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Global Share Market Integration and Diversification: A Study of Asian Emerging Market

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Abstract
This study attempts to look at emerging markets as an alternative for international diversification. This study examines if equity investors from Asian Emerging Markets are able to gain diversification benefit by investing in the equity markets of other Asian Emerging Markets. An assessment of market integration is made using a cross country correlation analysis and a Johansen cointegration test. The results indicate that Asian Emerging Markets are moving towards integration as well. Therefore, this study concludes that diversification among Asian Emerging Markets is no longer a viable option in the long run.

I. INTRODUCTION

From the early of study of Grubel (1968) to the influential study of Solnik (1974), researchers have come a long way in establishing the wisdom that international diversification reduces portfolio risk for a given amount of return. The ability to achieve such risk reduction is due to the low correlations between returns of different countries. Such low correlations are perhaps attributable to cross border segmentation. Economic and trade relationship across national borders has been quite restricted in the past due to trade barriers, low investor protection and cultural differences. Nonetheless, against a background of globalization and the lowering of trade barriers, cross border trading has become prevalent and economies of nations become more and more dependent on one another. As trade relationships are cemented, financial markets also begin to show signs of dependencies. Correlation among stock markets, which has been historically low, is gradually getting higher, thus suggesting that the ability of an investor to reduce risk through international diversification is being eroded. The body of evidence which suggests the irrelevance of global diversification as an investment strategy is on the increase. Many of these studies arrive at such conclusion after examining the integration between national stock markets. However, these contemporary studies are mostly focused on developed markets. The study on stock market integration among emerging markets (China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan and Thailand) is still limited. Nonetheless, emerging markets have been gaining prominence and recognition of late. Asian emerging markets like China have shed their image as a second class market and have proved the world that they are promising destinations for the world's capital. According to Bloomberg News (2010), China has surpassed Japan, a developed market, as the largest economy in Asia and Fox News (2011) reported that the International Monetary Fund (IMF) predicts China to surpass even the United States to be the largest economy in the world. With spectacular economic prospects, it would be natural for investors from Asian emerging markets themselves to consider other Asian emerging markets as a destination for international diversification. Besides prospects, investors from Asian emerging markets would also be more confident in diversifying within the region as they are more familiar with their neighbouring markets. However, against a background of global market integration, the prospects of international diversification among Asian emerging markets remain questionable. Therefore, this study will investigate if Asian emerging markets are able to benefit from international diversifying to other emerging markets within the region. A market integration approach will be taken in this endeavour.

II. LITERATURE REVIEW

Past studies found that correlation based methodology, like Roll's (1982) standard tracking error variance (TEV) minimizing model have some serious limitations. Alexander and Dimitriu (2005) commented the TEV might form a sample-specific portfolio which will be very unstable in times of high volatility. Other weaknesses identified are sensitivity to presence of outliers, volatility clustering and non-stationarity. As such, the weakness of correlation would include limited use of long historical data and flawed conclusions of long term relationships. An alternative method using cointegration is found to be more superior as the price spread between the portfolio created and the benchmarked index show minimal volatility. Consistent with findings of Engle and Granger (1987), only cointegration-optimal portfolio show stationarity in the price spread with its benchmark, (Alexander and Dimitriu, 2005). This is because cointegration ensures the reversion of the assets to the underlying benchmark. Since cointegrated stock markets are mean reverting, there is less need for portfolio rebalancing A survey of empirical evidence on market integration by Goldstein and Mussa (1993) revealed linkage of international markets have been increasing over the decade especially in equity of developed markets. Emerging markets are also

found to be slowly integrating with the world financial markets. As such, international diversification benefits are perceived as slowly eroding. A separate study by Blackman et al. (1994) on 17 OECD markets seeks to determine if financial markets are getting more integrated. They took two samples; one for the period of January 1970 to December 1979 and another from January 1984 to February 1989. Using the Johansen cointegration test, they found no evidence of cointegration in the first sample but strong evidence of cointegration in the latter sample. Therefore, a conclusion is formed that stock markets have been increasingly integrated in the 1980s.

