

Dynamic Linkage among Pakistan, Emerging and Developed Equity Market

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The study evaluates the relationship of Pakistan Stock Exchange¹ (PSX) with progressing and well-established equity markets from 1997 to 2014. The Johansen's multivariate cointegration tests i.e. maximum eigenvalue & trace statistics proposes three co-integrating vectors at 5% critical values with the progressing and well-established equity markets. Furthermore, vector correction model implies that PSX is positive and statistically robust in relation to India at lag 2, while negative and statistically significant in relation to China at lag 1 and USA at lag 2. Though, the bivariate co-integration trace and maximal eigenvalues recommends that the PSX individually have no relationship with other markets. This study further recommends that PSX is extremely unpredictable stock market in between from 44% to -24%. It might be desired by risky investors.

Keywords: PSX, Asian emerging equity markets, developed equity markets, Co-integration

The estimation of cointegration amongst World's stock markets gets significant status because of economy, as a global phenomenon. At present the flow of investment funds throughout the world is enhanced by state-of-the-art technology, advanced buying/selling structure & novelty of financial assets/instruments in financial markets. It develops stake of both practitioners and academicians to study and bring together world stock markets. The correlation between the world's stock markets has been improvised, once global stock market was collapse in October 1987 and hence more in Asian financial turmoil of 1997. Several scholars previously have evaluated this affiliation between the progressing and well-established world's stock markets.

Because of globalization and state of art technology, investor/s attitude is frequently fluctuating in stock market worldwide; that could be imparted in the smooth growth of economies. This could be result in fragile economies towards amalgamation between newly growing economies, like NAFTA, ASEAN, EU, Scandinavian states & MENA. It minimizes probability of loss of fiscal downfalls in almost every associated stock market which is favorable indication for the prosperity of global economy. Pakistan stock exchange is seen as an uprising stock market where their financial framework is in a rising phase. Asjeet (2005) evaluated the short and long-term association between the well-known stock markets of South Asia i.e. Sri Lanka, India and Pakistan with those of developed equity markets of the globe like UK, USA and Japan. Their research paper determined that selected Asian markets are comparatively separate from prominent established ones and came to know that South Asian stock markets are getting highly combined with each other but comparatively at a sluggish speed. Because of divergence in uprising stock markets, there are further possibilities for fund managers & institutional investors to diversify their investment via construction of portfolio diversification. The cointegration among well established and emerging stock markets is utmost need to optimize diversification via portfolio for potential investors. Particularly, after 1997 due to Asian financial crisis the parameter of influence of cointegration between Asian emerging equity markets went upbeat. The examination of cointegration of Pakistan Stock Exchange with other uprising stock markets is of interest, as PSX became conspicuously famous market since 2002. This research aims on evaluating the cointegration of Pakistan stock market with five Asian emerging stock indices that is BSE, KLSE, JCI, HIS and CSE & six developed stock markets that is NIKKEI, NYSE, FTSE100, AORD, CAC100 & DAX.

¹ Pakistan Stock Exchange (PSX) was formerly named as Karachi Stock exchange (KSE). However, the indices are still named same as previous i.e. KSE100, KSE 30 etc.

