

A Cointegration Analysis of the Pakistan Stock Exchange with Emerging Markets

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ABSTRACT

The study aims to investigate cointegration of PSX with emerging stock markets. To test the hypotheses in the study, monthly closing data of selected stock market returns for a period of 20 years from January 2001 to December 2020 were collected from different sources such as Yahoo Finance, Business Recorder and the World Bank. The study is based on the data collected during the research period to investigate seven stock markets that are developing. A time series diagnostic test was carried out to conduct the inquiry. As per the study, in terms of returns as well as volatility, Pakistan Stock Exchange (PSX) has the highest returns and volatility over other emerging markets. The correlation research shows that there is a weak correlation between the PSX and most of the stock markets. The data is at rest at the first difference, as results of the Phillip Peron and Augmented Dickey-Fuller tests indicate. As for the cointegration analysis, it is found that three cointegration relationships exist among the variables or series of all the main emerging stock markets. The lead-lag relationship then was checked by calculating the Granger causality test on the returns series of the stock market. "We find that there is a lead-lag relationship between PSX and certain markets." A vector error correction model is used to quantify the rate of adjustment of shocks. The results indicate that PSX adapts to some developing stock markets in a short period of time. Findings of the study indicate that there are equities that are more affected by shocks in the short term. The article relies on impulse response test to visually determine the rate of adjustment. Future research directions, limitations, recommendations and managerial implications are also addressed.



Introduction

Integration of the Market in the World Markets

Financial market integration is a phenomenon which has gained significance over the past 2 decades. Bekaert and Harvey (2002) observe that the global risk variables and premiums of interconnected economies are determined based on local risk variables. Recent studies have shown that these tests, which test the diversification of profits in a large number of markets, increasingly are supporting portfolios. Correlation coefficient between the national bond indices is one of the basic measures of market integration. Smith and Walter (1998) discovered that the relationship between the Pakistani and the US stock markets between February 1993 and January 1996 had a -0.01 relation. The world market has some demand as indicated by 0.02 and 0.04 correlations between Pakistan and MSCI global market index (Harvey, 1995).

Still, there is a weak connection between the Pakistani and the developed stock markets. Korajczyk (1996) employed an inclusion measure based on an international APT model price error to study the convergence in the market. He discovered that the biggest post-liberalization errors were larger than expected whereas in Pakistan, the pricing errors were smaller. Recent studies have employed cointegration and Vector Autoregression (VAR) to analyse complex relationships among capital markets. Pakistan despite its fluctuating stock market with established markets in the US, UK and Japan showed no causal effect on Pakistan meaning it can be diversified by the reputable markets according to Naz et al. (2012). Although Darrat and Zhong (2002) explored the effect of the US and Japan on ten Asia markets, including Pakistan, during the period between November 1987 and November 1999, and arrived at the conclusion that the US economy is a major factor in shaping the Pakistan market, Naeem (2002) examined the co-movement between Pakistan Stock Exchange (PSX) and the developed markets in the period between January 1994 and April 1998. A 1997-2003 research cointegration study by Lamba (2003) reveals that the market of Pakistan is relatively independent, despite the strong linkage of Indian market to the American market. Overall, Pakistan is yet to realize full integration with the advanced markets as is the case in other emerging markets.

Background of Study

The important targets of developing countries like Pakistan are economic development and prosperity and the means of attaining the target is investment. According to Robertson (1936), capital markets are best suited to invest and savings tend to be transformed into investments. These markets enable investment culture, through effective funnels in the portfolios investment. It is relevant in firms which issue shares, agents and investors. Parallel market movements have to be reflected in the movement of bonds, in the achievement of the purpose of maximizing lender equity, of maintaining, security of principal and a suitable ratio between risk and returns. Direct investment in financial markets is easily achieved whereas indirect investment is handled by the financial intermediaries. The investments are either direct or indirect.

Foreign Direct investment and Foreign Portfolio Investment (FDI) enable investors to manage their savings in an international basis Portfolio investments can be differentiated by the concept of passive ownership and the absence of securities management, besides the focus on monetary gain only. Share portfolios are mainly handled by financial institutions (Awan et al., 2020). Diversification does risk reduction and maximization of returns, Williams (1938) also argued that a diversified portfolio would not eliminate risks all together. The Markowitz Portfolio Diversification Hypothesis (Markowitz, 1952) suggests that the diversified stock investments should lower the risk to the investors. The financial pricing shift can constrain the long-term returns of global investors, yet there are possibilities of portfolios internationalization of fair

returns and growth. Diversification has implications that investors and fund managers should be made aware of (Shah, 2015).