Ng (2002) investigates the correlation of stock returns of Indonesia, Malaysia, Philippines, Singapore and Thailand between 1988 and 1997 and found that the ASEAN stock has become more closely related. Monthly data was used and the period was split into two (1988-92 and 1993-97). It was found that the correlation for the stock markets in question was stronger in the latter period. However, there was no evidence of a cointegrating relationship between stock markets examined. Dunis and Shannon (2005) explored if the emerging markets (Malaysia. Philippines, Thailand, Indonesia, China, Korea and India) still offer diversification benefit to the investors in established markets (United States, United Kingdom, Japan). Using Johansen cointegration test, variance decomposition and Kalman filter, stocks from countries which show decreasing or constant integration with the US are chosen to be included in the portfolio of a US investor. Portfolios with international stocks are found to outperform an exclusively US stock portfolio during both the in and out of sample period. There are however some discrepancies between the findings of Ng (2002) and Dunis and Shannon (2005). The prior study found that correlation between the overlapping countries examined is increasing with and there is no evidence of cointegration between the markets in study. On the other hand, the latter found that there is no evidence of increased correlation between the stock markets in study but found that there is evidence of cointegration in the long run. There is a differences in data between the two studies are the time period, and frequency of data used (monthly against daily).

Majid et al. (2009) concluded that ASEAN stock markets, specifically Malaysia, Indonesia, Thailand, Philippines and Singapore are moving towards integration especially after the 1997 Asian financial crisis. The arrive at this conclusion after finding more cointegrating vectors among the stock markets in the post-crisis period as compared to the pre-crisis period. A separate study by Majid and Kassim (2009) conducted a study to provide empirical evidence of the impact of the 2007 US financial crisis on Malaysian and Indonesian stocks. Using a VAR framework, it was concluded that no long run equilibrium relationship exist in the pre-crisis period between Malaysia, Indonesia, United States and United Kingdom and that the long run equilibrium relationship was only formed during the crisis period. Ansari (2009) examined the cointegration in ten major stock markets using the Johansen and Juselius method and found that there is an "extremely strong long run relationship" between the markets. Therefore, he concluded that intenational diversification between the countries studied, namely Australia, Canada, United States, Germany, France, Hong Kong, Japan, United Kingdom, Switzerland and Singapore, would have limited benefit. He even went on to comment that international diversification might no longer be a relevant investment strategy. Past studies by Grubel, (1978), Lessard (1973) and Solnik (1974) have managed to establish the benefits of global diversification. The ability of risk reduction depended on low correlations among national stock markets.

However, the integration of national stock markets gave rise to the contagion effect. Ibrahim (2005) found that shocks from one markets are found to be transmitted to other stock markets causing an increase in correlation, especially during crisis period. This reduces the benefit of international diversification when at a time when it is needed the most. Therefore, the extent of market integration is an important subject of study. Most study on developed markets like those by Hamao (1990), Britten-Jones (1999), and Blackman et al, (1994) found there is interdependence among developed markets and they are increasingly integrated. Ansari (2009) in his study of integration of developed markets even concluded that international diversification might no longer be a relevant investment strategy.

However, the evidence on emerging markets is still mixed. Results with contradicts each other was found in Ng (2002) and Dunis and Shanon (2005). Moreover, studies like those by Ng (2002), Majid et al, (2009) and Majid and Kassim (2009) has been limited to a small geographical region like South East Asia. No comprehensive study has been conducted on the integration of emerging stock markets with a wider geographical dispersion. There is a possibility that relationship between emerging markets of a larger geographical dispersion might differ due to their trade, cultural and geographical difference.
Past studies by Bahng (2005), Majid et al. (2009) and Majid and Kassim (2009) show that relationships between national stock markets have a tendency to grow closer after a major economic crisis.

Nonetheless, no comprehensive literature on whether the relationship between all Asian emerging markets changed after the 2007 Great Recession is found.