Literature Review

Kashif and Arshad (2011) studied the causal and constantly changing affiliation of KSE100 index with developing stock markets of Malaysia, China, Turkey, Hong Kong, Thailand, Brazil, Indonesia and India. Further their study also considers developed equity markets of UK, France, Japan and U.S.A for period of 1998 to 2008. By using Johansen co-integration method, result shows that KSE100 index have long run affiliation with Brazil and Indonesian stock markets & short-run relation with China stock market. Apart from this, result shows that equity markets of Nikkei225, JCI, SCI, KLSE, ISE, BCI, BSE & SET granger causes to KSE100, whereas KSE100 index granger cause to KLSE, SET, HSI & JCI. Iqbal et al., (2011) evaluated the constantly changing relation among uprising equity markets of Pakistan, India and well-established stock market of U.S.A for time of 2003 to 2009. Their study uses Johansen cointegration method and came to know that there is no cointegration among equity markets of Pakistan, India and U.S.A. On the other hand, outcomes from granger causality technique implied that U.S.A granger cause to Pakistan & Indian stock markets. Worthing and Higgs (2006) tested the weedy kind of market competence among ten Asian newly establishing equity markets which includes Indian, Chines, Korean, Indonesian, Pakistani, Malaysian, Srilankan, Philippines, Thailand and Taiwan equity market along-with five well established stock markets are Hong Kong, Australian, New Zealand, Japanese and Singapore equity market. Their study analyzed daily data for period of 1987 to 2003 with help of variance ratio technique. It showed that all chosen establishing stock markets are featured by haphazard trends whereas a few established stock markets like Hong Kong, Japan and New Zealand stock market shows haphazard walk. Lim et al., (2007) tested weak kind of efficacy in ten Asian markets which include Chines, Indonesian, Indian, Korean, Malaysian, Pakistani, Philippines, Taiwan, Srilankan and Thailand. The bi-correlation technique exhibits that these Asian indices have competence to connect with each other for a longer time. Asjeet (2005) carried out a study to evaluate the long-run and short-run relationship between the stock markets of South Asia. It composed of Srilanka, India and Pakistan and of three main established stock markets that is U.K, U.S.A and Japan for period of 1997 to 2003. For this purpose, Johansen's co-integration test is used. The outcomes were that the India equity market is influenced by chosen well-established stock markets which are U.K, U.S.A and Japan. The terrorist attacks on 11th September 2001 on U.S.A effect on Indian stock market. The research similarly arrived at the result that Pakistan and Srilanka are relatively separated from mainstream established markets whereas it is also found that the chosen Asian stock markets are step by step adhering to each other. Majid et al., (2007) focused eight stock markets of OIC to test financial relationship among OIC markets. It comprises four Middle East and North Africa areas. The study considers daily data for period of January 2002 to December 2006 to find out the amalgamation between predetermined variables. The study concluded that worldwide integration only existed among equity markets of Indonesia, Malaysia and established markets and no amalgamation is founded among Pakistan, Bangladesh and established markets. The research further resulted in no indication of amalgamation between OIC markets. Arshad et al., (2008) evaluated the long run association between Pakistan stock markets and established world through the use of Johansen and Juselius (1990) cointegration technique. It was established that PSX is linked with the established markets. Whereas pair wise co-integration technique elaborated that PSX is not linked with U.K, Canada, USA, Italian, Australian and German stock markets. Though, PSX is linked with France and Japan stock markets. Kadir and Suzan (2010) carried out a research to find out the financial amalgamation in Balkans by using multivariate co-integration between four uprising markets. They came to know indications of co-integration between the Balkans equity market indexes. Wang (2014) took into account the co-integration among key East Asian equity markets with respect to earlier and later on global financial crisis. This research resulted that the global financial crisis during 2007-2009 fortified the correlation among the East Asia equity markets. These markets were less responsive to the shocks in Unites States after global financial downfalls. Arsyad (2015) applied the Johansen cointegration to test the long run relationship among the Southeast and East Asian security markets. The Johansen test concludes in the existence of long-run relations among Southeast and East Asian markets. Apart from this, it also exhibits that the ASEAN_3 countries perform different to external shocks. The research further applied the Granger-causality test to decide about the short-run relationship among given markets. This test result exhibits that the Japan and Singapore Granger influence all the existing equity markets in Southeast and East Asia respectively.

Currently due to of globalization, the approaches of individual and institutional investors are quickly altering in the global stock market. It could be result in fragile economies towards combination amongst uprising

economies. Due to globalization and novelty and improvement in technology, the investments drift into the financial assets increased extremely. Apart from this, numerous stock markets in globe are inclining towards amalgamation similarly MENA, NAFTA, EU, ASEAN and Scandinavian states. It permits investors to invest in portfolio and decrease the uncertainty of financial decline in any equity market.

