FINANCIAL INTEGRATION THROUGH EQUITY MARKETS AND THE ROLE OF EXCHANGE RATE: EVIDENCE FROM ASEAN-5 COUNTRIES

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ABSTRACT

This study explores equity market integration for five major ASEAN countries: Malaysia, Singapore, Thailand, Philippines and Indonesia. The motivation emanated from the fact that these countries have been implementing financial reforms in their attempt to promote economic efficiency. By applying the bivariate and multivariate cointegration techniques we test whether ASEAN-5 stock markets are globally or regionally integrated. For the global markets, the study focus on the role of the US, Japan and world market. The importance of exchange rate on the integration is examined under the multivariate framework. The study also address the possible impact of 1997 Asian financial crisis on the integration. While the findings revealed that some of these markets are regionally and globally integrated, the integration however is not fully complete, thus reflect some diversification benefits in these markets. The study also support previous findings that documented evidence on the increasing influence of Japan on ASEAN countries relative to the US. The study also shows significant impact of the financial crisis and provide evidence on the importance of exchange rate on the integration.

Keywords: ASEAN stock markets, cointegration, financial integration, financial crisis

INTRODUCTION

Increasing liberalization measures undertaken by many countries in the world, notably during the last two decades has motivated studies on financial market integration. Liberalization of financial markets can be in the form of removal of

capital barriers, exchange controls or ownership barriers (Ragunathan, 1999). For example, in the 1970s government-imposed barriers to the international capital flow in major industrialized countries were gradually relaxed, and by the 1980s they had been substantially eliminated (Throop, 1994). The relaxation or removal of barriers to investment has provided easier access to one country's capital market thus may lead to financial market integration.

The economic implications of financial market integration have increased research interest on this subject matter. Benefits gained from the market integration have been widely documented. Among others, improving the global allocation of capital and helping countries to better share risk by reducing consumption volatility (Kose, Prasad, & Terrones, 2003), a larger investment opportunity set and increasing growth rate. Despite these benefits, increasing market integration or reducing market segmentation diminishes the ability of governments to achieve independent economic policies (Swanson, 1987). Financial integration also may have impact upon risk return relationship between assets (Ragunathan, 1999), which is pertinent in the issue of portfolio selections and asset pricing. Zhang (2006) pointed out that if markets are globally integrated, only global risk factors are priced for international assets and from the perspective of a portfolio investor, stock market integration suggests that separate markets move together and have high correlations, so there is less benefit from portfolio diversification across countries (Click & Plummer, 2005).

Studies on financial integration in developed markets (e.g. Davies, 2006; Choudhary, 1994; Corhay, Tourani, & Urbain, 1993) and in less developed market (e.g. Antell & Vaihekoski, 2007; Gerlach, Wilson, & Zurbruegg, 2006; Click & Plummer, 2005; Daly, 2003) have provided mixed and conflicting evidence. Comparisons as to the reasons of such different conclusions is difficult due to different markets indices used over various sample period and varying frequency of returns. Thus, determining the integration of national equity market from international financial markets is an empirical question and because of its economic implications, it is deserved to be explored further.

The objective of this study is to examine financial integration on ASEAN market. The interest on ASEAN markets emanated from the fact that these countries have been implementing financial reforms in their attempt to promote economic efficiency. For example Singapore were the first to begin liberalizing their financial systems by removing or relaxing interest rate regulations and abolishing exchange controls in the mid 1970s. This was followed by Malaysia with significant financial reforms in the late 1970s (Phylaktis, 1997). In addition, the emerging equity markets which includes some of the ASEAN countries have attracted the attention of international fund managers as an opportunity for portfolio diversification (Jan, Chou, & Hung, 2000) and have also intensifies the

curiosity of academics in exploring international market linkages because increasing degree of integration between emerging markets and developed countries may decrease their ability to enhance and diversify international portfolio (Yu & Hassan, 2006).

