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Time Varying Stock Market Integration and Diversification Opportunities within Emerging and Frontier Markets

Summary: This study examines the time-varying feature of Emerging and Frontier stock markets to identify diversification opportunities. For this purpose, we sample 29 emerging and frontier countries ranging from 2000-2018 from America, Europe, Asia, Middle East, and Africa with each region consisting of a panel with one home country and other as remaining countries portfolio. Our results highlight few diversification opportunities in the post-crisis period for international investors in emerging and frontier stock markets as compared to the pre-crisis period. In the post-crisis period; Peru, Philippine, Jordan offer diversification opportunities for long run whereas Brazil, Mexico, Peru in emerging America, Philippine from Emerging Asia, Kazakhstan in frontier Europe, Kenya, Morocco in frontier Africa and Bahrain, Jordan from frontier Middle East offer short-run diversification opportunities for international investors.

Keywords: stock market integration, portfolio diversification, emerging markets, frontier markets, VECM
JEL codes: G01, G11, G15, F3, F21, F65
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International risk diversification has been a significant aspect of financial investment allocation. Earlier studies of *Markowitz* (1952) and *Grubel* (1968) attained a lot of consideration in international portfolio diversification. Stock market integration is a phenomenon in which the stock of various countries moves similarly, depicts a similar trend regarding expected risk-adjusted returns (Jawadi and Arouri, 2008). Stock market integration means keeping other things equal the same model for the valuation of the stock can opt for each country regardless of its traded place (Heimonen, 2002). The problem of vibrant financial market integration among stock markets has become a valuable topic in contemporary literature of finance that encompasses various facets of the interrelationship across the stock markets. After the advancement of globalization, the flow of funds has increased from one country to another. By keeping this in mind the investors and portfolio managers start diversifying their investments internationally to maximizing the returns level and minimizing the risk

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level, but diversification of stock investments is worthless if stock markets of these countries are highly integrated. According to the Traditional portfolio theory, a diversified portfolio increases the possibility of the return. It can help to generate the highest return with a relatively lower risk (Lai and Hang, 2014). Effective portfolio diversification is a key element for international investors but correlation values between stock returns are just an indicator of the relationship between stock returns (Rehman and Kashif,2018). So before investing in international markets, one must need to study the level of integration among the stock markets that is the reason research of stock market integration gains more value, particularly in the last few decades.

There are numerous studies on stock market integration, focus on a specific region like America, Europe, Asia, Africa, from developed, emerging, and frontier markets. Majority of the studies on stock market integration are associated to the developed markets and according to the previous literature the level of integration among developed markets is very high (see; Carrieri et al. 2013; Maghyereh et al., 2015; Sehgal, Gupta, and Deisting,2017). Few studies like *Bruner et al*. (2008); and *Pukthuanthong and Roll* (2009) and *Shahzad, Hernandez, Rehman, Al-Yahyaee, and Zakaria, M*. (2018) they used global sample over the longer period and *Batten et al*. (2015) suggest stock market integration is a time-varying feature that allows us to test the level of stock market integration in different periods. The major purpose of our study is also related to the current status of stock market integration within emerging and frontier markets. In this respect; MSCI classified the world countries into three classifications for their economic activities and level of development in the country. Our study includes six MSCI (Morgan Stanley Capital International) world regions from emerging and frontier markets to analyze the level of integration, long and short-run association within the region.

There is also a debate in financial literature that markets behave differently in normal and turmoil period. Global financial crises can affect the intensity of the market association and ultimately expected opportunities for diversification (e.g. Syllignakis and Kouretas 2011). Few studies found strong evidence of contagion like; Bae and Zhang, (2015), Rizavi et al. (2011). The integrated stock market has more probability to cause each other, at the same time integrated stock markets cannot provide any potential benefit of risk diversification rather it can enhance the risk of external shock during the time of crises (see; Collins and Biekpe, 2002; Arouri et al. 2010; Huyghebaert, and Wang,2010; Mohamad Jais and Karim, 2011; Bae and Zhang, 2015). *Móczár, J*. (2010) pointed out that economic science does not have any model or empirically tested theories to avoid uncertainty in the financial market. So many of the scholar argued that crisis could not be fully avoided nor predicted. For this reason study of stock market patterns before, during and post-crisis is very important.

Our contribution in this field of study follows; first we use both frontier and emerging markets as there are limited studies that cover both markets into one study for a longer period of 19 years. Secondly, we use three different periods to analyze the time-varying nature of Frontier and Emerging markets and the effect of the global financial crisis (2008-09) on stock returns of these countries. Third, we use panel data co-integration and Vector Error Correction Model (VECM) to test the integration, the short and long-run association between country-level assets, because panel methodology is famous and rapidly applied in the finance literature,

previously similar sort of studies was conducted by applying time series analysis. Our study mainly helpful for those investors who want to diversify their portfolio in the short and long run in a specific region.

LITERATURE REVIEW

Earlier studies on stock market integration confirm that slight integration exists among country-level stocks (see; Bowman and Comer, 2000; Bhar and Nikolova, 2009), while current literature on stock market integration indicate that interdependence level has increased in recent time (see e.g., Beirne et al., 2010; Okicic, 2015; Jebran et al.,2017; Baumohl et al., 2018. We reviewed that most of the studies focused on the interdependence of developed market like; USA, Japan, and other major European countries (see e.g, Bekaert and Campbell, 1995; Majid et al., 2006; Dunis, Sermpinis, and Karampelia, 2013; Maghyereh et al., 2015; Shahzad, Kanwal, Ahmed, and Rehman, (2016), Sehgal, Gupta, and Deisting, 2017), as they found the level of integration has increased among developed countries, then most of the researcher moved their focus toward the emerging and frontier markets to find out the new combinations of stocks for portfolio diversification. In this regard, *Carrieri et al.* (2013) also indicate that developed markets are almost fully integrated with the global economy, and emerging markets are yet not effectively integrated.

After that many researchers studied emerging and frontier markets, including Asian emerging countries (see e.g., Jebran et al., 2017; Narayan and Rehman (2018), Kim et al., 2015; Bowman and Comer, 2000) they found Asian countries were less integrated before the global financial crisis of 2008-09. Than few studies are also conducted on Emerging and Frontier European countries (see e.g., Nikkinen Piljak and Rothovius, 2011; Syriopoulos 2011) that suggest co-movement between emerging markets is increasing and in frontier markets still there is some combination which displays weak correlation. Many individual and cross regions studies are also found on emerging America (see e.g.; Kumar, 2017), Frontier GCC and African countries (see e.g., Cheng et al., 2010; Guyot et al. 2014).

Stock market integration in Emerging Markets

Plenty of research has been conducted on stock market integration by using a particular region or across the region through various econometrics techniques, e.g. Rehman, Shah, and Hussain (2019), and Rehman and Shah (2016). Current Empirical results show that some emerging stock markets still have a probability to provide greater diversification benefits for international investors in both normal and turmoil period. However, the finding of these studies provides mixed results (Larisa Yarovaya, 2016). Emerging economies demonstrated a higher economic growth rate as compared to the developed economies, increasing share in world GDP and FDI and Emerging countries are also less affected by the economic crisis that makes them more attractive for investors. (e.g. Bekiros, 2014). *Li et al.* (2003) and *Berger et al.* (2011) recommended the presence of high-risk reduction probability when diversifying portfolios into the frontier and emerging markets.

Guesmi and Nguyen (2011) studied global integration of four emerging region Asia, Latin America, South-Eastern Europe, and the Middle East, they conclude world market integration is time-varying and high degree segmentation is still exist in emerging

markets of world regions but integration level is increasing by the time in those markets. *Sharma and Seth*, (2012) suggest that the level of stock market integration in emerging economies is increasing from the last few years. *Groot, Pang, and Swinkels* (2012) indicate frontier markets are better options to improve the efficiency of the investment portfolio due to the potential growth for that reason these markets deserve the intention of the international investor.

Ajaya, (2017) indicated Stock markets of Chile, Peru, and Venezuela are highly integrated. The co-integration test suggests there is a long-run equilibrium association that exists between these markets. *Diamandis* (2009) suggest the stock market are integrated that four market of Latin America (Mexico, Brazil, Chile, and Argentina) and the US. *Syllignakis and Kouretas* (2011) shown that the conditional correlation between the stock returns of Eastern and Central European emerging markets and developed markets of the USA and UK is significantly improved during the Global crises of 2008-2009. *Voronkova, S.* (2004) suggests a stronger significant long-run association between central European markets within the region and with the rest of the world than previous studies in this region. *Later, Munteanu, Filip, and Pece, A.* (2014) study the interconnection of the US and twelve emerging stock markets of European countries from 2005 to 2013 found a significant relationship.

Stock Market Integration in Frontier Markets

We also found many shreds of evidence regarding stock market integration in frontier markets including Europe, Asia, the Middle East, and Africa. *Wang and Shih* (2011) provided evidence of stock market integration between emerging markets of Europe and five frontier markets that indicate stock markets are partially integrated with global markets. *Nikkinen, Piljak, and Rothovius*, (2011) found Croatia, Estonia, and Slovenia show a significant financial integration with comparison to the world market portfolio. Wang and Shih, (2013) provided evidence of stock market integration between emerging markets of Europe and five frontier markets that stock market is partially integrated with global markets. *Lucey, B. M.*, and Voronkova, S. (2008) studied the Russian stock market association with emerging markets in central and eastern parts of Europe including Poland, the Czech Republic, and developed markets. They found long-run association does not exist but short term bivariate conational exist between the above countries. Rehman and Shahzad (2017) studied the linkages between the frontier and emerging equity markets of Asia and found that emerging markets are more integrated with Pakistani equity markets as compare to the Sri Lankan equity market. *Basher, Nechi, and Zhu* (2014) indicate the presence of conditional dependence between various pairs of stock markets from GCC. *Arouri and Nguyen,* (2010) suggested cross-market correlation is time-varying and time-dependent in Gulf stock markets. But co-movement between Gulf countries is still very low and insignificant between the Gulf and the rest of the World countries. *Espinoza, Prasad, and Williams* (2011) studied the degree of regional financial integration in the member countries of the Gulf corporation council. Empirical findings using equity data confirm that stock markets are integrated compare to the other emerging markets. *Boamah* (2016) find out that African stock markets are more integrated with other world markets as compare to the African regional integration and this global integration become enlarge in recent times. These results

may be due to the trading system of the African economies. They sum up that level of stock market integration growing over time and global financial crises also impact the African stock markets.

