).

(2)   Modern research in stock market integration has not adequately studied the driving forces of stock market co-movement, especially in Asia and in Islamic emerging economies (Karim and Majid 2017).

(3)   Existing research on stock market co-movement has not adequately focused on whether the extent of bilateral trade between two different countries is expected to explain co-movement between the stock markets of these countries (Mobarek et al. 2016).

(4)   Existing research on stock market co-movement has not adequately focused on whether or not the similarity in macroeconomic variables between emerging economies will result in the co-movement between these countries (Mobarek et al. 2016).

(5)   Current research on stock market co-movement has not adequately focused on whether or not the volatility in the bilateral exchange rate and absolute changes in the bilateral exchange rate between emerging economies will result stock market co-movement between these countries (Mobarek et al. 2016).

1.4. Research Questions

The following research questions are dealt with in this study:

(1)   Are financial markets co-integrated?

(2)   Whether or not the similarity in macro-economic variables between two different countries will result in higher levels of stock market co-movement

(3)   Whether or notstronger bilateral trade relationship between two different countries will result in higher levels of stock market co-movement

(4)   Whether or notgreater absolute changes in the bilateral exchange rate will result in higher levels of stock market co-movement

(5)   Whether or notgreater volatility in the bilateral exchange rate will result in higher levels of stock market co-movement

(6)   Whether or not the volatility in the world stock market will result in higher levels of stock market co-movement

2. Literature Review

The existing literature presents numerous studies that show the existence of stock market interdependence, with the idea that stock markets have been showing tighter co-movements with each other. Academic literature allots this increased level of stock market integration to development in closer economic and financial linkages. However, it is obvious that very few studies have been conducted on the determinants of stock market co-movement, which makes it an interesting research area. Consequently, attention is directed towards research on the nature of links that lead the interdependence of international stock markets. Can the extent of integration be explained by the fundamental determinants? In other words, either the co-movement of stock markets is contagion in reality or can it be clarified by economic or financial fundamentals?

2.1. Empirical Studies Showing the Cross Market Co-Movement

Recently, results of different studies on stock market interdependence reveal a substantial degree of integration (Mobarek et al. 2016). Al Nasser and Hajilee (2016) studied stock market integration among emerging economies (Brazil, China, Mexico, Russia, and Turkey) and developed economies (U.S., U.K. and Germany). Results of the ARDL model revealed that short-term integration is found between the stock markets of growing and developed countries. It was further reported that only the German stock market is integrated with Brazil, China, Mexico, Russia and Turkey.

Bashiri and Zadeh (2014) examined the interdependence between stock markets of Malaysia, Indonesia, Philippines, Japan, Turkey and those in the U.S. by using monthly data for the period of 1995 to 2010. Results revealed that integration is found between U.S. and Asian stock markets. It was further reported that the extent of integration between Japan and other Asian markets is low. In another study conducted by Deltuvait (2015), the integration of the Baltic stock markets was examined by applying cross-correlation analysis, Granger causality test. Results of different techniques showed the higher integration of Lithuanian and Estonian stock markets.

Rua and Luis (2009) examined co-movement in the time–frequency space by applying the wavelet analysis. Results of the study emphasize the significance of taking into account the time and frequency varying properties of stock returns co-movement in designing portfolios at the international level.

2.2. Empirical Evidences of Determinants of Stock Market Co-Movement

Karim and Majid (2017) examined the fundamental driving forces of integration among 10 Islamic stock markets by applying Pooled OLS and found that all variables are insignificant in describing the integration. Results of the panel data estimation have found that only GDP growth differential and inflation differential are significant in explaining the co-movement between the stock markets of Islamic countries. Another study related to the driving forces of stock market co-movement was conducted by Mobarek et al. (2016) and reported that import dependence as well as size differential of stock markets are significant in explaining the co-movement between the returns of stock markets. In addition to these determinants, GDP growth rate differential and time trend also has a significant relationship with the co-movement of stock market.

Guesmi and Teulon (2014) examined the underlying forces of stock market integration of Middle East countries (Turkey, Israel, Jordan and Egypt). The results revealed that domestic (inflation, rate of spread variation and exchange rate volatility) and global (global interest rate, world market returns, and world market dividend yields) factors are significant in explaining the integration between the stock markets of Middle East countries.

