# The Linkage between Emerging and Developed Markets: Implication for International Portfolio Diversification

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**Abstract:** This study is a holistic attempt to examine the linkage between emerging and developed markets between January 2012 and June 2016 using iShares MSCI Emerging Markets ETF and iShares MSCI World ETF to measure emerging and developed markets respectively. Employing the Johansen, Engle-Granger, and Philip-Ouliaris, cointegration testing approaches, this study reveals that there is no cointegration between emerging and developed markets, thus indicating that international portfolio diversification is feasible for investors holding financial assets in both markets. This finding implies that investors can reduce risk by constructing a portfolio consisting of assets in both emerging and developed markets.

**Keywords:** Emerging markets; Developed markets; International portfolio diversification; Cointegration

**JEL Classification:** G11; G15

## 1. Introduction

Due to the liberalisation of capital accounts in virtually all countries, investors can hold a portfolio comprising domestic and foreign financial assets. Investors' liberty to strategically allocate wealth across domestic and foreign financial assets provides an opportunity to minimise portfolio risk through international portfolio diversification. International portfolio diversification allows investors to have a wider variety of foreign financial assets to include in their portfolio, so as to enhance their reward in relation to risk (Wong, Penm, Terrell & Lim, 2004). Bodie, Kane and Marcus (1999) contend that the risk of an internationally diversified portfolio can be reduced by more than half the risk of a domestically diversified portfolio in the US stock market. Investors have limited chance to reap the benefits of international portfolio diversification when stock markets move together.

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Emerging markets serve as preferable investment centres for international investors to achieve international portfolio diversification. Harvey (1995) claims that it is possible for international investors to maximise returns by investing in emerging markets because they offer higher returns and are segmented from the global market. In the early 2000s, emerging markets rewarded investors for the risk they assumed because of their low equity valuations compared to developed markets (Davis, Aliaga-Diaz, Cole & Shanahan, 2010).

Recent studies show that emerging markets are becoming integrated with developed markets (Singh & Kaur, 2015; Lingaraja, Selvam & Vasanth, 2015; Trivedi & Birău, 2013; Ali, Butt & Rehman, 2011; Kamaralzaman, Samad & Isa, 2011; Singh, 2010). When emerging and developed markets are integrated, it raises doubt on the possibility for an international investor to diversify. It also tends to permit the contagion effect of developed market crisis on emerging markets and vice versa. The 2007 US subprime mortgage crisis metamorphosed into a global financial crisis as a result of financial integration. Contagion effect has significant implication for international portfolio diversification. Recently, Mauldin (2016) reported that the International Monetary Fund (IMF) warned that major emerging markets, led by the China, are becoming more likely to spread fear to financial markets, leading to poor stock performance in the United States and other developed countries. This signifies that the performance of emerging markets tends to drive the performance of developed markets. Put differently, emerging markets crises may lead to developed markets crises.

It is against this backdrop that this study examines the linkage between emerging and developed markets with the aim of providing implication for international portfolio diversification. The rest of this study is structured as follows: Section 2 provides the literature review, Section 3 deals with the data and preliminary analyses, Section 4 presents the empirical findings and Section 5 gives the conclusion.


## 2. Literature Review

The linkage between emerging and developed markets has been given considerable empirical attention. Singh and Kaur (2015) found a unidirectional causality from the US stock market to the Indian and Chinese stock market during the US subprime crisis. Lingaraja et al. (2015) observed that the US stock market leads the stock market of India, Malaysia and Philippines while it does not lead the stock market of China, Indonesia, Korea, Taiwan and Thailand. Kapingura, Mishi and Khumalo (2014) examined the integration of the South African stock market to other African markets as well as developed markets. It showed that the market is fully integrated to the developed markets but not to other African markets.

Dania and Malhotra (2013) examined the interdependence of stock market returns of BRICS nations on the stock market returns of 3 developed countries (France, Germany and US) and found no evidence of interdependence. Trivedi and Birău (2013) showed co-movement, interdependence and inter-linkage between emerging and developed markets. Birău and Trivedi (2013) analysed the linkage between the Romanian stock market and the stock markets of France, Germany and Greece in the milieu of the global financial crisis. The study found that there is absence of causality between the Romanian stock market and the developed markets in the pre-global financial crisis. However, in the post-global financial crisis period, only the Greek stock market leads the Romanian market.

Gupta and Guidi (2012) investigated the integration of the Indian market to 3 Asian developed markets (Hong Kong, Japan and Singapore). The result showed that the Indian market is not integrated to the developed markets. Agyei-Ampomah (2011) found that African markets except South Africa are not integrated to the global market. It also found low correlation among African markets. Kamaralzaman et al. (2011) analysed the cointegration between the Malaysian market and 10 developed markets. It showed that the Malaysian stock market is cointegrated with the developed markets.