III. RESEARCH METHODOLOGY

The definition of Asian emerging markets for this research will be the emerging markets included in the MSCI Emerging Markets Index under the Asian category. The markets to be included in this index are reviewed annually and are announced every June. As at June 2010, the MSCI Emerging Market Index consists of 8 Asian emerging markets which are China, India, Korea, Indonesia, Malaysia, Philippines, Taiwan and Thailand, (MSCI, 2011).
The stock market indices which are used in this study are as follows:

- MSCI China Index
- India Bombay Stock Exchange (100) National Index
- Jakarta Composite Index
- Korea Stock Exchange Composite Index (KOSPI)
- FTSE Bursa Malaysia KLCI Index
- Philippines Stock Exchange Index (PSEi)
- Taiwan Stock Exchange Weighted Index
- Thailand SET 50 Index.

These indices represent the respective stock markets of China, India, Indonesia, Korea Malaysia, Philippines, Taiwan and Thailand; the AEMs. Daily closing prices denominated in local currency from 1 January 2002 to 31 March 2011, representing the latest available data, are extracted from the Thomson Reuters Datastream database. Daily data is used in this study to as it can capture potential interactions between stock markets, (Dunis and Shannon, 2005). In line with Subramaniam (2008), the index prices are denominated in local currency to avoid problems of fluctuating foreign exchange rate and the assumption that the purchasing power parity holds. One major issue identified in the data obtained is missing observations due to different stock market bank holidays. As the regressions in this study incorporate lags, one missing data will render many other data points unusable. Rather than using a method of interpolation, this study follows the approach of Majid et al., (2009) by filling in missing data points with the data of the previous day; based on Occam's razor principle. The basis of this technique is that a bank holiday would not produce any new information. Therefore, the index price on bank holidays will not change and be the same as the index price the day before. Anticipating a structural break, the data used in this study is divided into two with one representing the pre-recession period and the other the post-recession period. The data for the pre-recession period begins on 1 January 2002 and ends on 30 November 2007. The data for the post-recession period begins on 1 July 2007 and ends with the latest available data on 31 March 2011. Data during the Great Recession period from 1 December 2007 to 30 June 2009 are not used in this study. To ascertain if the one AEM country is able to reduce risk by holding equities in other AEM countries, this study first examines the cross country correlation between the markets and how they have changed after the Great Recession.

Next, an Augmented Dickey Fuller (ADF) unit root test and a Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationarity test shall be conducted to determine the order of integration of all the time series investigated. The results of these tests are essential inputs for the Johansen cointegration test and for the construction of a Vector Autoregressive (VAR) model. Subsequently, the Johansen cointegration test is used to determine if AEMs are integrated. The framework is used to examine whether a long-run relationship between the AEMs exists during the pre-recession period and if this changes in the post-recession period. The effect of stationarity is illustrated by Brooks (2008) by considering an autoregressive time series as below:

$$y_t = \emptyset y_{t-1} + u_t \quad (1)$$

Let $\emptyset$ take any value for now. Lagging equation (1) one period and then two periods will produce

$$y_{t-1} = \emptyset y_{t-2} + u_{t-1} \quad (2)$$

$y_{t-2} = \emptyset y_{t-3} + u_{t-2}$ (3)

Substituting into (1) from (2) for y_{t-1} yields

$$y_t = \emptyset(\emptyset y_{t-2} + u_{t-1}) + u_{t-1}$$

$$y_t = \emptyset^2 y_{t-2} + \emptyset u_{t-1} + u_{t-1}$$

Substituting again for y_{t-2} from (3)

$$y_t = \emptyset^2(\emptyset y_{t-3} + u_{t-2}) + \emptyset u_{t-1} + u_{t-1}$$

$$y_t = \emptyset^3 y_{t-3} + \emptyset^2 u_{t-2} + \emptyset u_{t-1} + u_{t-1}$$

T successive substitutions of this type lead to

$$y_t = \emptyset^{T+1} y_{t-(T+1)} + \emptyset u_{t-1} + \emptyset^2 u_{t-2} + \emptyset^3 u_{t-3} + \cdots + \emptyset^T u_{t-T} + u_t$$