Narayan et al. (2014) examined the integration of stock markets among emerging Asian economies and developed markets by applying the EGARCH-dynamic conditional correlations (DCC). Results of the study revealed strong correlations during the period of financial crisis. Results further reported that price differentials, exchange rate risk, global financial crisis, bilateral trade relations, openness variable and domestic market characteristics are underlying forces of stock market integration.

Contrary to the above, Kose et al. (2003) found that results do not support the hypothesis that bilateral trade and stock market co-movement have a positive relationship. A research work by Bracker et al. (1999) analyzed the driving forces of stock market co-movement and reported that numerous factors like bilateral trade and size differentials of two marketsare notablylinked with the degree of the co-movement. In addition, a time trend and regional dummy variable was also significant in explaining the co-movement between the returns of two stock markets.

Pretorius (2002) studied the driving forces of co-movement between stock markets and found that significant results were observed between the bilateral trade and the stock market co-movement. In addition, industrial production growth differential was also significant in describing the co-movement between stock markets of two countries. Another study related to bilateral trade and stock market co-movement was conducted by Johnson and Soenen (2003) and found that trade is significantly correlated with the degree of stock market co-movement over time.

Bracker and Koch (1999) suggested that the extent of stock market co-movement is dependent on the extent of economic integration between two countries. Put differently, if the two countries have strong economic integration, then they must have a greater co-movement in their stock markets. The results point out that the extent of stock market co-movement (measured as the magnitude of the correlation structure) is positively associated with trend and volatility in the world market. In addition, the extent of stock market integration has a negative association with volatility in bilateral exchange rate, real interest rate differentials, term structure differentials and return on a world market index.

Lin and Cheng (2008) analyzed the driving forces of the stock market co-movement and reported that volatility in the stock market, interest rate differentials, and the rate of change in exchange rate are significant in explaining the co-movement between the returns of stock markets.

2.3. Hypothesis

Hypothesis 1. *There is co-movement between the stock markets of two countries.*

Hypothesis 2. *The greater (lesser) the divergence between interest rate differentials, the lower (higher) the co-movement between the stock markets will be.*

Hypothesis 3. *The greater (lesser) the divergence between inflation rate differentials, the lower (higher) the co-movement between the stock markets will be.*

Hypothesis 4. *The greater (lesser) the divergence between industrial production growth rate differentials, the lower (higher) the co-movement between the stock markets will be.*

Hypothesis 5. *The greater (lesser) the divergence between GDP growth rate differentials, the lower (higher) the co-movement between the stock markets will be.*

Hypothesis 6. *The greater (lesser) the absolute changes in the bilateral exchange rate, the lower (higher) the co-movement between the stock markets will be.*

Hypothesis 7. *The greater (lesser) the volatility in the bilateral exchange rate, the lower (higher) the co-movement between the stock markets will be.*

Hypothesis 8. *The greater the volatility in the world equity market, the greater the co-movement between the stock markets will be.*

Hypothesis 9. *The stronger the bilateral trade ties between the two countries, the higher the co-movement between the stock markets will be.*

3. Research Methodology

3.1. Sample

The purposive sample consists of Asian emerging economies by the MSCI Global Investable Market Indices. Table 1 shows the indices used for Asian stock markets.

Table 1. Description of Indices.

Country	Stock Market Index	Country	Stock Market Index
China	SHASHR index	Malaysia	FBMKLCI index
India	NIFTY index	Pakistan	KSE 100 index
Indonesia	IDX composite index	Philippine	PSEI index
Korea	KOSPI index	Thailand	SEI index

3.2. Sample Period

The study period is from 1 January 2001 to 31 December 2015 and includes the global financial crisis that started suddenly in U.S. financial institutions in 2007 and escalated to other developed countries in the first six months of the year 2008.

3.3. Data Collection

Daily data of different emerging stock indices was collected from the Data Stream. Daily data was selected to evade the incorrect correlation problem (Patra and Poshakwale 2006). To manage missing data, Occam's razor technique is used in this study by filling in the last day price of the stock market (Majid et al. 2009; Hirayama and Tsutsui 1998). Secondary data for the determinants of stock market co-movement was collected from Data Stream, State Bank of Pakistan, World Bank, KSE website, and trading economics website.