Our study attempt to provide clearer picture on the integration in ASEAN equity market by examining whether these markets are integrated with the global as well as regional financial markets. We focus on five major ASEAN economies, namely Malaysia, Singapore, Indonesia, Philippines and Thailand since they are among the largest equity markets in ASEAN region. For global market we use US, Japan and world market as proxy, as most of previous studies have concentrated on the influence of the US and Japan on ASEAN countries (see among others Durand, Kee, & Watson, 2001; Ghosh, Saidi, & Johnson, 1999; Phylaktis, 1999; 1997). On the regional integration, such attempt is parallel to several development made by these countries as initiatives to coordinate the five national capital markets and to undertake economic and financial integrative measures such as the forming of the ASEAN Free Trade Area (AFTA) and the ASEAN Investment Area (AIA) and also the possibility of a currency union in the region (Click & Plummer, 2005). Several studies among others have provided evidence on the significant impact of financial crisis on financial integration. For example, Gerlach et al. (2006) have argued that the diversification benefits of integration are actually less than that suggested by an analysis incorrectly ignoring the crisis, since the existence of a structural break may disguise the true nature of any potential relationships between financial assets. Finally, besides focusing on the bivariate framework, the study also applies the multivariate framework to include the possible impact of exchange rate on integration. As pointed by Tai (2007), exchange rate is important in testing for financial market integration since purchasing power parity (PPP) does not hold, as documented by many empirical studies. In the absence of PPP, international investors will face different real returns when holding the same assets. In addition, exchange rate mechanism in many small and/or emerging markets often differs from developed markets such as the US (Antell & Vaihekoski, 2007).

LITERATURE REVIEW

Many attempts have been made to examine financial integration either in developed or less developed countries motivated by the globalization of financial markets and financial liberalization. Major issues concerning the literature on financial integration are whether financial markets are integrated or segmented with global markets. For developed countries, studies by Davies (2006), Choudhary (1994), Corhay et al. (1993), among others, have yielded mixed results. While Choudhary found no evidence of long run relationship among

developed countries namely US, UK, Japan, Italy, France, Canada and Germany for the period of 1953 to 1989, Corhay et al. (1993) found evidence of strong integration among five major European markets (France, Germany, Italy, Netherlands and UK). Davies have found scant evidence in favor of market integration among seven major developed equity markets (US, UK, Japan, Germany, Switzerland, Australia and Canada) with a single regime treatment, however significant evidence of long run relationship when a two-regime Markov switching is applied.

Studies for less developed market (e.g. Gerlach et al., 2006; Click & Plummer, 2005; Daly, 2003; Durand et al., 2001; Masih & Masih, 1999) have also yielded mixed conclusions. In examining whether these markets are globally integrated, most of the studies, particularly using data on the Asian emerging markets, have focused on the influence of two major world economies: the US and Japan. Studies by Durand et al. (2001) among others found that these markets are integrated with global markets specifically with US markets. In contrast, Masih and Masih (1999) found evidence that the stock market fluctuations in southeast region are mostly influenced by the regional rather than the advanced markets. Their study includes world's most advanced stock markets as well as four emerging Asian stock markets (Hong Kong, Thailand, Singapore and Malaysia) to examine the long and short term dynamic linkages among international and Asian emerging stock markets.

Several other studies have examined integration across the ASEAN market and found evidence that these markets are regionally integrated. Chai and Rhee (2005) and Click and Plummer (2005), among others have confirmed to some extent that ASEAN markets are regionally integrated. Chai and Rhee (2005) used cross-market correlations, focused mainly on the stock market to examine financial integration in East Asian countries, namely Korea, China, Japan, Hong Kong, Taiwan, Indonesia, Malaysia, Philippines, Singapore, Thailand, with 14 European countries. Click and Plummer (2005) examined stock market integration in ASEAN five markets in the aftermath of the Asian financial crisis using daily and weekly data and stock prices in local and common currencies: US dollar and Japanese yen. They pointed out that the capital market efficiency in Southeast Asia has become more important after the crisis. Using high frequency data on stock indices for the period of July 1998 through December 2002 they found that the stock markets are not completely segmented by national borders and concluded that ASEAN five stock markets are integrated in the economic sense, but that integration is not complete. They stressed that the findings does not depend on the data frequency (whether analyzed using daily or weekly data) and the choice of currency (whether analyzed in local or common currencies).