Pakistan is never categorized in such integration although Pakistan stock exchange is thought of as an uprising stock market and their financial framework & industries are in a rising phase. It is on record that Asian markets are comparatively separated from the main established ones and found that South Asian stock markets are getting further connected with each other, though comparatively low rate. The outcome of this research study may assist in understanding close integration of equity markets with Pakistan.

Method

This study considers monthly data of twelve equity indices from August 1997 to October 2014. It includes Pakistan stock exchange plus five Asian uprising and well-established stock markets. It includes India, Malaysia, Indonesia, Hong Kong and China, Japan, USA, UK, Germany, France and Australia. The sources utilized in this study are Yahoo Finance and other web sources. The natural log is applied to estimate compound return (Table 1). To examine the cointegration among given stock market, this research use Johansen cointegration and Granger Causality technique. Further, unit root tests are used to exam the stationarity that is Phillips-Perron Test (1988) and Augmented Dickey Fuller Test (1981). The mathematical expression of ADF test with constant and trend and without trend is:

$$\Delta z_t = \gamma_1 + \gamma_2 t + \beta z_t - 1 + \pi \sum_{t=1}^n \Delta z_t - 1 + \mu t \quad (\text{eq.1})$$

$$\Delta z_t = \gamma_1 + \beta z_t - 1 + \pi \sum_{t=1}^n \Delta z_t - 1 + \mu t \quad (\text{eq.2})$$

Equation 1 contains both constant (γ_1) and trend term (γ_2) and Equation 2 contains constant trend only. Whereas, Δ and μt is a difference operator and error term respectively with zero mean and constant variance.

The mathematical expression of Phillips-Perron test with a constant and trend and without trend is:

$$\Delta z_t = \alpha_1 + \alpha_2 t + \pi z_t - 1 + \mu t \quad (3)$$

$$\Delta z_t = \alpha_1 + \pi z_t - 1 + \mu t \quad (4)$$

Equation 3 above contains constant (α_1) and (α_2) trend, while equation 4 contains constant term (α_1) only. The null hypothesis in equation (3) and (4) is $\pi = 0$.

Johansen's (1991) technique is used for examining the cointegration among given indices. It checks the presence of long-run relationship among the given indices. This technique allows multiple co-integrating relationships, which is mostly valid than Engle and Granger test that is grounded on Dickey and Fuller (1979, 1981) unit root test in residuals from a single co-integrating relationship.

Generally, mathematical expression of JJ cointegration equation is as follow;

$$\Delta X_t = \phi X_{t-1} + \sum_{i=1}^{k-1} \vartheta_i \Delta X_{t-i} + \lambda y_t + \varepsilon_t \quad (5)$$

Here,

$X_t = (n \times 1)$ random vector of time series variables $I(1)$

$\lambda y_t = (n \times 1)$ vector of constants

$\vartheta_i = (n \times n)$ matrices of short term coefficients that is parameters of lagged difference

$\phi = (n \times n)$ matrix of long term parameters of the error correction factor

Following are Trace & Maximal Eigenvalue test.

$$\lambda_{trace(r)} = -T \sum_{i=r+1}^k \ln(1 - \hat{\lambda}_i) \quad (6)$$

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (7)$$

Akaike Information Criterion is applied for choosing the lag length that is required for Vector Autoregressive technique. Similarly, bivariate cointegration technique is used between two financial time series. It is applied for examining long-run correlation between two various time series. There are few shortcomings whereas applying the Johansen multivariate cointegration to indicate lead lag correlation among variables. Hence, this paper uses granger causality technique to check causality between series which would decide that whether variation in one variable would impact on variations of other variables.

