

# The Impact of Subsequent Stock Market Liberalization on the Integration of Stock Markets in ASEAN-4 + South Korea

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**Abstract**—To strengthen the capital market, there is a need to integrate the capital markets within the region by removing legal or informal restriction, specifically, stock market liberalization. Thus the paper is to investigate the effects of the subsequent stock market liberalization on stock market integration in 4 ASEAN countries (Malaysia, Indonesia, Thailand, Singapore) and Korea from 1997 to 2007. The correlation between stock market liberalization and stock market integration are to be examined by analyzing the stock prices and returns within the region and in comparison with the world MSCI index. Event study method is to be used with windows of  $\pm 12$  months and  $T-7 + T$ . The results show that the subsequent stock market liberalization generally, gives minor positive effects to stock returns, except for one or two countries. The subsequent liberalization also integrates the markets short-run and long-run.

**Keywords**—ASEAN, event method, stock market integration, stock market liberalization.

## I. INTRODUCTION

JAPAN'S Deputy Minister of Finance stated in his speech [1] that before the Asian financial crisis, those Asian countries had liberalized international capital flows and had received large inflows of unhedged, short-term foreign capital to finance long-term domestic lending. In 1997, there were rapid changes in market perceptions which led to massive outflows of capital and excessive mismatch of currency and maturity. It has been recognized that one of the structural weaknesses of Asian countries was underdeveloped capital markets. In addition to that, the world is moving toward a globally integrated capital market like European Union and North American Free Trade Agreement.

Therefore there is a need to strengthen financial cooperation to promote financial stability and to balance out the strong EU and NAFTA politically & economically. By having stronger financial cooperation and stability, the financial and capital markets would be able to fully mobilize savings, assets, and resources at lower transaction costs and provide medium and long-term capital. Those show the need to integrate the markets.

To integrate the capital markets within the region, Sheng [2] addressed that the cross-border activity within the region needs an improvement by creating transactions platform,

agreeing on common standards and principles, and removing legal or informal restrictions. The government decision on removal of legal or informal restrictions on capital inflows and outflows [3] is called stock market liberalization, which is to be the main focus of the paper. Stock market liberalization, in other words, is a government's decision to allow foreigners to purchase shares in that country's stock market. However, it has been a debatable issue, especially to the emerging markets like Malaysia, whether stock market liberalization would be able to integrate the markets, which is to be the concern of this paper. There are arguments that such move would only expose the country to more of negative consequences such as hot money and financial crisis. However, as the world is becoming more and more integrated, Malaysia and the neighboring countries in the region are somehow have to work on it.

This paper is to figure out to what extent the subsequent stock market liberalization would integrate the stock exchange markets in 4 ASEAN countries (Malaysia, Indonesia, Thailand, and Singapore) and South Korea. The results would be able to assist the authorities of other emerging economy to consider if they should think of implementing the subsequent stock market liberalization in order to integrate the market with the rest of the world. They would also be able to decide whether to amend or cancel the liberalization if the stock market liberalization policy fails to integrate the market, or should they go for tighter global financial regulation as suggested by France and Germany at G20 meeting in April 2009?

The 4 ASEAN countries (Malaysia, Thailand, Singapore, and Indonesia) and South Korea have been chosen as the study area due to the relationship, contribution, and impact of those countries in terms of population, gross domestic products, trading partners, and initiatives in integration. However, those countries have different socio-cultural and political beliefs which can also affect the market performances. ASEAN was established on August 8, 1967, which currently consists of Malaysia, Brunei, Indonesia, Philippines, Thailand, Singapore, Cambodia, Laos, Myanmar, and Vietnam. ASEAN and South Korea have embarked on initiatives to strengthen economic cooperation and financial security in ASEAN-Republic of Korea Commemorative Summit on June 2, 2009 and ASEAN-Korea Free Trade Area in November 2004. Chiang Mai initiative is another agreement

meant to strengthen financial cooperative framework in the region, including China and Japan.

Therefore, this paper aims to examine the effect of stock market liberalization on stock market performance as well as, international capital market integration in ASEAN-4 and South Korea. Only 4 ASEAN countries are analyzed and they are Singapore representing well-developed economy, Malaysia and Thailand representing developing economies and Indonesia representing a less-developing economy. Since the other four ASEAN countries do not have their own stock exchanges, they are excluded in the sample.

The objectives of this research are two folds. First, to examine the effect of subsequent stock market liberalization on the performance of stock market indices in ASEAN-4 + South Korea. For this research, the event study methodology is applied and hence, the daily cumulative abnormal return of each country's stock market index is measured, and this acts as a proxy for stock market performance. Second, to find out what happened to international stock market integration following stock market liberalization in these five countries.

Stock market liberalization has been generally defined as the government's or central bank's decision on the removal of restrictions on foreign capital inflows and outflows [3] and [14]. It is a gradual process generally involving several liberalizations subsequent to the first [3]. This paper, however, analyzes the subsequent stock market liberalization instead of the initial stock market liberalization. The stock market liberalization has been defined as the percentage change of foreign ownership ceiling on local equity.

The stock market is considered integrated when the rewards of bearing risk are similar. That is the condition when the two assets of same risk level from two arbitrarily selected stock markets, have same expected returns [22].

The research, therefore, comprises of these questions:

1. Does subsequent stock market liberalization affect country's stock index performances?
2. Are the stock exchange markets in ASEAN-4 + South Korea are well integrated?