Previous studies have examined the effect of financial crisis on the financial integration with mixed conclusions. Gerlach et al. (2006) pointed out that shocks such as financial crisis may generate a structural break which may disguise the true nature of any potential relationships between assets. While studies by Arshanapalli and Doukas (1993) and Gerlach et al. (2006), among others, have found evidence of the effect of financial crisis on the relationship between stock markets. Daly (2003) have documented mixed evidence. Arshanapalli and Doukas (1993) examined the interactions among stock price indices across the major world exchanges during the pre- and post-October 1987 period. They found evidence of stronger long run relationship between three European markets: France, Germany and the UK with the US stock market during post-1987 crash period than the pre-1987 period. Gerlach et al. (2006) examined the impact of financial crisis upon the integration and dynamic links between a number of Asia-Pacific real estate markets. They found that the Asian crisis generated a structural break that caused a shift in the model parameter values around mid-1997. Despite such structural shift, the results showed that Asia-Pacific property markets are integrated. Daly (2003) studied the interdependence of the stock markets of Southeast Asian (Indonesia, Malaysia, Philippines, Singapore and Thailand) and the advanced stock markets of Australia, German and the US. They found mixed results on the effect of financial crisis. While the correlation analysis indicate that the majority of stock markets in the study became more integrated after the October 1997 crash, the bivariate cointegration between Thailand and Indonesia reveals one co-integrating vector over both the pre- and post-1997 crisis periods. However, the multivariate cointegration between the stock markets of Australia, Germany and the US with the Southeast Asian market show no evidence in support of cointegrating relationships, in either the pre- or post-crisis period.

Other studies such as Antell and Vaihekoski (2007) and Tai (2007), have examined the possible impact of exchange rate on financial integration. Tai (2007) found evidence that exchange rate is significant when examining the integration between Asian emerging stock and world capital markets. Antell and Vaihekoski (2007) included exchange rate risk to study the international capital asset pricing model on Finnish stock market. They found evidence that currency risk is priced in the Finnish market.

DATA AND METHODOLOGY

Five major ASEAN markets are used in the study namely Malaysia, Indonesia, Singapore, Thailand and Philippines. The global markets are the US, Japan and world market. All data are monthly closing prices for the period of April 1983 to December 2006 for Malaysia, Indonesia, Singapore, Thailand and January 1986

to December 2006 for Philippines, collected from Datastream International. The stock indices used are Indonesia Jakarta Composite, Malaysia KLCI, Philippines Composite Index, Singapore Straits Times Index, Bangkok S.E.T., S&P 500 Composite for US, Nikkei 225 Stock Average for Japan, and Morgan Stanley Corporation (MSCI) World price index. For exchange rate variables, we use bilateral exchange rates of each country against the US dollar. The US is chosen due to the global importance of both the US economy and the US dollar, along with the availability of US dollar-based exchange rate data (Salehizadeh & Taylor, 1999). For Malaysia, since Ringgit Malaysia was pegged from September 1998 until May 2005, we also use nominal effective exchange rates (NEER) for comparison purposes. Besides testing for full sample, to address the impact of financial crisis, the sample is further divided into the pre-crisis from April 1983 to June 1997 and post-crisis from July 1998 to December 2006. Previous studies that examined the impact of financial crisis, among others study by Chai and Rhee (2005), Fujii (2002) and Phylaktis and Ravazzolo (2002) have used period before June 1997 as the pre-crisis period. For the post-crisis, studies by Click and Plummer (2005) and Tan and Tse (2002) have used mid-1998 (July 1998) as the beginning of the post-crisis period because the bulk of the Asian financial crisis had ended by then (Click & Plummer, 2005).

Johansen (1988) cointegration test has been widely used in testing for financial integration. Particularly, the technique of multivariate cointegration has been used extensively to study financial market integration around the world (Click & Plummer, 2005). The test indicates the number of cointegrating vectors using the maximum likelihood approach. It provides two test statistics to test for the existence of *r* cointegrating vectors which are the maximum eigenvalue test and trace test. This study rely on both the maximum eigenvalue and trace statistics.

A long run relationship between two stock market indices, *j* and *i*, can be represented by:

$$Ln(P_t^j) = a_0 + a_1 Ln(P_t^i) + e_t \qquad (1)$$

where the stock market integration in the long run implies a linear relationship between the natural logarithms of the market price indices, $Ln(P^j)$ and $Ln(P^i)$. This is a test of the cointegration of two variable series. If both of them are cointegrated, the error term *e* in the above equation is stationary, and there exists a long run equilibrium relationship between the two series.