Stock Market Integration and Global Financial Crisis

Those countries which allow the free movement of capital and adopt a free-floating exchange rate that is determined by economic forces could cause by the external shock that leads to an increase (contagion) or decrease in market co-movements. (Kiss, G. D., and Kosztopulosz, A, 2012). After the strong growth of world economies until 2007, a crisis starts from the real state sector of the United States soon become global. In beginning, it affected the United States and advanced economies of Western Europe but soon it hit various member states of the European Union to a different level and become a global financial crisis in 2008 (Terazi, E., and Şenel, S, 2011). There are many studies which use a subsampling approach to test the gradual change in the level of integration and impact of the crisis by taking pre, during, and post-crisis period. Syllignakis and Kouretas (2011) argued Global financial crises can affect the intensity of the market association and ultimately expected opportunities of diversification. Literature suggests the degree of stock market integration is time-varying in nature that could be caused by the financial crises (Yang et al. 2006). *Horvath, R., and Petrovski, D.* (2013) studied the co-movement between Western and Central Europe including the Czech Republic, Hungary, Poland, and Croatia, Macedonia, and Serbia. Co-movement is higher between the two regions in the sample time of 2006-2011. All stock markets fall intensely at the start of the 2008 crisis and we do not find that the crisis changed the degree of stock market integration between these groups of countries.

DATA

We sample 29 countries from emerging and frontier markets to test the level of stock market integration. We include 5 Emerging American countries (Brazil, Chile, Colombia, Mexico, and Peru), 4 Emerging European (Czech Republic, Greece, Hungary, and Poland), 8 Emerging Asian (China, India, Indonesia, Malaysia, Pakistan, Philippines, Taiwan, and Thailand), 4 Frontier African (Kenya, Mauritius, Morocco, and Tunisia), 4 Frontier European (Croatia, Estonia, Kazakhstan, and Slovakia) and 4 frontiers Middle East countries (Bahrain Jordan, Kuwait, and Oman) into the analysis.

The data employed in this study is Monthly stock indices spanning from January 2000 to December 2018 extracted from Thomason data stream. Following MSCI indices of particular countries are further divided; January 2000- December 2007 considered as Pre-crisis, January 2008-December 2009 taken as Crisis period and January 2010-December 2018 declared as post Crisis period. Prices of stock indices are used to calculate the stock market returns. We construct panel data for all 29 countries by dividing these countries into 6 regions of emerging and frontier markets.

In the first phase, we did a basic time series analysis for all these countries. In the second phase, we convert all data into different panels and apply panel co-integration techniques to test the level of integration within regions (see; Narayan and Rehman (2017). In each region, countries are supposed to test against all other countries. We construct a model by including a panel of the only home country as dependent denoted by P_{it} and panel of other countries

as independent P_{jt}. In all the regions similar panels are constructed to test the stock market integration. We use the Panel data approach to test the current status of stock market integration, by applying panel co-integration tests including (Kao (1999), Maddala and Wu (1999), and Pedroni (1999, 2004). In the last step, we apply VECM to check the short and long-run association between country-level data. Rehman, M., and Shah, (2016) applied the same method in their study.

Monthly Returns

In the case of both emerging and frontier markets, the movement of monthly stock returns remains normal to expect a few periods. In all regions, monthly returns are declining in 2008-09 due to the global financial crisis. Some of the countries shown abnormal returns in other periods that are mentioned in *Figures 1 and 2.*

In post-crisis period average panel returns are 2.3 0.66, 0.45, 0.37, 0.09, and –0.58 while in pre-crisis period it was 0.22, 0.93, 0.96, 0.2, 2.6, and 0.28 and in case of during crisis countries returns went into decline and average group returns were –0.35, –2.1, –1, –0.5, –2 and –2.8 respectively from panel A to E. *(See table 1)*

Panel Unit Root Test

ADF unit root, Im, *Pesaran, and Shin* (IPS, 2003) and *Levin, Lin, and Chu* (LLC, 2002) tests are used to determine the stationarity of MSCI indices including all countries from the group except the home country. MSCI price data is used for testing at the level and return data is used for the first difference. Tests are performed with drift and no trend for the price and returns data.

Panel Co-integration Test

We begin our empirical analysis for a typical investor in any one of the nations, i, with an investment portfolio comprising of their national stock market index, other market indices. We applied a panel co-integration test including *Kao* (1999), *Maddala and Wu* (1999) and *Pedroni* (2004) to check the long-run co-integration between country-level data.

$$P_{it} = \delta_{1i} + \theta_{1i} P_{jt} + u_{it} \qquad (1)$$

Here, P_{it} is each of the group countries' MSCI; P_{jt} is a portfolio of MSCI for other countries in the group. The Co-integration test implies the presence of at least one long-run association across all regions. In all cases, one co-integration relationship found in monthly price data of both emerging and frontier regions except a few cases where no co-integration relationship found according to given data. *(See table 2)*

Vector error correction model (vecm)

Here, we estimate the short-run relationship between the variables using the panel VECM. Of interest is the relationship portrayed here in the equation:

$$\Delta P_{it} = \delta_{2i} + \theta_{1i} \sum_{k=1}^{n} \Delta P_{jt-k} + \delta_{1i} ECT_{it-1} + \varepsilon_{it} \qquad (2)$$

All variables from equation (1) appear in equation (2) in the first differenced form, represented by Δ. The parameters to be estimated are δ and θs. The Error Correction Term (ECT), which is one lag of the residual from equation (1) if significant and negative, confirms a stable long-run relationship between the variables identified. Short term

Figure 1

MONTHLY RETURNS OF EMERGING STOCK MARKETS (JANUARY 2001–DECEMBER 2018)

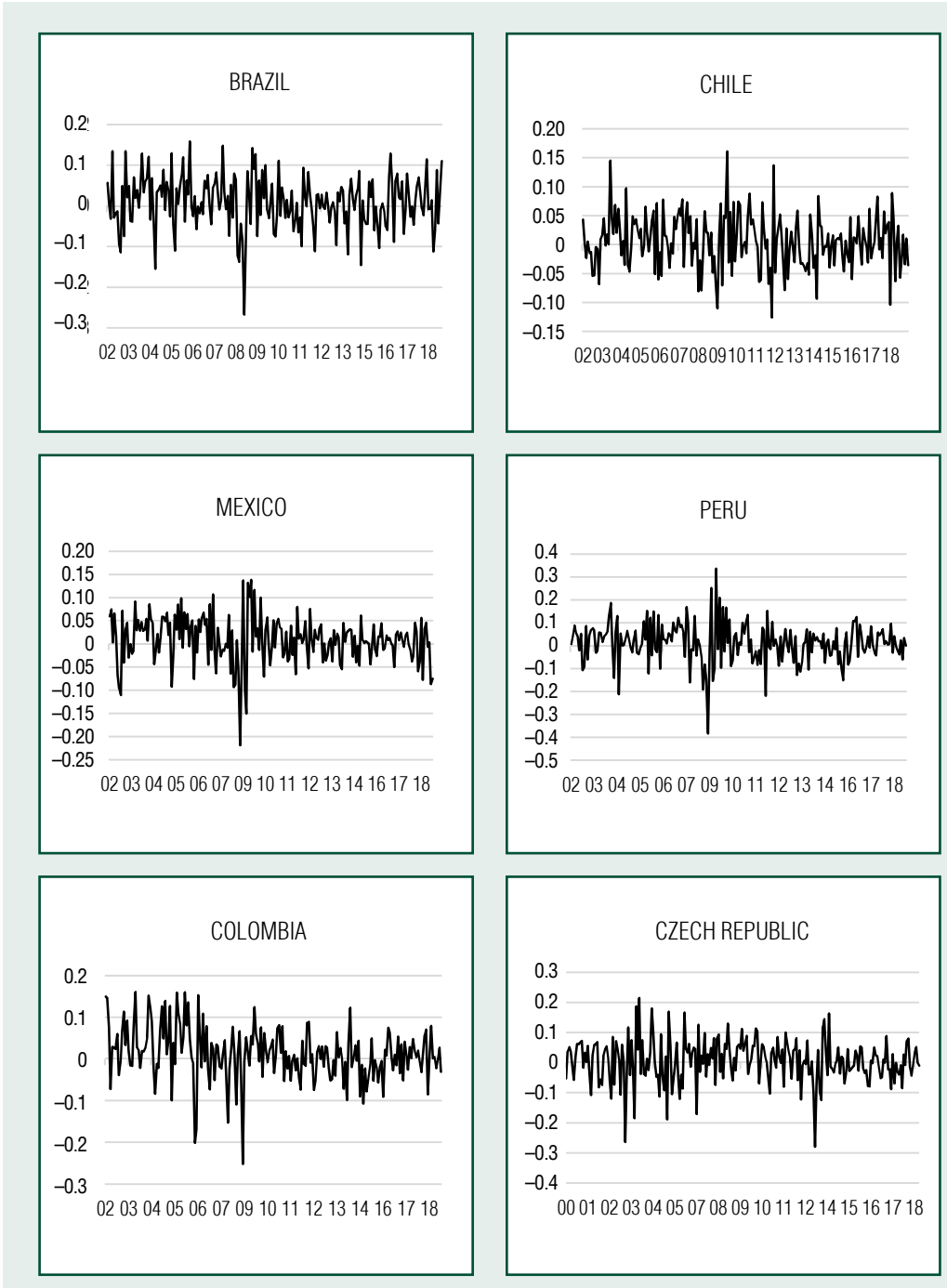

Figure 1

MONTHLY RETURNS OF EMERGING STOCK MARKETS (JANUARY 2001–DECEMBER 2018)

