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FACTORS INFLUENCING CO-MOVEMENT OF DIVERSIFIED PORTFOLIO BETWEEN PAKISTAN AND INDIA*

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ABSTRACT

An internationally diversified portfolio is effective if the co-movement pattern among underlying securities is analyzed not only on the basis of past returns but also on market and economic factors that can explain such co-movements. The current study determines the role of bilateral foreign portfolio equity holding, gross domestic product (GDP) and interest rate differential on international co-movement patterns among emerging and frontier Asian (EFA) markets. We started our analysis by estimating rolling beta estimation used in formulating bilateral co-movement index. After that, ARDL technique is applied to check long term relationship among the included variables. For short term relationship, error correction term is added for measuring speed of convergence toward long run equilibrium. Finally, we applied variance decomposition analysis under the VAR framework to check individual variances of each independent variable on bilateral equity return co-movement. We report significant long run relationship between bilateral equity co-movement and GDP growth differential of Pakistan and India. The presence of short run relationship among all variables with high speed of convergence suggests that the process reverts itself toward the long run. Our findings regarding significance of Gross Domestic Product (GDP) growth differential between India and Pakistan support the portfolio balance theory proposed by Kodres and Pritsker (2002).

JEL Classification: G10, G11, G15

Key words: Equity returns, Portfolio diversification, Time varying co-movements, Autoregressive distributed lags, Vector autoregression model

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1. INTRODUCTION

International stock market co-movement pattern is an important aspect for international portfolio diversification because of its practical applications in asset allocation and risk management. The importance of international diversification has increased following work of Grubel (1968) and many other studies that investigated the dynamic pattern of equity co-movement over time in developed markets especially after the mid-1990s. Grubel (1968) after Markowitz (1952) proposed the portfolio diversification theories thereby broadening the international capital market field. However, this portfolio formulation not only depends on co-movements and level of financial integration but also on some underlying phenomena that not only affects but also gets affected by equity co-movement. In some instances, these factors also serve as catalysts to trigger and transmit return co-movements. By including only a single form of market efficiency, i.e., frontier, developed or emerging markets for portfolio diversification, maximum diversification advantages become hard to achieve. By including a mix of markets i.e., frontier and developing markets, like in our present study, investors can achieve the maximum of those international diversification benefits.

International equity market dependence structure has recently gained attention among the research community, practitioners and theorists following the global financial crisis. After the 1930s financial crisis, the financial turbulence of 2008 was the worst of its kind. This crisis along with downfall of Lehman Brothers affected not only developed but also emerging countries. The crisis of 2008 triggered more financial disturbances like London movement, Eurozone crisis and public pressure on Greece, Turkey, Italy and Egypt. All these events brought attention to the fundamentals of international equity market co-movement to determine major causes of simultaneous deterioration in a large group of country wealth. According to Bekaert et al. (2011) and Christoffersson et al. (2012), emerging markets are clustered as compared to developed markets because of their fundamental characteristics such as size, geographical location and institutional structure. Countries with strong bilateral trade ties exhibit high level of stock market co-movement among themselves. Walti (2011) in his study used several variables highlighting macro-economic and financial integration to investigate factors of time varying co-movement.

Besides traditional statistical techniques, many new techniques such as non-overlapping sample periods or rolling window

correlation can provide reliable results (Lin et al. 1994). Many factors account for return co-movement among countries, therefore mere discussion of return correlation is insufficient. The factors causing these equity market co-movements need to be discussed to highlight the underlying factors. Our contribution in this study is now presented.

First our study deals with the diversification of international portfolio by selecting equity stocks from emerging and frontier Asian (EFA) markets. Secondly, we investigated stability and commonality of macro-economic variables and market determinants among a pair of emerging and frontier markets. Finally, we addressed determinants of bilateral equity co-movement between Indian and Pakistani equity markets. The rest of the paper is structured as follows. Section 2 reviews the past literature. Section 3 introduces the empirical framework and section 4 discusses results and conclusion.