Thus, this paper extends the literature by focusing on to what extent would the subsequent removal of restrictions on foreign ownership of local equity within the period of 1997 to 2007, can integrate the stock exchange markets of Asean-4 and South Korea.

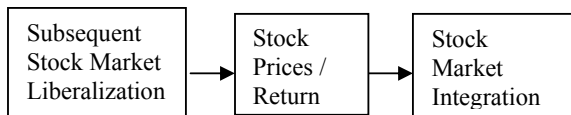


Fig. 1 Conceptual Framework

## II. LITERATURE REVIEW

A number of researchers have begun investigating the impact of market liberalization and capital market integration. They have defined stock market liberalization as comprehensive financial liberalization programs, such as: removal of interest rate and loan ceilings on loans and deposit

accounts, dismantle of government credit allocation programs, diversification of financial markets and institutions, removal of regulations, prevail measures that encourage competitiveness and free entry in the financial system [11]; the listing of new country funds and government decision to allow foreign investors to purchase more shares in their stock markets by relaxing capital controls [16]; the establishment of the first country fund and the increase in the investability index of at least 10 percent [3].

### A. Empirical studies on the Impact of Market Liberalization

There are studies done on the impact of market liberalization on real economy [4]-[6], risks [7] and [8], growth rates of private investment [14], foreign equity portfolio holdings [4], and efficiency of equity markets [9] and [10].

Studies by Grabel [11], Kwan and Reyes [12], Levine and Zervos [13], Henry [14], Bae, Chan and Ng [15], and Patro [16] emphasize on the impact of market liberalization on stock prices, stock returns and stocks volatility. Levine and Zervos [13] also concern on the impact on stock market size and liquidity.

The impact of stock market liberalization on market integration has been investigated by Tai [17], Hunter [18], Baharumshah, Sarmidi and Tan [19], Rangunathan [20], and Levine and Zervos [13]. However those studies emphasize on the period of pre and post first market liberalization of each country. Furthermore, none of the studies solely focus on ASEAN-4 + South Korea.

Kwan and Reyes [12] study on Taiwan, Grabel [11] focuses on Argentina, Columbia, Venezuela, South Korea, and Philippines, Laopodis [10] concentrates on Greece, Rangunathan [20] examines Australian market, Hunter [18] analyzes Argentina, Chile, and Mexico markets, Tai [17] focuses on 6 Asian emerging markets: India, Korea, Malaysia, Philippines, Taiwan, and Thailand. Baharumshah, Sarmidi, and Tan [19] study on Malaysia, Taiwan, Thailand, and South Korea. Levine and Zervos [13], Henry [3] and Patro [16] examine on 16, 11, and 18 emerging countries respectively, which includes Korea, Malaysia, Philippines, and Thailand.

Henry [3] conducts event study to assess the impact of stock market liberalization on emerging market equity prices. He uses cumulative abnormal returns and dividend yield with panel regression in event time to measure the relationship:

$$R_{it} = \alpha_i + \gamma \text{Lib}_{it} + \epsilon_{it} \quad (1)$$

$\alpha$  = country specific dummies

$\gamma$  = average abnormal return across region

$\text{Lib}_{it}$  = a dummy variable that takes on the value 1 in each of the 8 months for  $T^*-7$  to  $T^*$

To analyze the effects of financial market liberalization on emerging market country fund premiums, share prices, and net asset values (NAV), Patro [16] uses the theoretical models of Errunza and Losq [31]. Errunza and Losq develop a model of 'mild' segmentation. The monthly premium, excess return on shares, and excess return on net asset values (NAV) of

each U.S.-traded country fund are used in panel regression models.

Theoretically, according to Henry [14], to identify whether stock market liberalization is associated with a reduction in the cost of equity capital and a revaluation of equity prices, standard international asset pricing models (IAPMs) are used. IAPMs predict that stock market liberalization may reduce the liberalizing country's cost of equity capital by increasing the net capital inflows [16]. There are three reasons to explain on the relationship. First, the stock market liberalization might increase net capital inflows which could reduce the risk-free rate. Second, stock market liberalization is also allowing foreigners to purchase domestic shares, which facilitates risk sharing between domestic and foreign residents. Increased risk sharing should reduce equity premium. Increased capital inflows may also increase stock market liquidity [13], which will also reduce equity premium [3]. Moreover, if stock market liberalization reduces the aggregate cost of equity capital then, holding expected future cash flows constant, there should be an increase in a country's equity price index when the market learns that stock market liberalization is going to occur.

#### B. Empirical studies on the Capital Market Integration

Whether the capital or stock markets have been integrated, there are many different ways of investigation have been done. Guo [21] examines the evidence on saving-investment correlations and the covered interest parity conditions by using GARCH model to gauge the degree of financial integration. He focuses on 8 East Asia emerging markets. Lin [22] uses unconditional mean variance efficiency of MSCI to 16 OECD countries, Hong Kong, and 5 Asian emerging countries. The integration of capital markets has also been examined by adopting legally separated share markets (LSSM) by Qi [23], analyzing the co-movements of real interest rates by Phylaktis [24], formulating a multivariate panel regression model to examine investment barriers and global business cycle by Chuah [25], measuring the consumption patterns by Bayoumi [26], analyzing foreign direct investment as a measure for capital flows by Egger, Falkinger, and Grossmann [27], measuring variance of returns as measure of risk by Solnik [28], examining value of corporate diversification by Fauver, Houston, and Naranjo [29], and measuring resources to be held securely and intertemporally transferred at a lower rate of return by Rowat and Dutta [30].