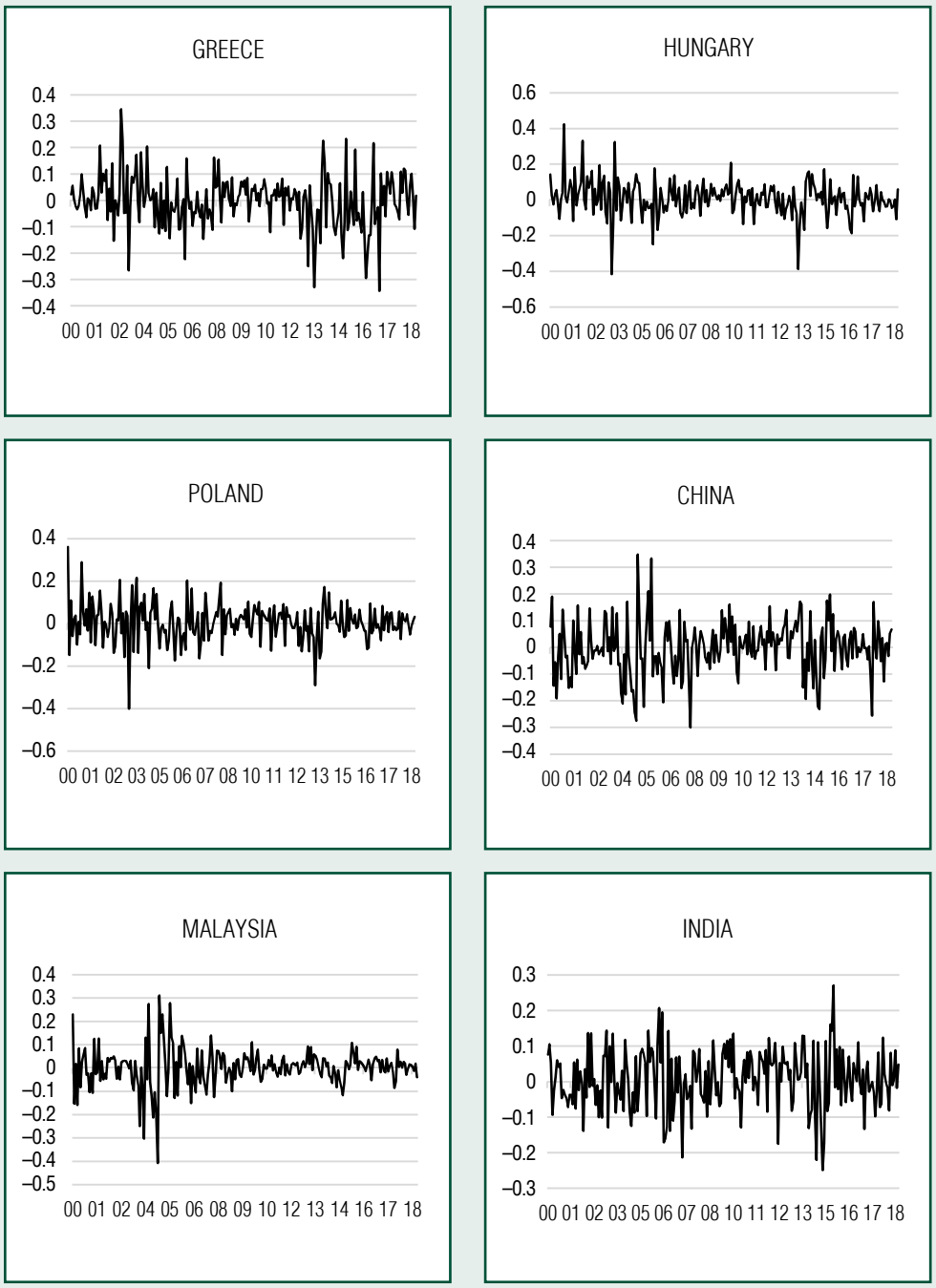

Figure 1

MONTHLY RETURNS OF EMERGING STOCK MARKETS (JANUARY 2001–DECEMBER 2018)

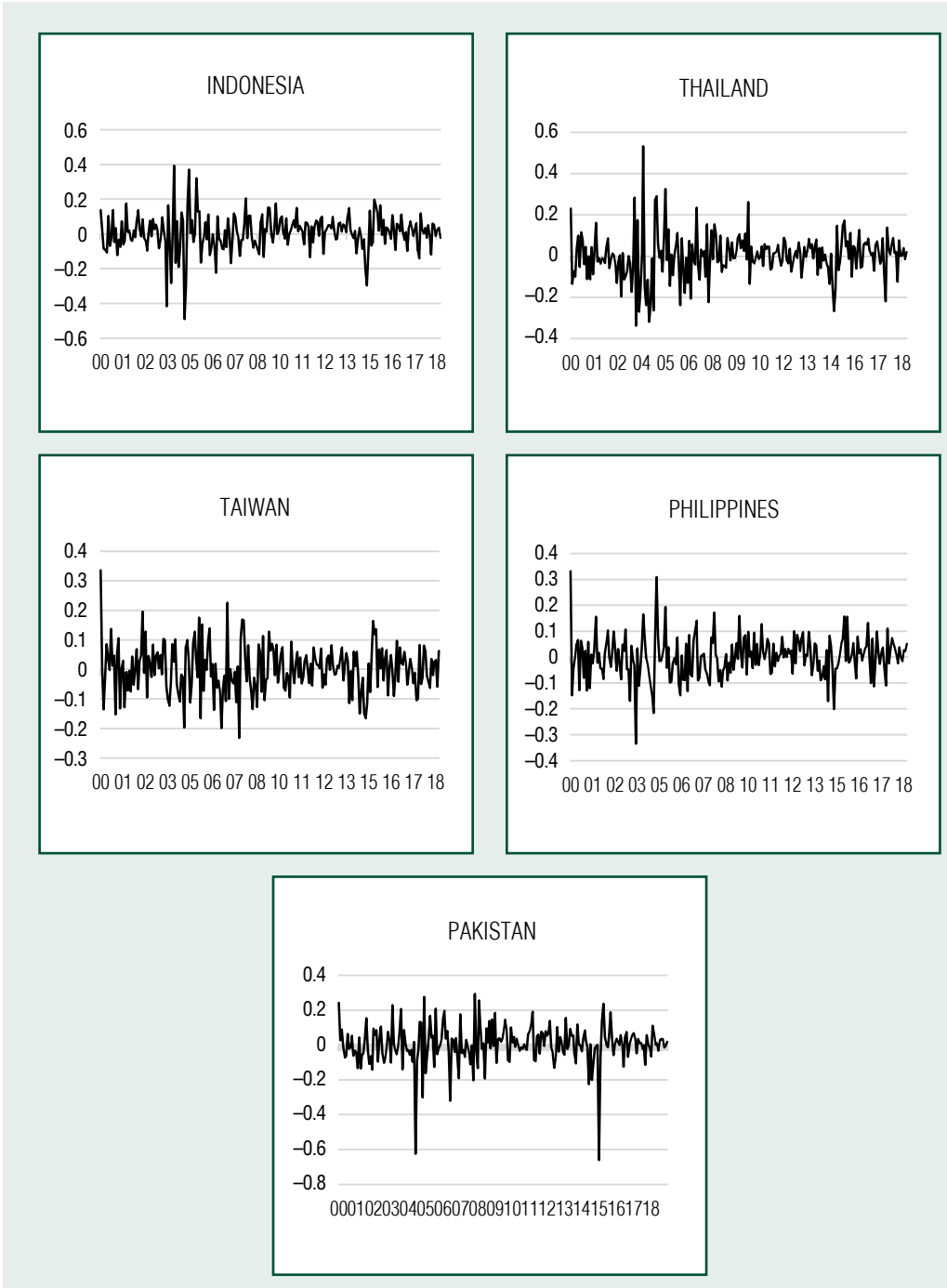

Figure 2

MONTHLY RETURNS OF FRONTIER STOCK MARKETS (JANUARY 2001–DECEMBER 2018)