2. REVIEW OF LITERATURE

Financial integration between any two countries can be measured through the ease that an investor has in trading and holding securities in some other country. According to Coeurdacier and Guibaud (2011) this financial integration is inversely related with financial frictions between the underlying countries. With an increase in financial liberalization, volatility level in emerging markets tends to decrease considerably. With time, convergence between developed and emerging markets tends to increase; however the frontier market index shows no increase in integration with their developed and emerging counterparts (Pukthuanthong and Roll 2009). Despite major decrease in segmentation over time, integration among emerging stock markets is not as effective as in developed stock markets (Bekaert et al. 2009).

Past literature mostly deals with the instability of correlations among different financial stock markets (Guidolin and Hyde 2008). Interrelation among different financial markets increases during times of high volatility in stocks returns. This results in higher than average correlation values at times when major gains are expected from diversification. This suggests that portfolio gains are hard to achieve during bull markets (Longin and Solnik 1995). Arouri, Lahiani, and Nguyen (2011) reported that cross market linkages are subject not only to several breaks but are also time varying in nature. The financial contagion perspective was also not supported by previous studies on developed and emerging markets. According to Gklezakou and Mylonakis (2009) and Mabrouk (2011), globalization

has enhanced interrelationship among international stock markets. Gklezakou and Mylonakis (2009) suggested that loosely related markets of South Eastern Europe exhibit much strong interrelationship during a normal course than under economic recession conditions. The integration among international financial markets increase more during crises periods raising concerns for investors regarding portfolio diversification effectiveness (Baur 2006).

Hartmann et al. (2004) reported that stock markets crashed together in one out of five to eight crashes on average. As far as contagion effect is concerned, G5 stock markets exhibited more interdependence during crises periods. Yang et al. (2007) and Ebrahim (2008) suggested that if financial market integration exists, any unanticipated event occurring in a single market can cause variance in other markets. Taylor and Tonks (1989), Li and Rose (2008), Gilmore et al. (2008) and Syriopoulos (2007) focused on correlation among market returns and spillover and found co-movements pattern with positive relation between correlation and volatility. Speidell and Krohne (2007) found low correlation values between frontier and developed markets. According to Aktar et al. (2011), the term contagious differs from correlation between the markets. If there is co-movement between stock returns in the crisis period, markets are said to be contagious whereas if correlation exists only in normal period then this phenomenon is more of correlation than contagion effect between the associated stock markets.

3. EMPIRICAL FRAMEWORK

Many past researchers used equity returns as a dependent variable to measure effect of different factors on it. Zheng et al. (2012) also took home country returns to observe variance of equity trading volume on stock market co-movement. In this paper, time varying parameter (TVP) framework is used because of the changing nature of stock market co-movement over time. The same TVP model is also proposed by Kizys and Pierdzioch (2009) and Rockinger and Urga (2001) expression of which is given below:

$$(1) \quad SMC_{ij,t} = \beta_0 + \beta_1 R_{i,t-1} + \beta_2 R_{j,t}$$

In (1), $SMC_{ij,t}$ is bilateral stock market co-movement between India and Pakistan. It is measured by taking the daily return correlation value from 2000 to 2003 by which we measure rolling betas through

multivariate regression. These rolling betas are then used to calculate bilateral monthly correlation values from 2003 to 2012. β_0 presents the regression intercept, $R_{i,t-1}$ is the lagged value of equity returns in home country (i.e., Pakistan) and $R_{j,t}$ is the Indian equity return. β_1 and β_2 represent coefficient of Pakistan lagged equity and Indian equity returns respectively. Similar equation was also used by Kizys and Pierdzioch (2009) in which they took lagged value of country that was selected as a benchmark. In this study, returns of Pakistani and Indian equity markets are used to construct the co-movement index. According to Fratzcher (2002), lagged values inclusion in the equation helps in capturing investor's irrational behavior and market inefficiencies that result in autocorrelation. The included coefficient in the equation has time varying component thus following random walk process. In this way time varying betas can be taken as time varying coefficients. For similar reason, we used current value of host country (i.e., India) with lagged value of home country (i.e., Pakistan) in constructing the equity co-movement equation through the TVP model. Many past researchers such as Hamao et al. (1990), Longin and Slonik (1995), Bakaert and Harvey (1995), Bakaert and Wang (2010) and Caporale et al. (2005) have measured equity co-movement by using the TVP model concluding that with the passage of time, the liberalization and globalization process tends to change the international co-movement pattern.