3.4. Variables of Study

3.4.1. Correlation between Country i and j (Cor_{ij})

Correlation between daily rate of return of countries i and j during quarter t.

3.4.2. Bilateral Trade

The sum of the value of bilateral trade as a proportion of each country's total trade is used.

$$Trade_{ij} = \frac{X_{ij} + M_{ij}}{X_i + M_i} + \frac{X_{ji} + M_{ji}}{X_j + M_j} \tag{1}$$

where X_{ij} and M_{ij} is the exports and imports from country i to country j. X_i and M_i is the total export and total import of country i.

3.4.3. Convergence of Macroeconomic Variables

As direction of causality is not involved in case of correlation, it is important to use the absolute value of the interest rate differential, inflation rate differential, GDP growth rate differential and industrialproduction growth rate differential.

3.4.4. Absolute Change in the Bilateral Exchange Rate

Percent change in bilateral exchange rate during quarter t is calculatedby suggesting a possible indirect negative relationship between the absolute exchange rate changes and the co-movement of the two stock markets.

3.4.5. Volatility in the Bilateral Exchange Rate

Standard deviation in daily bilateral exchange rate during quarter t is calculated for volatility in the bilateral exchange rate, suggesting that the greater the exchange rate volatility, the lower the co-movement between the stock markets will be.

3.4.6. World Market Volatility

Standard deviation of daily world stock market index return in quarter t is calculated for volatility in the world market, suggesting a positive association between the volatility in the world market and the co-movement of the stock markets.

3.5. Econometric Model for Fundamental Determinants of Stock Market Co-Movement

The final regression model incorporates all of the determinants mentioned as earlier:

$$Cor_{ij} = \beta_0 + \beta_1 |Int_i - Int_j|_t + \beta_2 |Inf_i - Inf_j|_t + \beta_3 |Ind_i - Ind_j|_t + \beta_4 |Gdp - Gdp_j|_t + \beta_5 TRADE_{ijt} + \beta_6 |XRCH_{ij}|_t + \beta_7 XRSD_{ijt} + \beta_8 WMV_t + \varepsilon_{ijt}$$

Cor_{ij} = Estimated correlation between daily returns in countries i and j during quarter t.
ε_{ijt} = disturbance term, assumed to be iid N $(0, \sigma^2)$.

Int$_{it}$ = Interest rate in country *i* during quarter *t*.
Inf$_{it}$ = Inflation rate in country *i* during quarter *t*.
Ind$_{it}$ = Industrial production growth rate in country *i* during quarter *t*.
Gdp$_{it}$ = GDP growth rate in country *i* during quarter *t*.
XRCH$_{ijt}$ = Percent change in bilateral exchange rate during quarter *t*.
XRSD$_{ijt}$ = Standard deviation in daily bilateral exchange rate during quarter *t*.
WMV$_t$ = Standard deviation of daily world stock market index return during quarter *t*.

4. Results of Stock Market Integration (Long Term Integration)

Descriptive statistics for stock returns, unit root tests and co-integration test of data period 2001–2015 are presented in the tables below.

4.1. Descriptive Statistics

Table 2 presents descriptive statistics for daily stock market returns. We note that all emerging stock markets posted positive average performance during the time period. We examine the volatility of all countries market returns. It has been reported in modern literature that volatility is usually found in emerging stock markets. The stock index for Korea shows the maximum volatility among all the stock returns. The stock index for Malaysia shows the minimum volatility among all the stock returns.

Table 2. Descriptive Statistics for Asian Stock Market Returns.

Variable	Mean	Median	Maximum	Minimum	Std. Dev
China	0.000	0.000	0.321	−0.168	0.017
India	0.000	0.000	0.162	−0.120	0.015
Indonesia	0.000	0.000	0.140	−0.119	0.015
Korea	0.000	0.000	0.119	−0.120	0.017
Malaysia	0.000	0.000	0.231	−0.214	0.013
Pakistan	0.000	0.000	0.136	−0.123	0.015
Philippines	0.000	0.000	0.175	−0.122	0.014
Thailand	0.000	0.000	0.120	−0.148	0.015

4.2. Unit Root Test

Table 3 shows that all emerging stock market indices are integrated of order one, I(1). Results of the ADF test are hereby confirmed by the Philips-Perron test. As a result, we can move towards co-integration analysis, examining if there is a long-run relationship between Pakistan and selected emerging stock markets or not.

