

International Stock Market Diversification among BRICS-P: A Cointegration Analysis

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Abstract: This study explores the benefits associated with the international portfolio diversification among BRICS-P economies. The dynamics of the globe are changing, and the economic transformations have made the emerging economies a prominent center for investments. The possibility of international diversification among the BRICS-P economies may help the investors in maximizing their utilities by earning a higher return with a given level of risk. To assess the benefits of diversification and to explore the long term and short term dynamics of the selected stock markets, this study uses Auto Regressive Distributive Lag (ARDL) approach. The findings show that substantial portfolio diversification benefits exist when the funds of Brazil, Russia, South Africa and China are merged. The study also found that Pakistan and India's funds are co-integrated, and that the prospect of diversification exists if the funds of these two economies are mixed. The results will help the investors in constructing their portfolios by merging the funds of the selected economies, because having a diversified portfolio leads to better risk return performance than having a portfolio with only native funds.

Keywords: BRICS-P, international portfolio diversification, emerging economies, ARDL.

Introduction

Modern portfolio theories propose diversified portfolio for maximization of utility and minimization of risk. Investors can bring about an even more substantial reduction in the risk if they carry an internationally diversified portfolio. An internationally diversified portfolio can prove itself more efficient than the domestic ones on the global frontier (Bahlous & Yusof, 2014). By diversifying across different countries where economic cycles are not perfectly correlated, investors can typically minimize the variability of their returns. Grubel (1968); Haim and Sarnat (1970); Solnik and MacLeavey (1991) were the pioneers in documenting a relatively weak correlation among international securities than the domestic securities. Earlier studies have also suggested that weak correlation in international securities can lead to substantial gains from diversification (Cosset & Suret, 1995).

The theories also predict that when the markets are not perfectly correlated, benefits of international portfolio diversification can be achieved because the stock markets have volatility in their behavior. A market having consistent performance with other regions

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or markets is rarely found. There are several plausible reasons of low cross country correlations like differences in the fiscal and monetary policies, economic trends and cycles, exchange rates, valuation of stocks (Bahlous & Yusof, 2014; Gregg, 2012). In this way, international diversification can make sense and consequently, an investor can hold an internationally diversified portfolio. Investment in different foreign markets provides an opportunity for investors to connect with various global assets, which would not only serve the purpose of getting a higher return but also help in reducing the risk (Li, Sarkar, & Wang, 2003).

However, the liberalization policies of capital markets along with the technical advancements and growth of multinational corporations (MNCs) have increased market integration over time. It has produced contrasting evidence by raising reservations on the benefits of international diversification. As the markets are becoming more integrated and inter-linked, the benefits of diversification are fading away (Longin & Solnik, 1995). Various past researches suggested the evidence of volatility and contagion among stock markets during the financial crisis (Mensi, Hammoudeh, Reboredo, & Nguyen, 2014; Guidi & Ugur, 2014; Batareddy, Gopaldaswamy, & Huang, 2012). The existence of correlation among the markets limits diversification benefits for active investors. Whereas, increasing levels of long term integration suggests that markets have long term trend, making it difficult for a passive investor to reap benefits from international diversification.

Over the past few years, the dynamics of the world economy are gradually changing and shifting from advanced economies to emerging markets. Investors are now more attracted towards the emerging economies because of their high potential for investments. Among them, Brazil, Russia, India, China and South Africa (BRICS) have got an important role as they are the most significant emerging market economies. According to the World Economic Forum, regarding nominal GDP, Brazil, Russia and India have caught up with the smallest G7 economy (Italy) whereas, China has surpassed Japan and has become world's second largest economy. Our analysis is motivated by the fact that the BRICS countries are the major recipients of global investment flows and are among the leading global consumers of commodities. Regarding trade and development, BRICS countries make their places attractive for investment for non-native investors. Different aspects such as capturing more than a quarter of the world's land area, forty percent of the world's population and about 15% of global GDP, make these economies superior over other regions of the world. According to Goldman Sachs, by 2050, the total nominal GDP is about to reach \$128 trillion for the four BRIC countries (excluding South Africa) as compared to \$66 trillion for the G7 countries at that time. It is also expected that by 2030, BRIC countries may take up 41% of the world's stock market. From BRICS countries, China is about to become largest equity market as it is expected to overtake the stock market capitalization of USA (Mensi et al., 2014).

At the global level, the recent changes in the oil prices have created winners and losers. According to International Monetary Fund, it is indeed a 'Moment of Opportunity' for Pakistan. The country is going through a massive economic transformation that can place it well among the emerging market economies. The economy has been recently upgraded from a frontier economy to an emerging market in Morgan Stanley Capital International (MSCI) index. According to Bloomberg and MSCI, KSE-100 index is performing the best

among all Asian stock markets and therefore, it has been rated as world's fifth best market.

Keeping in view the facts stated above, there is substantial need for exploring the benefits associated with portfolio diversification and investing in these evolving economies. Past studies have concluded that by diversifying the portfolio among different regions of the world, and among markets with differing maturity levels and differing company sizes would yield more substantial diversification benefits to the investors (Mensi et al., 2014; Sukumaran, Gupta, & Jithendranathan, 2015; Dhanaraj, Gopaldaswamy, & Babu, 2013). This study is endeavoring to evaluate the diversification benefits among the BRICS-P economies. More specifically, the study strives to find out the answers to the following question: Can a nonnative investor of the BRICS-P economies have the opportunity to get any benefits of diversification among selected stock markets? Is there any long-run and the short-run relationship between selected stock markets?