Different past researchers investigated different aspects of the relationship between international equity co-movement and macro-economic factors (Dumas et al. 2003; Bekaert and Harvey 1995; Forbes and Chinn 2004). Gross Domestic Product (GDP) is an important economic indicator in measuring not only comparative growth of an economy but also stock market development and its relative performance. Many past researchers used GDP growth rate in measuring relative performance and analyzing stock market efficiency. However, in case of emerging markets this variable seems to play a more important role in the context of international stock market co-movement. Johnson and Soenen (2003) used the annual GDP growth rate differential to measure its impact on stock market co-movements between United States and its trading partners. The role of interest rate differences between two countries has also gained importance in the recent past. Ripley (1973) found some countries whose income tends to move together to anticipate role of bilateral interest rate differential therefore reducing its level to stimulate bilateral stock market co-movement.

3.1 PRELIMINARY ANALYSIS

Table 1 presents descriptive statistics of included variables. Mean value is presented by M and standard deviation is denoted by σ. All the variables are presented as differential of Pakistan and India. Bilateral co-movement and interest rate differential between India and Pakistan is positively whereas the remaining two are negatively skewed. Value of kurtosis is high for bilateral co-movement and foreign portfolio equity holdings. Hypothesis for normality is rejected for all variables.

TABLE 1
Descriptive Statistics

Statistics	Co-movement	Foreign Portfolio Equity Holdings	GDP Diff.	Interest Rate Diff.
Mean	0.0031	23.121	0.0011	4.5929
Std Deviation	0.0510	0.7873	0.0087	2.6880
Maximum	0.2085	24.216	0.0106	9.7310
Minimum	-0.1397	19.875	-0.0161	0.0000
Skewness	0.5081	-1.2526	-0.2925	0.2733
Kurtosis	5.5166	5.5098	1.6912	1.7214
JB	36.828*	57.115*	10.275*	9.668*
Correlations				
Co-movement	1			
Foreign Portfolio Equity Holdings	-0.0705	1		
GDP Differential	0.3026*	-0.3324*	1	
Interest Rate Differential	-0.0956	0.1563	-0.0453	1

Note: *, ** and *** presents the level of significance at 1, 5 and 10 percent respectively. JB represents Jarque Bera normality test.

Correlation analysis presented in Table 1 shows that bilateral equity co-movement between both countries has low correlation values with other variables. Interest rate differential has low values of negatively correlation with return co-movements and GDP growth rate differential whereas it is positively correlated with foreign portfolio equity holding. Foreign portfolio equity holding has moderate negative correlation with return co-movements and GDP differential. It should be noted that this level of correlation is not quite high thus reducing problems of multicollinearity among included variables. Investors willing to invest in the Indian equity market from Pakistan should consider these correlation values between two

countries. Theoretically, stock markets represent economy of any country given that the assumptions of efficient market hypothesis are fulfilled. With economic integration among countries, equity market co-movement tends to increase. Our included macro-economic variables represent bilateral differential values between India and Pakistan; however, only one out of two is theoretically consistent, namely the interest rate differential (with an increasing gap in macro-economic indicator, bilateral co-movement tends to decrease). GDP growth rate differential seems not to comply with existing theories. However we mentioned the assumption of market efficiency with which both selected sample markets i.e. India and Pakistan do not comply, therefore justifying the irregular behavior of GDP differential as a macro-economic indicator. These correlation values serve to provide preliminary analysis whereas results of the auto regressive distributed lag (ARDL) model will provide more insights into the existing relationship among our variables of interest.

3.2 AUTO REGRESSIVE DISTRIBUTED LAG MODEL

We applied the auto regressive distributed lag model (ARDL) to check the impact of foreign portfolio equity holding, interest and GDP growth rate differential on bilateral equity co-movement between Pakistan and India. Before applying ARDL, we tested the stationarity of our variables. Table 2 shows test results of augmented Dickey Fuller (ADF) stationarity test. Lag length selection criteria is based on Schwarz Information Criteria Interest rate differential between the two countries is non-stationary at level whereas other included variables are stationary at level.

TABLE 2
ADF Statistics and Mackinnon (1996) One-sided *p*-Values

	Level		First Difference	
Variables	Stats	Probability	Stats	Probability
Return Co-movement	-9.4557	0.0000		
Foreign Portfolio Equity Holdings	-4.4369	0.0004		
GDP Differential	-5.8471	0.0000		
Interest Rate Differential	-1.2174	0.6653	-4.0116	0.0019

Table 3 shows the results of lag order selection criteria used in applying ARDL model. We have selected lags up to second order as per SIC criteria.