Results

The descriptive statistics in table 1 shows the index returns of twelve stock markets. It consists of mean, median, maximum, minimum and standard deviation. Table 1 shows that average returns of all equity indexes except Japan are negative for given period. The average return of PSX is negative i.e. -1.02% with the total risk of 9.85%. Average return of Japan stock market is highest that is 0.4% amongst the chosen countries for given period at the given level of total risk that is 5.92%. The PSX is riskiest equity market with return fluctuation in between from 44.8% to -24.1%, whereas Japan market returns variation in between from 27% to -12%. The comprehensive output is that risky investor may desire PSX as the highest expected returns is up to 44.9%.

Table 1
Descriptive Statistics of selected Equity Markets

Stock Market	Country	Mean	Median	Max.	Min.	Std. Dev.
PSX	Pakistan	-1.02%	-0.018	0.449	-0.242	9.85%
BSE	India	-0.8%	-0.012	0.273	-0.249	7.78%
KLSE	Malaysia	-0.33%	-0.010	0.285	-0.295	7.46%
JCI	Indonesia	-1.16%	-0.022	0.378	-0.251	8.89%
HIS	Hong Kong	-0.15%	-0.010	0.349	-0.254	7.841%
CSE	China	-1.23%	-0.012	0.185	-0.226	7.6%
NIKKEI	Japan	0.43%	-0.003	0.273	-0.121	5.92%

NYSE	USA	-0.21%	-0.009	0.218	-0.103	4.83%
FTSE_100	UK	-0.07%	-0.005	0.140	-0.085	4.44%
DAX	Germany	-0.24%	-0.013	0.294	-0.194	6.99%
CAC_100	France	-0.08%	-0.0124	0.1923	-0.126	5.92%
AORD	Australia	-0.3%	-0.013	0.151	-0.074	3.95%

Table 2 shows that Pakistan Stock Exchange is significantly correlated by the developed stock markets and almost emerging markets. The table depicts that there occur 17.7%, 17.3%, 19.3%, 16.6% correlation among Pakistan Stock Exchange & China, Japan, USA, Germany respectively at 95% confidence level while 29.1%, 21.2% and 20.6% with India, Malaysia and Hong Kong respectively. The relationship between all developed stock markets is present noticeably between European countries.

Table2*Correlation matrix for Selected Equity Markets*

	PSX	BSE	KLSE	JCI	HIS	CSE	NIKKEI	NYSE	FTSE-100	DAX	CAC-100	AORD
PSX	1	.29**	.212**	0.054	.206**	.177*	.173*	.193*	0.104	.166*	0.148	0.105
BSE	.291**	1	0.099	.177*	0.106	.278**	0.109	0.094	-	0.075	0.060	0.112
KLSE	.212**	0.099	1	.519**	.564**	.153*	.280**	.449**	.382**	.390**	.326**	.423**
JCI	0.054	.177*	.519**	1	.445**	0.085	.527**	.527**	.495**	.457**	.448**	.500**
HIS	.206**	0.106	.564**	.445**	1	0.057	.523**	.667**	.645**	.574**	.575**	.660**
CSE	.177*	.278**	.153*	0.085	0.057	1	0.035	0.038	0.057	0.085	0.096	0.072
NIKKEI	.173*	0.109	.280**	.527**	.523**	0.035	1	.605**	.581**	.563**	.569**	.644**
NYSE	.193*	0.094	.449**	.527**	.667**	0.038	.605**	1	.849**	.775**	.786**	.783**
FTSE-100	0.104	-0.012	.382**	.495**	.645**	0.057	.581**	.849**	1	.816**	.859**	.775**
DAX	.166*	0.075	.390**	.457**	.574**	0.085	.563**	.775**	.816**	1	.915**	.682**
CAC-100	0.148	0.060	.326**	.448**	.575**	0.096	.569**	.786**	.859**	.915**	1	.714**
AORD	0.105	0.112	.423**	.500**	.660**	0.072	.644**	.783**	.775**	.682**	.714**	1

{**}. Correlation is significant at the 0.01 level (2-tailed).

{*}. Correlation is significant at the 0.05 level (2-tailed).