Ali et al. (2011) showed that the Pakistani stock market does not move together with stock markets of UK, US, Taiwan, Malaysia and Singapore but otherwise with the stock markets of India, China, Japan and Indonesia. Singh (2010) examined the link between the Chinese and Indian market and 4 developed markets (US, UK, Japan and Hong Kong). It was discovered that both markets are positively correlated with the developed markets and there is at least a unidirectional causal relationship between the developed markets and the Indian and Chinese market. Arouri and Jawadi (2009) revealed that the stock markets of Philippines and Mexico are nonlinearly integrated to the global market. Raj and Dhal (2008) showed that the Indian stock market is integrated with global and major regional markets.

Worthington and Higgs (2007) provided evidence of long run relationship as well as short and long run causality between 3 developed and 8 emerging Asian markets. Ibrahim (2005) did not find cointegration evidence between the Indonesian market and other Association of Southeast Asian Nations (ASEAN) markets as well as the US and Japan stock market prior to and after the 1997 Asian financial crisis. Wong et al. (2004) investigated the relationship between 3 developed markets (US, UK and Japan) and 8 emerging Asian markets. The study observed that some of the developed and emerging markets move together. It also found that the interdependence between most of the developed and emerging markets increased after the 1997 Asian financial crisis.

Syriopoulos (2004) discovered that international portfolio diversification benefits are limited for international investors in the Polish, Czech Republic, Hungarian, and Slovakian stock markets. Gilmore and McManus (2002) found that the US stock market is not linked to the emerging stock markets of Czech Republic, Hungary, and Poland. Cha and Oh (2000) revealed that the link between the stock markets of Hong Kong, Korea, Singapore, and Taiwan started to increase after the October 1987 stock market crash, and has substantially increased since the 1997 Asian financial crisis.

## 3. Data and Preliminary Analyses

The data consists of monthly closing index for iShares MSCI Emerging Markets ETF and iShares MSCI World ETF from January 2012 to June 2016. The data are measured in US dollar and were obtained from Yahoo Finance. Monthly data was used in order to overcome the problem of non-synchronous trading and the possible effects of autocorrelation in volatility which are common features inherent in market data obtained on daily and weekly basis (Alagidede, 2008; Ibrahim, 2005). The iShares MSCI Emerging Markets ETF and iShares MSCI World ETF were used to proxy for the emerging and developed markets respectively. The iShares MSCI Emerging Markets ETF is an index designed to capture the performance of equities in the global emerging markets while iShares MSCI World ETF is an index built to track the performance of equities of developed markets. The preliminary analyses consist of the descriptive statistics, heteroskedasticity test, unit root tests and a combined graphical plot of both indexes. Table 1 presents the descriptive statistics of the emerging and developed markets index.

**Table 1. Descriptive Statistics**

| Statistic | EMERGING | DEVELOPED |
|---|---|---|
| Mean | 39.58389 | 65.65778 |
| Maximum | 45.06000 | 75.10000 |
| Minimum | 30.32000 | 50.49000 |
| Standard Deviation | 3.794818 | 7.514342 |
| Skewness | -0.855483 | -0.636029 |
| Kurtosis | 2.762534 | 1.999374 |
| Jarque-Bera | 6.713544** | 5.893613** |
| Observation | 54 | 54 |

*Source: Author's computation*

Note: ** denotes rejection of hypothesis of normal distribution at 5% significance level.

The mean, maximum and minimum value of the developed markets index is higher than the emerging markets index. Also, the standard deviation of the developed markets index is higher than the emerging markets index, thus implying that price

is more volatile in developed markets than emerging markets. The skewness statistic of both indexes is negative and this implies that it is possible to obtain more negative values from the indexes than positive values. The Kurtosis coefficient of both indexes is less than 3 and this indicates they both have a platykurtic (thin-tailed and low-peaked) distribution. The Jarque-Bera statistic shows that the hypothesis of normal distribution is rejected for both indexes.

**Table 2. Heteroskedasticity Test**

| Lag | EMERGING | DEVELOPED |
|-----|----------|-----------|
| 1 | 73.32009* | 123.3439* |
| 2 | 37.93868* | 64.42466* |
| 3 | 28.81491* | 39.78424* |
| 4 | 20.61307* | 28.84834* |

*Source: Author's computation*

Notes: * indicates the rejection of the hypothesis of no ARCH component at 1% significance level. Heteroskedasticity test performed with the ARCH LM test and F-statistic reported for the test.