The answer to these questions will be helpful for investors in understanding and undertaking actions for maximizing utility and minimizing risk. If the risk and performance analysis came up with some gains from diversification, this would help the investors in obtaining a higher level of utility. The investors can develop an optimal portfolio in this case by diversifying their investment portfolio among BRICS-P economies.

The study uses Time Series data set to analyze the extent of long term and short term investment dynamics among the selected economies. Auto Regressive Distributive Lag (ARDL) approach is used to gauge the effect of the temporal relationship and contemporaneous correlations in the funds of selected economies. If the chosen funds were found to be negatively or weakly correlated, it could be concluded that investors of these economies can hold a well-diversified portfolio. The study also stresses that even if the correlation turns out to be positive, investors can still yield the benefits of diversification if the correlation is not perfect.

The remaining part of the study is organized as follows. The next section of the study briefly reviews the past literature on international diversification along with the theoretical underpinnings. Section three discusses about the data and methodology employed for the study. Empirical findings are discussed in section four. And section five concludes the study with suitable policy implications and future recommendations.

Literature Review

Theoretical Background

Our study is primarily based on the theoretical underpinnings of The Capital Asset Pricing Model (CAPM) introduced by Sharpe (1964) and Lintner (1965) and the Modern Portfolio Theory presented by Markowitz (1952). The Modern Portfolio theory postulates that selection of assets is not only based upon the unique characteristics of the securities. But instead, an investor needs to consider the co-movement of the securities. If investors take into account these co-movements, they will be able to develop a portfolio with the same expected return and lesser risk. The CAPM predicts that the expected return on an asset above the risk-free rate is proportional to the non-diversifiable risk. It is measured by

the covariance of the asset return with a portfolio composed of all the available assets in the market. The modern portfolio theory considers how an optimizing investor should behave, whereas, CAPM is concerned with the economic equilibrium assuming that all investors are optimizing in a particular manner. These theories are of the view that rational investors who are seeking to maximize their utilities should hold a well-diversified portfolio to mitigate risk. They can do so by investing in diversified portfolios on an international level that would dominate domestic-only ones on the efficient frontier. An international portfolio of stocks from different regions or countries should earn a higher return for the same level of risk and carry less risk for the same level of return from a non-diversified portfolio (Bahlous & Yusof, 2014).

Empirical Findings

Many empirical studies have focused on international diversification benefits. Some of them are summarized below.

The past literature is filled with studies that have tried to assess the diversification benefits and dependence of emerging markets on the global financial markets. A study of a similar kind was carried out by Mensi et al. (2014). They used Quantile Regression approach and investigated the impact of different global factors on the stock market of BRICS countries. The study suggested that the dependence structure is asymmetric and got influenced by the financial crunch that hit the US financial market. However, the uncertainty of the US economic policy failed to affect the BRICS stock market. Their findings were also supported by Patev, Kanaryan, and Lyroudi (2006) who reported that the evidence of no long-run co-integration among the US and Central Eastern Europe stock markets. The results of the study confirmed a reduction in diversification benefits during the crisis period and an increment in the same during the post-crisis period. Contradictory evidence was found by Guidi and Ugur (2014), who analyzed the co-integration of the South-Eastern European market with their developed counter parts. The study reported a higher degree of co-integration between the SEE markets and their developed counterparts. They also found the evidence of time-varying co-integration particularly for the periods of shocks such as financial crisis. The authors argued that despite the co-integration, diversification benefits still prevails in these markets. Similar kind of results was presented by Batareddy et al. (2012) who showed that because of the integration among markets, the selected Asian economies are not protected by the shocks created in the US and Japanese Stock markets. According to Johnson and Soenen (2009), the developed and emerging markets both are partially integrated with the world equity market.

Several studies have been undertaken in the past that showed the benefits of regional diversification. Significant research in this regard is of Dhanaraj et al. (2013). Their empirical findings showed that the US stock market dominates over the Asian stock markets. The authors postulated several reasons for this inter dependence. For instance, US is one of the largest economies in the world, a significant trading partner and supplier of capital to the Asian economies. The study also argued that Asian economies are susceptible to shocks originating in the US stock markets. However, the effects of these shocks vary considerably across markets. Similarly, Dunis, Sermpinis, and Karampelias (2013)

examined the extent and promptness of integration among the five newest members of European Monetary Union (EMU) and the euro area. Results indicated that the selected states exhibited a variable but accelerated degree of integration after their accession to the EU. Whereas, EMU does not seem to have the same positive impact on the process. In the same way, [Bahlous and Yusof \(2014\)](#) tried to assess the benefits of international diversification for the investors who opt only for Islamic funds. In the authors' view, the Islamic fund's investors can maximize their utilities by investing in Islamic funds across the selected regions. [Rua and Nunes \(2009\)](#) also examined the co-movement among stock markets of Germany, Japan, the UK and the USA. The analysis showed that Germany exhibited a higher degree of co-integration with UK and USA over the whole sample period whereas, Japan presented a relatively low degree of co-integration with all the other states considered in the sample. [Majid, Meera, and Aziz \(2009\)](#) investigated the linkages among Association of Southeast Asian Nations (ASEAN) and found that for the non-native investors, the region of ASEAN is not beneficial for portfolio diversification.