As one of the objective of this study is to examine the importance of exchange rate on the integration, besides employing the bivariate framework as in

equation (1), we also employ the multivariate cointegration to include exchange variable in equation (1), represented by:

$$Ln(P_t^j) = a_0 + a_1 Ln(P_t^i) + a_2 Ln(X_t) + e_t \qquad (2)$$

where $Ln(P_t^j), Ln(P_t^i)$ and $Ln(X_t)$ are the natural logarithms of the market price indices *j* and *i* and the exchange rate (bilateral exchange rates of each country against the US dollar and also NEER and REER for Malaysia only) at time *t*.

Before testing for cointegration, the series are required to be integrated of the same order. We tested for unit roots to verify the stationarity for all the series using the Augmented Dickey Fuller (ADF) test with the following regression:

$$\Delta r_t = \alpha + \gamma r_{t-1} + \sum_{i=1}^{k} \theta_i \Delta r_{t-i} + \varepsilon_t \qquad (3)$$

where, α and γ are parameters, *r* is the variable under consideration and ε_t is assumed to be white noise. The results of the test can be sensitive to the choice of the lag length *k*, therefore the Akaike Information Criteria (AIC) and Schwartz Bayesian Criterion (SBC) are employed to determine the optimal lag-structure specification of equation (2).

RESULTS AND DISCUSSIONS

Descriptive Statistics

The descriptive statistics for monthly stock indices from the period of April 1983 to December 2006 is provided in Table 1. The table shows that Japan has the highest mean price (9.768) compared to all the global and ASEAN markets. Among the ASEAN markets, Philippines has the highest mean of 7.249 with higher standard deviation compared to the rest of ASEAN markets except Indonesia which has the highest standard deviation of 0.750 with average mean of 5.989. Singapore has the lowest mean relative to other markets (5.264) and, as expected, has the lowest standard deviation (0.310).

Table 1
Summary Statistics of Monthly Stock Indices of Five Major ASEAN and Global Markets for Full Sample

	Phil	Japan	Mal.	Ind	Sing.	Thai	US	World
Mean	7.249	9.768	6.477	5.989	5.264	6.322	6.462	6.686
Median	7.300	9.777	6.555	6.115	5.257	6.462	6.495	6.705
Max	8.138	10.569	7.151	7.499	6.004	7.428	7.325	7.504
Min	4.892	8.966	5.146	4.122	4.209	4.860	5.356	5.685
St. Dev.	0.609	0.347	0.438	0.750	0.310	0.571	0.602	0.394
Skew	−1.276	−0.046	−0.899	−0.963	−0.500	−0.322	−0.173	−0.027
Kurto	5.455	2.638	3.345	3.767	3.965	2.679	1.518	2.124
J-Bera	131.655	1.464	35.221	45.095	20.279	5.450	24.325	8.084
Prob	0.000	0.481	0.000	0.000	0.000	0.066	0.000	0.018

Notes: Phil = Philippines; Sing = Singapore; Mal = Malaysia; Ind = Indonesia; Thai = Thailand; US = United States

Correlations

Correlation among ASEAN markets and with global markets are presented in Table 2.

Table 2
Correlation between Stock Price Indices of Five Major ASEAN and Global Markets for Full Sample

	Phil	Japan	Mal	Ind	Sing	Thai	US	World
Japan	−0.123	1	−0.261	−0.305	−0.252	0.240	−0.664	−0.489
Mal	0.897	−0.261	1.000	0.846	0.830	0.713	0.613	0.618
Ind	0.763	−0.305	0.846	1.000	0.840	0.559	0.732	0.725
Sing	0.777	−0.252	0.830	0.840	1.000	0.485	0.733	0.772
Thai	0.687	0.240	0.713	0.559	0.485	1.000	-0.014	0.022
US	0.585	−0.664	0.613	0.732	0.733	−0.014	1.000	0.970
World	0.638	−0.489	0.618	0.725	0.772	0.022	0.970	1.000
Phil	1.000	−0.123	0.897	0.763	0.777	0.687	0.786	−0.623

Notes: Phil = Philippines; Sing = Singapore; Mal = Malaysia; Ind = Indonesia; Thai = Thailand; US = United States

Positive correlations are observed among five major ASEAN countries ranging from 0.485 (Singapore and Thailand) to 0.897 (Malaysia and Philippines). Correlations among the global markets are higher, ranging from −0.489 (Japan and World) to 0.970 (US and World). Between ASEAN countries and the global market, correlation with Japan are generally the lowest ranging from 0.123 (Philippines and Japan) and 0.305 (Indonesia and Japan). In general, most correlation are less than one especially between ASEAN markets and Japan which indicates some diversification benefits for portfolio investors in the ASEAN region.