For the unit root case, $\emptyset = 1$, so $\emptyset^T = 1 \; \forall \; T$. As such, shocks in the system never reduce and the current value of y will be the total sum of past shocks plus a starting value of y_0. This is shown as

$$y_t = y_o + \sum_{t=0}^{\infty} u_t \, , as \; T \to \infty$$

Cointegration is the notion that if two non-stationary variables are combined in a linear equation, the resulting equation will be stationary. Such a case occurs when two time series move together over time and are seem to be bound by some relationship. The cointegrating relationship, therefore, can also be interpreted as an equilibrium relationship in the long-term. Deviation from this relationship is possible in the short run, but their association would return in the long run, (Brooks, 2008). To test for cointegration among stock markets the Johansen (1998) approach is adopted. This is because the Johansen cointegration test is superior in that it can identify more than one cointegrating vector. The Johansen Cointegration test begins with a Vector Autoregressive [VAR(k)] model as follows:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_k Y_{t-k} + \varepsilon_t \quad (1)$$

where $Y_t = (Y_{1t}, Y_{2t}, \ldots, Y_{nt})$'. Subtracting Y_{t-1} from both sides of equation (1) will produce:

$$\Delta Y_t = (A_1 - I) Y_{t-1} + A_2 Y_{t-2} + \cdots + A_k Y_{t-k} + \varepsilon_t$$

then adding and subtracting $(A_1 - I) Y_{t-2}$ from both sides to get

$$\Delta Y_t = (A_1 - I) Y_{t-1} + (A_2 + A_1 - I) A_2 Y_{t-2} + \cdots + A_k Y_{t-k} + \varepsilon_t$$

then adding and subtracting $(A_2 + A_1 - I) Y_{t-3}$ from both sides will produce

$$\Delta Y_t = (A_1 - I) Y_{t-1} + (A_2 + A_1 - I) A_2 Y_{t-2} + (A_3 + A_2 + A_1 - I) A_2 Y_{t-2} \ldots + A_k Y_{t-k} + \varepsilon_t$$

Following the studies of Kasa (1992), Heinesen (1995) and Cheng (2000), as cited in Majid et al., (2009), the continuous addition and subtraction of the above pattern will turn the VAR(k) model into a Vector Error Correction Model (VECM), which is to be specified as follows:

$$\Delta Y_t = \delta + \Gamma_i \Delta Y_{t-i} + \cdots + \Gamma_k \Delta Y_{t-k} + \prod Y_{t-k} + \varepsilon_t$$

where Y_t is an *n x 1* vector of variables and δ is an *n x 1* vector of constant, respectively. Meanwhile Γ is an *n x n* matrix of coefficient of short run dynamics.

$\prod = \alpha\beta$' where α is an *n x 1* column vector representing the speed of short-run adjustment to rectify disequilibrium and β' is an *1 x n* cointegrating row vector indicating the matrix of long-run coefficients such that Y_t converge in their long-run equilibrium. Finally, ε_t is an *n x 1* vector of white noise error term and *k* is the order of autoregression.

As this study investigates market integration among the eight AEMs, n = 8. The Johansen test centres around the $\prod$ matrix and the $\prod$ matrix can be interpreted as the long term coefficient matrix. This is because in equilibrium, all the Δy_{t-1} will be zero, setting the error terms, ε_t, to their expected value of zero leaving $\prod Y_{t-k} = 0$. The test for cointegration between the time series is calculated by looking at the rank of the $\prod$ matrix via its eigenvalues. There are two test statistics for determining cointegration under the Johansen approach and they are the trace test and maximum eigenvalue test as follows.

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{g} In(1 - \lambda_i)$$

and

$$\lambda_{max}(r, r+1) = -T\, In(1 - \lambda_{r+1})$$

The critical values used for this test are those provided by Johansen and Juselius (1990).
For both tests, the first null hypothesis tested is $r = 0$, which means there is no cointegrating vectors. If the null hypothesis cannot be rejected, then it can be concluded that the time series tested are not cointegrated. However, if it is rejected, then the null hypothesis that $r = 1$, that there is one cointegrating vector and so on is tested until $r = 7$ as there can at most be seven or n-1 number of cointegrating vectors in our eight variable VECM. The Johansen cointegration test can be affected by the lag length used in the Vector Error Correction Model. Therefore, the lag length is optimally selected using the Akaike Information Criteria (AIC). This is consistent with other researches using the Johansen cointegration test, (Dunis and Shannon; 2005; Low and Ghazali, 2007; Karim and Majid, 2010).