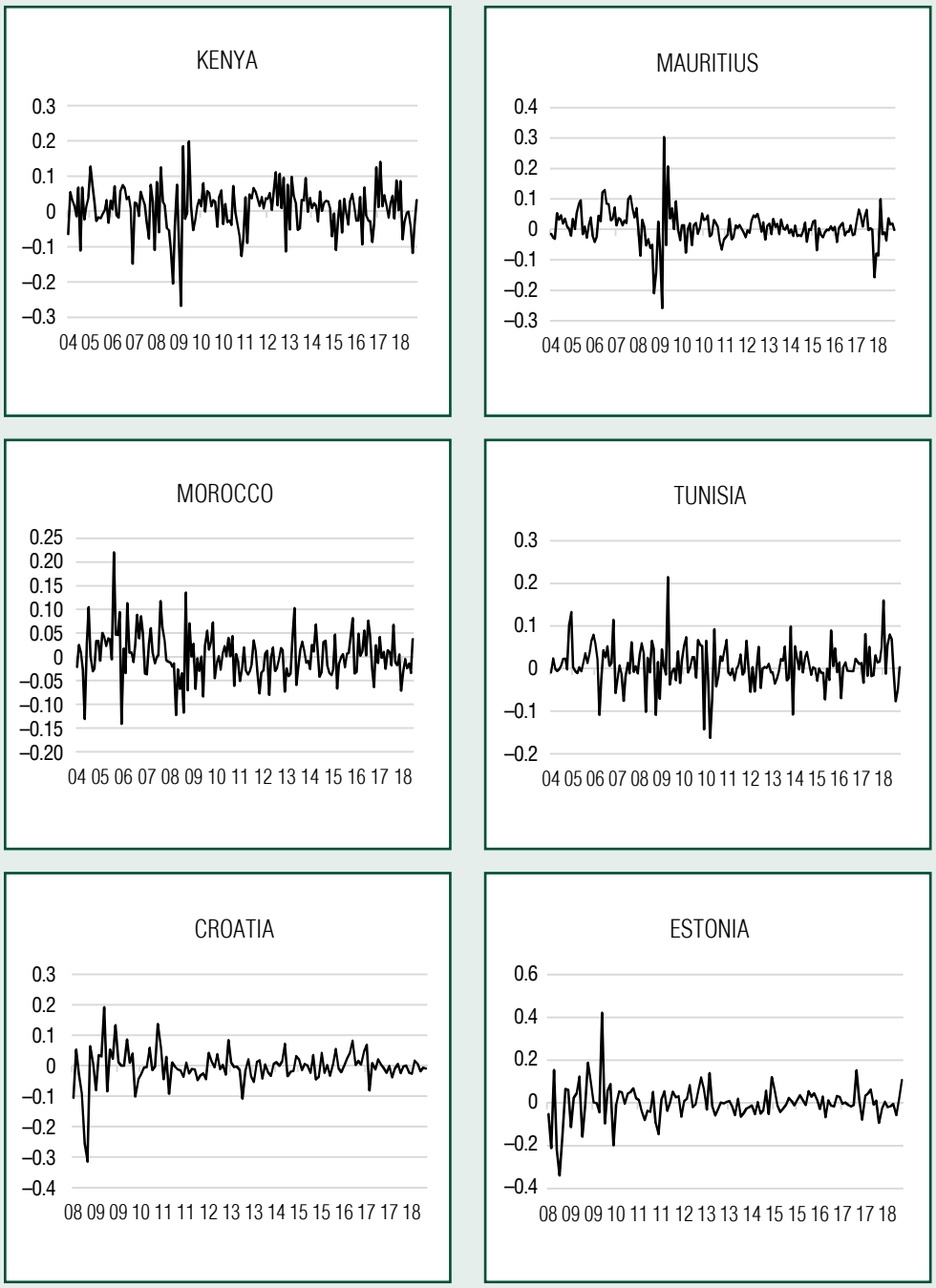

Figure 2

MONTHLY RETURNS OF FRONTIER STOCK MARKETS (JANUARY 2001–DECEMBER 2018)

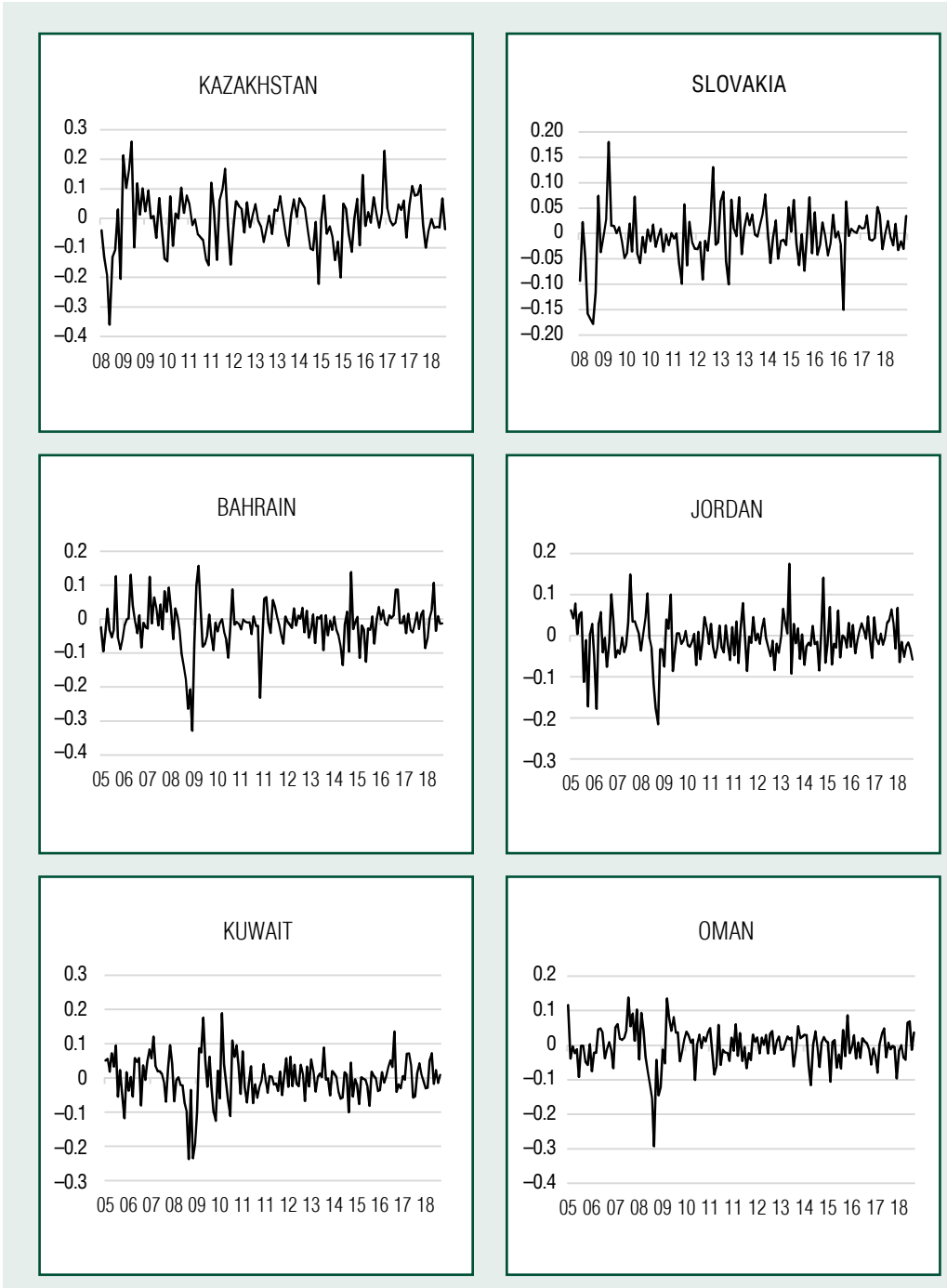

Table 1

DESCRIPTIVE STATISTICS AND UN-CONDIONAL CORRELATION

Panel A	Pre-crisis					During crisis					Post Crisis					
	Brazil	Chile	Colombia	Mexico	Peru	Brazil	Chile	Colombia	Mexico	Peru	Brazil	Chile	Colombia	Mexico	Peru	
Max	0.159	0.145	0.161	0.107	0.187	0.142	0.161	0.124	0.138	0.336	0.129	0.137	0.123	0.080	0.152	
Min	–0.154	–0.148	–0.201	–0.128	–0.212	–0.267	–0.11	–0.252	–0.219	–0.383	–0.146	–0.126	–0.107	–0.086	–0.218	
Std.	0.065	0.045	0.077	0.051	0.073	0.097	0.063	0.081	0.094	0.159	0.056	0.044	0.045	0.035	0.066	
Skew	–0.258	–0.315	–0.472	–0.83	–0.613	–0.674	0.477	–1.438	–0.299	0.153	–0.149	0.004	–0.036	–0.355	–0.318	
Kurt	3.157	4.447	3.495	3.331	3.937	3.256	3.014	5.32	2.642	3.263	2.869	3.423	2.956	2.743	3.296	
Brazil	1	0.508	0.207	0.101	0.574	1	0.646	0.727	0.152	0.830	1	0.521	0.525	–0.160	0.633	
Chile		1	0.205	–0.013	0.392		1	0.567	–0.198	0.532		1	0.474	–0.080	0.459	
Colombia			1	0.167	0.145			1	0.156	0.553			1	0.037	0.492	
Mexico				1	–0.179				1	0.212				1	0.048	
Peru					1					1					1	

Panel B	Pre-crisis				During crisis				Post Crisis							
	Czech Republic	Greece	Hungary	Poland	Czech Republic	Greece	Hungary	Poland	Czech Republic	Greece	Hungary	Poland				
Mean	0.017	–0.002	0.013	0.009	–0.016	–0.03	–0.020	–0.021	–0.004	–0.027	0.003	0.001				
Max	0.180	0.162	0.208	0.202	0.163	0.226	0.159	0.173	0.088	0.233	0.171	0.111				
Min	–0.190	–0.222	–0.248	–0.173	–0.279	–0.329	–0.387	–0.289	–0.101	–0.343	–0.187	–0.12				
Std.	0.070	0.07	0.075	0.077	0.094	0.128	0.121	0.106	0.042	0.116	0.063	0.048				
Skew	–0.370	–0.313	–0.421	–0.057	–0.463	–0.309	–0.917	–0.385	–0.117	–0.264	–0.076	0.121				
Kurt	3.240	3.341	3.922	3.070	4.176	2.941	4.622	3.136	2.599	3.008	4.005	2.662				
Czech Republic	1	0.393	–0.080	0.123	1	0.793	–0.039	–0.120	1	0.336	–0.106	–0.063				
Greece		1	–0.029	0.030		1	–0.003	–0.031		1	–0.077	0.081				
Hungary			1	0.666			1	0.886			1	0.603				
Poland				1				1				1				