The ARCH LM test indicates that there are ARCH effects in both indexes, thus indicating the presence of volatility clustering in both markets. The F-statistic obtained for developed markets index at lag 1 to 4 is higher than that of the emerging markets index. This implies that the developed markets index is more volatile than the emerging markets index. This is consistent with the standard deviation statistic obtained in Table 1.

**Table 3. Unit Root Test Results**

| | Panel A: Unit Root Test without Structural Break | | | | | |
|---|---|---|---|---|---|---|
| | EMERGING | | | DEVELOPED | | |
| | Level | First Difference | I($d$) | Level | First Difference | I($d$) |
| ADF | -2.316631[b] | -6.392912*[a] | I(1) | -1.879969[a] | -8.728190*[b] | I(1) |
| DF-GLS | -2.312472[b] | -6.392912*[b] | I(1) | -1.670890[b] | -8.063469*[b] | I(1) |
| PP | -2.316631[b] | 6.934119*[a] | I(1) | -1.882336[a] | -9.634603*[b] | I(1) |
| Ng-Perron | -8.93723[b] | -25.4542*[b] | I(1) | -5.61806[b] | -25.5189*[a] | I(1) |
| | Panel B: Perron Unit Root Test with Structural Break | | | | | |
| | Level | | First Difference | | | |
| | Break Date | Coefficient | Break Date | Coefficient | | I($d$) |
| EMERGING | 2015:05 | -0.451704 | 2014:07 | -1.012691* | | I(1) |
| DEVELOPED | 2015:06 | -0.388086 | 2015:12 | -1.248238* | | I(1) |

*Source: Authors' computation*

Notes: * denotes 1% critical value, [a] and [b] indicate test equation with constant only and constant and trend respectively and MZa statistic reported for the Ng-Perron test and the Perron unit root test with structural break was performed in an innovative outlier model. Also, critical value for the Perron unit root test with structural break was obtained from Table 1(e) in Perron (1997).

Table 3 shows that both indexes are non-stationary series with or without structural break. The emerging and developing markets index are integrated at first order.
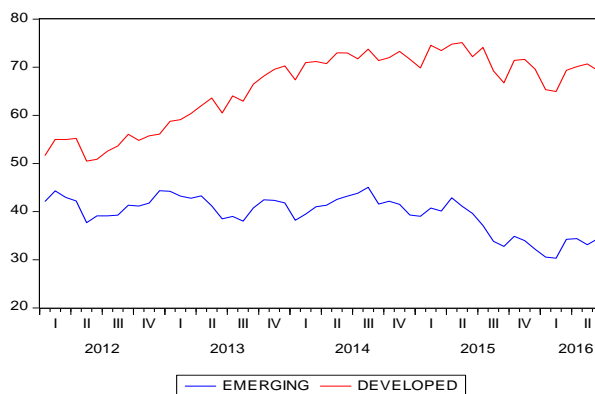


**Figure 1. Combined Graph of Emerging and Developed Markets Index**

The combined graph shows the indexes move in opposite direction. This implies that the index of emerging and developed markets are negatively correlated.

## 4. Empirical Findings

### 4.1. Cointegration Test

The cointegration test was performed using three alternative methods applicable when all series in a model are integrated at first order. These methods are Johansen, Engle-Granger and Phillips-Ouliaris cointegration test. The existence of cointegration between the markets indicates that there is possibility of causal linkage between the markets at least in one direction, which suggests evidence of financial integration. The opportunity to enjoy international portfolio diversification is limited when markets are integrated. The cointegration test has been widely used to determine whether markets are integrated (for example, Kamaralzaman et al., 2011; Ibrahim, 2005; Wong et al., 2004). Table 4 presents the cointegration test results.

**Table 4. Cointegration Test Results**

| Panel A: Johansen Cointegration Test (Trace Test) | | | | |
|---|---|---|---|---|
| **Hypothesized No. of CE(s)** | Eigenvalue | Trace statistic | 0.05 Critical Value | p-value |
| **None** | 0.084463 | 7.154675 | 15.49471 | 0.5597 |
| **At most 1** | 0.048147 | 2.565941 | 3.841466 | 0.1092 |

| Panel B: Engle-Granger Cointegration Test | | | | |
|---|---|---|---|---|
| Dependent Variable | tau-statistic | p-value | z-statistic | p-value |
| EMERGING | -1.718046 | 0.6712 | -6.424145 | 0.5976 |
| DEVELOPED | -1.971579 | 0.5472 | -5.159544 | 0.7074 |
| Panel C: Phillips-Ouliaris Cointegration Test | | | | |
| Dependent Variable | tau-statistic | p-value | z-statistic | p-value |
| EMERGING | -1.805030 | 0.6300 | -7.051146 | 0.5443 |
| DEVELOPED | -1.911954 | 0.5773 | -4.411157 | 0.7708 |

*Source: Authors' computation*

It can be deduced from Table 4 that all the tests show that there is no cointegration between emerging and developed markets index. This implies that the emerging markets and developed markets do not move together over a long period.