TABLE 3
Lag Length Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	149.3280	NA	0.0001	-3.4195	-3.3045	-3.3732
1	551.5201	757.06	0.0002	-12.5064	-11.9316	-12.2752
2	746.8801	349.34*	0.0010	-16.7266*	-15.6921*	-16.3105*
3	761.8740	25.4014	0.0009	-16.7029	-15.2086	-16.1019
4	769.4634	12.1431	0.0020	-16.5050	-14.5509	-15.7190
5	778.1627	13.1001	0.0003	-16.3332	-13.9193	-15.3623
6	789.5193	16.0329	0.0001	-16.2240	-13.3503	-15.0681
7	797.9939	11.1665	0.0020	-16.0469	-12.7134	-14.7061
8	810.9847	15.8946	0.0001	-15.9761	-12.1828	-14.4503

Note: FPE shows Final Prediction Error, LR denotes Sequential Modified Test Statistics, AIC denotes Akaike Information Criteria, HQ represents Hannan Quinn Information Criteria whereas SIC represents Schwarz Information Criteria. * shows the selected lag order.

As all variables are stationary at level and first difference, we applied the auto regressive distributed lag (ARDL) model to check short and long run relationship among them. The ARDL model has many benefits, offering ease of operation compared to traditional co-integration approaches. Traditional co-integration requires similar stationarity level among associated variables whereas we can apply the ARDL model at different levels of stationarity.[1] Another ARDL model benefit is its application on short time series as compared to co-integration techniques requiring long time series data sets. The ARDL approach also helps in capturing long run relationship among associated variables that are integrated at different levels. Furthermore, the application of unrestricted error correction model (UECM) can capture dynamics of both short and long term relationship.

The equation for ARDL model is presented next:

$$(2)\quad \Delta SMC_t = \alpha_0 + \alpha_1 SMC_{t-1} + \alpha_2 FPEH_{t-1} + \alpha_3 IR_{t-1} + \alpha_4 GDP_{t-1} + \sum_{i=1}^{p} \theta_1 \Delta SMC_{t-i} + \sum_{i=0}^{s} \theta_4 \Delta GDP_{t-i} + \sum_{i=0}^{q} \theta_2 \Delta FPEH_{t-i} + \sum_{i=0}^{r} \theta_3 \Delta IR_{t-i} + trend + \mu_t$$

In (2), Δ represents the differenced values, *t* represents current time period and *t*-1 the lagged values; SMC represents stock market co-movement, FPEH represents foreign portfolio equity holding, GDP represents gross domestic product differences, IR represents interest rate differential. Testable hypothesis of no cointegration for the ARDL framework is given in (3):

(3) $H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$

Critical values by Pesaran et al. (2001) with unrestricted intercept and restricted trend are presented in Table 4.

TABLE 4
Critical Values ARDL Bound Test

	90 percent		95 percent		99 percent	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Critical Values	*I*(0)	*I*(1)	*I*(0)	*I*(1)	*I*(0)	*I*(1)
Equity Co-movement	2.68	3.53	3.05	3.97	3.81	4.92

From Table 5, the value of Wald statistics (i.e. 21.02) is greater than critical values presented by Pesaran et al. (2001) suggesting long term relationship among included variables. Results of Table 5 show that coefficient value of GDP differentials is significant at all lag levels whereas foreign portfolio equity holding and interest rate differential are significant at second lags.