Hunter [18] uses the conditionally expected monthly returns on value-weighted indices (portfolios) of American Depository Receipt (ADRs) and the U.S. markets in an asset pricing model to examine the level of integration. The ADRs and the U.S. markets expected returns are jointly modeled as a product of time-varying prices and quantities of equity and currency risks. The prices of risks for local ADRs portfolios and the U.S. market portfolios, in the post-liberalization period, are tested.

Ragunathan [20], conducts test for both integration and

segmentation using continuously compounded monthly rates of return on 23 CRIF industry portfolios and the MSCI World and US indices as proxies for the global index as modeled by Jorion and Schwartz (1986). In the integration test, the value-weighted industry portfolios are assumed to be priced solely according to the global index:

$$E(r_{it}) = \gamma_0 + \gamma_1 B_i^G, \quad (2)$$

which means the excess returns for the portfolio equals the expected excess returns on a zero beta portfolio, plus the market risk premium  $\gamma_1 = E(r_G) - \gamma_0$  multiply  $B_i^G$ , the relative risk of portfolio  $i$  relative to the global index. To avoid the error-in-variables problems, the maximum likelihood estimation has been used. On the other hand, in the test of segmentation, the roles of domestic and US markets are reversed. It is to identify whether segmentation parameters denoted by  $\delta$  equal zero.

Levine and Zervos [13] use both ICAPM and IAPM, where both imply expected return on each asset is linearly related to a benchmark portfolio or linear combination of a group of benchmark portfolios. In ICAPM, the benchmark portfolio is the excess return on a value-weighted portfolio of common stocks. Whereas, in IAPM regression of  $R_{it} = \alpha_i + b_i P_t + \epsilon_{it}$  (3);  $P$  is the estimated common factors based on an international portfolio of assets using the asymptotic principal components technique. For a perfectly integrated market, the intercept is a regression of any asset's excess return on the appropriate benchmark portfolio,  $P$ , should be zero.

Generally, based on the studies done on major European countries, U.S.A., and Japan, the capital markets are highly integrated. However, for other emerging countries, the capital markets are increasingly integrated after relaxing foreign investment restrictions in the 1990s [21]-[26] and [28].

Theoretically, according to Henry [14] stock markets are fully integrated when equity premium is proportional to covariance of country's aggregate cash flows with those of a world portfolio. When equity premium is proportional to variance of country's aggregate cash flows, then the stock markets are segmented. Generally, it is the condition when local price of risk (variance) exceeds the global price of risk (covariance).

Errunza and Losq [31] developed model of 'mild' segmentation, which is the prices of restricted securities are determined jointly by international and national risk premiums. Patro [16] uses such model to define fully integrated market.

$$ER_i - irf = \text{Agg Coef Cov} (R_i), (R_m) \quad (4)$$

$$E(r_i) - R_i = \beta[E(r_m) - R_m] \quad (5)$$

Lin [22] defines integrated stock markets as when 2 assets of the same risk level from 2 arbitrarily selected capital markets have the same expected return. She uses mean-variance efficiency of the MSCI world index in the context of the Sharpe-Lintner CAPM. In other word, if Sharpe-Lintner CAPM holds for the set of assets and the benchmark portfolio is mean-variance efficient, then the capital markets are integrated [22].

Sharpe-Lintner CAP Model is:  $R_{it} = \alpha_i + \beta r_{mt} + \epsilon_{it}$  (6)

$R_{it}$  = excess return on asset  $i$  in period  $t$

$r_{mt}$  = excess return on the MSCI world index in period  $t$

$\epsilon_{it}$  = disturbance term for asset  $i$  in period  $t$

If the error terms follow an iid multivariate normal distribution, the classical F-test is used. If the iid multivariate normality assumption is violated, the GMM (generalized method of moments) is to be used.

Capital asset pricing model states that cost of equity capital equals risk-free return plus a risk adjustment that is the product of the return on the market as a whole multiplied by beta risk measure of individual firm or project. Systematic risk is measured relative to a world market index and IAPM performs better than a purely national specification in an integrated market. However in a segmented market, the systematic risk is measured relative to a domestic index. In not fully integrated market, there should be gains from international diversification.

According to Tahai, Rutledge, and Karim [32], rewards for bearing risk should be similar in integrated markets. They use monthly stock indices of G7 on MSCI indices and check for cointegration of order two and VER. On the other hand, Hunter [18] measures integration based on equality of risk prices on American Depository Receipts. He uses an asset pricing model in which conditionally expected return on portfolio of ADRs and US market are jointly modeled as a product of time-varying prices and quantities of equity and currency risks. Rangunathan [20] states that the value-weighted industry portfolio is priced solely according to global index in the integrated market.

### III. METHODOLOGY

The study focuses on the ASEAN-4 (Malaysia, Singapore, Indonesia, and Thailand) + South Korea monthly main or composite index and cumulative abnormal monthly returns from Jan, 1997 to December, 2007. The data comprise of daily price index of each country's main or composite index, valued in US dollars. The indices used are the price indices of Malaysia's Kuala Lumpur Composite Index, Singapore's SES Index, Thailand's Bangkok SET Index, Indonesia's Jakarta Composite Index, South Korea's KOSPI Index, and MSCI World Index. The data are collected from Datastream.