Unit Roots Test

Prior to cointegration analysis, the univariate properties of the variables (stock price indices and exchange rates) need to be tested for unit root employing the ADF unit root test. The number of lags utilized is chosen using the AIC and SBC. The test results using both the AIC and SBC, not reported, are qualititatively similar (results are available from the author upon request). In general, the null hypotheses of unit roots in exchange rates and stock indices are not rejected in all markets for the levels, whereas rejected in the first difference for the full sample and also for the three sub-periods. Since the series are integrated of same order and is I(1), thus cointegration analysis is appropriate.

Cointegration Test

For cointegration tests, the results for only those combinations that reveal significant cointegrating relationships are reported (fully-detailed results are available upon request). Table 3(a) reports the bivariate cointegration test within ASEAN region for the whole sample, pre-crisis and post-crisis.

Table 3(a)
Bivariate Cointegration Test among ASEAN Stock Markets for Full Sample, Pre- and Post-Crisis

Countries	Null	Full sample		Pre-crisis		Post-crisis	
		Trace	Max eigen value	Trace	Max eigen value	Trace	Max eigen value
Sing + Thai	$r = 0$	5.591	4.339	12.495	10.167	13.177	7.372
	$r \leq 1$	1.252	1.252	2.329	2.329	5.805*	5.805*
Sing + Phil	$r = 0$	18.337*	15.835*	24.02**	16.500*	18.857*	18.048*
	$r \leq 1$	2.502	2.502	7.517**	7.517**	0.809	0.809
Thai + Mal	$r = 0$	16.975*	10.407	12.251	7.958	10.519	8.927
	$r \leq 1$	6.5686*	6.568*	4.294*	4.294*	1.592	1.592
Thai + Phil	$r = 0$	18.017*	15.683*	9.282	8.629	9.467	7.745
	$r \leq 1$	2.334	2.334	0.653	0.653	1.721	1.721
Mal + Phil	$r = 0$	23.17**	16.202*	16.535*	13.287	10.644	10.116
	$r \leq 1$	6.974**	6.974**	3.248	3.248	0.529	0.529
Ind + Phil	$r = 0$	15.794*	13.743	11.749	7.559	2.131	2.088
	$r \leq 1$	2.051	2.051	4.190*	4.190*	0.043	0.043

Notes: *(**) significant at 5% (1%) level
Critical values are based on Osterwald-Lenum (1992)
Phil = Philippines; Sing = Singapore; Mal = Malaysia; Ind = Indonesia; Thai = Thailand

The results show that for the full sample, Malaysia is cointegrated with Thailand and Philippines are cointegrated with all other ASEAN countries with a strong significant relationship between Philippines and Malaysia (1%

significance level). However, such relationship differs during the pre- and post-crisis. During pre-crisis period, Philippines are cointegrated with all the countries except Thailand and Malaysia is cointegrated with Thailand. During the post-crisis, only Singapore have long run relationship with Philippines and Thailand. While the results show evidence of regional integration across some of the countries, they are not consistent between the full sample and the two sub-periods which suggest the impact of financial crisis on the integration.

Table 3(b)
Bivariate Cointegration Test between ASEAN and Global Stock Market for Full Sample, Pre- and Post-Crisis

Countries	Null	Full sample		Pre-crisis		Post crisis	
		Trace	Eigen value	Trace	Eigen value	Trace	Eigen value
Phil + Japan	r = 0	15.89*	14.030	16.95*	15.65*	18.38*	17.050*
	r ≤ 1	1.856	1.856	1.296	1.296	1.329	1.329
Phil + US	r = 0	19.27*	17.945*	14.024	12.749	6.190	4.930
	r ≤ 1	1.329	1.329	1.275	1.275	1.260	1.260
Sing + Japan	r = 0	7.509	6.983	13.130	8.703	12.991	12.420
	r ≤ 1	0.527	0.527	4.426*	4.426*	0.571	0.571
Sing + World	r = 0	15.194	8.417	18.309*	15.648*	5.723	3.966
	r ≤ 1	6.78**	6.776**	2.661	2.661	1.758	1.758
Thai + Japan	r = 0	8.042	5.106	13.593	7.318	16.38*	12.018
	r ≤ 1	2.937	2.937	6.275*	6.275*	4.363*	4.363*
Mal + World	r = 0	10.375	5.482	9.451	6.818	7.911	6.603
	r ≤ 1	4.893*	4.893*	2.633	2.633	1.307	1.307
Ind + Japan	r = 0	10.204	9.612	14.354	10.212	5.793	4.631
	r ≤ 1	0.591	0.591	4.141*	4.141*	1.162	1.162