Substantial portfolio diversification benefits exist for the emerging market economies. This hypothesis gets its support from a wealth of studies. For instance, ([Zonouzi, Mansourfar, & Azar, 2014](#)) postulated that several potential benefits like increasing rate of return or decreasing risks are associated with international portfolio diversification. The authors were also of the view that the investors who wish to diversify their portfolio among the emerging group of economies may get a higher rate of return with a given level of risk. On the same line of thought, ([Li et al., 2003](#)) presented the view that although the integration in the world equity market has reduced the diversification benefits, they are not vanished off completely. Results showed that advantages of international diversification remain considerable if short sell constraints are imposed by the emerging markets on the US investors or the non-native investors in US equity market. With the same token, [Sharma and Bodla \(2011\)](#) tried to investigate the portfolio diversification benefits among India, Pakistan, and Srilanka and showed that all of the selected Asian markets hold substantial diversification benefits in particular, whereas, diversification benefits exist for all South Asian markets in general. [Hoque \(2007\)](#) empirically examined that Japanese stock market has no impact on Bangladesh stock market, whereas, USA market shocks create an impact on Bangladesh stock market. The author argued that due to similar stock market trend in the selected economies, non-native investors cannot enjoy diversification benefits. Similarly, [Boubaker and Jouini \(2014\)](#) investigated the causal links between the equity markets of South-Eastern and Central Europe and developed countries, i.e., Western Europe and the US. They showed that because of the co-integration in the selected markets, the sensitivity to fluctuations in these markets increases both in short and the long run. [Valadkhani, Chancharat, and Harvie \(2008\)](#) in their study, provided the evidence that geographical vicinity and the level of economic development have a significant influence on the stock markets co-movements. If the investors want to reap comprehensive benefits of portfolio diversification, they should take these factors into account. According to [Sukumaran et al. \(2015\)](#), frontier markets can be an exciting place for portfolio diversification. The difference in the economic structure of developed markets with least developed ones makes the frontier markets considerable for portfolio diversification.

Methodology

Data

The study aims to explore the short run and long run investment dynamics among the BRICS-P economies. Therefore, in line with the given objective, the study employed seven stock indexes to measure the extent of integration among them. Yahoo Finance is used to obtain data. The selected countries are Brazil, Russia, India, China, South Africa and Pakistan which is a good representation of emerging economies of the world. Monthly data was taken for the period from November 2003 to October 2016. Following [Bahlous and Yusof \(2014\)](#), we did not include information on the dividend in our analysis as the purpose of this study is to evaluate the benefits of international portfolio diversification and for evaluating it, we do not need to have information on dividends of different funds.

Statistical Technique

The study adopted the Auto Regressive Distributed Lag (ARDL) approach [Pesaran, Shin, and Smith \(1996\)](#) to check the long run association among the selected emerging economies. It is a regression model of one variable on its past and past and present values of other considered variables. This approach has got numerous practical advantages. First and foremost, this approach can be used to check the existence of a relationship between variables regardless of the fact that the considered variables are stationary or not. The regressors need not be integrated on I (0) or I (1). The ARDL model does not require a unique level of integration for variables ([Narayan & Narayan, 2006](#)). Secondly, the ARDL model takes into consideration sufficient numbers of lags so that a general-to-specific modelling framework can be captured ([Laurenceson & Chai, 2003](#)). Moreover, [Narayan and Narayan \(2006\)](#) also endorsed that the ARDL co-integration model is efficient and unbiased, and in addition to it, it can explain the short run and long run components of the model simultaneously.

The ARDL model specifications used in the present study are as follows,

$$Pakistan_t = \alpha_0 + \alpha_1 Brazil_t + \alpha_2 Russia_t + \alpha_3 India_t + \alpha_4 China_t + \alpha_5 SouthAfrica_t + \alpha_6 USA(S\&P500)_t + \epsilon_t \quad (1)$$

$$Brazil_t = \alpha_0 + \alpha_1 Pakistan_t + \alpha_2 Russia_t + \alpha_3 India_t + \alpha_4 China_t + \alpha_5 SouthAfrica_t + \alpha_6 USA(S\&P500)_t + \epsilon_t \quad (2)$$

$$Russia_t = \alpha_0 + \alpha_1 Brazil_t + \alpha_2 Pakistan_t + \alpha_3 India_t + \alpha_4 China_t + \alpha_5 SouthAfrica_t + \alpha_6 USA(S\&P500)_t + \epsilon_t \quad (3)$$

$$India_t = \alpha_0 + \alpha_1 Brazil_t + \alpha_2 Russia_t + \alpha_3 Pakistan_t + \alpha_4 China_t + \alpha_5 SouthAfrica_t + \alpha_6 USA(S\&P500)_t + \epsilon_t \quad (4)$$

$$China_t = \alpha_0 + \alpha_1 Brazil_t + \alpha_2 Russia_t + \alpha_3 India_t + \alpha_4 Pakistan_t + \alpha_5 SouthAfrica_t + \alpha_6 USA(S\&P500)_t + \epsilon_t \quad (5)$$

$$SouthAfrica_t = \alpha_0 + \alpha_1 Brazil_t + \alpha_2 Russia_t + \alpha_3 India_t + \alpha_4 China_t + \alpha_5 Pakistan_t + \alpha_6 USA(S\&P500)_t + \epsilon_t \quad (6)$$

It is worth to mention here that in the present study, index prices are I (0) series and their first difference that is index returns are I (1) series. The chosen indexes are IBOVESPA for Brazil, MICEX for Russia, BSE SENSEX for India, SSE for China, EZA for South Africa, and KSE-100 for Pakistan. Finally, S&P500 has been taken as a measure for the global market.