Panel C	Pre-crisis								During crisis							
	China	India	Indonesia	Malaysia	Pakistan	Philippines	Taiwan	Thailand	China	India	Indonesia	Malaysia	Pakistan	Philippines	Taiwan	Thailand
Mean	0.011	0.016	0.016	0.007	0.017	0.004	0	0.007	–0.021	–0.007	–0.004	–0.005	–0.023	–0.008	–0.008	–0.007
Max	0.172	0.207	0.204	0.139	0.292	0.171	0.226	0.262	0.198	0.271	0.198	0.108	0.236	0.157	0.164	0.173
Min	–0.300	–0.213	–0.222	–0.150	–0.320	–0.148	–0.232	–0.237	–0.231	–0.249	–0.296	–0.116	–0.660	–0.201	–0.165	–0.265
Std.	0.082	0.082	0.080	0.054	0.098	0.068	0.077	0.083	0.123	0.131	0.115	0.055	0.169	0.085	0.092	0.106
Skew	–0.690	–0.440	–0.317	–0.205	–0.155	0.082	–0.024	–0.18	–0.005	0.070	–0.362	0.015	–2.192	–0.151	–0.028	–0.367
Kurt	4.299	3.142	3.071	3.473	4.165	2.514	3.665	4.495	2.064	2.303	3.324	2.700	9.631	3.283	2.189	2.923
China	1	0.276	0.308	0.225	0.064	0.115	0.113	0.038	1	0.342	0.485	0.514	–0.115	0.416	0.302	0.518
India		1	0.453	0.329	0.354	0.337	0.407	0.409		1	0.733	0.797	–0.089	0.748	0.813	0.773
Indonesia			1	0.264	0.195	0.440	0.270	0.398			1	0.794	–0.019	0.606	0.796	0.883
Malaysia				1	0.121	0.166	0.571	0.297				1	–0.031	0.729	0.723	0.761
Pakistan					1	0.125	0.167	0.222					1	0.039	0.208	–0.079
Philippi-nes						1	0.340	0.521						1	0.626	0.537
Taiwan							1	0.508							1	0.815
Thailand								1								1
	Post crisis															
	China	India	Indonesia	Malaysia	Pakistan	Philippines	Taiwan	Thailand								
Mean	0.001	0.006	0.006	0.002	0.004	0.007	0.003	0.007								
Max	0.170	0.123	0.118	0.079	0.170	0.131	0.097	0.139								
Min	–0.250	–0.133	–0.145	–0.087	–0.157	–0.112	–0.124	–0.219								
Std.	0.061	0.045	0.051	0.028	0.054	0.047	0.041	0.050								
Ske	–0.780	–0.113	–0.612	–0.600	–0.292	–0.261	–0.59	–0.826								
Kurt	5.485	`	3.665	4.218	3.807	3.333	3.566	6.074								
China	1	–0.155	0.007	–0.059	–0.011	–0.143	–0.005	–0.044								
India		1	0.510	0.471	0.221	0.614	0.581	0.526								
Indonesia			1	0.511	0.141	0.678	0.416	0.698								
Malaysia				1	0.293	0.490	0.466	0.515								
Pakistan					1	0.115	0.305	0.155								
Philippi-nes						1	0.426	0.640								
Taiwan							1	0.554								
Thailand								1								

„D" Panel	Pre-crisis				During crisis				Post crisis			
	Kenya	Mauritius	Morocco	Tunisia	Kenya	Mauritius	Morocco	Tunisia	Kenya	Mauritius	Morocco	Tunisia
Mean	0.014	0.033	0.020	0.015	–0.012	–0.006	–0.01	0.008	0.010	0.001	–0.002	0.006
Max	0.128	0.131	0.221	0.133	0.198	0.303	0.136	0.215	0.140	0.100	0.103	0.160
Min	–0.150	–0.041	–0.141	–0.108	–0.267	–0.258	–0.123	–0.109	–0.127	–0.156	–0.080	–0.163
Std.	0.053	0.044	0.060	0.045	0.107	0.117	0.064	0.063	0.054	0.034	0.037	0.047
Skew	–0.780	0.391	0.212	0.211	–0.185	0.379	0.408	0.992	–0.277	–0.961	0.243	–0.337
Kurt	4.205	2.463	5.835	4.257	3.411	4.305	3.09	6.214	3.012	6.784	2.945	5.259
Kenya	1	–0.067	–0.053	0.126	1	0.690	–0.186	–0.004	1	0.063	0.084	–0.012
Mauritius		1	0.054	–0.153		1	–0.167	–0.100		1	0.057	–0.221
Morocco			1	0.235			1	0.124			1	–0.010
Tunisia				1				1				1

„E" panel	Pre-crisis				During crisis				Post crisis			
	Croatia	Estonia	Kazakhstan	Slovakia	Croatia	Estonia	Kazakhstan	Slovakia	Croatia	Estonia	Kazakhstan	Slovakia
Mean	0.030	–0.010	0.050	0.037	–0.019	–0.028	–0.001	–0.032	–0.001	0.006	–0.006	–0.003
Max	0.260	0.155	0.649	0.162	0.192	0.189	0.260	0.180	0.137	0.422	0.229	0.131
Min	–0.080	–0.155	–0.261	–0.050	–0.315	–0.339	–0.359	–0.178	–0.108	–0.198	–0.222	–0.150
Std.	0.072	0.080	0.195	0.056	0.115	0.131	0.141	0.086	0.037	0.067	0.077	0.042
Skew	1.767	0.076	1.478	0.292	–0.715	–0.536	–0.475	0.083	0.382	1.989	–0.153	–0.046
Kurt	6.662	3.082	5.785	2.486	3.628	2.642	3.227	3.031	4.963	15.606	3.471	4.250
Crotia	1	0.157	–0.070	–0.115	1	0.688	0.494	0.784	1	0.244	0.188	0.287
Estonia		1	0.152	0.531		1	0.417	0.528		1	0.243	0.178
Kazakhstan			1	–0.22			1	0.493			1	0.205
Slovakia				1				1				1

„F" panel	Pre-crisis				During crisis				Post crisis			
	Bahrain	Jordan	Kuwait	Oman	Bahrain	Jordan	Kuwait	Oman	Bahrain	Jordan	Kuwait	Oman
Mean	–0.010	–0.003	0.014	0.005	–0.048	–0.021	–0.030	–0.016	–0.014	–0.006	0.001	–0.004
Max	0.130	0.149	0.118	0.138	0.157	0.103	0.164	0.136	0.139	0.175	0.194	0.087
Min	–0.090	–0.178	–0.118	–0.091	–0.328	–0.215	–0.231	–0.293	–0.231	–0.092	–0.113	–0.115
Std.	0.058	0.072	0.057	0.052	0.117	0.074	0.098	0.101	0.049	0.044	0.047	0.040
Skew	0.898	–0.568	–0.471	0.499	–0.571	–0.869	–0.287	–0.780	–0.583	0.906	0.726	–0.534
Kurt	3.401	3.584	2.607	3.268	3.047	3.950	2.755	3.505	6.612	5.338	4.975	3.095
Bahrain	1	–0.040	0.354	0.411	1	0.668	0.638	0.646	1	0.061	0.297	0.243
Jordans		1	0.174	0.368		1	0.517	0.534		1	0.072	0.144
Kuwait			1	0.148			1	0.744			1	0.334
Oman				1				1				1

Table 2

CO-INTEGRATION TESTING

			Kao Panel Co-integration				Pedroni Panel Co-integration Statistics			Johansen Panel Co-integration Trace statistics	
Region	**Country**	**ADF *t*-Stat.**	**Panel *v***	**Panel *rho***	**Panel PP**	**Panel ADF**	**Group *rho***	**Group PP**	**Group ADF**	**None**	**1**
Emerging America Pre-Crisis	Brazil	4.05	2.26	–0.51	0.33	0.70	0.10	0.85	1.51	16.54	10.18
	Chile	2.31	1.19	–0.74	–0.34	0.27	–0.09	0.04	1.02	9.07	7.57
	Colombia	0.79	0.01	0.18	0.24	–0.12	1.04	0.94	0.49	4.95	9.94
	Mexico	3.08	0.54	–0.66	–0.24	0.66	0.04	0.20	1.32	10.37	7.35
	Peru	5.00	1.17	0.70	1.33	1.75	1.30	1.86	2.76	23.48	11.52
Emerging America During-Crisis	Brazil	–1.10	–0.54	0.56	0.05	0.03	0.23	–0.46	–0.36	11.08	11.93
	Chile	–0.10	0.23	–0.41	–0.53	–0.26	0.19	–0.28	0.18	3.79	12.93
	Colombia	0.52	–0.24	1.11	1.56	0.98	1.43	1.99	1.49	1.90	10.23
	Mexico	0.37	–15.00	0.39	–0.08	–0.51	0.06	–0.57	–0.59	4.75	12.92
	Peru	–0.08	–0.27	0.38	0.00	–0.13	–0.26	–0.89	–0.55	11.30	9.85
Emerging America Post-Crisis	Brazil	0.36	1.20	0.12	0.83	0.34	0.44	1.23	0.61	9.40	15.59
	Chile	–1.10	1.28	–1.30	–1.04	–0.64	–0.46	–0.60	–0.15	12.99	19.16
	Colombia	–2.10	0.47	–0.68	–0.87	–0.98	0.42	–0.21	–0.38	10.80	19.97
	Mexico	–2.30	–0.99	0.07	–0.96	–1.68	1.06	–0.41	–1.29	10.90	15.19
	Peru	–1.50	1.84	–0.90	–0.59	–0.42	–0.55	–0.47	–0.44	10.18	14.38
Emerging Europe Pre-Crisis	Czech Rep.	–2.10	–1.20	0.50	–0.51	0.48	0.04	–0.76	0.26	13.08	5.81
	Greece	–3.59	1.73	–0.62	–0.61	–1.27	–0.55	–3.86	–2.58	37.79	2.79
	Hungary	–0.94	–0.86	0.12	–0.97	0.02	–0.16	–0.99	0.00	14.87	4.30
	Poland	–0.94	–0.26	–0.52	–1.67	–0.75	0.24	–1.20	–0.29	15.02	5.05
Emerging Europe During-Crisis	Czech Rep.	–2.84	0.53	–0.79	–0.53	–0.79	0.21	0.15	–0.10	6.79	6.79
	Greece	–1.62	1.73	–0.62	–0.61	–1.27	0.25	0.04	–0.46	6.13	13.56
	Hungary	–1.57	2.00	–0.11	0.32	0.55	0.21	0.27	0.75	9.10	9.41
	Poland	–1.75	2.33	–1.52	–0.96	–0.74	–0.86	–1.02	–0.54	12.54	14.77
Emerging Europe Post-Crisis	Czech Rep.	–1.09	–0.17	–0.14	–0.68	–1.05	0.30	–0.48	–0.63	21.36	16.36
	Greece	–3.86	0.07	–1.03	–3.43	–2.60	–0.55	–3.86	–2.58	43.95	20.21
	Hungary	1.07	–0.64	1.31	1.97	1.82	2.09	3.00	2.84	11.20	2.03
	Poland	–2.13	2.20	–2.19	–1.71	–1.41	–1.21	–1.43	–1.07	22.65	14.20