Notes: *(**) significant at 5% (1%) level
Critical values are based on Osterwald-Lenum (1992)
Phil = Philippines; Sing = Singapore; Mal = Malaysia; Ind = Indonesia; Thai = Thailand; US = United States

Table 3(b) provides the result of the bivariate test between ASEAN countries and global markets. For the full sample, Philippines are cointegrated with Japan, US and Singapore and Malaysia are cointegrated with the world market. The long run relationship between Philippines and Japan under the full sample are consistent under both the pre- and post-crisis. During the pre-crisis, Japan are cointegrated with all the countries except Malaysia and world market cointegrates only with Singapore. During the post-crisis only Japan are cointegrated with Philippines and Thailand. The results show evidence of global integration for some of the ASEAN countries especially with world and Japan. The results under bivariate framework thus support previous studies such as Tan and Tse (2002) who found evidence of increasing influence of Japan on ASEAN markets relative to US.

To address the possible impact of exchange rate on financial integration as was raised in previous studies, the multivariate cointegration test the financial integration across ASEAN markets and global markets together with exchange rate variable. Tables 4(a) and 4(b) presents the results for the multivariate cointegration for the whole sample and also for the two sub-periods. From Table 4(a), for the full sample only few markets have long run relationship with each other specifically Singapore are cointegrated with other ASEAN markets except Philippines; Malaysia is cointegrated with Thailand. The relationship differs during the pre- and post-crisis whereby more countries are cointegrated with each other. The results thus confirm previous studies that show the impact of financial crisis and significant role of exchange rate on integration. Similarly, the results from Table 4(b) highlights the impact of financial crisis and significant role of exchange rate on integration. Cointegration between the markets have increased during the pre- and post-crisis compared to the full sample. During the post-crisis period the results show that Japan are cointegrated with all the countries except Singapore thus demonstrates the increasing influence of Japan on ASEAN countries relative to US. Applying multivariate cointegration approach with the inclusion of exchange rate in the model also support previous studies such as Tan and Tse (2002) and Durand et al. (2001) who found increasing influence of Japan on Asian markets. The results also support the benefits gain for portfolio diversification in these countries.

Table 4(a)
Multivariate Cointegration Test between ASEAN Stock Market and Exchange Rate for Full Sample, Pre- and Post-Crisis

Countries	Null	Full sample		Pre-crisis		Post-crisis	
		Trace	Max eigen value	Trace	Max eigen value	Trace	Max eigen value
ST sing/usd	$r = 0$	50.29^{**}	40.7^{**}	38.55^{**}	27.41^{**}	30.163^{*}	16.962
SM sing/usd	$r = 0$	33.953^{*}	24.7^{*}	37.77^{**}	24.563^{*}	40.69^{**}	26.05^{**}
SI sing/usd	$r = 0$	19.652	15.18	22.995	18.838	32.294^{*}	22.251^{*}
SP sing/usd	$r = 0$	33.96^{*}	24.0^{*}	42.95^{*}	26.00^{**}	30.009^{*}	17.417
	$r \leq 1$	9.951	7.687	16.950^{*}	13.650	12.592	12.556
TS baht/usd	$r = 0$	21.335	14.67	46.45^{**}	22.006^{*}	40.03^{*}	27.77^{**}
	$r \leq 1$	6.666	5.901	24.45^{**}	17.724^{*}	12.263	8.650
	$r \leq 2$	0.765	0.765	6.724^{**}	6.724^{*}	3.613	3.613
TM baht/usd	$r = 0$	34.331^{*}	23.0^{*}	42.14^{**}	26.59^{*}	32.176^{*}	18.301
	$r \leq 1$	11.328	9.743	15.551^{*}	13.653	13.875	10.742
TI baht/usd	$r = 0$	20.402	13.35	51.94^{**}	37.71^{*}	22.913	16.056
MS neerm	$r = 0$	24.105	15.01	38.62^{**}	27.53^{*}	44.12^{*}	25.366^{*}
	$r \leq 1$	9.099	7.181	11.093	5.825	18.751^{*}	12.618
	$r \leq 2$	1.918	1.918	5.268^{*}	5.268^{*}	6.133^{*}	6.133^{*}