The table 3 diversified into two panels i.e. panel-A & panel-B, to test if series comprises a unit root or not. The panel-A displays outcome of log levels whereas applying ADF & PP test. The panel-A result recommends that each variable consist of unit root whereas applying ADF & PP technique. The panel-B of table 3 presents each variable at 1st difference which indicates that each variable is stationary by using ADF and PP test. Conclusively, all given variables are non-stationary at log level and stationary at 1st difference at the 95% confidence level. Therefore, all indices are integrated of order one i.e., I (1).

Table 3*Unit Root Analysis by Using Augmented Dickey Fuller and Phillips-Perron*

Stock Index	ADF Tests	PP Tests	Stock Index	ADF Tests	PP Tests
Panel-A Log Levels			Panel-B 1st Difference		
PSX	-0.5108	-0.528	PSX	-12.502	-12.503
BSE	-0.3601	-0.5165	Ln BSE	-12.193	-12.252
KLSE	-1.5503	-1.348	KLSE	-10.589	-10.397
JCI	-0.3375	-0.0777	JCI	-10.343	-10.198
HIS	-1.7552	-1.6744	HIS	-11.529	-11.549
CSE	0.9112	0.63124	CSE	-11.484	-11.559

NIKKEI	-1.5675	-1.8264	NIKKEI	-11.709	-11.783
NYSE	-2.2944	-2.4299	NYSE	-10.715	-10.755
FTSE-100	-1.9196	-2.1564	FTSE-100	-12.16	-12.175
DAX	-1.9026	-2.1351	DAX	-11.874	-11.895
CAC-100	-1.9472	-2.2812	CAC-100	-11.24	-11.327
AORD	-1.4078	-1.638	AORD	-11.283	-11.487

Test critical values:

1% level	-3.470
5% level	-2.8785
10% level	-2.5759

As the above result shows that each variable is integrated at order one I (1), which further allow to test the Johansen and Juselius multivariate and bivariate cointegration. For this purpose, table 4 shows outcomes of Johansen's multivariate cointegration test. It pursues equally maximum eigenvalue and trace statistics. The trace statistics reveals that there are three cointegrating vectors at 5% critical values and one integrating vector at 10% critical values. Similar outcome is achieved by using maximum eigenvalue statistics. It indicates three cointegrating vectors at 5% critical value & one integrating vector at 10% critical value. Conclusively, result shows that the cointegration among subjected market exists. These results give us the opportunity to follow vector error correction model to check long run association among given series. The vector error correction model result is followed by table 4 that is table 5 along with its econometric model.

Table 4*Multi-variate Cointegration Analysis Trace Statistics and Max-Eigen*

Hypothesis	Trace Statistics	Critical Values at 0.05	P-value at 0.05	Max-Eigen Statistics	Critical Values at 0.05	P-value at 0.05
None *	422.45	334.98	0.00	88.09	76.58	0.00
At most 1 *	334.36	285.14	0.00	72.36	70.54	0.03
At most 2 *	262.00	239.24	0.00	68.56	64.50	0.02
At most 3	193.44	197.37	0.08	56.47	58.43	0.08
At most 4	136.97	159.53	0.43	45.52	52.36	0.21
At most 5	91.46	125.62	0.84	30.97	46.23	0.72
At most 6	60.49	95.75	0.94	19.15	40.08	0.98
At most 7	41.34	69.82	0.92	13.45	33.88	0.99
At most 8	27.88	47.86	0.82	12.00	27.58	0.93
At most 9	15.88	29.80	0.72	7.49	21.13	0.93
At most 10	8.40	15.49	0.42	6.57	14.26	0.54
At most 11	1.83	3.84	0.18	1.83	3.84	0.18

Table 5 describes the normalized co-integrating vector error correction on PSX. The sign of 1st error correction coefficient in determination of DPSX is negative and statistically significant at 10% confidence level. It shows speed of adjustment in long run. It implies that PSX react in long run to variation in under study market to regain the equilibrium relation once deviation occurs. Further, its measurement depicts positive and significant relationship with Indian stock market at lag 2, while negative and statistically significant relation with CSE at lag 1 and NYSE at lag 2. These negative and statistically significant relations give opportunity to the investors to spread the risk by investing in these integrating equity markets. The value of R² indicates that 25 percent variation in PSX has been explained by variation in given markets, which further shows that PSX may be affected by country own macro and micro economic factors e.g. foreign reserve, inflation, money supply etc. (Akbar et al., 2012).