Table 3. Results of Augmented Dickey Fuller Test and Philips-Perron Test.

Countries	Level ADF Test Statistics	1st Difference ADF Test Statistics	Level PP Test Statistics	1st Difference PP Test Statistics
China	−1.827	−71.29 *	−1.836	−71.295 *
India	0.142	−65.449 *	−0.104	−65.984 *
Indonesia	0.105	−62.430 *	−0.012	−62.314 *
Korea	−1.029	−68.351 *	−1.075	−68.250 *
Malaysia	−0.852	−68.422 *	−0.940	−68.441 *
Pakistan	0.733	−66.220 *	0.307	−68.093 *
Philippines	0.048	−62.009 *	−0.119	−61.872 *
Thailand	−0.981	−66.887 *	−1.110	−67.088 *

Note: * indicates that ADF statistics and PP statistics are significant for the first difference of all stock indices at 5% level of significance.

It can be seen in Table 3 that all the variables are integrated of the same order i.e., I(1) stationary at 1st difference.

4.3. Co-Integration Tests

Results of pair wise Johansen and Juselius co-integration tests are reported in Table 4. They reveal that there is long-term integration between the stock market of Pakistan and the stock markets of China, India, Indonesia, Korea, Malaysia, Thailand and Turkey, as critical value do not exceed the trace statistics at 5% level of significance.

Table 4. Results of Co-integration Tests.

Country	No. of Hypothesized CE(s)	Trace Test		Maximum Eigen Value Test	
		Test Stat	**Crit. Value**	**Test Stat**	**Crit. Value**
China	None	14.093	18.397	8.729	17.147
	At Most 1	5.3643	3.841	5.364	3.841
India	None	16.792	18.397	11.189	17.147
	At Most 1	5.6030	3.841	5.603	3.841
Indonesia	None	11.001	18.397	5.964	17.147
	At Most 1	5.0374	3.841	5.037	3.841
Korea	None	18.064	18.397	10.842	17.147
	At Most 1	7.2225	3.841	7.222	3.841
Malaysia	None	11.177	18.397	6.638	17.147
	At Most 1	4.5390	3.841	4.539	3.841
Philippines	None	8.1399	18.397	5.693	17.147
	At Most 1	2.446	3.841	2.446	3.841
Thailand	None	13.316	18.397	8.377	17.147
	At Most 1	4.939	3.841	4.939	3.841

5. Country Wise Determinants of Stock Market Co-Movement between Pakistan and Asian Emerging Economies

5.1. Pakistan and China

Determinants of stock market co-movement between Pakistan and China are reported in Table 5. The coefficient estimate for the volatility in the bilateral exchange rate between Pakistan and China is significant and negative. Such results are in line with Bracker et al. (1999), Lin and Cheng (2008). They report that volatility in the bilateral exchange rate is significant and negatively associated with stock market co-movement. In other words, greater volatility in the bilateral exchange rate between Pakistan and China results in lower co-movement between their stock markets. The coefficient estimate for the world market volatility between Pakistan and China is significant and positive. Such results are in line with the earlier research work of Bracker and Koch (1999). Putting it differently, world market volatility is positive and significant in explaining the correlation between two stock markets. The co-efficient estimate for the gdp growth rate, industrial production growth rate, inflation rate and interest rate between Pakistan and China is insignificant and will therefore have no effect on the returns of the two stock markets. The R-square of 0.308 indicates that 30.8% of the variation in the correlation coefficients is explained by the variables under study, which is indication of a reasonably good fit.

Table 5. Determinants of Stock Market Co-movement between Pakistan and China.