The investors want to diversify their portfolio by accessing foreign market to increase the risk adjusted returns; they are commonly attracted into the stock markets of the developing countries owing to the high returns and less risks. Causes like political uncertainties and power outages in their domestic markets have caused the local investors to invest their funds in the stronger global markets. The rich countries have lower market entry barriers and favourable policies, which draw the flow of foreign investors that are vital in the economic development of the developing countries (Alvi et al., 2015).

The existence of capital flow ties stock markets across nations and gets concentrated through the world financial crises such as the Wall Street crash of 1987 and the Asian financial crisis in 1997. The crisis of 1997 and the recent global recession of 2007 demonstrated how far the financial problems can go (Ali et al., 2021). The 2007 recession was mainly due to a decline in interest displayed by investors on mortgage securities that resulted in liquidity crisis. The collective movements of capital markets which are conditioned by the globalization and financial crises have become a subject of interest among academics (Gulzar et al., 2016).

The integration and efficiency of the stock market has been boosted owing to the convergence of the global economy. An evaluation of the World Bank in 1997 shows that it is the desire to gain greater returns and attempt to diversify risks in the emerging economies that are promoting the metamorphosis of the global capital markets into one economy. Bekaert and Harvey (1995) state their results that it is the level of integration with the global capital markets that determines commercial and financial policies in a country.

The financial economy hypothesis holds that there is an increase in growth and stability because of the deep financial integration, an improved market structure and capital efficiency, and There is an increase in diversification of portfolios (Paurer, 2005). The co-movements in capital exchanges will have to be comprehended in order to handle the wealth effectively. The changes in the financial markets may lead to the challenge of the Efficient Market Hypothesis (EMH) according to which the stock prices cannot be anchored in the publicly available information of the other markets.

Globalization, liberalization and technological progress are the key factors that have led to convergence of domestic and foreign capital markets in the recent past. Bekaert and Harvey (1997) have gone further to theorize that financial market liberalization has brought about an improvement in the relationship among returns in the stock market. The policymakers acknowledge the advantages of financial integration which entail increased competition, increased expenditure and economic growth. The availability of international stock markets will give the investors a variety of risks-adjusted returns and diversification opportunities. Good knowledge of behavior of the money and stock markets is required of the politicians, investors, portfolio managers and financial analysts to make informed decisions.

Problem Statement

Stock market being a predictor of economic success of a country has significant influence on economic growth of a country. Factors that influence performance of stock market include the success and depreciation of other international stock markets among many others. As there is a dearth of previous literature in the specified area (Bibi et al., 2021; Ahmad et al, 2021; Wahid et al., 2018; Zaheer, A., & Kiran, N., 2020), the study at hand tries to explore the question of whether the Pakistan Stock Market (PSX) is cointegrated with leading stock markets worldwide. Specifically, the research examines the integration of PSX with the emerging economies such as

Turkey, Taiwan, Italy, and Singapore and major economies such as USA, China, Malaysia, UK, and Canada (Akhtar and Khan, 2016). It further examines the co-movement of PSX with the emerging markets such as Bangladesh, India, Venezuela and Zimbabwe (Ali et al, 2011). These reasons ensure the study also analyzes the cointegration of PSX with other world economies.

Significance of the Study

This paper explores the process of co-integration of the Pakistan Stock Exchange (PSX) with the stock exchanges of other countries both developed, emerging and developing. The objective is to get a better understanding of the relationship and co-movement between the PSX and other markets. The investigation will enable the investors and the stock market authorities to know the potential ways that can reduce the impact of foreign market moves on the PSX by establishing whether the PSX is cointegrated with international markets. High co-movement can imply that bearish movements in other markets cannot affect the PSX adversely and bullish movements can lead to the increase of the higher tendencies in the PSX. This knowledge is necessary in order to have a clear picture of the economic picture. Besides, the research will provide scholars and investigators with valuable data on PSX movements, and in case positive integration is found, it could draw in foreign capital. The growth in foreign direct investment (FDI) may prove beneficial to PSX administration in case the integration with leading economies is successful.

Literature Review

Co-integration, which had originally been introduced by Kasa in 1992, is an important method of analyzing the integration of stock markets. Shah, S. Z. A., & Hussain, Z. (2012) empirically investigated the association between the Pakistan Stock Exchange (PSX) and the G-8 countries (Japan, UK, US, France, Italy, Canada, Russia and Germany) using data collected weekly in 2004-2009. Some of the co-integration statistics they employed included the vector error correction model (VECM), Johnson and Julius (JJ) test, impulse response test, variance decomposition test and the Granger causality test. In their study, Esqueda et al. (2012) measured the risk with monthly data and tested the relationship between the market integration and the market volatility with experimental annual data between 1997 and 2005 in an attempt to determine the link between the PSX and the G-8 stock markets. They concluded using GARCH and Unit Root tests, that developing markets had a negative effect on the stock volatility, but that the developed markets were not strongly affected by other markets. This implies that a well-integrated market reduces volatility of stocks.