Table 5*Integration among Equity Markets by Using Vector Error Correction Model*

Variables	Coefficient	Std. Error	t-Statistic	Prob.
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CointEq ₁	-0.050329	0.029066	-1.73155	0.0855
Δ PSX _{t-1}	0.050027	0.083548	0.598779	0.5503
Δ PSX _{t-2}	-0.046909	0.084881	-0.55265	0.5814
Δ BSE _{t-1}	-0.030989	0.138866	-0.22315	0.8237
Δ BSE _{t-2}	0.312062	0.106832	2.921055	0.0041
Δ KLSE _{t-1}	0.232841	0.148039	1.572833	0.118
Δ KLSE _{t-2}	-0.108227	0.152777	-0.7084	0.4799
Δ JCI _{t-1}	-0.088718	0.125543	-0.70667	0.4809
Δ JCI _{t-2}	0.180409	0.118338	1.524528	0.1296
Δ HIS _{t-1}	-0.115032	0.163951	-0.70162	0.4841
Δ HIS _{t-2}	0.072746	0.162326	0.448148	0.6547
Δ CSE _{t-1}	-0.175827	0.10549	-1.66676	0.0978
Δ CSE _{t-2}	0.092615	0.107986	0.857658	0.3925
Δ NIKKEI _{t-1}	0.075625	0.189028	0.400073	0.6897
Δ NIKKEI _{t-2}	0.146593	0.178906	0.819385	0.4139
Δ NYSE _{t-1}	-0.37045	0.340136	-1.08912	0.2779
Δ NYSE _{t-2}	-0.751033	0.347177	-2.16326	0.0322
Δ FTSE_100 _{t-1}	0.321567	0.50095	0.641915	0.522
Δ FTSE_100 _{t-2}	0.342201	0.47633	0.718413	0.4737
Δ DAX _{t-1}	-0.230459	0.294159	-0.78345	0.4347
Δ DAX _{t-2}	-0.283333	0.279432	-1.01396	0.3123
Δ CAC_100 _{t-1}	0.09992	0.399836	0.249903	0.803
Δ CAC_100 _{t-2}	0.41563	0.362227	1.147428	0.2531
Δ AORD _{t-1}	0.608198	0.386593	1.573227	0.1179
Δ AORD _{t-2}	0.195394	0.382661	0.510619	0.6104
C	0.009598	0.007933	1.20999	0.2283
R-squared	0.25501	F-statistic	1.944265	
Adjusted R-squared	0.12385	Prob(F-statistic)	0.008242	
Durbin-Watson stat	1.915942			
Δ PSX = $\alpha_1 + \beta_2\Delta$ PSX _{t-1} + $\beta_3\Delta$ PSX _{t-2} + $\beta_4\Delta$ BSE _{t-1} + $\beta_5\Delta$ BSE _{t-2} + $\beta_6\Delta$ KLSE _{t-1} + $\beta_7\Delta$ KLSE _{t-2} + $\beta_8\Delta$ JCI _{t-1} + $\beta_9\Delta$ JCI _{t-2} + $\beta_{10}\Delta$ HIS _{t-1} + $\beta_{11}\Delta$ HIS _{t-2} + $\beta_{12}\Delta$ CSE _{t-1} + $\beta_{13}\Delta$ CSE _{t-2} + $\beta_{14}\Delta$ NIKKEI _{t-1} + $\beta_{15}\Delta$ NIKKEI _{t-2} + $\beta_{16}\Delta$ NYSE _{t-1} + $\beta_{17}\Delta$ NYSE _{t-2} + $\beta_{18}\Delta$ FTSE_100 _{t-1} + $\beta_{19}\Delta$ FTSE_100 _{t-2} + $\beta_{20}\Delta$ DAX _{t-1} + $\beta_{21}\Delta$ DAX _{t-2} + $\beta_{22}\Delta$ CAC_100 _{t-1} + $\beta_{23}\Delta$ CAC_100 _{t-2} + $\beta_{24}\Delta$ AORD _{t-1} + $\beta_{25}\Delta$ AORD _{t-2} + ϵ_{26}				