To evaluate short run portfolio diversification dynamics, Error Correction Model (ECM) is used. Using simple linear transformation, a dynamic error correction model can be derived from ARDL (Banerjee, Dolado, Galbraith, & Hendry, 1993). The purpose of using ECM is that it integrates the short run dynamics with the long run equilibrium, without causing any change in the long run information. The ECM specifications can be given as,

$$\begin{aligned} \Delta \ln Pakistan_t = & \alpha_0 + \sum_{j=1}^{k1} b_j \Delta \ln Brazil_{t-j} + \sum_{j=0}^{k2} c_j \Delta \ln Russia_{t-j} + \\ & \sum_{j=0}^{k3} d_j \Delta \ln India_{t-j} + \sum_{j=0}^{k4} \epsilon_j \Delta \ln China_{t-j} + \sum_{j=0}^{k5} f_j \Delta \ln SouthAfrica_{t-j} + \\ & \sum_{j=0}^{k6} g_j \Delta \ln USA(S\&P500)_{t-j} + n_1 \ln Pakistan_{t-1} + n_2 \ln Brazil_{t-1} \\ & + n_3 \ln Russia_{t-1} + n_4 \ln India_{t-1} + n_5 \ln China_{t-1} + n_6 \ln SouthAfrica_{t-1} + \\ & n_7 \ln USA(S\&P500) \quad (7) \end{aligned}$$

$$\begin{aligned} \Delta \ln \text{Brazil}_t = & \alpha_0 + \sum_{j=1}^{k1} b_j \Delta \ln \text{Pakistan}_{t-j} + \sum_{j=0}^{k2} c_j \Delta \ln \text{Russia}_{t-j} + \sum_{j=0}^{k3} d_j \Delta \ln \text{India}_{t-j} + \\ & \sum_{j=0}^{k4} \epsilon_j \Delta \ln \text{China}_{t-j} + \sum_{j=0}^{k5} f_j \Delta \ln \text{SouthAfrica}_{t-j} + n_1 \ln \text{Pakistan}_{t-1} + n_2 \ln \text{Brazil}_{t-1} + \\ & n_3 \ln \text{Russia}_{t-1} + n_4 \ln \text{India}_{t-1} + n_5 \ln \text{China}_{t-1} + n_6 \ln \text{SouthAfrica}_{t-1} \quad (8) \end{aligned}$$

$$\begin{aligned} \Delta \ln \text{Russia}_t = & \alpha_0 + \sum_{j=1}^{k1} b_j \Delta \ln \text{Brazil}_{t-j} + \sum_{j=0}^{k2} c_j \Delta \ln \text{Pakistan}_{t-j} + \\ & \sum_{j=0}^{k3} d_j \Delta \ln \text{India}_{t-j} + \sum_{j=0}^{k4} \epsilon_j \Delta \ln \text{China}_{t-j} + \sum_{j=0}^{k5} f_j \Delta \ln \text{SouthAfrica}_{t-j} + \\ & \sum_{j=0}^{k6} g_i \Delta \ln \text{USA}(S\&P500)_{t-j} + n_1 \ln \text{Pakistan}_{t-1} + n_2 \ln \text{Brazil}_{t-1} + \\ & n_3 \ln \text{Russia}_{t-1} + n_4 \ln \text{India}_{t-1} + n_5 \ln \text{China}_{t-1} + n_6 \ln \text{SouthAfrica}_{t-1} + \\ & n_7 \ln \text{USA}(S\&P500) \quad (9) \end{aligned}$$

$$\begin{aligned} \Delta \ln \text{India}_t = & \alpha_0 + \sum_{j=1}^{k1} b_j \Delta \ln \text{Brazil}_{t-j} + \sum_{j=0}^{k2} c_j \Delta \ln \text{Russia}_{t-j} + \\ & \sum_{j=0}^{k3} d_j \Delta \ln \text{Pakistan}_{t-j} + \sum_{j=0}^{k4} \epsilon_j \Delta \ln \text{China}_{t-j} + \sum_{j=0}^{k5} f_j \Delta \ln \text{SouthAfrica}_{t-j} + \\ & \sum_{j=0}^{k6} g_i \Delta \ln \text{USA}(S\&P500)_{t-j} + n_1 \ln \text{Pakistan}_{t-1} + n_2 \ln \text{Brazil}_{t-1} + \\ & n_3 \ln \text{Russia}_{t-1} + n_4 \ln \text{India}_{t-1} + n_5 \ln \text{China}_{t-1} + n_6 \ln \text{SouthAfrica}_{t-1} + \\ & n_7 \ln \text{USA}(S\&P500) \quad (10) \end{aligned}$$

$$\begin{aligned}
\Delta \ln China_t = & \alpha_0 + \sum_{j=1}^{k1} b_j \Delta \ln Brazil_{t-j} + \sum_{j=0}^{k2} c_j \Delta \ln Russia_{t-j} + \\
& \sum_{j=0}^{k3} d_j \Delta \ln India_{t-j} + \sum_{j=0}^{k4} \epsilon_j \Delta \ln Pakistan_{t-j} + \sum_{j=0}^{k5} f_j \Delta \ln SouthAfrica_{t-j} + \\
& \sum_{j=0}^{k6} g_i \Delta \ln USA(S\&P500)_{t-j} + n_1 \ln Pakistan_{t-1} + n_2 \ln Brazil_{t-1} + \\
& n_3 \ln Russia_{t-1} + n_4 \ln India_{t-1} + n_5 \ln China_{t-1} + n_6 \ln SouthAfrica_{t-1} + \\
& n_7 \ln USA(S\&P500) \quad (11)
\end{aligned}$$

$$\begin{aligned}
\Delta \ln SouthAfrica_t = & \alpha_0 + \sum_{j=1}^{k1} b_j \Delta \ln Brazil_{t-j} + \sum_{j=0}^{k2} c_j \Delta \ln Russia_{t-j} + \\
& \sum_{j=0}^{k3} d_j \Delta \ln India_{t-j} + \sum_{j=0}^{k4} \epsilon_j \Delta \ln China_{t-j} + \sum_{j=0}^{k5} f_j \Delta \ln Pakistan_{t-j} + \\
& \sum_{j=0}^{k6} g_i \Delta \ln USA(S\&P500)_{t-j} + n_1 \ln Pakistan_{t-1} + n_2 \ln Brazil_{t-1} + \\
& n_3 \ln Russia_{t-1} + n_4 \ln India_{t-1} + n_5 \ln China_{t-1} + n_6 \ln SouthAfrica_{t-1} + \\
& n_7 \ln USA(S\&P500) \quad (12)
\end{aligned}$$