Ali et al. (2011) studied the co-movement of the Pakistani Stock Exchange (PSX) with emerging (India, Singapore, Taiwan, Indonesia) and established markets (USA, UK, Japan, Malaysia, China) based on the monthly stock return data between the year 1998 and 2008. They found no cointegration of PSX with several other well-established markets and this implies that they can be diversified to at least a few other markets and this will help the investors to reduce the risk. However, they found cointegration between PSX and Chinese, Indonesian, Japanese and Indian markets, which implies that in such cases, diversification is not the most effective risk-reduction tool.

Wang, Chen, and Huang (2011) employed the use of variance decomposition and vector error correction models in examining co-movement in 38 countries during the period between 1992 and 2007. They found out that the discount rates of cash flows and returns were cointegrated across the selected countries, which points to the fact that discount rate co-movement is more significant than other co-movements.

Chow (2017) analyzed the cointegration of East Asian countries and the US market based on more than 30 years of the weekly data between 1980 and 2011. Depending on their economies, they divided the nations into two blocks, one comprised the US, China, and Japan and the other comprised Singapore, Taiwan, Korea, and Hong Kong. In their statistics, the US and Japanese market had a low correlation and no joint movement of stock returns between the two blocks. Blackburn, D. W., & Chidambaran, N. K. (2015) applied the W-FF factor model and the W-GCC method to analyze co-movement between 10 developing and 23 developed economies during a similar period (30 years) (1980-2010). They concluded that co-movement of stock prices was not significantly influenced by determinants of a nation or industry meaning that investors had a chance to diversify. They have also noticed co-integration of stock prices of small and major economies and found that countries moved around more in the period 1995-2000.

To establish the relationship of the Pakistan Stock Exchange (PSX) and the emerging markets, 11 years of weekly data were examined in the study by Hussain, A., Awan, M. A., & Tariq, R. (2020) between the year 2000 and 2010. As the results of their findings indicate, the US market and PSX are closely correlated with PSX having a higher risk-return ratio as compared to the US and UK market. Subhani et al. (2011) explored the cointegration of various stock markets in Asia using the daily data of Bangladesh, India, Pakistan, Nepal among others between 1995 and 2011, using PSX as the platform to recommend that foreign investors could invest in. They found a long-term relationship between PSX and the Bangladeshi stock exchange but did not find any cointegration between PSX and the emerging economies (China, Malaysia, Japan, and Taiwan) they selected as well (Shahzad et al., 2014). They established a short-term relationship but no long-term relation between PSX and these markets by using unit root tests, VECM, VAR, correlation analysis and Johansen cointegration.

Based on the data of stock prices on PSX (2001-2014, daily), Aamir and Shah (2018) examined the co-movement of PSX with a broader pool of emerging markets, including Chile, Brazil, Egypt, China, Argentina, Korea, Peru, Israel, India, Czech Republic, Hungary, Turkey, Poland, Morocco, Indonesia, Thailand, and Malaysia. Their cointegration studies indicated that PSX did not cointegrate with the stock markets of the Philippines, the Czech Republic, Argentina, Hungary, and Peru, which would allow the investors to gain profits by investing in such markets as a means to diversify their portfolios. Conversely, they found that there was a positive correlation between PSX and the Chilean, Indonesian, Egyptian, Moroccan, Thai and Indian stock markets.

The paper by Husain and Saeed (2017) employed correlation and ARDL cointegration to examine the co-movement of the Pakistan Stock Exchange (PSX) and developed economies and new Emerging markets of Asia from 1995 to 2014 According to their research, PSX has a low short and long term correlation to the following markets. This suggests that opportunities exist for overseas investors when they invest in PSX. Khan et al. (2018) showed that the relationship between PSX and the major stock markets was explored. Between 1997 and 2014 they gathered data. The-variable cointegration test (Johansen cointegration test) and VECM were applied. The PSX is found to have a positive, but substantial, relation with the Indian market and a negative, but significant, relation with the US and Chinese markets, they found. They concluded that PSX is the most volatile stock market. Ahmed et al. (2021) employed the cointegration approach to observe the interdependence and long memory on five stock exchanges of Asia, in which it is suggested that risk-seeking investors may be favored in such a market. In order to validate their hypotheses, the Granger causality test was used and it was found that the stock markets of China, Hong Kong, India and Sri Lanka were highly associated with the Pakistan Stock Exchange (PSX). They found that PSX and every other market they selected was correlated over the long-term, suggesting that diversification would not in the long run benefit investors.