TABLE 5
Autoregressive Distributive Lag Framework

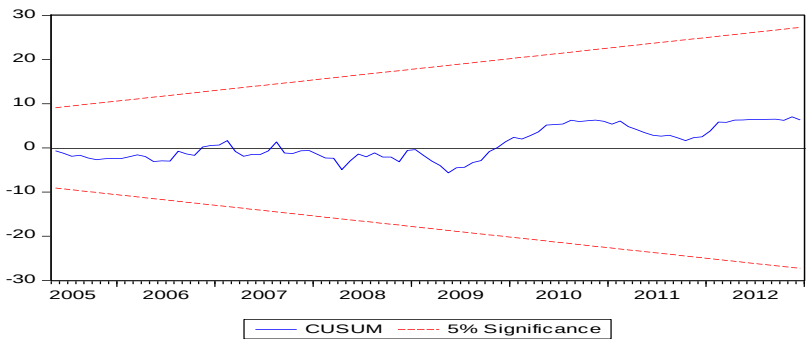
Variables (1,2,2,2) based on SIC	Coefficient	Std. Error	*t*-Ratio	Probability
Intercept	0.013	0.013	1.042	0.300
Δ(SMC(-1))	0.179	0.095	1.883	0.063
Δ(FPEH)	0.000	0.000	-1.302	0.196
Δ(FPEH(-1))	0.000	0.000	-0.419	0.676
Δ(FPEH(-2))	0.000	0.000	1.718	0.089
Δ(GDP)	1.295	1.664	0.778	0.438
Δ(GDP(-1))	3.950	1.686	-2.344	0.021
Δ(GDP(-2))	2.0263	1.598	-2.495	0.035
Δ(IR)	-0.068	0.047	-1.455	0.149
Δ(IR(-1))	0.004	0.062	0.061	0.952
Δ(IR(-2))	0.100	0.047	2.122	0.036
@TREND	-1.254	0.137	-9.127	0.000
R^2value	0.6116	F-Stat		11.471
Adjusted R^2	0.5583	F-sig.		0.0000
AIC criteria	-3.2577	DW-stats		1.9439
SIC criterion	-2.9036	BG-LM statistics		0.2991
Wald statistics	21.0208*			

In Table 6, we can see that all variables have positive coefficient values. GDP growth rate differential has significant relationship with bilateral co-movement whereas coefficient values of foreign portfolio equity holding and interest rate differentials are insignificant. These results suggest that with an increase in GDP gap between India and Pakistan, bilateral co-movement tends to increase. Therefore, for international investors, investment in any one country is preferable in case of high economic integration for more diversification benefits. However, any changes either in foreign portfolio equity holding or interest rate differential has no explanation in bilateral equity market co-movement. Another aspect of these statistics suggests that an arbitrage opportunity does not exist between equity markets of India and Pakistan (in terms of interest rate parity). However, foreign portfolio equity holding level by Pakistani equity market is indifferent to co-movement of stocks between these two countries.

TABLE 6
Long Run Coefficients for Autoregressive Framework

Variables	Betas	Std. Error	*t*-Ratio	Probability
FPEH	0.000	0.000	-0.215	0.830
GDP Differential	1.476	0.861	1.714	0.090
IR Differential	0.002	0.002	0.926	0.356

FIGURE 1
CUSUM Test Results Before ECT



Serial correlation of our model is checked by applying Breusch Godfrey LM test value which is insignificant at 10 percent. Therefore, we do not reject the null hypothesis of no serial correlation.

Figure 1 shows the stability of model as it has not crossed any upper and lower boundary. Expression of error correction term (ECT) to check short term relationship is presented here:

$$(4)\quad \Delta SMC_t = \alpha_0 + \sum_{i=1}^{p} \theta_1 \Delta SMC_{t-i} + \sum_{i=0}^{q} \theta_2 \Delta FPEH_{t-i} + \sum_{i=0}^{r} \theta_3 \Delta IR_{t-i} + \sum_{i=0}^{s} \theta_4 \Delta GDP_{t-i} + trend + \beta_1 ECT_{t-i} + \mu_t,$$

where:

$$(5)\quad ECT_{t-i} = SMC_{t-1} - \alpha_2 FPEH_{t-1} - \alpha_3 IR_{t-1} - \alpha_4 GDP_{t-1}$$