In the given ECM specifications, the summation sign terms in the given specification are signifying the error correction dynamics whereas, the n_s terms are representing the long run relationships. In the long run, the null hypothesis of no co-integration can be given as, $H_0 : n_1 = n_2 = n_3 = n_4 = n_5 = 0$. This null hypothesis is tested against the alternate hypothesis of at least one non-zero result i.e., $H_1 : n_1 \neq 0$ or $n_2 \neq 0$ or $n_3 \neq 0$ or $n_4 \neq 0$ or $n_5 \neq 0$ using F-test, where the critical values if F-test vary depending upon the notion that whether the variables are I(0) or I(1) stationary. Following the given notion, three types of outcomes can arise depending upon if the data are I(0), contains both I(0) and I(1) values or it is I(1) only. If the calculated F-statistics exceeds the upper bound level, the null hypothesis is rejected and we say that co-integration exist among variables. However, if the calculated F-statistics is lesser than the lower bound level, we cannot reject the null hypothesis that further validates the non-existence of co-integration. If the value of the f-statistics lies between the upper and lower bound, the results remain inconclusive (Pesaran et al., 1996).

To determine the suitable lag length that can be used and to select the ARDL model that can be estimated, the study used Akaike Information Criteria.

Data Analysis

Descriptive Statistics

Table 4.1

Descriptive Statistics

Countries	Mean	Std. Dev	Maximum	Minimum.
Pakistan	0.00071	0.013	0.083	-0.06
Brazil	0.00038	0.018	0.137	-0.121
Russia	0.00054	0.033	0.654	-0.54
India	0.00055	0.015	0.16	-0.118
China	0.00023	0.017	0.09	-0.093
South Africa	-0.00003	0.026	0.206	-0.721

Table 4.1 shows the descriptive statistics of the dataset used. From the given table, it can be seen that Russian Stock market, with a minimum value of -0.540 and a maximum of 0.654, shows the highest volatility as its standard deviation is the highest among all the markets with a value of 0.033 and the lowest volatile market is Pakistan with the standard deviation of 0.013 among BRICS-P countries, a minimum value of -0.060 and a maximum value of 0.083. In a similar way, Brazilian funds took a minimum value of -0.121 and the maximum value of 0.137 where as the standard deviation is 0.018. The minimum value of India is -0.118, and the maximum value is 0.160, and standard deviation is 0.015. The minimum value of China is -0.093, and the maximum value is 0.090, and standard deviation is 0.017. The minimum value of South Africa is -0.721 and the maximum value is 0.206, and the standard deviation is 0.026.

Results of ARDL Estimates (Long and Short Run)

The data employed for the study is the log price returns of stocks. Since it is a return series, it is assumed to be stationary at level, and hence, the problem of unit root does not exist in the data. However, the data was explored for the problem of unit root, and as assumed, it was found to be stationary at level (results not reported for the sake of brevity). The next step involves estimating Equations (7-12) using the appropriate lag-length. Table 4.2 present the ARDL model estimates, long-run coefficients and short run estimates for all the models tested (Models 7-12). The results for each model are presented in panel A for long-run estimates or coefficients and panel B for short-run estimates and panel C for the bound test.

In addition, panel A also provides information about which lagged values and which variable matters for the prediction of the future values of the endogenous index in the model. For example in Equation 7, the endogenous index investigated is Pakistan stock market. Panel A shows that Pakistan stock market's value at time 't' is negatively linked to India. These results could be exploited for forecasting purposes and could be very useful for fund managers of both economies who are actively managing their funds over short time horizons.