Methodology

The study targets stock markets in emerging economies using Morgan Stanley Capital International (MSCI) standards in order to classify the developed and the emerging markets. A representative sample of 7 emerging markets (Chile, Egypt, Greece, Hungary, Mexico, Poland and Qatar) were selected by employing purposive sampling. The secondary data were obtained in the form of stock market returns through the World Bank, Yahoo Finance, and Business Recorder, among others.

Among the analytical tools used in the study, there are the Unit Root Test, the Granger causality test, the Vector Error Correction Model (VECM), the Johansen and Juselius (1990) co-integration test, and the Impulse Response. For determining stationarity of the data, the unit root test is used while the Johansen and Juselius co-integration test is used to determine co-integration of variables. The Granger causality test is used when certain patterns in the series have been identified and the VECM is used to derive the sensitivity of markets to aftershocks.

The impulse response concept is to see what happens to the variables of the VAR system when different shocks are applied, to see what is happening in the system when it responds to exogenous disturbances, and to see how different variables respond to a given shock. The study is going to introduce a holistic understanding of the characteristics of the stock market and their contribution to economic growth.

Empirical Results

Descriptive Statistics

The results in table 1, shows that PSX market has the highest average return of 9.40 and a risk score of 0.69 and therefore has the most promising return potential. At a specified risk level, Chile, Egypt and Mexico also had strong returns. With a value of 0.17 at risk of 2.58, Hungary's stock market had the worst performance of the rich countries. With the highest risk because of a high rate of return for investors, the PSX market is the most volatile among the emerging markets.

Egypt, Greece, Hungary, Mexico, Poland and Qatar)

Table 1: Descriptive Statistics of PSX and Emerging Markets

	PAK	CHI	EGY	GRE	HUN	MEX	POL	QAT
M	9.40	4.69	4.05	2.68	2.53	3.68	3.34	7.41
Mdn	9.40	4.45	4.04	2.74	2.58	3.88	3.34	7.41
Max	10.77	8.09	4.46	3.21	2.82	4.31	3.67	7.72
Min	7.03	0.69	3.59	1.76	1.85	2.44	3.01	7.12
SD	0.69	0.25	0.21	0.35	0.17	0.51	0.13	0.14
Skew.	-0.65	-0.04	0.06	-0.48	-1.47	-1.04	0.19	0.14
Kurt.	2.64	2.41	1.96	2.37	5.47	2.76	2.74	1.84
JB Stat	17.28	13.268	10.35	12.33	139.02	41.83	21.06	13.38
p-value	0.000176	0.01	0.005	0.002	0.00	0.00	0.003	0.001
Sum	2124.87	1061.69	917.47	606.37	573.51	832.61	756.14	1675.88
SSD.	222.2	1147.49	10.04	27.77	6.68	59.84	4.27	5.04
N	229	229	229	229	229	229	229	229

According to the correlation analysis (table 2) of the PSX returns and emerging market stock returns, there is a positive correlation between PSX and some stock returns. The strongest correlation was between Chile and Qatar, the weakest was between Poland and Qatar. The analysis

and evaluation of the co-movement of different stock markets were enhanced through co-integration approach of the study.

Table 2: Correlation of PSX and Emerging Stock Markets

	PAK	CHI	EGY	GRE	HUN	MEX	QAT	POL
PAK	1							
CHI	0.88	1						
EGY	-0.56	-0.41	1					
GRE	-0.40	-0.52	-0.20	1				
HUN	-0.53	-0.65	-0.12	0.60	1			
MEX	0.79	0.57	-0.71	0.15	-0.16	1		
QAT	0.81	0.83	-0.44	-0.49	-0.60	0.55	1	
POL	-0.14	-0.02	0.51	-0.29	-0.144	-0.46	-0.13	1