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	−0.176	0.179	−0.984	0.331
$Trade_{ijt}$	0.003	0.002	1.182	0.244
GDP	0.002	0.025	0.090	0.928
IND	0.000	0.002	0.320	0.750
INF	−0.009	0.007	−1.247	0.219
INT	0.010	0.017	0.582	0.563
WLDVOL	0.003	0.001	2.513	0.016
XRCH	−5.727	2.689	−2.129	0.039
XRSD	−1.364	0.453	−3.010	0.004
R-squared	0.308			
Prob(F-statistic)				0.065

5.2. Pakistan and India

Determinants of stock market co-movement between Pakistan and India are reported in Table 6. The coefficient estimate for bilateral trade between Pakistan and India is significant and positive, showing that bilateral trade is significant in explaining the correlation between Pakistan and India. Such results are in line with Bekaert and Harvey (1997), Bracker et al. (1999), Johnson and Soenen (2003), Pretorius (2002), and Walti (2005). They report that trade is significantly and positively associated with stock market co-movement. In addition, our results are in line with Forbes and Chinn (2004), Lucey and Zhang (2010). They report that the extent of stock market co-movement is dependent on the extent of strong bilateral trade relationships. Putting it differently, stronger bilateral trade ties between Pakistan and India result in higher co-movement between their stock markets.

Table 6. Determinant of Stock Market Co-movement between Pakistan and India.

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	−0.089	0.110	−0.808	0.423
$Trade_{ijt}$	0.134	0.063	2.122	0.040
GDP	−0.026	0.014	−1.859	0.0709
IND	0.003	0.002	1.628	0.111
INF	−0.032	0.019	−1.604	0.117
INT	−0.024	0.008	−2.749	0.009
WLDVOL	0.005	0.002	2.456	0.018
XRCH	−2.136	3.051	−0.700	0.488
XRSD	3.526	3.043	1.158	0.254
R-squared	0.223			
Prob(F-statistic)				0.259

The coefficient estimate for the interest rate differential between Pakistan and India is significant and negative. The results of this study are also in line with Bracker and Koch (1999), Bracker et al. (1999), and Lin and Cheng (2008). They report that interest rate differential of two countries is significantly and negatively associated with the co-movement of stock markets. Putting it differently, smaller interest rate differential promotes the integration of stock markets of two countries. The coefficient estimate for gdp growth rate, industrial production growth rate, inflation rate, world market volatility, absolute change in the bilateral exchange rate and volatility in the bilateral exchange rate is insignificant and will have no influence on the prices and returns of the stock markets of Pakistan and India. The R square of 0.223 indicates that 22.3% of the variation in the correlation coefficients is explained by the variables under study and also indicate the presence of other variables affecting the correlation.

5.3. Pakistan and Indonesia

Determinants of stock market co-movement between Pakistan and Indonesia are reported in Table 7. The coefficient estimate for the world market volatility between Pakistan and Indonesia is significant and positive. Such results are consistent with previous research work like Bracker and Koch (1999). In other words, world market volatility is positive and significant in explaining the correlation between the two stock markets. The R-square of 0.248 indicates that 24.8% of the variation in the correlation coefficients is explained by the variables under study and also indicate the presence of other variables affecting the correlation. The coefficient estimate for the bilateral trade, gdp growth rate, industrial production growth rate, inflation rate, interest rate, absolute change in the bilateral exchange rate and volatility in the bilateral exchange rate is insignificant and will have no influence on the prices and returns of the stock markets of Pakistan and Indonesia.

Table 7. Determinant of Stock Market Co-movement between Pakistan and Indonesia.

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	−0.077	0.104	−0.736	0.466
$Trade_{ijt}$	0.072	0.106	0.680	0.500
GDP	−0.008	0.008	−1.048	0.301
IND	0.000	0.002	0.178	0.859
INF	−0.010	0.006	−1.448	0.156
INT	0.016	0.010	1.543	0.131
WLDVOL	0.004	0.002	2.158	0.037
XRCH	−0.301	2.902	−0.103	0.918
XRSD	−406.136	795.639	−0.510	0.612
R-squared	0.248			
Prob(F-statistic)				0.181

5.4. Pakistan and Korea

Determinants of stock market co-movement between Pakistan and Korea are reported in Table 8. The coefficient estimate for the GDP growth rate differential between Pakistan and Korea is significant and negative, showing that the lower GDP growth rate difference between Pakistan and Korea results in higher co-movement. Such results are in line with the results of earlier studies like Johnson and Soenen (2003), Mobarek et al. (2016). These researchers also report that the higher the GDP growth rate difference between the market pairs, the lower will be the co-movement between the two stock markets. World market volatility is the second important determinant of stock market co-movement between Pakistan and Korea. The coefficient estimate for the world market volatility between Pakistan and Korea is significant and positive. Such results are consistent with previous research work like Bracker and Koch (1999).