Table 4.2
The long-run & short-run estimates ARDL Models 7-12

Regressors	Dependent Variables					
	Co-efficient / (p-value)					
Lag Length	Pakistan (4,0,4,0,1,1,2)	Brazil (3,0,3,2,2,4,2)	Russia (4,2,2,1,4,0,4)	India (2,0,0,0,3,0,0)	China (4,2,0,0,0,0,1)	SAfrica (4,4,0,0,0,0,0)
C	0.0006 (0.0174)	0.0039 (0.164)	0.0004 (0.229)	0.0005 (0.054)	0.0002 (0.544)	-0.0002 (0.940)
Pakistan	-	-0.036 (0.3040)	0.048 (0.391)	-0.027 (0.197)	0.0283 (0.274)	0.008 (0.776)
BRAZIL	0.025 (0.122)	-	0.008 (0.821)	-0.0013 (0.928)	-0.037 (0.254)	-0.0043 (0.933)
RUSSIA	0.022 (0.134)	0.073 (0.000)	-	0.074 (0.000)	-0.0062 (0.535)	0.006 (0.577)
INDIA	0.044 (0.287)	-0.083 (0.0236)	0.027 (0.408)	-	0.0587 (0.007)	-0.020 (0.427)
CHINA	0.015 (0.357)	0.023 (0.163)	0.067 (0.072)	0.042 (0.007)	-	0.067 (0.003)
SOUTHAFRICA	0.031 (0.047)	0.0763 (0.0045)	0.065 (0.0064)	-0.0097 (0.353)	0.0625 (0.000)	-
S&P500	0.0066 (0.881)	0.0284 (0.523)	0.055 (0.072)	-0.028 (0.210)	-0.0166 (0.541)	0.0042 (0.895)
Panel-B: Short-Run Estimates						
D(PAKISTAN)	-	0.039 (0.113)	0.032 (0.452)	-0.026 (0.196)	0.0257 (0.274)	0.010 (0.774)
D(BRAZIL)	0.019 (0.120)	-	0.105 (0.0007)	-0.001 (0.928)	0.023 (0.174)	0.029 (0.250)
D(RUSSIA)	0.005 (0.463)	0.0353 (0.000)	-	0.021 (0.011)	-0.0057 (0.531)	0.0077 (0.577)
D(INDIA)	-0.0179 (0.225)	-0.0027 (0.895)	0.094 (0.009)	-	0.0533 (0.007)	-0.023 (0.427)
D(CHINA)	0.011 (0.353)	0.0255 (0.1605)	-0.0059 (0.853)	0.041 (0.007)	-	0.078 (0.003)
D(SOUTHAFRICA)	0.0033 (0.696)	0.0135 (0.259)	0.020 (0.337)	-0.009 (0.353)	0.0333 (0.004)	-
D(S&P500)	0.004 (0.825)	0.0462 (0.074)	0.082 (0.071)	-0.02 (0.209)	-0.0151 (0.541)	0.004 (0.895)
CointEq(-1)	-0.775 (0.000)	-1.094 (0.000)	-1.475 (0.000)	-0.975 (0.000)	-0.907 (0.000)	-1.161 (0.000)
Panel-C: ARDL Bound Test						
F-Statistics calculated	91.543	185.9	156.199	240.048	100.168	155.529
Upper Bound Critical Value	4.43	4.43	4.43	4.43	4.43	4.43

Source: Author's estimation

Table 4.3
Summary of benefits of diversification based on ARDL models

Investors who domicile in	Benefits of diversifying in											
	Pakistan		Brazil		Russia		India		China		South Africa	
	LR	SR	LR	SR	LR	SR	LR	SR	LR	SR	LR	SR
Pakistan	-	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Brazil	Yes	Yes	-	-	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Russia	Yes	Yes	No	No	-	-	No	No	Yes	Yes	Yes	Yes
India	Yes	Yes	No	Yes	Yes	No	-	-	No	No	Yes	Yes
China	Yes	Yes	Yes	Yes	No	Yes	No	No	-	-	No	No
South Africa	No	Yes	No	Yes	No	Yes	Yes	Yes	No	No	-	-
S&P 500	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

Notes: LR, SR represents Long Run and Short Run

Panel A provides information about which lagged values and which variable matters for the prediction of the future value of the endogenous index in the model. For example in Equation 7, the endogenous index investigated is Pakistan stock market. Panel A shows that Pakistan stock market's value at time t is insignificantly linked to India. These results could be exploited for forecasting purposes and could be very useful for fund managers of both economies who are actively managing their fund over short time horizons.

For Model 7 (Table 4.2, panel A), we found a significant positive relationship of Pakistan's stock market with South Africa as the p -value of the long run estimate is less than 0.05. It means that both markets move together yielding no diversification benefits. However, Pakistan's stock market has an insignificant correlation with that of the markets of China, India, Russia and USA. Hence we can conclude that investors in Pakistan can yield diversification benefits by combining their portfolios with Chinese, Russian, and Indian funds.

For Model 8 (Table 4.2, Panel A), we found a significant negative correlation between Brazil and India, and an insignificant correlation of Brazil with Pakistan, China, and US SP500. It means that Brazilian investors can reap diversification benefits with any of the given funds. However, South African and Russian Market are found positively associated with Brazilian Market showing that no diversification benefits exist among these markets for Brazilian investors.

For Model 9, (Table 4.2, panel A), an insignificant relationship of Russian stock market with Pakistan, Brazil and India showing that diversification benefits exist for Russian investors in these markets. For Model 10, (Table 4.2, panel A) insignificant negative correlation of India with Brazil, Pakistan, South Africa and US S&P500 is found. It reflects that Indian investors can enjoy the benefit of diversification in the longer run by investing in Brazil, Pakistan, South African and US market stock market. For Model 11, (Table 4.2, panel A), it is found that the correlation of Chinese stock market with Pakistan, Brazil,

S&P500 and Russia is insignificant which represents the fact that Chinese investors can invest in these markets to get diversification benefits in long run. For Model 12, (Table 4.2 panel (A)), for South African investors there is an opportunity to get diversification benefits by investing in countries like Pakistan, Brazil, Russia, India and US as there is an insignificant relationship among these markets.

In addition to it, as observed in panel B for all the models (7-12), it seems that the ECM have the correct significant value to specify the significance of the co-integrating relationships for all the models tested. The short run dynamics of relationships among the BRICS-P economies is captured by the Error Correction Representation and can be interpreted as following.

In model 7, (table 4.2, panel B), the ECM based ARDL approach shows that changes in none of the observed markets have a significant short run impact over Pakistan's stock market.

In ECM of model 8, it is established that changes in Russian and US stock markets have short run effect on Brazilian market whereas, Brazilian Market remain unaffected by any changes in the rest of markets in short run.

In model 9, the ECM specification showed that changes in the Brazilian and Indian funds can impact Russian funds in the shorter run. Whereas, Russian fund remains unaffected by the changes in the rest of the observed markets in the shorter run.