TABLE 7
ECT for Autoregressive Term

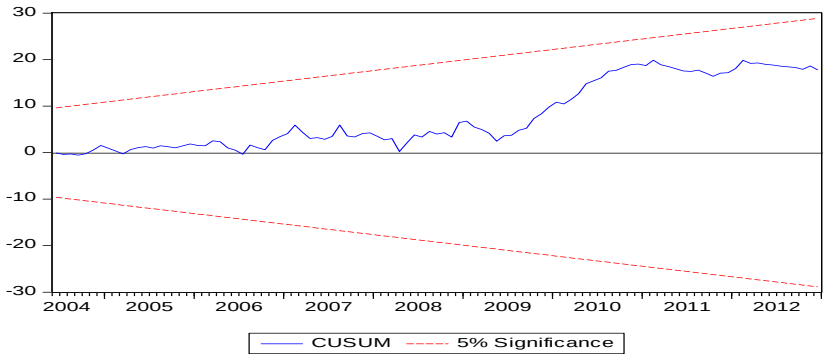
Variables	Coefficient	Std. Error	*t*-Ratio	Probability
Intercept	0.012	0.010	1.249	0.214
Δ(SMC(-1))	0.161	0.094	1.719	0.089
Δ(FPEH)	0.000	0.000	-1.187	0.238
Δ(FPEH(-1))	0.000	0.000	-0.385	0.701
Δ(FPEH(-2))	0.000	0.000	1.858	0.066
Δ(GDP)	1.856	1.597	1.162	0.248
Δ(GDP(-1))	4.216	1.623	-2.597	0.011
Δ(GDP(-2))	2.305	1.732	-2.698	0.049
Δ(IR)	-0.054	0.044	-1.210	0.229
Δ(IR(-1))	0.005	0.062	0.087	0.931
Δ(IR(-2))	0.089	0.046	1.939	0.055
@TREND	0.000	0.000	-1.435	0.154
ECT(-1)	-0.697	0.134	-9.032	0.000
R^2value	0.6012	*F*-Stat		14.3892
Adjusted R^2	0.5594	*F*-sig.		0.0000
AIC criteria	-3.2826	DW-stats		1.9346
SIC criterion	-2.9993	BG-LM statistics		0.5106

Table 7 reports the ECT coefficients for short term relationship between bilateral equity co-movement and foreign portfolio equity holding, interest rate and GDP growth rate differentials. Coefficient value for ECT is significant (i.e., speed of adjustment is almost 70 percent with a coefficient value of -0.697). All the included variables are significant, however, at various lag levels. Foreign portfolio equity holding is significant at the second lag level only. This suggests that changes in foreign portfolio equity holding take some time to induce changes in bilateral co-movement; however immediate change is not evident. This also confirms the hypothesis of weak efficient market

for both India and Pakistan. GDP growth rate differential is significant at first and second lag level. With an increasing level of difference between the GDP growth rates of India and Pakistan, co-movement tends to increase in the short term; however with lagged values, results become more significant.

Finally, interest rate differential has moderate significant value at second lag suggesting little explanation in bilateral co-movement between India and Pakistan. Results of Breusch Godfrey LM test suggest no serial correlation in the model that is also evident in Figure 2.

FIGURE 2
CUSUM Test Results After ECT



3.3 FORECAST VARIANCE DECOMPOSITION ANALYSIS

Variance decomposition analysis (VDA) results are shown in Table 8 to explain the variation in bilateral equity market co-movement. Almost 93 percent self-variation is produced in bilateral equity co-movement that reduces to 80 percent in the last quantile. Aside from self-variation of bilateral stock market co-movement, maximum variation is provided by foreign portfolio equity holding of almost 6 percent in short term which increases to 6.5 percent in the long run. Interest rate differences also have almost 10 percent long run variation in bilateral stock market co-movement. These statistics suggest that as far as Pakistani investors are concerned in making equity investments in India stock markets, foreign portfolio equity holding and interest rate differential provide moderate variation in bilateral co-movement.

However, slight variation is provided by GDP growth rate differential. Therefore, as far as diversification benefits are concerned

in the light of variance decomposition analysis, interest rate differential behaves as the most important determinant.

TABLE 8
Variance Decomposition Analysis

Period	S.E.	IR Diff.	FPEH	SMC	GDP Diff.
1st	0.047	0.349	6.258	93.393	0.000
2nd	0.048	1.992	6.809	90.783	0.416
3rd	0.049	5.366	6.512	87.066	1.056
4th	0.050	7.484	6.561	84.197	1.758
5th	0.050	8.716	6.494	82.570	2.219
6th	0.051	9.442	6.412	81.478	2.667
7th	0.051	9.784	6.356	80.745	3.114
8th	0.051	9.872	6.346	80.262	3.519
9th	0.051	9.844	6.396	79.896	3.863
10th	0.051	9.810	6.509	79.542	4.139