There are two major analyses to be done: 1) study on the association of stock market liberalization on stock prices and returns, and 2) study on the stock market integration.

Event study method is used for the analysis, in which time period is divided into two sections: pre and post subsequent stock market liberalization implementation month. Therefore the implementation months of subsequent stock market liberalization during the time period of 1997 to 2007 are identified. Data are collected from central banks and stock exchanges of ASEAN-4 + 3 countries, International Financial Statistics (IFS) of IMF, Economist Intelligent Unit, International Finance Corporation, Asian Development Bank, Morgan Stanley Capital Investment (MSCI), and Lexis-Nexis.

TABLE I  
IMPLEMENTATION MONTHS OF SUBSEQUENT STOCK MARKET  
LIBERALIZATION

Country	Date	% change in foreign ownership ceilings
Korea	May 1998	100%
Thailand	May 1998	100% in banks and finance companies up to 10 years
Indonesia	May 1998	100%
Singapore	Sept 1999	49%
Malaysia	18 April 2005	30% to 49% (source: Lexis-Nexis)

Data on the implementation months of subsequent stock market liberalization are available in Table I.

To assess the impact or association of stock market liberalization on country's abnormal returns, an event study is used. There are two event windows to be studied: 1)  $\pm 12$  months, which is 12 months before and 12 months after the implementation month, T, 2) T-7 to T, which is 7 months before and on the implementation month. The event time T is the implementation month of subsequent stock market liberalization, which is the implementation month of policy change on the percentage of foreign ownership ceilings on local equity during 1997 to 2007. The result of the first event window would identify the relationship or coefficient of the series between the period before and the period after the implementation date of the percentage change in foreign ownership in local equity. However, the result of the second event window would identify the relationship or coefficient of the series in the period of possible announcement of the subsequent stock market liberalization till its implementation month. The first analysis is to identify the behavior of daily stock price index performance of each country for full sample size from Jan 1, 1997 to December 31, 2007. Second is to identify the behavior of the cumulative monthly abnormal return for full sample size. Third identifies the descriptive statistics of individual series of monthly returns. Forth examines the stationarity of the time series. Fifth is to examine the normality and heteroscedasticity of the series residuals. Sixth is to identify the behavior of the average performance of all 5 countries monthly return, 12 months before and after the implementation date (T). Last is the regression analysis in reference to (1) for two event windows, without and with a control on the effects of world stock market fluctuations.

Whereas, for the second study on stock market integration, analysis is done on three sample periods: a) full sample, which is from Jan 1997 to Dec 2007; b) pre-sample, which is in a period of Jan 1997 to Apr 1998. It is a period before the liberalization implementation month in Korea, Thailand, and Indonesia; c) post-sample, which is a period of May 1998 to May 2001. It is a period on and after the liberalization implementation month in Korea, Thailand, and Indonesia. May 1998 is the implementation month of percentage change of foreign ownership ceilings on local equity of those countries.

The data are analyzed by using regression analysis in reference to (6), correlation coefficient, and cointegration test.

IV. RESULTS

A. Analysis on Association of Stock Market Liberalization

1) Plots of Price Indices Behaviors

Plots below show the daily price indices in US dollar for Malaysia, Thailand, Indonesia, Singapore, Korea, and MSCI-World. The data are collected from Datastream.