IV. RESULT OF ANALYSIS

A. Correlation Analysis

The cross country correlations for log returns of stock indices for Asian Emerging Markets (AEMs) for periods before and after the 2007 Great Recession are computed using Eviews and the results are tabulated in Table 1 and Table 2, respectively, below. The change in correlations between the periods concerned are then computed and tabulated in Table 3.

Pre-Recession

Table 1: Cross Country Correlations (Pre-Recession)

	China	India	Indonesia	Korea	Malaysia	Philippine	Taiwan	Thailand
China	1.0000							
India	0.4171	1.0000						
Indonesia	0.4625	0.3661	1.0000					
Korea	***0.5337***	0.3515	0.3968	1.0000				
Malaysia	0.4355	0.2473	0.4063	0.3849	1.0000			
Philippine	0.2611	0.1960	0.2804	0.2852	0.3094	1.0000		
Taiwan	0.4855	0.2906	0.3854	***0.5833***	0.3587	0.2628	1.0000	
Thailand	0.3674	0.2546	0.3617	0.3502	0.3259	0.1938	0.3294	1.0000

The pre-recession cross country correlations shown in Table 1 indicate that correlations among the Asian emerging markets are generally low. Figures highlighted in grey show correlations above 0.5 and there are only two of these. They are between Korea-China and Korea-Taiwan. Philippines, on average, exhibits the lowest correlations with other AEMs. Most emerging stock markets show a higher correlation with China than with any other emerging markets within the region. However, they do not exhibit higher correlations with India, an economy of comparable size.
There is also a lack of evidence that stock markets of countries with close geographical proximity are more closely linked. The correlations between Indonesia-Philippines-Malaysia-Thailand which are located in the South East Asian region are rather low.

Post-Recession

Table 2: Cross Country Correlations (Post-Recession)

	China	India	Indonesia	Korea	Malaysia	Philippine	Taiwan	Thailand
China	1.0000							
India	***0.5473***	1.0000						
Indonesia	***0.5579***	0.4560	1.0000					

Korea	***0.6201***	0.3959	0.4748	1.0000				
Malaysia	***0.5371***	0.3595	0.4519	0.4752	1.0000			
Philippine	0.3658	0.2666	0.3651	0.2857	0.2761	1.0000		
Taiwan	***0.6313***	0.3783	0.4612	***0.6636***	0.4686	0.3074	1.0000	
Thailand	***0.5270***	0.4875	0.4390	0.3967	0.3757	0.2129	0.3516	1.0000

The post-recession cross country correlation shown in Table 2 suggests that correlations among Asian emerging markets are generally higher than their pre-recession period. Figures highlighted in grey indicate correlation above 0.5 and the number has increased from two to seven. Most of these are between China and other AEMs. The only exception is the correlations between Korea-Taiwan which was already high during the pre-recession period. Once again, Philippines exhibits the lowest correlation with every other AEMs. This preliminary finding indicates that investors from the Philippines are able to gain substantial risk reduction benefits from diversification in the equity markets of other AEMs due its low correlations with them in both periods before and after the Great Recession.
There is once again lack of evidence that stock markets which are close geographically exhibit closer ties. The correlations between the South East Asian emerging markets remain rather low.

B. Unit Root and Stationarity Test

As two separate periods has been identified, there will be two separate sets of time series with each containing log prices of stock market indices of the eight Asian Emerging Markets (AEMs). Both sets of these time series are tested separately to identify their order of integration using the Augmented Dickey-Fuller (ADF) unit root test and the Kwaitkoski-Phillips–Schmidt–Shin (KPSS) stationarity test. The test statistics for both tests are computed using Eviews and are reported Table 4 and Table 5 below based on their time period.