Unit Root Test of PSX and Emerging Markets

To test the stationarity of data, unit root tests also known as AR(1) techniques are used. The data may be considered as stationary or non-stationary. The long-term variance of non-stationary data is varying but the long-term variance of stationary data is fixed. Co-integration analysis requires the variables or series to be stationery at the same level or order. The data stationarity is tested in two ways, Phillips Perron (PP) and Augmented Dickey Fuller (ADF). Unlike PP, the tests of ADF assume similar distributions of the independent variables. At the 5-percent level, ADF exceeds -2.91877, so the data does not change stationary. Otherwise, it is indicated in the P-value ($P < 0.05$) that upon consideration of first differences, the series or variables are stationary. Repeat it with all the variables and all the ADF and PP test assumptions. Adopt the ARDL method in the Microfit software when the data is not held at the same order. The two panels were Panel-A and Panel-B to conduct the unit root test using ADF and PP. The results indicated that all the variables or indices had unit root when used simultaneously. The initial difference of all the variables had a P value of less than 0.05 at a 5% confidence range which showed that the variables have become stationary. The variables in Panel-B at the 1st difference at a 5% significance level exceeded the critical value (-2.87). After in-depth analysis, it was discovered that the variables in Panel B were not moving in the first difference at a confidence interval of 95 percent, but the variables in Panel A moved non-parietally at the log level. All indices were thus suitable to cointegration analysis.

Table 3: Unit Root Analysis by ADF and PP (Augmented Dickey Fuller and Phillips-Perron)

Stock Index	ADF Statistics	PP Statistics	Stock Index	ADF Statistics	PP
Statistics	Panel-A Log levels		Panel-B 1 st Difference		
PAK	-1.68	-1.70		-14.68	-14.69
EGY	-1.84	-1.88		-13.99	-14.01
GRE	-0.91	-0.94		-14.63	-14.63
HUN	0.14	0.14		-14.08	-14.08
MEX	-1.83	-1.87		-13.28	-13.29
CHI	-2.19	-2.20		-14.88	-14.90
POL	-2.14	-2.21		-14.33	-14.33
Qat	-1.06	-0.72		-15.27	-16.12

Test Critical Values

1% level -3.46

5% level -2.87
10% level -2.57

Results of the Multivariate Cointegration Analysis

Table 4 shows the result of a co-integration study between the Pakistan Stock Exchange and the stock exchange of emerging countries. Results of the analysis indicate three cointegrating equations among a set of four variables, indicating that the variables chosen are in three common recurrent patterns. These results are consistent with both the multivariate trace statistics co-integration test and the multivariate maximum eigenvalue test. The trace statistics indicate three co-integrating patterns at 5% level while max-Eigen value test indicates two patterns at 0.05 level. The results reveal that the various topic markets are co-integrated, which empirically substantiates the presence of lead-lag relationships. The lead-lag relationship was tested by using Granger causality test.

Table 4: Summary of Cointegration Test Results

Test	No. of CE(s)	Statistic	5% Critical Value	Probability**
Trace	None *	200.81	159.53	0.000
	At most 1 *	139.06	125.61	0.000
	At most 2 *	96.60	95.75	0.040
	At most 3	62.01	69.81	0.170
Max-Eigen	None *	61.74	52.36	0.000
	At most 1 *	42.45	46.23	0.020
	At most 2	34.59	40.07	0.180

*Note: **MacKinnon-Haug-Michelis (1999) p-values. (Rejects H_0 at 5% significance).
indicates 3 co-integrating eqn (s) at the 0.05 level
Max-Eigen value test indicates 2 co-integrating eqn (s) at the 0.05 level*

Pairwise Granger Causality Test Outcomes of PSX and emerging markets.

Granger causality test is the basis of analysis of patterns in a series. $P < 0.05$ indicates a lead-lag relationship, whereas $P > 0.05$ indicates no relationship. One-way relationship is shown by a significant P-value. The results are consistent with the null hypothesis in that there is no Granger-causal relation between the resurgence of the Hungry Stock Exchange and the resurgence of the Pakistan Stock Exchange. The alternative hypothesis is considered to be the basis of leadership for the Hungarian stock exchange. The P value is less than the significance level of 0.05 which indicates that there is no correlation between the Pakistan Stock Exchange and the Hungry Stock Exchange. This means that the last set of results will be succeeded by a second set of series or variables. The analysis concludes that the return of the Hungry Stock Exchange has a substantial influence on the resurrection of the Pakistan Stock Exchange.

The study compares the performances of German Stock Exchange and PSX. The alternative hypothesis is accepted and the null hypothesis rejected, that is, at the 10 percent critical level, the returns of the PSK and that of the German stock market are not statistically significant. This means that the PSX's return will be at the same time as the German stock exchange recovery.

The alternative hypothesis is accepted, and null hypothesis is rejected as PSK and P-value of German stock exchange (0.092) is less than 0.10. Accordingly, the German stock exchange will be the front-runner in its renaissance followed by the Egyptian stock exchange. Also, it implies that the first set of results will be deemed to be superior to the second set of variables.

There is no Granger-Causal relationship between the two stock exchanges, since the P-value (0.02) of the Egyptian and Hungarian stock exchanges is smaller than the significance level of 0.05. This means that the null hypothesis is refuted, and the alternative hypothesis is confirmed.