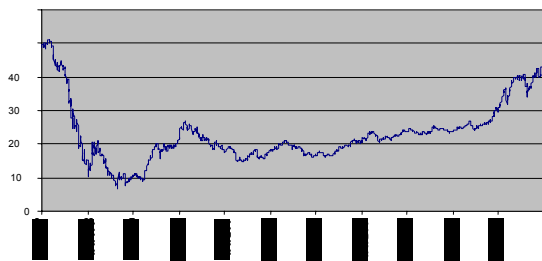


Fig. 2(a) KLCI Composite-Daily Price Index in US\$ From 1/1/97 to 31/12/07

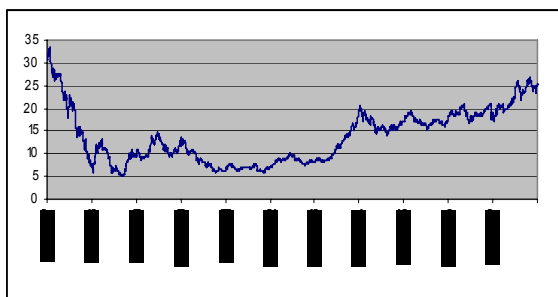


Fig. 2(b) Bangkok S.E.T-Daily Price Index in US\$ From 1/1/97 to 31/12/07

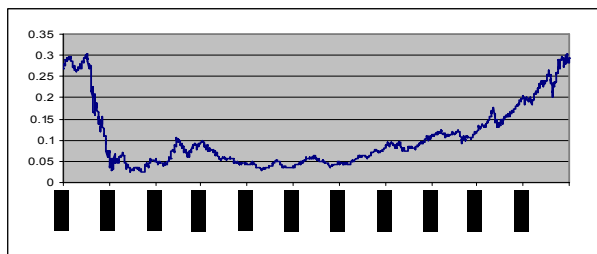


Fig. 2(c) Jakarta SE Composite-Daily Price Index in US\$ From 1/1/97 to 31/12/07

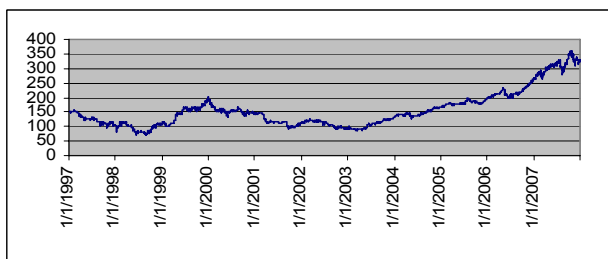


Fig. 2(d) Singapore Straits.DS-Daily Price Index in US\$ From 1/1/97 to 31/12/07

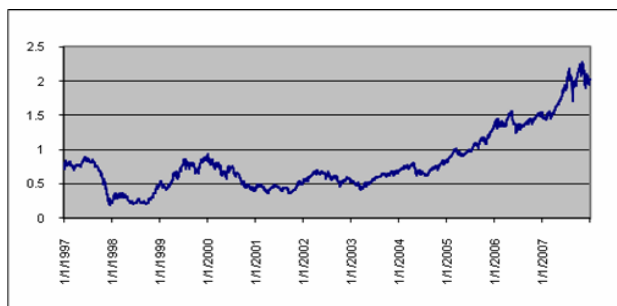


Fig. 2(e) Korea SE Composite (KOSPI)-Daily Price Index in US\$ From 1/1/97 to 31/12/07

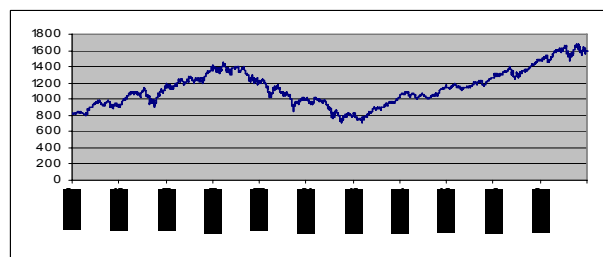


Fig. 2(f) MSCI World US-Daily Price Index in US\$ From 1/1/97 to 31/12/07

Generally, all the 4 ASEAN countries and Korea have almost similar movement of the series. The price indices have been plummeted significantly after January 1997 till the lowest point in September 1998, before starting to slightly increase back at higher volatility. However, Singapore and Korea have much smoother declines in 1997 and easily get back to the earlier position and even perform a lot better after 1998, as compared to the other three ASEAN countries. MSCI, on the other hand, has an opposite direction. Despite of having plummeting index at the beginning of the period, it has an increasing trend till it reaches the peak around March 2000 and declines till March 2003. It is around the same time period, March 2003, when all the other indices are started showing an increasing trend at an increasing rate throughout Dec 2007.

2) Plots of Cumulative Monthly Returns

The movements of the monthly cumulative abnormal returns in US dollar for full sample period from January 1, 1997 to December 31, 2007 for each country are shown in the figures below. All the countries seem to have means of around zero with high volatility at the first half of the series. There is no particular trend shown.

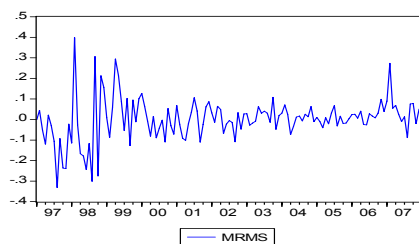


Fig. 3(a) Malaysia Cumulative Monthly Returns (US\$)

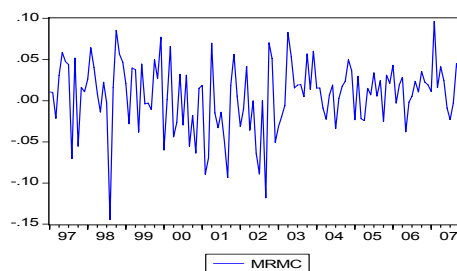


Fig. 3f MSCI-World Monthly Returns (US\$)

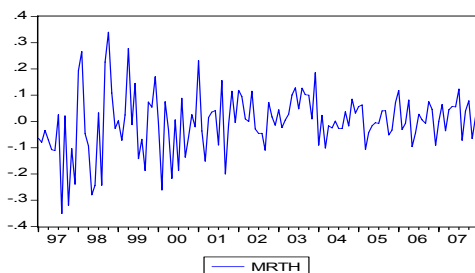


Fig. 3(b) Thailand Cumulative Monthly Returns (US\$)

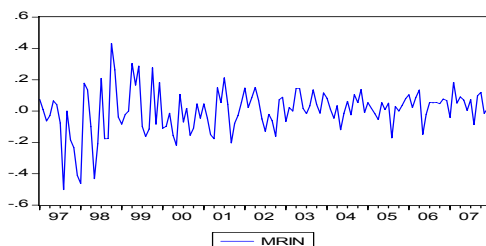


Fig. 3(c) Indonesia Cumulative Monthly Returns (US\$)

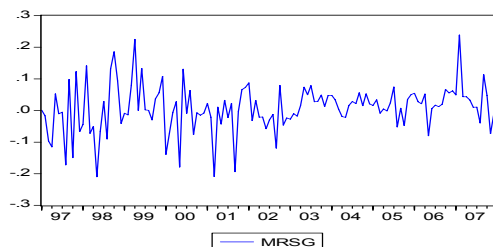


Fig. 3d Singapore Monthly Returns (US\$)