For model 10, the ECM specification showed that Indian market is highly susceptible to changes occurring in Russian and Chinese stock markets. However, the rest of the observed markets in short run do not impact Indian funds in the short run.

For model 11, the ECM specification shows that changes in Indian and South African markets impact Chinese funds in the short run. However, it remains unaffected by any changes in the rest of the studied stock markets.

For model 12, the ECM specification represented that South African Funds are only affected by changes occurring in Chinese funds in the short run. None of the other observed markets affect the South Asian funds in the short run.

To identify the co-integration among the data series, ARDL Bound test is applied (Pesaran et al., 1996; Pesaran, Shin, & Smith, 2001). To evaluate whether the series are co-integrating or not, F-statistics is used. When the upper bound critical value is lesser than the calculated F-statistics, the null hypothesis of no co-integration is rejected. As the table 4.2, panel C shows, the upper bound critical value is lesser than the calculated F-statistics for all models, hence, we reject the null hypothesis and conclude that all series are co-integrating in the long run.

For the ease of interpretation, the results of ARDL test have been summarized in Table 4.3. by considering that substantial diversification benefits exist if the coefficient in panel A and B are either negative and significant (negative correlation) or not significant (no correlation); while if the coefficient is positive and significant (positive correlation), diversification benefits are not found.

Discussion

The purpose of the given study was to identify portfolio diversification benefits that exist among the BRICS-P economies. To serve the purpose, monthly data of the stock returns of the given economies, i.e., Brazil, Russia, India, China, South Africa and Pakistan were used for the period November 2003 to October 2016. We used ARDL approach for testing the long run relationships among these economies. To test the short run co-integration dynamics, Error Correction specification is used. The rationale of using these techniques is that these methods can be used for predictive purposes and, are more useful methods instead of the traditional methodology that utilizes a static covariance matrix to find an efficient frontier at a given point of time.

The results of the long run analysis provided the evidence that there exist substantial portfolio diversification benefits among all BRICS-P states namely, Brazil, Russia, China, India, South Africa and Pakistan. All of these results are in line with a number of past studies, such as, (Sharma & Bodla, 2011), who found that portfolio diversification benefits exist among emerging markets. The findings of Zonouzi et al. (2014) that with the given level of risk, the economies of the emerging markets can assure a greater rate of return also lend support to our findings. Li et al. (2003) was also of the view that although the integration of the global equity markets has reduced the diversification benefits, however, they have not finished off completely. In the same vein, Sukumaran et al. (2015) also showed that the difference in the economic structures between developed and less developed markets makes these markets attractive place for portfolio diversification.

We also used US S&P500 to represent the major global stock returns and checked the dependence of BRICS stock returns on S&P 500. The results showed that the stock returns of BRICS-P countries are not dependent on the global stock return nor in the short run, neither in the long run. Russia was the only country which is found to be affected by the global stock returns both in short and long run. The reason of such kind of relationship between the BRICS-P and global funds could be the existence of asymmetric dependence structure in these markets as explained by (Mensi et al., 2014). Because of this asymmetric dependence structure, the funds of BRICS-P economies do not get affected due to any stress or turmoil occurring in the global financial market and hence, the investors of these economies can reap diversification by diversifying their portfolio using the global funds.

The existence of diversification benefits between Pakistan and India is another important implication of the study. The investors of both countries can reap potential benefits if they invest in either fund, both in the short and long run. It is an important conclusion and it should be taken into account by the investors as well as the economic policy makers and governments officials of both the countries. To realize the untapped advantage of portfolio diversification between these countries, there is a need for addressing several impediments. The financial policies should be designed in such a way that helps the investors of both of these countries in merging their portfolios.

Conclusion

The motivation of international portfolio diversification gets support from the idea that merging funds of different regional equity markets help in reducing risk associated with the investment. This applies to all investment funds but is more useful for the funds of emerging markets because these markets have got more potential for investments. The constraint faced by the emerging markets is that investors consider these markets to be extremely volatile as various kinds of risks including social risks, political risks and economic risks are associated with them. However, the investors need to realize the benefits that are associated with the emerging markets. The biggest advantage associated with them is their potential for high growth and hence, investing in these markets can be a good diversifier as the economic down turns in the native country can be offset by the growth of the emerging markets.

The study put forwards some important policy implications. First and foremost, it is providing a better insight of the actions that should be taken by the investors whose primary goal is to maximize their utility. Since the capital markets of BRICS-P economies are not perfectly correlated, investors can use the funds of these economies to achieve diversification benefits. Investors can construct an optimal portfolio by reducing the risk associated with a given level of investment and at the same time, they can ensure a higher rate of return for themselves. Secondly, this conclusion can be of great advantage for the public investments as well. The governments of different economies can diversify their financial portfolios by opting for the funds of these emerging markets. This analysis also justifies the promotion of emerging market economies as potential centers for investments that can provide better opportunities for investment making the funds of these economies more desirable for investors.

Another important implication arising from the results of the study is the existence of diversification benefits between Pakistan and India. Despite the close geographical vicinity, the diplomatic relations of the two states remain uncertain. Because of this diplomatic uncertainty, higher political risk is associated with them. According to [Solnik and MacLeavey \(1991\)](#), 'The political risks of foreign investment might dampen the enthusiasm for international diversification. This political transfer risk might take the form of a prohibition on repatriation of profits and/or capital investment from a foreign country. While the risk is extremely small in the major markets, the associated potential loss is large'. This phenomenon is experienced by the investors of both countries. As risk aversion is a rational behavior of investors, they try not to invest in such countries where there is a higher political risk. It results in the decline of profits that the investors might have earned on investment. There is a strong need of formulation of financial policies in both India and Pakistan taking into account the benefits of merged portfolios. According to [Cosset and Suret \(1995\)](#), the inclusion of high political risk countries in the global portfolio reduces the overall portfolio risk. This reduction in the portfolio volatility reflects low correlation coefficients between returns in high and low political risk countries and hence, it can ensure better risk performance with higher expected return.