In addition, the returns of the two currencies are significantly unidirectionally related, as the P-value (0.01) of the returns of the German and Hungarian stock exchanges is less than 0.05. This means that if the Hungarian stock exchange leads, the German stock exchange will do the same.

Finally, the P-value (0.012) is less than 0.05, which shows that there is a unidirectional association of significance between the return of the Qatar Stock Exchange and the Hungarian Stock Exchange. As a result, it appears that the reparation of QSE and the Hungry Stock Exchange do not have a Granger-causality relationship, and the inverse hypothesis holds.

Table 5: Significant Pairwise Granger Causality Relationships

Cause Variable	Effect Variable	F-Statistic	p-value	Direction
RLHU (Hungary)	RLPA (Pakistan)	3.94	0.021 **	Unidirectional
RLME (Mexico)	RLPA (Pakistan)	15.11	< 0.001 ***	Unidirectional
RLHU (Hungary)	RLEG (Egypt)	3.68	0.027 **	Unidirectional
RLME (Mexico)	RLEG (Egypt)	14.03	< 0.001 ***	Unidirectional
RLHU (Hungary)	RLGR (Greece)	4.48	0.012 **	Unidirectional
RLME (Mexico)	RLGR (Greece)	11.39	< 0.001 ***	Unidirectional
RLME (Mexico)	RLHU (Hungary)	12.44	< 0.001 ***	Bidirectional
RLHU (Hungary)	RLME (Mexico)	3.54	0.031 **	Bidirectional
RLHU (Hungary)	RLPO (Poland)	3.37	0.036 **	Unidirectional
RLHU (Hungary)	RLQA (Qatar)	4.00	0.020 **	Unidirectional
RLME (Mexico)	RLPO (Poland)	12.61	< 0.001 ***	Unidirectional
RLME (Mexico)	RLQA (Qatar)	13.94	< 0.001 ***	Unidirectional

Notes: *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively. This table only includes relationships significant at least at the 10% level.

Vector Error Correction Model

The result of the vector error correction model with a negative value of D (PSX) is presented in Table 6. At the 5% confidence level, the CointEq1 and D(PSX) values indicate a fast adaptation as they are not statistically significant. This shows that other markets exert influence on the Pakistan Stock Exchange and cause a short-term disturbance in equilibrium. In the emerging countries' interconnected markets, a negative number represents a disequilibrium adjustment of 31.11%, and an opportunity for investors to lower risk.