Table 8. Determinant of Stock Market Co-movement between Pakistan and Korea.

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	−0.097	0.127	−0.763	0.449
$Trade_{ijt}$	0.163	0.124	1.314	0.196
GDP	−0.022	0.010	−2.091	0.043
IND	0.003	0.002	1.186	0.243
INF	1.90×10^{-5}	0.005	0.003	0.997
INT	0.001	0.012	0.154	0.877
WLDVOL	0.005	0.002	2.177	0.035
XRCH	−3.311	0.973	−3.401	0.001
XRSD	−85.947	29.595	−2.904	0.006
R-squared	0.316			
Prob(F-statistic)				0.056

The other determinant of stock market integration between Pakistan and Korea is volatility in the bilateral exchange rate. The coefficient estimate for the volatility is significant and negative. Such results are in line with Bracker et al. (1999), and Lin and Cheng (2008). They report that volatility in the bilateral exchange rate between two countries is significant and negatively associated with stock market co-movement. Absolute change in the bilateral exchange rate is another determinant of co-movement between Pakistan and Korea. The coefficient estimate for the absolute change in the bilateral exchange rate between Pakistan and Korea is significant and negative. Such results are in line with Bracker et al. (1999), and Lin and Cheng (2008). These researchers report that larger change in the bilateral exchange rate offers more benefit to the country with the depreciating currency by influencing bilateral trade conditions and influencing the returns of the two stock markets. The R-square of 0.316 indicates that 31.6% of the variation in correlation coefficients is explained by the variables under study, which is evidence of a reasonably good fit.

5.5. Pakistan and Malaysia

Determinants of stock market co-movement between Pakistan and Malaysia are reported in Table 9. The coefficient estimate for the volatility in the bilateral exchange rate between Pakistan and Malaysia is significant and negative. Such results are in line with Bracker et al. (1999), and Lin and Cheng (2008). They report that volatility in the bilateral exchange rate between two countries is significant and negatively associated with stock market co-movement. In addition, absolute change in the bilateral exchange rate between Pakistan and Malaysia is another determinant of stock market co-movement. The coefficient estimate for absolute change in the bilateral exchange rate between Pakistan and Malaysia is significant and negative. Such results are in line with Bracker et al. (1999), and Lin and Cheng (2008). These researchers also report that large change in the bilateral exchange rate leads to more benefit for the country with the depreciating currency by influencing bilateral trade conditions and influencing the stock prices of the two stock markets.

Table 9. Determinant of Stock Market Co-movement between Pakistan and Malaysia.

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	0.007	0.141	0.051	0.959
$Trade_{ijt}$	−0.071	0.205	−0.347	0.731
GDP	−0.003	0.031	−0.102	0.919
IND	0.006	0.004	1.595	0.124
INF	−0.012	0.008	−1.408	0.172
INT	0.015	0.016	0.919	0.367
WLDVOL	0.003	0.002	1.820	0.081
XRCH	−10.467	1.913	−5.471	0.000
XRSD	−0.736	0.154	−4.774	0.000
R-squared	0.432			
Prob(F-statistic)				0.067

The coefficient estimate for the bilateral trade, GDP growth rate, industrial production growth rate, inflation rate, interest rate, world market volatility is insignificant and will have no influence on the prices of the stock markets of Pakistan and Malaysia. The R-square of 0.432 point out that 43.2% of the variation in the correlation coefficients is explained by the variables under study, which is indication of a reasonably good fit.

5.6. Pakistan and Thailand

Determinants of stock market co-movement between Pakistan and Thailand are reported in Table 10. The coefficient estimate for the GDP growth rate differential between Pakistan and Thailand is significant and negative, showing that the lower GDP growth rate difference between Pakistan and Thailand results in higher co-movement. Such results are in line with the results of earlier studies like

Johnson and Soenen (2003), and Mobarek et al. (2016). These earlier researchers report that the GDP growth rate differential of two economies is significant and negatively associated with stock market co-movement. The second important determinant of stock market co-movement between Pakistan and Thailand is world market volatility. The coefficient estimate for the world market volatility between Pakistan and Thailand is significant and positive. Such results are consistent with previous research work like Bracker and Koch (1999). In other words, world market volatility is positive and significant in explaining the correlation between the two stock markets.