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Countries	Null	Full sample		Pre-crisis		Post-crisis	
		Trace	Max eigen value	Trace	Max eigen value	Trace	Max eigen value
MT myr/usd	r = 0	35.111*	20.83	31.806*	17.858	45.031*	28.550*
	r ≤ 1	14.279	11.73	13.949	9.352	16.481*	14.743*
	r ≤ 2	2.551	2.551	4.597*	4.597*	1.738	1.738
MT neerm	r = 0	32.584*	21.2*	36.48*	23.833*	33.127*	22.629*
	r ≤ 1	11.382	10.72	12.646	8.028	10.498	8.618
	r ≤ 2	0.662	0.662	4.618*	4.618*	1.880	1.880
MI myr/usd	r = 0	14.909	10.24	28.693	21.850*	29.960*	19.888
MI neerm	r = 0	20.708	11.52	18.913	8.803	30.094*	24.826*
MP myr/usd	r = 0	25.459	14.95	26.568	16.125	33.021*	20.343
MP neerm	r = 0	26.950	16.63	31.921*	23.143*	26.401	13.030
PS peso/usd	r = 0	26.709	14.73	42.14*	26.59*	37.41**	28.8**
PI peso/usd	r = 0	20.810	15.03	31.353*	18.068	15.922	13.615
PM peso/usd	r = 0	28.318	17.67	26.013	15.451	29.830*	19.339
IT rupiah/usd	r = 0	25.438	18.23	13.686	8.621	28.917	21.171*
IM rupiah/usd	r = 0	12.421	7.139	17.555	9.894	51.95**	35.95**
	r ≤ 1	5.281	4.992	7.662	4.849	16.003*	14.910*
IP rupiah/usd	r = 0	18.973	14.19	29.687*	15.739	23.723	20.269
	r ≤ 1	4.776	3.255	13.948	9.698	3.454	3.378
	r ≤ 2	1.521	1.521	4.250*	4.250*	0.076	0.076

Notes: *(**) significant at 5% (1%) level
Critical values are based on Osterwald-Lenum (1992)
P = Philippines; S = Singapore; M = Malaysia; I = Indonesia; T = Thailand; sing = Singapore dollar; usd = US dollar; myr = Ringgit Malaysia; neerm = nominal effective exchange rate for Malaysia

Table 4(b)
Multivariate Cointegration Test between ASEAN and Global Stock Market and Exchange Rate for Full Sample, Pre- and Post-Crisis

Countries	Null	Full sample		Pre-crisis		Post-crisis	
		Trace	Eigen value	Trace	Eigen value	Trace	Eigen value
PJ peso/usd	r = 0	24.511	16.933	27.506	16.22	26.090	22.916*
PW peso/usd	r = 0	33.471*	20.865	16.118	13.87	19.492	14.056
SJ sing/usd	r = 0	19.421	11.732	29.716*	15.17	26.403	18.340
SUS sing/usd	r = 0	37.23**	26.58*	26.222	20.45	22.351	14.693
SW sing/usd	r = 0	32.155*	21.484*	36.60*	27*	22.682	14.703
TJ baht/usd	r = 0	15.549	11.155	46*	23.4*	32.406*	19.355
	r ≤ 1	4.394	2.894	22.62*	19**	13.051	11.040
	r ≤ 2	1.500	1.500	3.914*	3.91*	2.011	2.011
TUS baht/usd	r = 0	29.834*	18.949	32.137*	21.5*	25.291	15.654
	r ≤ 1	10.885	6.390	10.661	9.590	9.637	7.488
	r ≤ 2	4.495*	4.495*	1.071	1.071	2.148	2.148
TW baht/usd	r = 0	22.265	12.826	41.31**	24.6*	26.143	15.606
	r ≤ 1	9.439	7.750	16.688*	16.1*	10.537	8.375