Table 6: Vector Error Correction Model

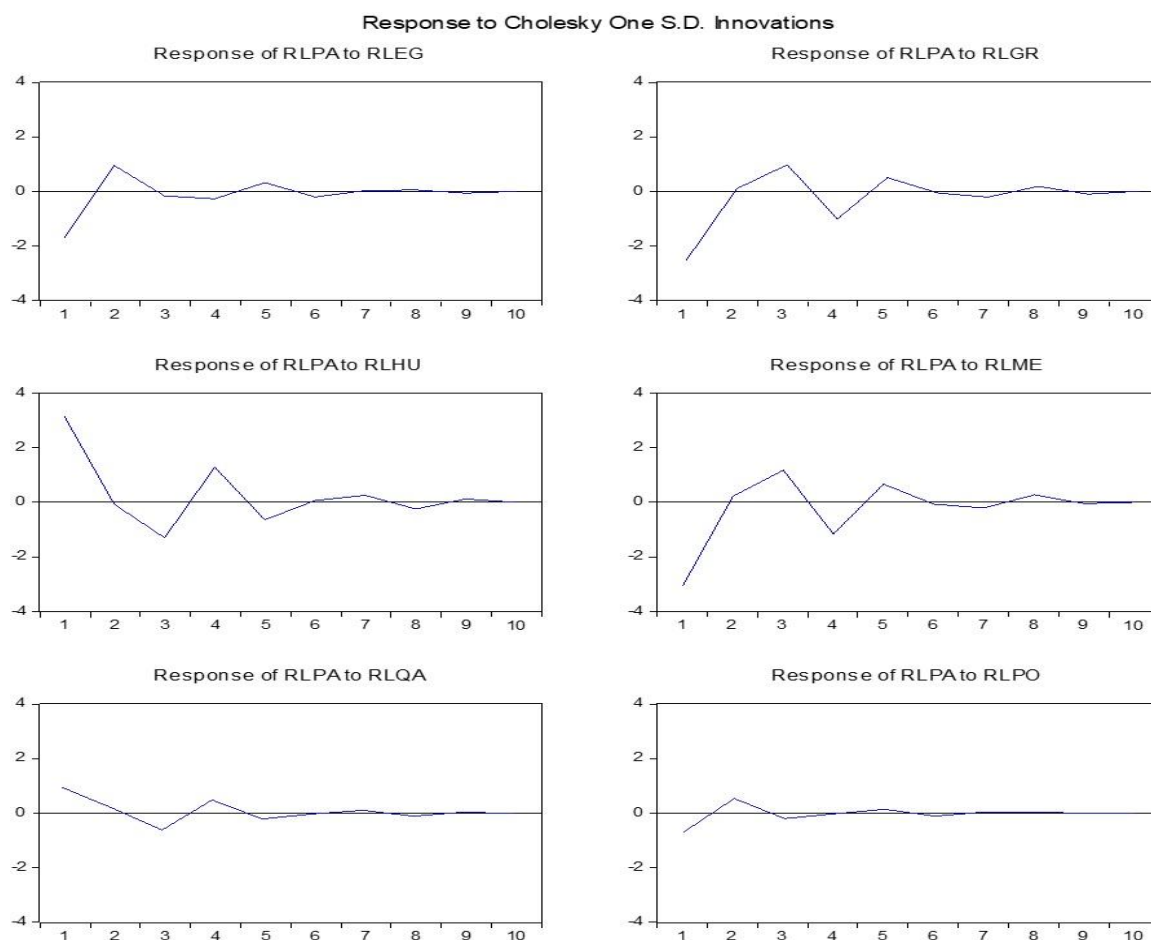
Error Correction:	D(RLPA)	D(RLEG)	D(RLGR)	D(RLHU)	D(RLME)	D(RLPO)	D(RLQA)
CointEq1	-.311994 (0.68599) [-4.54811]	-1.025661 (0.27129) [-3.78069]	-0.879452 (0.15061) [-5.83917]	-0.379466 (0.12674) [-2.99410]	-0.456822 (0.22887) [-1.99597]	-0.773189 (0.21455) [-3.60371]	-1.881346 (0.48237) [-3.90025]
D(RLPA(-1))	1.000391 (0.66900) [1.49536]	0.501573 (0.26457) [1.89580]	0.636059 (0.14688) [4.33039]	0.179445 (0.12360) [1.45183]	0.104845 (0.22320) [0.46973]	0.349954 (0.20924) [1.67250]	0.942944 (0.47042) [2.00447]
D(RLEG(-1))	-0.673015	-0.882780	0.080478	-0.103940	-0.363635	-0.131718	-0.568698

	(0.94244)	(0.37271)	(0.20692)	(0.17412)	(0.31444)	(0.29476)	(0.66270)
	[-0.71412]	[-2.36854]	[0.38893]	[-0.59695]	[-1.15647]	[-0.44686]	[-0.85816]
D(RLGR(-1))	1.361342	0.432793	-0.170295	0.151730	0.191520	0.377214	0.860754
	(0.73567)	(0.29094)	(0.16152)	(0.13592)	(0.24545)	(0.23009)	(0.51730)
	[1.85049]	[1.48759]	[-1.05433]	[1.11635]	[0.78029]	[1.63941]	[1.66394]
D(RLHU(-1))	1.290128	0.580864	0.162419	-0.360600	0.551488	0.415162	0.944046
	(0.90140)	(0.35648)	(0.19791)	(0.16654)	(0.30074)	(0.28193)	(0.63384)
	[1.43125]	[1.62944]	[0.82068]	[-2.16529]	[1.83375]	[1.47258]	[1.48941]
D(RLME(-1))	-3.935084	-1.341363	-0.990457	-0.576615	-1.444054	-1.038732	-2.496511
	(0.71805)	(0.28397)	(0.15765)	(0.13266)	(0.23957)	(0.22458)	(0.50491)
	[-5.48025]	[-4.72363]	[-6.28255]	[-4.34651]	[-6.02772]	[-4.62518]	[-4.94446]
D(RLPO(-1))	-2.223201	-0.865562	-0.623108	-0.323645	-0.192766	-1.257166	-1.484967
	(1.08591)	(0.42945)	(0.23842)	(0.20063)	(0.36230)	(0.33964)	(0.76358)
	[-2.04732]	[-2.01552]	[-2.61351]	[-1.61318]	[-0.53206]	[-3.70150]	[-1.94474]
D(RLQA(-1))	1.613646	0.776003	0.167647	0.274514	0.402565	0.476064	0.550924
	(1.46674)	(0.58006)	(0.32203)	(0.27099)	(0.48936)	(0.45875)	(1.03137)
	[1.10016]	[1.33780]	[0.52059]	[1.01302]	[0.82263]	[1.03774]	[0.53417]
C	-0.052729	-0.020257	-0.010094	-0.008763	-0.017242	-0.016169	-0.036631
	(0.04487)	(0.01774)	(0.00985)	(0.00829)	(0.01497)	(0.01403)	(0.03155)
	[-1.17521]	[-1.14161]	[-1.02463]	[-1.05707]	[-1.15177]	[-1.15221]	[-1.16105]
R-squared	0.258969	0.245795	0.356972	0.204831	0.254757	0.220117	0.224532
Adj. R-squared	0.204213	0.190065	0.309458	0.146075	0.199690	0.162490	0.167232
Sum sq. resids	89.30695	13.96753	4.305045	3.048376	9.941223	8.736305	44.15785
S.E. equation	0.663277	0.262308	0.145627	0.122542	0.221295	0.207451	0.466397
F-statistic	4.729504	4.410502	7.512926	3.486109	4.626299	3.819693	3.918504
Log likelihood	-212.5269	-9.366726	119.5091	157.3061	27.86825	42.01596	-135.4051
Akaike AIC	2.087003	0.231660	-0.945288	-1.290467	-0.108386	-0.237589	1.382695
Schwarz SC	2.334607	0.479263	-0.697685	-1.042864	0.139218	0.010015	1.630298
Mean dependent	-0.049391	-0.018880	-0.009531	-0.008359	-0.016010	-0.015382	-0.034842
S.D. dependent	0.743526	0.291465	0.175245	0.132610	0.247368	0.226684	0.511086