References

- Bahlous, M., & Yusof, R., M. (2014). International diversification among islamic investments: Is there any benefit. *Managerial Finance*, 40(6), 613–633.
- Banerjee, A., Dolado, J. J., Galbraith, J. W., & Hendry, D. (1993). Co-integration, error correction, and the econometric analysis of non-stationary data. *OUP Catalogue*.
- Batareddy, M., Gopalaswamy, A. K., & Huang, C. H. (2012). The stability of long-run relationships: A study on Asian emerging and developed stock markets (Japan and US). *International Journal of Emerging Markets*, 7(1), 31–48.
- Boubaker, S., & Jouini, J. (2014). Linkages between emerging and developed equity markets: Empirical evidence in the PMG framework. *The North American Journal of Economics and Finance*, 29, 322–335.
- Cosset, J.-C., & Suret, J.-M. (1995). Political risk and the benefits of international portfolio diversification. *Journal of International Business Studies*, 26(2), 301–318.
- Dhanaraj, S., Gopalaswamy, A. K., & Babu, M. S. (2013). Dynamic interdependence between US and Asian markets: An empirical study. *Journal of Financial Economic Policy*, 5(2), 220–237.
- Dunis, C., Sermpinis, G., & Karampelias, F. M. (2013). Stock market linkages among new EMU members and the Euro area. *Studies in Economics and Finance*, 30(4), 370–388.
- Gregg, F. (2012). *Forbes Magazine*, available at: www.forbes.com/sites/greggfisher/2012/01/17/why-global-diversification-still-makes-sense/ (accessed January 17, 2012).
- Grubel, H. G. (1968). Internationally diversified portfolios: Welfare gains and capital flows. *The American Economic Review*, 58(5), 1299–1314.
- Guidi, F., & Ugur, M. (2014). An analysis of South-Eastern European stock markets: Evidence on cointegration and portfolio diversification benefits. *Journal of International Financial Markets, Institutions and Money*, 30, 119–136.
- Haim, L., & Sarnat, M. (1970). Diversification, portfolio analysis and the uneasy case for conglomerate mergers. *The Journal of Finance*, 25(4), 795.
- Hoque, A. A. B. H. (2007). Co-movement of Bangladesh stock market with other markets. *Managerial Finance*, 33(10), 810–820.
- Johnson, R., & Soenen, L. (2009). European economic integration and stock market co-movement with Germany. *Multinational Business Review*, 17(3), 205–228.
- Laurenceson, J., & Chai, J. (2003). *Financial reform and economic development in China*. Edward Elgar Publishing. Retrieved from <https://doi.org/10.4337/2F9781843767190> doi: 10.4337/9781843767190
- Li, K., Sarkar, A., & Wang, Z. (2003). Diversification benefits of emerging markets subject to portfolio constraints. *Journal of Empirical Finance*, 10(1-2), 57–80.
- Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *The Review of Economics and Statistics*, 47(1), 13–37.
- Longin, F., & Solnik, B. (1995). Is the correlation in international equity returns constant. *Journal of International Money and Finance*, 14(1), 3–26.
- Majid, S. A. M., Meera, K. M., & Aziz, A. (2009). Dynamic linkages among ASEAN-5 emerging stock markets. *International Journal of Emerging Markets*, 4(2), 160–184.

- Markowitz, H. M. (1952). Portfolio Selection. *The Journal of Finance*, 7(1), 77–91.
- Mensi, W., Hammoudeh, S., Reboredo, J. C., & Nguyen, D. K. (2014). Do global factors impact BRICS stock markets? A quantile regression approach. *Emerging Markets Review*, 19, 1–17.
- Narayan, P. K., & Narayan, S. (2006). Savings behaviour in Fiji: An empirical assessment using the ARDL approach to cointegration. *International Journal of Social Economics*, 33(7), 468–480.
- Patev, P., Kanaryan, N., & Lyroudi, K. (2006). Stock market crises and portfolio diversification in Central and Eastern Europe. *Managerial Finance*, 32(5), 415–432.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (1996). *Testing for the existence of a long-run relationship* (Tech. Rep.). Faculty of Economics, University of Cambridge.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289–326.
- Rua, A., & Nunes, L. C. (2009). International comovement of stock market returns: A wavelet analysis. *Journal of Empirical Finance*, 16(4), 632–639.
- Sharma, D. G., & Bodla, B. S. (2011). Inter-linkages among stock markets of South Asia. , 3(2), 132–148.
- Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The Journal of Finance*, 19(3), 425–442.
- Solnik, B. H., & MacLeavey, D. W. (1991). *International investments*. Addison-Wesley Reading, MA.
- Sukumaran, A., Gupta, R., & Jithendranathan, T. (2015). Looking at new markets for international diversification: Frontier markets. *International Journal of Managerial Finance*, 11(1), 97–116.
- Valadkhani, A., Chancharat, S., & Harvie, C. (2008). A factor analysis of international portfolio diversification. *Studies in Economics and Finance*, 25(3), 165–174.
- Zonouzi, J. M. S., Mansourfar, G., & Azar, B. F. (2014). Benefits of international portfolio diversification: Implication of the middle eastern oil-producing countries. *International Journal of Islamic and Middle Eastern Finance and Management*, 7(4), 457–472.