Pre-Recession

Table 4: Test Statistics Unit Root Analysis (Pre-Recession)

	ADF (Levels)	KPSS (Levels)	ADF (1st differenced)	KPSS (1st differenced)
China	1.5031	4.3953*	-36.1164*	0.4247
India	0.6261	4.8130*	-28.8668*	0.1313
Indonesia	0.1985	4.7632*	-35.4345*	0.1034
Korea	-0.1077	4.3753*	-38.6657*	0.1366
Malaysia	0.3127	4.1214*	-33.8399*	0.2012
Philippine	-0.0027	4.5712*	-35.2298*	0.1180
Taiwan	-0.8299	3.5751*	-38.1792*	0.0914
Thailand	-1.7154	4.008*	-39.8426*	0.1411

Note: * Indicates rejection of null hypothesis at the 5 per cent level.

Based on MacKinnon (1991), the critical value for 5 per cent level of significance is -2.8632 for the ADF test. The null hypothesis is that the time series has a unit root and this can only be rejected if the test statistics are more negative than the critical value. The null hypothesis that there is a unit root, therefore, cannot be rejected for all the time series tested in the levels as their test statistics are not more negative than the critical value. This indicates that the all the time series in levels has a unit root and are non-stationary. However, the same null hypothesis above is rejected for all the time series tested when first differenced because their test statistics are more negative than the critical value. This indicates that all the time series are stationary when first differenced and are therefore are integrated of order 1 or I(1).
All the time series are then retested using a KPSS test. With reference to Kwaitkoski et al. (1992), the critical value for 5 per cent level of significance is 0.4630 for the KPSS test. The null hypothesis is that the time series are stationary and this can only be rejected if the test statistics are higher than the critical value.

Post-Recession

Table 5: Test Statistics Unit Root Analysis (Post-Recession)

	ADF (Levels)	KPSS (Levels)	ADF (1st differenced)	KPSS (1st differenced)
China	-2.8575	1.2279*	-20.9029*	0.0468
India	-2.1139	1.9314*	-20.8913*	0.0872
Indonesia	-1.4081	2.5346*	-21.1382*	0.0889
Korea	-1.3379	2.3240*	-21.5488*	0.0556
Malaysia	-1.8254	2.4716*	-17.8259*	0.1209
Philippine	-1.7501	2.4281*	-26.3109*	0.1357

Taiwan	-2.1090	1.8664*	-16.3330*	0.0747
Thailand	-1.0004	2.4526*	-21.8495*	0.0421

Note: * Indicates rejection of null hypothesis at the 5 per cent level.
Based on MacKinnon (1991), the critical value for 5 per cent level of significance is -2.8677 for the ADF test. The null hypothesis that there is a unit root, therefore, cannot be rejected for all the time series tested in the levels as their test statistics are not more negative than their critical value. This indicates that the all the time series in levels has a unit root and are non-stationary.

C. Johansen Cointegration Test

As both time series of all log prices of Asian Emerging Markets (AEMs) pre-recession and post-recession are I(1), there is as chance that they are cointegrated and share a long run relationship. To ascertain if such equilibrium relationship does indeed exist, the Johansen cointegration test is separately conducted on both the pre-recession and post-recession time series. The pre-recession result is tabulated in Table 6 and the post-recession result is tabulated in Table 7.

Table 6: Result of Johansen Cointegration Test (Pre-Recession)

Hypothesis		Trace 5%	Trace Test	Max. Eigenvalue	Max. Eigenvalue
H0	**H1**	**Critical Value**	**Statistic**	**5% Critical Value**	**Test Statistic**
r=0	r>0	187.47	180.94	56.71	47.47
r≤1	r>1	150.56	133.47	50.60	42.18
r≤2	r>2	117.71	91.29	44.50	32.89
r≤3	r>3	88.80	58.40	38.33	21.49
r≤4	r>4	63.88	36.91	32.12	13.03
r≤5	r>5	42.92	23.88	25.82	10.89
r≤6	r>6	25.87	12.99	19.39	7.44
r≤7	r>7	12.52	5.55	12.52	5.55

The first null hypothesis that there is no cointegrating vector cannot be rejected as both trace and maximum eigenvalue statistics are not above their respective critical values at 5% level. The absence of a cointegrating vector indicates that the stock market indices of AEMs are not cointegrated in the pre-recession period and there is no long run equilibrium relationship between them.