Impulse Response Function

With the use of the Impulse Response Functions of PSX return and Stock return in emerging countries, the graph shows the impacts of the standard deviation shocks and transient changes in the market environment. Also, it indicates the frequency with which PSX reacts to these changes.

Figure 1: Impulse Response Function



Conclusion and Recommendations

Conclusion

This study aimed to explore the long-run and short-run dynamics of Pakistan Stock Exchange (PSX) with other emerging, developed and Asian markets. Our analysis uncovers a gripping narrative of PSX's unique place in the global financial landscape.

The first thing that can be noted is the double-edged nature of the PSX. It is the highest yielding market with an average return of 9.40%, but this comes with the highest risk, as affirmed by the superior volatility. This is consistent with the conclusions in Khan et al. (2018), Bibi et al. (2021) and Hussain et al. (2020), who consistently describe the PSX as a high-risk, high-return environment relative to other emerging markets.

There are three cointegrating equations indicative of a strong long-run equilibrium relationship with other emerging markets. Thus, in spite of their geographic and economic dissimilarities, these markets are correlated in the long run and share the same characteristics that tie their fortunes together. This result is in line with Khan et al. (2018) in the sense that PSX cannot be considered in isolation.

The results of Granger causality tests reveal a rather unexpected lead-lag structure when the Hungary Stock Exchange turns out to be a major influential, Granger-causing returns in PSX, Germany, Poland, and Qatar. This suggests that shock or new information in the Hungarian market has a forecasting effect on these other markets, even for Pakistan. Furthermore, we found a

unidirectional causality: PSX has an impact on Germany and vice versa, which shows that Pakistan also plays a role in the transmission of shocks, but to a more developed market.

This is then followed by how quickly this adjustment takes place, and this is where the PSX shows its reactivity. Especially the Vector Error Correction Model (VECM) results are highly indicative. A high, negative value of -0.3111 further implies that 31.11% of any short-term disequilibrium is adjusted within each period. Moreover, the PSX has a high adjustment rate as per Wahid, A. (2018), Joyo and Lefen (2019), which indicates that the PSX is very sensitive to shocks from its cointegrated emerging market peers.

In summary, this study finds that the Pakistan Stock Exchange is a high-volatility, high-return market intricately interwoven into the fabric of emerging markets globally. It keeps a long-run equilibrium with these markets in place and adjusts to short-term deviations from this equilibrium with exceptional speed. Although it is shaped by certain markets (Hungary) it can shape other markets, such as Germany. These results emphasize the diversification potential for foreign investors, but they also stress the fast risk spillover. For policymakers, knowledge of these deep interconnections is essential for developing a strategy that can stabilize the domestic market against unpredictable shocks from the external environment and help maintain financial stability.

Recommendations

The current research focuses on a few of the emerging markets, restricting its extrapolation. The research in the future should cover all developed and emerging markets and examine how they co-move with the PSX. The research used monthly stock returns that should be used on a daily or weekly basis. It is advisable to use macroeconomic indicators in order to improve understanding of the correlation between the PSX and other developed, emerging, and Asian markets. Furthermore, later researchers are interested in discussing countries that have portfolio investments in Pakistan.

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