## 4.2. Impulse Response Functions

A VAR-in-First Difference model was estimated since the series are I(1) but not cointegrated. It was specified with a lag length of 1 selected based on the Akaike information criterion (AIC), Final Prediction Error (FPE), sequential modified LR test and Hannan-Quinn information criterion (HQ). After estimating the VAR model, diagnostics tests were performed. The VAR residual serial correlation LM test confirms that there is no serial correlation in the model. The normality test based on the Cholesky (Lutkepohl) orthogonalization method accepts the hypothesis that the residuals are multivariate normal.
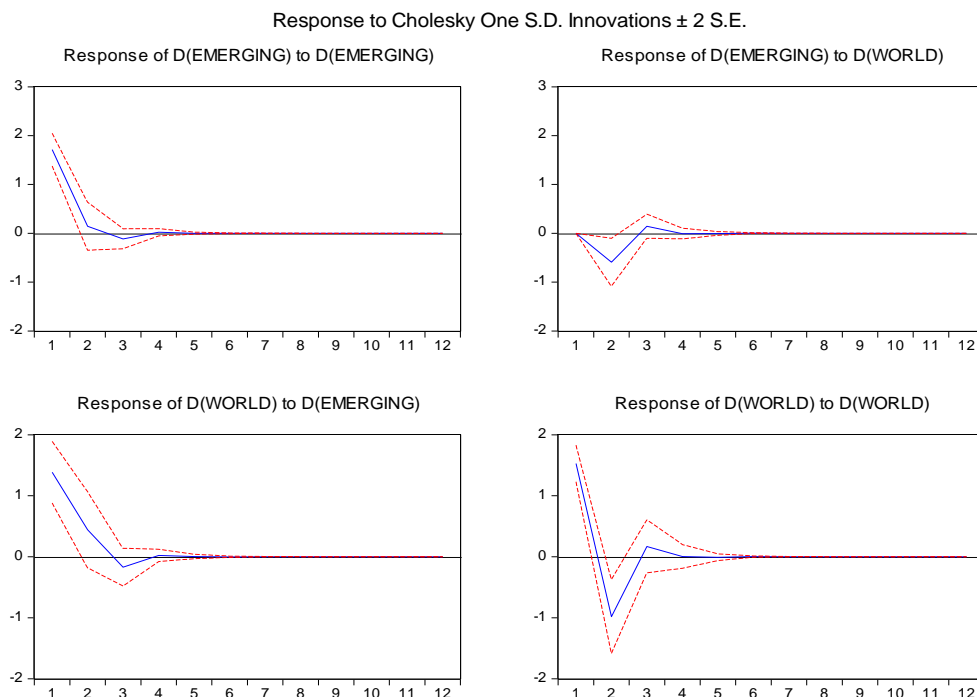
Response to Cholesky One S.D. Innovations ± 2 S.E.

Response of D(EMERGING) to D(EMERGING)          Response of D(EMERGING) to D(WORLD)

Response of D(WORLD) to D(EMERGING)          Response of D(WORLD) to D(WORLD)

**Figure 2. Impulse Responses of Emerging and Developed Markets**

The impulse response function graphs show that emerging markets negatively respond to shocks (innovations) from developed markets in the 1st and 2nd month but react positively in the 3rd and 4th month over a12-month horizon. From the 5th month onward over a 12-month horizon, emerging markets do not respond to developed markets shocks. On the other hand, developed markets positively respond to emerging markets shocks in the 1st and 2nd month but negatively respond in the 3rd month. However, developed markets do not react to shocks from emerging markets as from the 4th month.

## 5. Conclusion

Investors are concerned about the linkage between markets when seeking to diversify their portfolio internationally as a portfolio risk reduction strategy. This study took a holistic view on the linkage between emerging and developed markets by using the iShares MSCI Emerging Markets ETF and iShares MSCI World ETF to proxy for emerging and developed markets respectively. Using three alternative cointegration testing approaches, it was evidenced that there is no cointegration between the markets, thus indicating that international portfolio diversification is feasible for investors with financial assets in both markets in the long run. This

suggests that investors can construct a portfolio consisting of assets in both emerging and developed markets as a strategic approach to reducing risk on their portfolio. This study also showed that the shock transmission mechanism between the emerging and developed markets gradually changes as period increases.

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