Table 7: Result of Johansen Cointegration Test [Post-Recession]

Hypothesis		Trace 5%	Trace Test	Max. Eigenvalue	Max. Eigenvalue
H0	**H1**	**Critical Value**	**Statistic**	**5% Critical Value**	**Test Statistic**
r=0	r>0	187.47	201.12	56.71	57.52
r≤1	r>1	150.56	143.60	50.60	40.38
r≤2	r>2	117.71	103.22	44.50	36.04
r≤3	r>3	88.80	67.17	38.33	25.29
r≤4	r>4	63.88	41.88	32.12	16.79
r≤5	r>5	42.92	25.09	25.82	12.55
r≤6	r>6	25.87	12.54	19.39	8.94
r≤7	r>7	12.52	3.60	12.52	3.60

The first null hypothesis that there is no cointegration vector is rejected as both trace and maximum given value statistics are higher than their respective critical values at 5% level. This means that there is at least one cointegrating vector in the post-recession period. The next null hypothesis which is at most 1 cointegrating relationship cannot be rejected as both trace and maximum eigenvalue statistic are not higher than their respective critical values. This indicates that there is only one cointegrating vector between the stock market indices of AEMs. The presence of a cointegrating vector indicates that the AEM stock markets are cointegrated and there is a long run equilibrium relationship between them.

D. Overview of Analysis and Interpretation

The cross country correlation analysis found that emerging markets are getting more integrated. Correlations are found to be lower in the pre-recession period and they are found to have dramatically increased in the post-recession period. Most of the high correlations and high increases are with China, indicating that China might be the source of market integration within the Asian region. The Johansen

cointegration tests found no cointegrating vector among AEM stock market indices in the pre-recession period but found one cointegrating vector in the post-recession period. This indicates that the stock markets of AEMs are getting more integrated. As stock market integrates, there will be higher correlations and this is consistent with the cross country correlation analysis. All analyses arrive at the same conclusion that AEMs are getting more integrated. It was also found that the only possible way for diversification was between Philippines and one other AEM or between any one AEM and Philippines. Since the diversification choice is limited, the benefit of diversification among Asian emerging markets is seriously questionable. Investors from AEMs are therefore advised to consider other emerging markets outside Asia when looking for a destination to diversify their equity holdings.

V. DISCUSSION

This study approaches the issue of international diversification benefit by examining the extent of market integration among AEMs. To do so, a cross correlation analysis and Johansen cointegration test.
The tracking of correlation is able to provide an indication if markets are getting more integrated. The cross correlation analysis reveals that cross correlations between returns of AEMs are rather low in the pre-recession period. However, these correlations have increased dramatically in the post-recession period, thus indicating market integration between AEMs.

The correlation analysis also managed to rule out size of market and geographical proximity as catalyst for the market integration. Therefore, this study focuses on trade as the reason for market integration within the AEMs. Besides that, the correlation analysis also found that Philippines is the only country which have a low correlation with other AEMs and show no sign of integration in the post-recession period.

Subsequently, a Johansen cointegration test is conducted to determine if markets are cointegrated before and after the Great Recession. The results reveal that AEM stock market indices are not cointegrated before the Great Recession. This implies that the movement of the indices are not bound by any equilibrium relationship and therefore diversification among them will produce risk reduction benefits.
However, after the Great Recession, the AEM stock market indices are found to be cointegrated. The markets also seem to move more in synchrony when the time series of stock market index prices are compared. Thus, the diversification benefit among them will reduce as correlations between the AEM indices return are bound to increase.

All analyses provide the same conclusions; that the AEMs are not integrated in the pre-recession period but are integrated in the post-recession period. The finding that the AEM stock markets are more integrated after an economic crisis is consistent with the findings of Bahng (2005) and Majid et al. (2009). This study concludes that the strategy of international investment might not be a viable one in the future as the literature has found developed stock markets to be integrated and this study has found the emerging stock markets are integrated as well.

However, this study only examines implication stock markets integration on risk reduction benefit of international diversification and does not examine if international diversification is able to generate a higher return. This study is also focused on the eight AEMs and does not cover the other emerging market. The investigation on whether emerging markets from other parts of the world are integrated and if higher returns is obtainable by investing in emerging markets are aims worthy of another study.

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