Note: S.E. represents Standard error, SMC represents Stock Market Co-movement, IR Diff. represents Interest Rate differential, FPEH Foreign Portfolio Equity Holding, GDP Diff. represents GDP Growth Rate Differential

Our results of ARDL align with the findings of past studies. Cappiello et al. (2005) concluded that macro-economic variables have an asymmetric impact on equity returns. Arouri et al. (2011) also highlighted that co-movements are attributed to various economic events and regime shifts. Pretorius (2002) provided more support for macro-economic variables by suggesting that increasing GDP growth rate differential among the participant countries significantly increases bilateral stock market co-movement. These results also support our short and long run ARDL results at different lagged values. Interest rate differential in our study has weak explanation for bilateral co-movement that is also supported by Beine and Candelon (2007) suggesting that macro-economic variables have poor relation with stock market co-movement. These findings are also supported by Canova and Nicolo (2000).

4. CONCLUSION AND DISCUSSION

According to Markowitz (1952), risk can be minimized through diversified portfolio which is also supported by various past researchers by testing his theory based on co-movement of asset returns. This study focuses on the determinants of equity return co-movements by providing insight to investors and fund managers. This can help them in constructing a well-diversified portfolio. For international diversification, formulation of portfolio can be justified

only if co-movements pattern among underlying securities is fully understood. This pattern should not only be based on past returns but should also have insights about economic factors and explanations accountable for such co-movements. Initially identifying and then segregating stocks in different pools based on their return co-movements can result in a well-diversified portfolio. This study also embarks upon the importance of financial integration among frontier and emerging stock markets. The role of macro-economic variables in co-movements between the Pakistan and Indian equity market is also important. Our findings suggest that in the long run, only GDP differential between India and Pakistan as a macro-economic indicator has significant relation with bilateral equity co-movement. Interest rate differential and foreign portfolio equity holding has no significant impact on bilateral stock market co-movement. In the short run, however, all the three variables have significant impact on bilateral equity co-movement but again GDP differential is the only one with significant impact at all lag values.

Interest rate differential and foreign portfolio equity holdings are significant only at one and two lagged levels respectively. These findings are important for international investors willing to make equity investments in these emerging Asian markets. However, in times of higher macro-economic integration in general and GDP growth in particular, diversification benefits may increase. For long term investors, only GDP growth rate differential is significant whereas interest rate differential and foreign portfolio equity holding has no impact on bilateral equity co-movement. However, for short term international investors willing to make investments in these emerging Asian markets, GDP differential again is the most significant variable compared to interest rate differential and foreign portfolio equity holding. Interest rate differential among others has least explanation for bilateral stock market co-movement (i.e., only for lag values in short run). These findings have important implication for international investors and the inclusion of additional variables in investment analysis with equity co-movement pattern of markets can be helpful. Furthermore, our included bilateral variables also highlight the role they have in explaining weak efficient equity markets of India, Pakistan and their bilateral stock market relationship.

For future recommendation, the inclusion of Islamic equity markets can provide more insights into the international co-movement pattern. These Islamic indices are now represented as a major subset of global equity markets and therefore should be included in analysis. These markets can be explored either separately or in combination

with their conventional counterparts. Factors involved in the co-movement of Islamic indices can be different based on Islamic ideology and its modes of investment and financing.

ENDNOTES

1. We have selected stock market returns co-movement as a dependent variable. This variable is stationary at level because of return estimation from closing stock prices. ARDL model can be used if the dependent variable is stationary and independent variable is a mix of stationary and non-stationary i.e., I(1) variables. In Table 4, critical values presented by Pesaran et al. (2001), the authors state the assumptions for underlying data-generating process. They define a vector $z_t = (y_t,x'_t)'$, where y_t is the dependent variable and the vector x_t contains the (weakly) exogenous regressors. They then assume "[.] the elements of z_t to be purely I(1), purely I(0) or co-integrated [..]", which includes the case where y_t is I(0) and the variables in x_t are a mix of I(0) and I(1) variables. Other studies, including Engel and Granger (1987), Hassler and Wolters (2006) and Pesaran et al. (1999), also provide detailed discussions on ARDL and error correction models. In case when the dependent variable is stationary and the independent variables is a mix of stationary and non-stationary variables, one can proceed with the ARDL bound testing.

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