Table 4(b) *(Continued)*

Countries	Null	Full sample		Pre-crisis		Post-crisis	
		Trace	Eigen value	Trace	Eigen value	Trace	Eigen value
MJ myr/usd	r = 0	19.405	13.022	26.177	14.55	33.553*	21.421*
	r ≤ 1	6.383	5.340	11.629	9.168	12.132	8.056
	r ≤ 2	1.044	1.044	2.461	2.461	4.076*	4.076*
MJ neerm	r = 0	19.700	10.423	26.515	11.01	40.24*	20.039
	r ≤ 1	9.277	7.957	15.500*	9.676	20.20*	11.269
	r ≤ 2	1.320	1.320	5.824*	5.82*	8.933*	8.933*
MUS myr/usd	r = 0	26.330	19.033	15.816	8.664	25.769	12.484
	r ≤ 1	7.297	6.059	7.151	6.937	13.285	7.907
	r ≤ 2			0.214	0.214	5.378*	5.378*
MUS neerm	r = 0	19.761	11.756	17.441	11.01	37.79*	15.742
	r ≤ 1	8.005	6.680	6.434	5.571	22.05**	12.117
	r ≤ 2	1.325	1.325	0.863	0.863	9.930**	9.930*
MW myr/usd	r = 0	29.68	20.97	20.561	13.35	34.518*	18.075
	r ≤ 1	15.41	14.07	7.213	6.494	16.444*	10.657
	r ≤ 2	3.76	3.76	0.719	0.719	5.787*	5.787*
MW neerm	r = 0	22.236	9.873	26.113	16.75	38.45**	17.083
	r ≤ 1	12.363	7.790	9.359	9.357	21.37**	12.425
	r ≤ 2	4.573*	4.573*	0.002	0.002	8.945**	8.945**
IJ rupiah/usd	r = 0	16.478	12.385	23.032	10.86	26.230	22.013*
IW rupiah/usd	r = 0	13.784	8.366	30.394*	17.58	27.988	25.225*
	r ≤ 1	5.418	3.923	12.817	8.718	2.762	2.640
	r ≤ 2	1.496	1.496	4.098*	5*	0.122	0.122

Notes: *(**) significant at 5% (1%) level
Critical values are based on Osterwald-Lenum (1992)
P = Philippines; S = Singapore; M = Malaysia; I = Indonesia; T = Thailand; US = United States; J = Japan; W = world; sing = Singapore dollar; usd = US dollar; myr = Ringgit Malaysia; neerm = nominal effective exchange rate for Malaysia

CONCLUSIONS

Examining financial market integration through equity markets has received tremendous attention specifically for ASEAN markets due to the increasing financial liberalization measures undertaken by these countries. This study examines the regional and global integration in five major ASEAN countries using both the bivariate and multivariate cointegration framework. In the multivariate approach we examine the role of exchange rate since it may have important impact on financial market integration in the absence of PPP such as pointed out by Tai (2007). The empirical evidence showed that some of the ASEAN markets are found to be both regionally and globally integrated thus are not completely segmented by national borders reflecting some diversification benefits and the ability to influence their markets independently from the influence of global stock market. The results also show the increasing influence

of Japan relative to US on the ASEAN markets, thus supporting previous studies such as Durand et al. (2001), Ghosh et al. (1999) and Phylaktis and Ravazzolo (2002). Such finding suggests the importance of regional and global market especially the Japanese market as risk factors in ASEAN markets' asset pricing. This study also support the evidence by Gerlach et al. (2007) who found that the Asian crisis has generated a structural break that caused a shift in the model of their study. Finally, the results showed the significant impact of exchange rate on the integration thus suggesting that it is more appropriate to employ multivariate approach inclusive of exchange rate variables in examining financial integration in ASEAN markets.

This study has produced results with regard to the financial integration by examining the cointegration of the ASEAN stock markets focusing on the cointegration of two I(1) series and does not examine if the market is cointegrated with more than one countries. Omitting such relationship might give rise to model misspecification, thus this issue is worth to be examined in our next paper. The findings in this study could also be enhanced by examining further the role of economic integration on financial integration. Phylaktis and Ravazzolo (1999) suggest that economic integration can provide channels in linking the financial markets even in the presence of foreign exchange restrictions on international capital flows. The findings in this study could be enhanced by examining the role of economic integration on financial markets due also to increasing trends in trade activities across ASEAN markets and other global markets.

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