Table 10. Determinant of Stock Market Co-movement between Pakistan and Thailand.

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	0.146	0.111	1.314	0.196
$Trade_{ijt}$	0.088	0.149	0.591	0.557
GDP	−0.026	0.006	−3.793	0.000
IND	0.001	0.000	1.907	0.064
INF	−0.008	0.006	−1.452	0.154
INT	−0.017	0.010	−1.628	0.111
WLDVOL	0.004	0.001	3.111	0.003
XRCH	−0.629	1.174	−0.536	0.595
XRSD	0.403	1.087	0.371	0.712
R-squared	0.405			
Prob(F-statistic)				0.007

The coefficient estimate for bilateral trade, industrial production growth rate, inflation rate, interest rate, absolute change in the bilateral exchange rate and volatility in the bilateral exchange rate is insignificant and will have no effect on the prices of the stock markets of Pakistan and Thailand. The R square of 0.405 indicates that 40.5% of the variation in the correlation coefficients is explained by the variables under study, which is evidence of a reasonably good fit.

6. Country-Wise Diagnostic Test

Since all the variables in the regression are stationary, the assumptions of classic regression analysis are fulfilled. Consequently, standard diagnostic tests can be used to evaluate this function statistically. Table 11 summarizes the results of the diagnostic tests performed on the residuals. These diagnostic tests proved that the error terms are normally distributed and not auto-correlated.

Table 11. Country-wise Diagnostic Test.

PAKISTAN–CHINA			
Test Performed for	Test	Test Statistic	Conclusion
Normality	Jarque Bera	0.588	Residuals normally distributed
Serial Correlation	Durbin Watson	1.645	No serial correlation
PAKISTAN–INDIA			
Test Performed for	Test	Test Statistic	Conclusion
Normality	Jarque Bera	2.986	Residuals normally distributed
Serial Correlation	Durbin Watson	2.215	No serial correlation
PAKISTAN–INDONESIA			
Test Performed for	Test	Test Statistic	Conclusion
Normality	Jarque Bera	1.034	Residuals normally distributed
Serial Correlation	Durbin Watson	2.143	No serial correlation

Table 11. *Cont.*

PAKISTAN–KOREA			
Test Performed for	Test	Test Statistic	Conclusion
Normality	Jarque Bera	0.048	Residuals normally distributed
Serial Correlation	Durbin Watson	2.122	No serial correlation
PAKISTAN–MALAYSIA			
Test Performed for	Test	Test Statistic	Conclusion
Normality	Jarque Bera	3.068	Residuals normally distributed
Serial Correlation	Durbin Watson	1.812	No serial correlation
PAKISTAN–THAILAND			
Test Performed for	Test	Test Statistic	Conclusion
Normality	Jarque Bera	2.047	Residuals normally distributed
Serial Correlation	Durbin Watson	1.995	No serial correlation

7. Conclusions

Portfolio investors or speculators should diversify and pursue arbitrage opportunities. They need to consider this on priority and learn about the different mechanisms that enable co-movements among two countries, so they can make appropriate investmentdecisions. Policy makers also need to understand the mechanisms and changes of co-movements in order to make appropriate policy decisions; not taking these differences into account could result in policies that make the situation worse. The authors conclude that if policy makers want to enhance the international integration of equity markets, they need to focus on eliminating the fundamental causes of obstacles to cross-border settlements.

An important practical implication of this research is that it has developed a proper understanding on how far the two Asian powers (China, India) are economically integrated with Pakistan. This study is very important in the Asian context because of the shifting of global economic power towards China and India.

Policy makers need to improve their fundamentals to ensure financial stability. Investigating the dynamics of international stock market integration gives important insight to policymakers to design strategies that sustain the stability of the country's economy against global shocks. For example, by studying the Asian financial crisis (1997–1998), Von Hagen and Ho (2007) emphasized that any systematic shock (e.g., financial crisis) can spread from one economic system to another, if two markets are integrated. Therefore, it is very important for policy makers to develop a proper understanding of the extent and strength of stock market integrations in order to remain vigilant and undertake pre-emptive measures to prevent systematic shocks.

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