Table 6 shows the pair-wise cointegration properties of PSX along the Asian uprising & the selected developed stock markets in bivariate form. The suitable lag length is one, which is in line with the AIC & SIC. Trace & Maximal-Eigenvalues test shows that PSX individually have no connection with other markets, at 5% level. This result may not attract investors, to invest in these given countries for risk diversification through portfolio.

Table 6

Bivariate Co-integration Analysis: Trace and Max-Eigen Statistics

Variables	Hypothesis	Trace	Critical Values	P-value	Max-Eigen Statistics	Critical Values	P-value
		Statistics	at 5%	at 5%		at 5%	at 5%
PSX & BSE	None	5.39	15.49	0.77	4.92	14.26	0.75
PSX & KLSE	At most 1	0.48	3.84	0.49	0.48	3.84	0.49
PSX & JCI	None	5.09	15.49	0.80	4.63	14.26	0.79
PSX & HIS	At most 1	0.45	3.84	0.50	0.45	3.84	0.50
PSX & CSE	None	3.15	15.49	0.96	1.65	14.26	1.00
PSX & NIKKEI	At most 1	1.50	3.84	0.22	1.50	3.84	0.22
PSX & NYSE	None	7.96	15.49	0.47	7.53	14.26	0.43

HIS	At most 1	0.43	3.84	0.51	0.43	3.84	0.51
PSX &	None	4.23	15.49	0.88	4.00	14.26	0.86
CSE	At most 1	0.23	3.84	0.63	0.23	3.84	0.63
PSX &	None	4.09	15.49	0.90	3.84	14.26	0.88
NIKKEI	At most 1	0.25	3.84	0.62	0.25	3.84	0.62
PSX &	None	7.21	15.49	0.55	6.99	14.26	0.49
NYSE	At most 1	0.22	3.84	0.64	0.22	3.84	0.64
PSX &	None	5.47	15.49	0.76	5.04	14.26	0.74
FTSE-100	At most 1	0.43	3.84	0.51	0.43	3.84	0.51
PSX &	None	6.48	15.49	0.64	6.03	14.26	0.61
DAX	At most 1	0.45	3.84	0.50	0.45	3.84	0.50
PSX &	None	5.15	15.49	0.79	5.09	14.26	0.73
CAC-100	At most 1	0.07	3.84	0.80	0.07	3.84	0.80
PSX &	None	8.48	15.49	0.42	8.02	14.26	0.38
AORD	At most 1	0.46	3.84	0.50	0.46	3.84	0.50

The Johansen multivariate cointegration technique needs to identify and describe lead lag association among specified countries. According to representation theorem, if variables are cointegrated to each other then there will be at least one-way granger causality. Thus, to decide about the causal affects between the given indices, we additionally inquire about the causality among the given indices by applying granger causality test. The rejection of null hypothesis in table 7 presents that PSX have a one-dimensional causal relation with NYSE at 95% confidence level & unidirectional relation with BSE and JCI at 10% confidence level. Apart from this outcome depicts that there is bi-directional causal association between KLSE and NIKKEI at the 5% confidence level & has bi-directional causal relation with AORD & HIS at 10% level of possibility. Moreover, outcomes disclose that stock market of NIKKEI, KLSE and AORD granger affects the PSX at 5% confidence level and HIS granger cause PSX at 10% confidence levels. On other side, PSX granger cause to NIKKEI & KLSE at 5% confidence level, whereas BSE, AORD, HIS and JCI at 10% confidence level.