			Kao Panel Co-integration				Pedroni Panel Co-integration Statistics			Johansen Panel Co-integration Trace statistics	
Region	**Country**	**ADF *t*-Stat.**	**Panel *v***	**Panel *rho***	**Panel PP**	**Panel ADF**	**Group *rho***	**Group PP**	**Group ADF**	**None**	**1**
Emerging Asia Pre-Crisis	China	4.55	2.36	0.66	1.79	0.74	0.41	1.92	0.73	27.51	15.67
	India	8.45	0.44	0.59	1.35	1.76	–0.46	0.66	1.16	39.10	38.46
	Indonesia	3.17	0.40	1.39	2.40	2.24	0.49	1.74	1.68	69.70	52.91
	Malaysia	3.33	3.38	–1.82	–1.17	–1.05	–1.80	–1.23	–1.16	31.40	40.50
	Pakistan	3.56	–0.56	–0.24	–0.60	–0.18	–0.06	–0.57	0.13	17.73	9.77
	Philippines	3.40	0.77	–1.41	–1.42	–0.44	–1.88	–2.06	–0.76	32.93	21.63
	Taiwan	–6.23	2.26	–1.63	–2.48	–5.70	–0.22	–2.01	–5.82	22.15	21.85
	Thailand	3.88	–0.54	1.07	1.15	1.46	1.56	1.78	2.29	14.45	5.90
Emerging Asia During-Crisis	China	–1.24	3.95	–3.82	z–4.23	–2.46	–2.96	–5.33	–3.53	45.43	35.67
	India	–1.70	0.93	–2.19	–2.84	–2.02	–1.92	–4.34	–3.50	34.95	34.95
	Indonesia	–2.76	2.08	–1.48	–1.88	–1.95	–0.99	–2.35	–2.82	25.95	32.76
	Malaysia	–2.47	2.56	–1.49	–1.89	–1.94	–1.15	–2.54	–2.71	34.80	40.80
	Pakistan	–1.27	0.34	0.00	0.11	0.12	1.21	1.00	0.96	31.21	43.78
	Philippines	–2.24	3.06	–2.56	–2.96	–1.66	–1.99	–3.70	–2.07	29.76	40.40
	Taiwan	–1.59	2.54	–1.39	–1.44	–2.04	–0.55	–1.51	–2.89	29.80	31.99
	Thailand	–1.52	2.05	–2.02	–2.18	–1.10	–0.88	–2.02	–1.36	30.54	31.73
Emerging Asia Post-Crisis	China	–2.91	2.75	–1.74	–1.46	–1.65	–0.67	–1.07	–1.33	24.25	34.39
	India	1.65	–1.03	0.58	0.93	1.38	0.44	1.20	1.77	15.70	12.29
	Indonesia	–1.88	1.21	–2.28	–1.87	–1.29	–1.69	–1.84	–1.15	20.50	27.42
	Malaysia	–4.61	1.09	–1.57	–2.15	–2.37	–0.31	–1.68	–1.85	21.11	24.35
	Pakistan	–1.16	0.50	–0.23	–0.06	0.49	0.71	0.64	1.34	15.57	34.38
	Philippines	–1.93	–0.72	–0.16	–0.42	–0.22	0.85	0.25	0.49	10.96	30.53
	Taiwan	–0.56	1.77	–0.91	–0.88	–0.01	–1.05	–1.09	0.00	19.39	24.53
	Thailand	–3.13	1.35	–1.16	–1.46	–1.42	–0.18	–1.19	–1.06	16.12	24.70
Frontier Africa Pre-Crisis	Kenya	–1.88	1.60	–1.52	–1.26	–1.88	–0.57	–0.88	–1.63	6.74	6.040
	Mauritius	0.33	1.26	1.51	2.57	1.96	2.04	3.43	2.73	3.39	10.34
	Morocco	–1.42	0.06	–0.53	–0.26	–0.66	0.46	0.53	0.05	5.50	6.59
	Tunisia	–0.75	0.28	–0.09	–0.10	–0.43	0.54	0.26	–0.16	5.23	7.51

			Kao Panel Co-integration				Pedroni Panel Co-integration Statistics			Johansen Panel Co-integration Trace statistics	
Region	**Country**	**ADF *t*-Stat.**	**Panel *v***	**Panel *rho***	**Panel PP**	**Panel ADF**	**Group *rho***	**Group PP**	**Group ADF**	**None**	**1**
Frontier Africa During-Crisis	Kenya	–0.02	0.28	–0.60	–1.03	0.21	–0.46	–1.19	0.39	5.31	9.64
	Mauritius	–1.09	–0.17	0.42	0.24	0.51	1.02	0.69	1.01	4.28	9.38
	Morocco	1.41	0.92	–0.81	–0.71	1.12	–0.65	–0.79	1.72	4.36	3.97
	Tunisia	–0.95	0.27	–0.84	–0.98	–0.52	0.07	–0.53	0.00	3.35	7.26
Frontier Africa Post-Crisis	Kenya	–0.42	–0.72	0.26	0.09	0.19	1.12	0.76	0.89	8.17	11.32
	Mauritius	–2.99	2.96	–2.50	–1.73	–1.91	–1.52	–1.45	–1.68	9.35	7.38
	Morocco	–0.69	–0.45	0.47	0.37	0.07	1.28	1.07	0.70	3.20	6.90
	Tunisia	1.35	0.62	1.21	2.01	2.57	1.94	2.98	3.63	3.26	6.75
Frontier Europe Pre-Crisis	Crotia	–2.20	–0.65	0.15	–0.66	–0.77	0.91	–0.22	–0.55	17.60	23.65
	Estonia	–1.43	2.32	–0.15	0.38	–0.47	0.71	1.10	0.00	10.50	10.12
	Kazakhstan	–3.67	1.80	–1.18	–1.10	–2.66	–0.25	–0.68	–2.61	15.90	13.97
	Slovakia	–0.07	–1.05	0.86	1.16	0.90	1.52	2.05	1.77	10.10	12.99
Frontier Europe During-Crisis	Crotia	–1.50	0.77	–1.01	–1.36	–0.02	–0.73	–1.33	0.20	10.20	14.75
	Estonia	–0.53	0.22	–1.08	–1.50	0.09	–1.32	–2.21	–0.53	13.8	17.07
	Kazakhstan	–0.77	1.14	0.26	0.55	0.93	1.11	1.29	1.73	5.71	10.76
	Slovakia	–1.20	0.54	–0.41	–0.79	0.18	–0.27	–1.15	–0.55	10.4	14.11
Frontier Europe Post-Crisis	Crotia	–1.55	1.04	–0.37	–0.34	–0.61	0.47	0.19	–0.09	8.85	17.50
	Estonia	–0.93	1.75	–2.19	–1.84	–0.04	–1.17	–1.55	0.57	15.30	21.09
	Kazakhstan	–2.29	0.22	–0.39	–0.67	–0.93	0.49	–0.17	–0.42	12.30	18.53
	Slovakia	0.57	–1.50	0.67	0.81	0.75	1.44	1.64	1.57	5.32	0.80
Frontier Middle East Pre-Crisis	Bahrain	–3.00	2.15	–2.10	–2.64	–1.82	–1.44	–2.70	1.77	14.40	14.00
	Jordans	–0.47	–0.44	0.86	0.93	0.52	1.70	1.79	1.33	13.10	15.07
	Kuwait	–0.83	–0.23	0.28	–0.05	0.32	1.14	0.55	0.99	5.56	11.92
	Oman	–0.67	1.06	0.06	0.27	0.84	0.69	0.84	1.44	12.80	12.19
Frontier Middle East During-Crisis	Bahrain	–0.60	0.75	–0.32	–0.29	–0.42	0.40	0.13	–0.15	8.44	4.90
	Jordans	–2.52	1.46	–0.74	–0.66	–1.04	0.00	–0.34	–1.03	9.76	8.78
	Kuwait	–1.43	1.03	–0.55	–0.53	–1.45	0.28	–0.06	–1.35	4.65	7.78
	Oman	–1.09	1.42	–0.37	–0.19	–0.46	0.46	0.39	–0.29	2.17	6.15
Frontier Middle East Post-Crisis	Bahrain	–2.74	–0.73	–2.09	–2.53	–2.40	–2.40	–2.98	–2.47	21.40	26.68
	Jordans	–3.60	1.27	–3.34	–3.28	–3.13	–3.57	–3.79	–3.26	20.00	21.46
	Kuwait	–2.27	2.56	–2.85	–2.11	–2.50	–1.82	–1.86	–2.34	15.10	19.47
	Oman	–0.72	0.50	–0.52	–0.39	–0.21	0.28	0.11	0.32	9.48	14.22

linkages decide on the significance of the lag value of the return series against a particular country.

Emerging American countries have long run and short-run associations within the region except for few cases. All the countries have a long-run association with other countries in the panel/group except Chile in the pre-crisis period while during crisis only Brazil is insignificant as a dependent variable, and in the post-crisis period, Peru has no significant long-run relationship. On the other hand, Short-run association exist between all countries in the region except Colombia, while in during the crisis period Brazil and Peru are insignificant and post-crisis period we cannot found a short-run association between Brazil, Mexico, and Peru with other group countries. *(See table 3)*

In second panel we test the stock market integration between Emerging Europe countries as we found in the case of pre-crisis Greece is insignificant, while in during crisis the only Creech Republic is insignificant as a dependent variable, and in post-crisis period all countries have a significant long-run relationship with other countries in the region. The short-run association exists between all countries in the region except Greece at the time of pre-crisis while during the crisis period the Creech Republic is insignificant with other group countries in that region and in the post-crisis period we found a short-run association between all countries in the region.