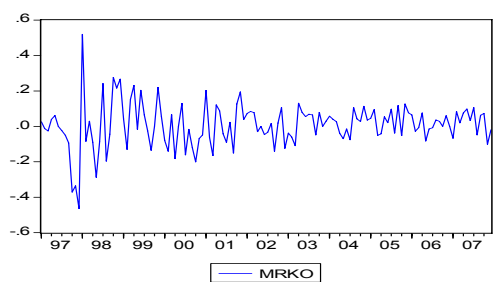


Fig. 3e Korea Monthly Returns (US\$)

3) Descriptive Statistics

TABLE II  
DESCRIPTIVE STATISTICS OF MONTHLY RETURNS

	INDO	KOREA	MSCI	MSIA	SPORE	THAI
Mean	0.00206	0.00761	0.00578	0.00116	0.00769	-0.00177
Median	0.01733	0.01761	0.01244	0.00828	0.01122	0.00116
Maximum	0.43078	0.51987	0.09636	0.39811	0.23831	0.34002
Minimum	-0.50240	0.46430	0.14447	0.33102	-0.20940	-0.35162
Std. Dev.	0.14050	0.12477	0.04165	0.10449	0.07417	0.11427
Skewness	0.66931	0.13378	0.71014	0.11022	-0.25375	-0.25807
Kurtosis	5.26461	6.25579	3.92859	5.97618	4.66498	4.15544
Jarque-Bera	38.0623	58.6946	15.8372	48.9845	16.6635	8.80802
Probability	0.00000	0.00000	0.00036	0.0000	0.00024	0.01223
Sum	0.27212	1.00519	0.76387	0.1532	1.01526	-0.23381
Sum Sq.	2.58625	2.03942	0.22733	1.4305	0.72073	1.71083
Dev.						
Observations	132	132	132	132	132	132

Specifically, the statistical table above proves that the means monthly returns for all countries are around zero, with the range of -0.00177 and 0.00761. Only Thailand has negative mean monthly return. Korea has managed to obtain the highest return of 0.52 and Indonesia has earned the lowest return of (-0.5). The returns have been dispersed from the range of 0.04 (MSCI) to 0.14 (Indonesia). Only Malaysia is slightly positively skewed. Jarque-Bera shows that all the countries are not Normally Distributed.

4) Stationary Tests

The plots in Fig. 3 above show that the series are similar to white noise with almost constant mean and variance across time.

The correlogram indicates that the ACF and PACF have values all reasonably within Bartlett's band and the ACF various lags hover around zero. Thus show that the series are similar to white noise.

The Augmented Dickey-Fuller unit root tests in table III show that the t-values for all the countries are less than the ADF critical value. Therefore, there is enough evidence to



reject Ho at 5% significant level. There is no unit root in the series and the series are stationary. The number of lags used in the reported unit root test is 0. The results are the same when Phillips-Perron unit root tests are applied. The unit root tests using the number of lags chosen by the AIC and SIC also have been performed. The results are also to reject Ho. The reported test in table III is a test for a random walk model with drift.

TABLE III UNIT ROOT TEST: ADF

Unit Root Tests: ADF			
	RW w/ drift	Probability	Result
Malaysia	-10.0007	0	Reject Ho
Thailand	-10.5069	0	Reject Ho
Indonesia	-9.02338	0	Reject Ho
Singapore	-11.1088	0	Reject Ho
Korea	-10.4016	0	Reject Ho
MSCI	-10.6887	0	Reject Ho

ADF critical value: 1% -3.48082; 5% -2.88358; 10% -2.5786

Table IV shows that the regression of the series is also not spurious since R<sup>2</sup> is lesser than the Durbin-Watson.

TABLE IV  
R<sup>2</sup> VS. DURBIN-WATSON

	R <sup>2</sup>	Durbin-Watson
Malaysia	0.436714	2.053071
Thailand	0.461143	2.021093
Indonesia	0.386944	1.952044
Singapore	0.488915	2.006964
Korea	0.456142	1.996783
MSCI	0.469676	1.994054

5) Stock Market Residuals

White heteroscedasticity test shows that there is not enough evidence to reject Ho. Therefore, time series residuals are homoscedasticity and Ordinary Least Square is acceptable.

TABLE V  
WHITE TEST: HETEROSCEDASTICITY

Malaysia	F-statistic	0.580294
	Probability	0.453938
Thailand	F-statistic	0.065128
	Probability	0.800835
Indonesia	F-statistic	0.05971
	Probability	0.809121
Singapore	F-statistic	0.037142
	Probability	0.848867
Korea	F-statistic	0.63467
	Probability	0.433794

Test for Normality, Jarque-Bera, shows that there is not enough evidence to reject Ho that the time series residuals are not normally distributed. Therefore, the series are normally distributed.

TABLE VI  
TEST FOR NORMALITY: JARQUE BERA

Jarque Bera				
Malaysia	Thailand	Indonesia	Singapore	Korea
0.0071	0.654068	1.017134	0.798232	0.891609

Test for AutoCorrelation of Breusch-Godfrey Serial Correlation LM Test also shows that there is not enough evidence to reject Ho. Therefore the series have got no serial correlation.