Table 7*Pair-Wise Granger Causality Test for PSX*

Null Hypothesis:	F-Statistic	Probability
BSE does not Granger Cause PSX	0.055	0.815
PSX does not Granger Cause BSE	2.961	0.087
JCI does not Granger Cause PSX	1.493	0.224
PSX does not Granger Cause JCI	3.296	0.071
KLSE does not Granger Cause PSX	5.922	0.016
PSX does not Granger Cause KLSE	5.461	0.021
CSE does not Granger Cause PSX	0.050	0.823
PSX does not Granger Cause CSE	0.022	0.882
HIS does not Granger Cause PSX	3.202	0.075
PSX does not Granger Cause HIS	3.039	0.083
NYSE does not Granger Cause PSX	2.318	0.130
PSX does not Granger Cause NYSE	5.103	0.025
NIKKEI does not Granger Cause PSX	3.803	0.053
PSX does not Granger Cause NIKKEI	6.336	0.013
DAX does not Granger Cause PSX	1.559	0.214
PSX does not Granger Cause DAX	1.360	0.245
FTSE_100 does not Granger Cause PSX	1.643	0.202
PSX does not Granger Cause FTSE_100	2.370	0.126
AORD does not Granger Cause PSX	8.562	0.004
PSX does not Granger Cause AORD	3.412	0.067

CAC_100 does not Granger Cause PSX	1.323	0.252
PSX does not Granger Cause CAC_100	1.740	0.189

Conclusion

The novelty and change accelerate the circulation of investment fund throughout. It catches the focus of both the practicing people and people from academia's interest in determining amalgamation of World's stock market. The globalization has affected an integration of financial markets like NAFTA, EU, ASEAN, MENA and Scandinavian countries. Instead of the fact that Pakistan stock exchange is a dynamic equity market but on other side it excelled globally in last decade. This research finding also depicts that the PSX is the riskiest market with the range of 44.9% to -24.12%. It might attract and persuade the risk-taking savers to gain the maximum returns up to 44.9%. The correlation matrix depicts that European countries have high level of correlation because of unrestricted movement of fund in between the European Union. On the other hand, the vector correction model proposes negative and statistically significant relationship between China and USA equity market which permits investors to spread portfolio risk. This study proposes conservative investors who have interest in PSX that not to design portfolio in relation to India market as it is positively and statistically significant to PSX. Furthermore, apart from these three markets it lacks long-run relation, which also permits the investors of these markets to gain out of portfolio diversification by investing in Pakistan stock exchange.

One of the causes of not having strong long-run relation is lacking both way free fund flows among chosen countries. Unluckily, Pakistan fund flow with well-established world is unidirectional i.e. outflow. Pakistan's imports are greater than its exports which result in adverse balance of trade. Moreover, depleted foreign reserves result in volatile exchange rate, which make foreign investors reluctant towards Pakistan stock market. This study recommends government to give more attention to macro and micro economic indicators to attract foreign investors by investing in financial securities. It will further improve the level of fund inflow in Pakistan.

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APPENDIX-A

List of Abbreviations

ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
ASEAN	Association of Southeast Asian Nations
BSE	Bombay Stock Exchange
CAC-100	Cotation Assistée en Continu (France Index)
CSE	China Stock Exchange
DAX	Deutscher Aktienindex (German Index)
EU	European Union
FTSE-100	Financial Times Stock Exchange 100 Index
HIS	Hang Seng Index
JCI	Jakarta Stock Exchange Composite Index
KLSE	Kuala Lumpur Stock Exchange
MENA	Middle East and North Africa
NAFTA	North American Free Trade Agreement
NYSE	New York Stock Exchange
OIC	Organization of the Islamic Conference
PP	Phillips-Perron
PSX	Pakistan Stock Exchange
SIC	Schwarz Information Criterion

Received: Jan 4th, 2018
Revisions Received: May 29th, 2018