In the case of Emerging Asia, we found mixed kinds of evidence regarding the long run and short-run association within the region. In pre-crisis, all the countries have long-run association while in during crisis only Indonesia and Malaysia is insignificant as a dependent variable, and in post-crisis period Philippine has no significant long-run relationship. In pre-crisis Short-run association exist between all countries in the region period except China and in during crisis period Indonesia, Malaysia and Thailand are insignificant with other panel countries in that region which means the short-run relationship is not found in those countries and in the post-crisis period we cannot found a short-run association between Philippine and other countries.

In the case of pre-crisis, all the countries have a long-run association with other countries in Frontier Africa panel while during crisis only Mauritius is insignificant. In the case of the post-crisis period, all countries have a significant long-run relationship with other countries in the region. In pre-crisis Short-run association exist between all countries in the region period except Morocco. During the crisis period, only Tunisia and Mauritius are significant with other panel countries in that region which means the short-run relationship is not found in other countries. In the post-crisis period, we found no short-run association between Kenya and Morocco panel countries in the region.

In the case of Frontier Europe, we have data of only during and post-crisis periods. During a crisis period, only Kazakhstan and Slovenia are significant while in the post-crisis period all countries have a significant long-run relationship. During the crisis period, only Lithuania is insignificant with other panel countries in that region and on the other hand, no short-run association is found between Kazakhstan and panel countries in the post-crisis period.

In the case of the pre-crisis period, Oman and Kuwait did not have a long-run association in frontier Middle East, while during crisis only Oman is insignificant as a dependent variable and in the post-crisis period, we found a long-run association between all panel countries in the region except Jordan. In pre-crisis Short-run association exist between all countries in the region except Oman, while

Table 3

PANEL VECM

Regressors	Pre-Crisis				During Crisis				Post Crisis			
Panel A	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept
Brazil	–0.571	–0.379	–0.208	0.001	–0.294	–0.092	0.058	–0.002	–1.298	–0.220	–0.068	0.001
	–0.108	–0.097	–0.070	–0.004	–0.210	–0.192	–0.127	–0.010	–0.098	–0.055	–0.051	–0.003
	[–5.286]	[–3.915]	[–2.954]	[0.267]	[–1.403]	[–0.480]	[0.452]	[–0.194]	[–13.228]	[–4.040]	[–1.354]	[0.311]
Chile	0.041	0.135	0.081	0.001	–1.312	–0.165	–0.018	–0.002	–0.952	–0.364	–0.148	0.000
	–0.024	–0.063	–0.045	–0.003	–0.204	–0.074	–0.054	–0.005	–0.102	–0.059	–0.044	–0.002
	[1.673]	[2.141]	[1.816]	[0.291]	[–6.446]	[–2.239]	[–0.331]	[–0.453]	[–9.297]	[–6.136]	[–3.363]	[–0.176]
Colombia	–0.923	0.052	0.080	0.000	–1.376	–0.572	–0.179	–0.004	–0.952	–0.364	–0.148	0.000
	–0.089	–0.062	–0.063	–0.004	–0.219	–0.109	–0.082	–0.007	–0.102	–0.059	–0.044	–0.002
	[–10.35]	[0.835]	[1.278]	[–0.076]	[–6.273]	[–5.236]	[–2.190]	[–0.572]	[–9.297]	[–6.136]	[–3.363]	[–0.176]
Mexico	–0.353	–0.254	–0.074	–0.001	–0.732	–0.526	–0.356	0.005	–1.426	–0.166	–0.022	–0.001
	–0.089	–0.066	–0.046	–0.003	–0.201	–0.137	–0.084	–0.009	–0.111	–0.031	–0.026	–0.002
	[–3.970]	[–3.857]	[–1.605]	[–0.259]	[–3.639]	[–3.832]	[–4.214]	[0.599]	[–12.896]	[–5.333]	[–0.841]	[–0.905]
Peru	–0.409	–0.262	–0.136	0.001	–0.672	–0.533	–0.368	–0.003	–0.128	–0.077	–0.041	–0.001
	–0.087	–0.113	–0.085	–0.005	–0.289	–0.359	–0.255	–0.017	–0.064	–0.129	–0.087	–0.003
	[–4.685]	[–2.314]	[–1.604]	[0.154]	[–2.323]	[–1.485]	[–1.443]	[–0.167]	[–1.989]	[–0.595]	[–0.470]	[–0.331]
Panel B	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept
Czech Rh	–0.915	–0.434	–0.279	–0.001	–0.137	–0.178	0.060	–0.001	–0.959	–0.134	–0.051	0.000
	–0.119	–0.065	–0.052	–0.004	–0.251	–0.126	–0.110	–0.012	–0.104	–0.028	–0.025	–0.002
	[–7.703]	[–6.644]	[–5.359]	[–0.143]	[–0.544]	[–1.414]	[0.547]	[–0.053]	[–9.215]	[–4.772]	[–2.009]	[0.016]
Greece	–0.117	–0.137	–0.018	0.000	–0.582	–0.453	–0.032	–0.002	–0.288	–0.503	–0.191	0.001
	–0.062	–0.082	–0.059	–0.004	–0.259	–0.161	–0.148	–0.015	–0.074	–0.179	–0.131	–0.007
	[–1.882]	[–1.666]	[–0.304]	[–0.041]	[–2.245]	[–2.809]	[–0.214]	[–0.125]	[–3.877]	[–2.818]	[–1.453]	[0.070]
Hungary	–0.999	–0.697	–0.154	0.002	–0.521	–0.636	0.001	0.002	–1.011	–0.238	0.001	–0.001
	–0.100	–0.082	–0.062	–0.004	–0.146	–0.179	–0.148	–0.011	–0.092	–0.041	–0.039	–0.003
	[–10.036]	[–8.520]	[–2.500]	[0.463]	[–3.577]	[–3.543]	[0.007]	[0.191]	[–10.968]	[–5.818]	[0.019]	[–0.201]
Poland	–1.189	–0.735	–0.217	0.002	–1.201	–0.719	–0.152	0.001	–0.781	–0.293	–0.053	–0.001
	–0.108	–0.079	–0.062	–0.004	–0.226	–0.137	–0.125	–0.010	–0.093	–0.042	–0.033	–0.003
	[–11.021]	[–9.303]	[–3.473]	[0.526]	[–5.311]	[–5.237]	[–1.213]	[0.128]	[–8.404]	[–6.975]	[–1.594]	[–0.298]

Regressors	Pre-Crisis				During Crisis				Post Crisis			
Panel C	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept
China	-0.081	0.024	0.002	0.004	-1.258	-0.483	-0.389	-0.004	-0.488	-0.251	-0.092	-0.001
	0.025	0.063	0.044	0.003	0.122	0.112	0.085	0.008	0.042	0.073	0.049	0.002
	[-3.197]	[0.380]	[0.046]	[1.262]	[-10.237]	[-4.297]	[-4.555]	[-0.504]	[-11.527]	[-3.422]	[-1.855]	[-0.691]
India	-0.939	-0.384	-0.188	-0.001	-0.955	-0.599	-0.253	0.001	-1.000	-0.339	-0.177	-0.001
	0.078	0.049	0.038	0.003	0.171	0.156	0.109	0.010	0.084	0.040	0.030	0.001
	[-12.029]	[-7.818]	[-4.847]	[-0.206]	[-5.560]	[-3.835]	[-2.312]	[0.078]	[-11.897]	[-8.471]	[-5.714]	[-0.549]
Indonesi	-0.541	-0.359	-0.164	0.0014	-0.248	-0.188	-0.090	-0.002	-1.007	0.213	0.119	0.001
	0.065	0.059	0.042	0.003	0.133	0.131	0.091	0.008	0.062	0.033	0.032	0.001
	[-8.229]	[-6.043]	[-3.875]	[0.440]	[-1.856]	[-1.425]	[-0.978]	[-0.259]	[-16.213]	[6.415]	[3.673]	[0.085]
Malaysia	-0.929	-0.178	-0.014	0.001	0.032	0.059	0.055	0.001	-1.333	-0.100	0.073	0.050
	0.066	0.029	0.023	0.002	0.105	0.054	0.037	0.003	0.072	0.018	0.016	0.001
	[-14.02]	[-6.111]	[-0.579]	[0.143]	[0.308]	[1.087]	[1.467]	[0.034]	[-18.399]	[-5.457]	[-4.409]	[0.090]
Pakistan	-1.175	-0.395	-0.181	0.001	-1.558	-1.085	-0.357	-0.003	-0.306	-0.375	-0.313	-0.001
	0.075	0.049	0.044	0.003	0.106	0.121	0.106	0.010	0.040	0.063	0.044	0.002
	[-15.475]	[-7.897]	[-4.085]	[0.031]	[-14.684]	[-8.922]	[-3.351]	[-0.265]	[-7.648]	[-5.915]	[-7.09]	[-0.331]
Philppines	-0.332	-0.168	-0.096	0.0001	-0.491	-0.201	-0.133	0.002	-0.006	0.017	-0.010	-0.001
	0.062	0.051	0.036	0.002	0.135	0.090	0.064	0.006	0.044	0.0634	0.042	0.001
	[-5.331]	[-3.289]	[-2.653]	[0.124]	[-3.613]	[-2.219]	[-2.057]	[0.407]	[-0.144]	[0.269]	[-0.279]	[-0.269]
Taiwan	-0.376	-0.225	-0.077	-0.001	-0.272	-0.189	-0.149	0.004	-0.733	-0.304	0.227	-0.001
	0.068	0.062	0.042	0.003	0.125	0.093	0.066	0.006	0.079	0.047	0.032	0.001
	[-5.514]	[-3.593]	[-1.799]	[-0.208]	[-2.167]	[-2.008]	[-2.260]	[0.635]	[-9.201]	[-6.356]	[-6.890]	[-0.388]
Thailand	-0.477	-0.210	-0.103	0.000	-0.454	-0.168	-0.092	0.002	-1.034	-0.394	-0.219	-0.001
	0.075	0.063	0.045	0.003	0.146	0.121	0.084	0.008	-0.084	-0.049	-0.037	-0.002
	[-6.286]	[-3.296]	[-2.287]	[-0.093]	[-3.097]	[-1.381]	[-1.083]	[0.361]	[-12.333]	[-8.012]	[-5.930]	[-0.331]