TABLE VII  
TEST FOR AUTO-CORRELATION

Breusch-Godfrey Serial Correlation LM Test:					
	Malaysia	Thailand	Indonesia	Singapore	Korea
F-statistic	3.20659	0.23143	1	2.020367	0.053155
Probability	0.07155	0.80144	0.227466	0.948761	0.979861

6) Plots of Average Stock Returns Behaviors

With the event windows of ± 12 month of the implementation month (T), Fig. 4 represents the performance of the average monthly stock returns of all five countries. The series seem to have more negative returns before the implementation month (T) and positive returns after the implementation month, T.

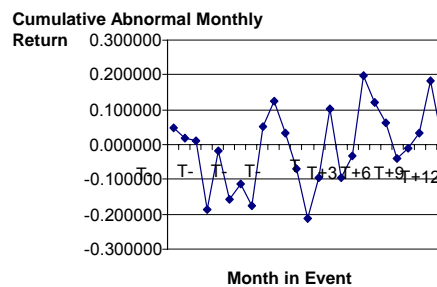


Fig. 4 The Behavior of Average Stock Returns

7) Regression Analysis of  $R_{it} = \alpha_i + \gamma Lib_{it} + \epsilon_{it}$  (1)

a) ± 12 months

TABLE VIII  
OLS of formula (1) for  $\pm 12$  month event windows

	Variable	Coefficient	Std. Error	t-Statistic	Prob.
MSIA	C	-0.00287	0.009138	-0.31385	0.7565
	DUM1	0.013091	0.012672	1.033005	0.3123
	R-squared	0.044338			
	Adjusted R-squared	0.002788			
KOREA	C	-0.07527	0.064406	-1.16868	0.2545
	DUM1	0.126147	0.089315	1.412378	0.1712
	R-squared	0.079809			
	Adjusted R-squared	0.039801			
SGPR	C	0.065581	0.02595	2.527226	0.0188
	DUM1	-0.07237	0.035986	-2.01094	0.0562
	R-squared	0.14953			
	Adjusted R-squared	0.112553			
THAI	C	-0.07203	0.054974	-1.31029	0.203
	DUM1	0.0826	0.076235	1.08349	0.2898
	R-squared	0.048563			
	Adjusted R-squared	0.007196			
INDO	C	-0.129	0.068918	-1.87172	0.074
	DUM1	0.146965	0.095572	1.53774	0.1378
	R-squared	0.093226			
	Adjusted R-squared	0.053801			

Table VIII shows the relationship of the series between 12 months before and 12 months after the subsequent stock market liberalization. The result shows that the t-statistics values for constant and dummy1 (liberalization) are not significant, except the constant for Singapore. Therefore, those right hand side variables do not have significant contribution to the model, except Singapore's constant value. Generally, coefficient of liberalization (Dum1) has a range from 1.3% to 14.7% increase in monthly returns, except Singapore which has negative 7% per month. Singapore may have such coefficient due to only up to 49% ownership in local equity is given to foreigners in comparison to 100% given by Korea, Thailand and Indonesia. Therefore the liberalization does not give much initiative to new investors. It may be good to Singapore to have lower price index for the purchase of the shares. The 49% foreign ownership by Malaysia also gives the country a small impact (coefficient of 1.3%). The coefficient of each country's constant is negative, except Singapore's. The standard errors are small, with low  $R^2$  with a range of 4.4% to 15% only. Thus the sample regression does not give excellent fit. F-statistics are also not significant which mean that right hand variables have no predictive value.

b) T-7 to T\* as dummy 1

TABLE IX  
OLS OF FORMULA (1) FOR T-7 TO T\* AS DUMMY 1

	Variable	Coefficient	Std. Error	t-Statistic	Prob.
MSIA	C	0.008946	0.146826	0.060929	0.9531
	DUM1	0.052274	0.155732	0.335668	0.747
	$R^2$	0.029073			
	$AR^2$	-0.109631			
KOREA	C	-0.09403	0.313537	-0.2999	0.773
	DUM1	-0.041489	0.332557	-0.12476	0.9042
	$R^2$	0.002219			
	$AR^2$	-0.140322			
SGPR	C	-0.008589	0.089438	0.096033	0.9262
	DUM1	0.058122	0.094863	0.612692	0.5595
	$R^2$	0.050898			
	$AR^2$	-0.084688			
THAI	C	0.020885	0.213477	0.097832	0.9248
	DUM1	-0.098487	0.226427	-0.43496	0.6767
	$R^2$	0.026316			
	$AR^2$	-0.112782			
INDO	C	-1.00E-06	0.248724	-4.0E-06	1
	DUM1	-0.188384	0.263812	-0.71409	0.4983
	$R^2$	0.067899			
	$AR^2$	-0.065258			

Table IX shows the regression results of having T-7 to T as dummy 1. Such scenario is to concern on the impact of stock market liberalization as a whole, taken into consideration 7 month before the implementation month. The 7 month period is used due to no reliable announcement dates and information leakage prior to official announcement. In addition to that there is a gradual process in receiving news [3].