Regressors	Pre-Crisis				During Crisis				Post Crisis			
Panel D	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept
Kenya	–1.000	–0.282	–0.02.	0.001	–1.112	–0.725	–0.325	–0.004	–0.057	–0.176	–0.027	–0.001
	–0.157	–0.089	–0.087	–0.005	–0.238	–0.212	–0.152	–0.012	–0.035	–0.107	–0.078	–0.003
	[–6.349]	[–3.180]	[–0.225]	[0.293]	[–4.663]	[–3.415]	[–2.131]	[–0.298]	[–1.645]	[–1.646]	[–0.349]	[–0.170]
Mauri	–0.297	0.354	0.192	0.003	–0.274	–0.152	–0.102	–0.008	–0.604	–0.173	–0.103	0.000
	–0.067	–0.085	–0.064	–0.004	–0.178	–0.298	–0.183	–0.014	–0.071	–0.043	–0.038	–0.002
	[–4.404]	[4.194]	[2.973]	[0.845]	[–1.540]	[–0.511]	[–0.557]	[–0.600]	[–8.470]	[–3.98]	[–2.729]	[0.104]
Morocc	–1.168	0.011	–0.123	0.000	–0.538	–0.307	–0.080	–0.003	–1.041	–0.001	–0.048	0.001
	–0.166	–0.099	–0.099	–0.006	–0.182	–0.101	–0.069	–0.007	–0.094	–0.039	–0.039	–0.002
	[–7.026]	[0.108]	[–1.245]	[–0.027]	[–2.955]	[–3.030]	[–1.158]	[–0.478]	[–11.10]	[–0.030]	[–1.238]	[0.555]
Tunisia	–0.190	0.260	0.159	0.000	–1.651	–0.021	0.048	0.002	–0.337	0.227	0.092	0.000
	–0.074	–0.109	–0.085	–0.005	–0.263	–0.068	–0.063	–0.007	–0.069	–0.083	–0.065	–0.003
	[–2.584]	[2.378]	[1.867]	[–0.025]	[–6.283]	[–0.306]	[0.751]	[0.298]	[–4.877]	[2.730]	[1.413]	[–0.172]
Panel E	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept
Croatia	–	–	–	–	–1.220	–0.351	–0.073	0.005	–0.599	0.208	0.1781	0.000
	–	–	–	–	(0.303)	(0.213)	(0.146)	(0.015)	(0.058)	(0.031)	(0.027)	(0.001)
	–	–	–	–	[–4.013]	[–1.644]	[–0.496]	[0.327]	[–10.205]	[6.694]	[6.515]	[–0.111]
Estonia	–	–	–	–	–1.089	–0.394	–0.264	–0.010	–0.284	0.564	0.301	0.0009
	–	–	–	–	(0.328)	(0.224)	(0.160)	(0.017)	(0.036)	(0.080)	(0.064)	(0.003)
	–	–	–	–	[–3.319]	[–1.754]	[–1.645]	[–0.560]	[–7.885]	[7.006]	[4.676]	[0.270]
Kazakhstan	–	–	–	–	0.0177	–0.243	–0.079	0.0275	–0.858	0.044	–0.062	–0.001
	–	–	–	–	(0.184)	(0.223)	(0.161)	(0.019)	(0.073)	(0.061)	(0.061)	(0.003)
	–	–	–	–	[0.096]	[–1.086]	[–0.490]	[1.404]	[–11.715]	[0.716]	[–1.008]	[–0.349]
Slovakia	–	–	–	–	–0.293	0.027	0.0521	0.000	–0.962	0.158	0.1459	0.0009
	–	–	–	–	(0.214)	(0.135)	(0.095)	(0.010)	(0.082)	(0.031)	(0.029)	(0.002)
	–	–	–	–	[–1.363]	[0.205]	[0.545]	[–0.017]	[–11.668]	[5.068]	[4.903]	[0.444]

Regressors	Pre-Crisis				During Crisis				Post Crisis			
Panel F	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept	ECT (-1)	Portfolio ret (-1)	Portfolio ret (-2)	Intercept
Bahrain	–1.003	–0.255	–0.084	0.001	–1.053	–0.534	–0.395	–0.005	–0.158	–0.185	–0.068	0.001
	–0.194	–0.111	–0.105	–0.007	–0.172	–0.167	–0.128	–0.009	–0.049	–0.105	–0.072	–0.003
	[–5.167]	[–2.309]	[–0.795]	[0.101	[–6.141]	[–3.192]	[–3.087]	[–0.500]	[–3.204]	[–1.771]	[–0.945]	[0.307]
Jordan	–1.042	–0.483	–0.27	–0.001	–0.829	0.004	–0.063	0.000	0.001	0.054	–0.054	–0.001
	–0.197	–0.148	–0.137	–0.008	–0.182	–0.101	–0.088	–0.007	–0.007	–0.079	–0.058	–0.003
	[–5.301]	[–3.265]	[–1.964]	[–0.145]	[–4.546]	[0.041]	[–0.710]	[–0.051]	[0.198]	[0.688]	[–0.932]	[–0.238]
Kuwait	0.004	0.410	0.084	–0.007	–0.764	–0.217	–0.085	–0.003	–1.198	–0.272	–0.091	0.001
	–0.002	–0.151	–0.114	–0.006	–0.208	–0.195	–0.150	–0.010	–0.093	–0.052	–0.050	–0.003
	[1.929]	[2.723]	[0.738]	[–1.111]	[–3.667]	[–1.110]	[–0.567]	[–0.323]	[–12.939]	[–5.214]	[–1.811]	[0.378]
Oman	0.015	0.053	0.002	0.005	0.213	0.303	0.280	–0.007	–1.058	0.163	0.134	0.000
	–0.028	–0.123	–0.091	–0.005	–0.142	–0.173	–0.135	–0.010	–0.090	–0.041	–0.040	–0.002
	[0.533]	[0.433]	[0.021]	[0.871]	[1.508]	[1.753]	[2.071]	[–0.760]	[–11.814]	[3.941]	[3.382]	[0.171]

during crisis period only Jordan and Kuwait is significant with other panel countries in that region and post-crisis Bahrain and Jordan are insignificant

CONCLUSION AND DISCUSSION

Due to the increasing integration trend among world stock markets put more emphasis on the discovery of new diversification opportunities for international investors. In this direction, our study explored short-run and long-run association within 29 counties of 3 emerging and 3 frontier regions including; America, Europe, Asia, Africa, and the Middle East for 2000 to 2018 in pre, during, and post-crisis periods. We particularly include both emerging and frontier European countries to test the level of integration within the European region. We found mixed evidence regarding stock market co-movement, short and long-run association within emerging and frontier markets. Based on unconditional correlation we conclude the level of stock market co-movements were weak in pre-crisis while in during and after crisis its level has increased that indicate the level of co-movement is increases by the time in emerging and frontier markets, a similar finding was mentioned by *Beirne et al.*, 2010; *Okicic*, 2015; *Jebran et al.*, 2017; *Baumöhl et al.*, 2018; *Huo and Ahmed,* 2017; *Ben Saïda et al.,* 2018). *Mensi, Shahzad, Hammoudeh, Zeitun,* and Rehman (2017) also found stock market integration vary in a different time and increase during the recent global crisis. We found European emerging and frontier markets are most integrated

within the region as compared to the other world regions in the study. *Nikkinen Piljak and Rothovius*, (2011); *Syriopoulos* (2011), *Horvath, R.,* and Petrovski, D, 2013) report similar findings in their studies. We observe international investors can diversify their portfolios in few interactions of countries in those regions where the short and rung run association among countries is not significant that in our case, (Peru) in the long run and (Brazil, Mexico, and Peru) in short-run within Emerging American group. Those investors who want to diversify their portfolios within the Emerging Asia group have the opportunity to go with Philippine in the long and short run as evidence found in our study. In the case of Frontier Africa, we only observe the opportunity for short-run investors in Kenya and Morocco. No short-run association has been found between Kazakhstan with other countries in the Frontier Europe group. Jordan is suitable in the long run and (Bahrain and Jordan) for the short run for those investors who want to invest in frontier Middle east group.

We observed there were higher opportunities in the pre-crisis period but it decreases during and after the crisis period as the stock market co-movement has increased in current time among underlying regions, a similar finding was given by (Syriopoulos, 2011). We also noticed average stock returns were negative in crisis periods for all countries except Mexico and Colombia out of 29. While pre-crisis and after the crisis-period average return was positive in major cases. Average monthly returns were highest in pre-crisis while it declined during the crisis period and even went into negative and then recovered in the post-crisis period for both emerging and frontier economies. Co-movement was also high in the crisis period as compared to the pre and post-crisis periods. So we can conclude the global financial crisis put a negative impact on the emerging and frontier markets**.** *Bae and Zhang,* (2015); Horvath, R., and Petrovski, D. (2013); and *Eichengreen et al.*, (2012) found similar results in his study on emerging markets.

Our finding could be helpful for international investors and fund managers in understanding the time-varying nature of stock market comovement, the long and short-run association of country-level stocks within emerging and frontier regions to effectively diversify the portfolios. Finally, the use of monthly data and the non-availability of frontier European countries' data in the pre-crisis period is considered as a limitation of the study. This study could further be extended by adding a cross-regional combination of different emerging and frontier market by adding other frequency of data with macroeconomic indicators.

Note

[1] This paper is part of a PhD dissertation by the first author Sultan Salahuddin along with their supervisors Muhammad Kashif (Associate Professor) and Mobeen Ur Rehman (Associate Professor).

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