The result in the table shows that none of the coefficient value is significant at 5%  $\alpha$ . The coefficient of liberalization (Dum1) has a range from -18% (Indonesia) to 5.8% (Singapore). Only Malaysia and Singapore have positive coefficient of liberalization. This means that stock market liberalization devalue the stock price indices of Korea, Indonesia and Thailand. The standard errors are greater than the earlier event window. The  $R^2$ s are lower, that is with the range of 0.2% to 6.8% of variation in monthly returns that can be explained by the variables. F-statistics are not significant.

$$s) \text{ Regression Analysis of } R_{it} = \alpha_i + \beta r_{mt} + \gamma Lib_{it} + \epsilon_{it} \quad (7)$$

The above formula is in reference to (1) but with  $\beta r_{mt}$ , which is a control for the effects of world stock market fluctuations [3].  $r_{mt}$  is the returns of MSCI world index. The result below indicates that

a)  $\pm 12$  months

Having the effects of world stock market fluctuations under control,  $R^2$ s are higher with the range of 23% to 50% variation. Thus, there is an improvement in regression fit. Only Singapore has positive constant coefficient. Thailand and Indonesia have significant constant coefficient at 5% significant level. The coefficient of liberalization (Dum1) varies from -4.7% (Singapore) to 17.9% (Indonesia). Only



Indonesia's coefficient of liberalization is significant. T-statistics for world index are all significant at 5%  $\alpha$ . Thus, when world market index increases by 1% point, then countries' monthly return will increase in a range of 58% (Malaysia) to 250% (Thailand and Indonesia).

TABLE X  
OLS OF (7) FOR  $\pm 12$  MONTHS EVENT WINDOWS

	Variable	Coefficient	Std. Error	t-Statistic	Prob.
MSIA	C	-0.006895	0.008562	-0.80531	0.4293
	MRMC	0.580004	0.251129	2.309588	0.0307
	DUM1	0.009244	0.011743	0.787182	0.4396
	R <sup>2</sup>	0.230833			
	AR <sup>2</sup>	0.160909			
KOREA	C	-0.11919	0.059393	-2.00681	0.0572
	MRMC	2.179699	0.809382	2.693042	0.0133
	DUM1	0.15373	0.079856	1.925077	0.0672
	R <sup>2</sup>	0.307949			
	AR <sup>2</sup>	0.245035			
SGPR	C	0.03388	0.021839	1.55133	0.1351
	MRMC	1.389671	0.352307	3.944486	0.0007
	DUM1	-0.046824	0.028895	-1.62048	0.1194
	R <sup>2</sup>	0.501841			
	AR <sup>2</sup>	0.456554			
THAI	C	-0.122581	0.043321	-2.82962	0.0098
	MRMC	2.508749	0.590358	4.249539	0.0003
	DUM1	0.114347	0.058247	1.963142	0.0624
	R <sup>2</sup>	0.477475			
	AR <sup>2</sup>	0.429972			
INDO	C	-0.179702	0.061809	-2.90736	0.0082
	MRMC	2.516587	0.842318	2.987693	0.0068
	DUM1	0.178811	0.083106	2.151601	0.0427
	R <sup>2</sup>	0.35495			
	AR <sup>2</sup>	0.296309			

b) T-7 to T\* as dummy 1

The R<sup>2</sup>s in the second event windows are higher with the range of 21% to 70% variation. Thus, the regression fit has improved further. Only Singapore and Thailand have significant coefficient of world market at 5% significant level. The coefficient of liberalization (Dum1) varies from -5.5% (Indonesia) to 11.6% (Korea). Only Indonesia's coefficient of liberalization is significant. There is a positive coefficient of world index with the countries' monthly returns, which is from 49% to 495%.

TABLE XI  
OLS OF (7) FOR T-7 TO T\* AS DUMMY 1

	Variable	Coefficient	Std. Error	t-Statistic	Prob.
MSIA	C	-0.00848	0.02870	-0.29528	0.7777
	MRMC	0.48691	0.36432	1.33649	0.2298
	DUM1	0.01062	0.03058	0.34743	0.7401
	R <sup>2</sup>	0.25181			
	AR <sup>2</sup>	0.00241			
KOREA	C	-0.30032	0.34340	-0.87456	0.4154
	MRMC	3.99276	3.18350	1.25421	0.2564
	DUM1	0.11633	0.34360	0.33857	0.7465
	R <sup>2</sup>	0.20947			
	AR <sup>2</sup>	-0.05404			
SGPR	C	-0.05536	0.05754	-0.96222	0.3731
	MRMC	2.27468	0.65918	3.45079	0.0136
	DUM1	0.09419	0.06022	1.56398	0.1689
	R <sup>2</sup>	0.68201			
	AR <sup>2</sup>	0.57601			
THAI	C	-0.23467	0.14681	-1.59847	0.1611
	MRMC	4.94629	1.36101	3.63427	0.0109
	DUM1	0.09703	0.14690	0.66050	0.5335
	R <sup>2</sup>	0.69585			
	AR <sup>2</sup>	0.59447			
INDO	C	-0.17375	0.26783	-0.64875	0.5405
	MRMC	3.36294	2.48292	1.35443	0.2244
	DUM1	-0.05546	0.26798	-0.20694	0.8429
	R <sup>2</sup>	0.28616			
	AR <sup>2</sup>	0.04821			

B. Analysis on Stock Market Integration

1) Regression Analysis of  $R_{it} = \alpha_i + \beta r_{mt} + \epsilon_{it}$  (6)

The regression analysis in table XII is performed in three different samples: a) full sample, b) pre-sample and c) post-sample

TABLE XII  
OLS OF (6) IN THREE SAMPLES

	Regression - Full Sample Jan1997 - Dec2007			
	A	b	R <sup>2</sup>	Adj R <sup>2</sup>
MSIA	-0.00383	0.86316*	0.118397	0.11161
THAI	-0.00971	1.37101*	0.249764	0.24399
INDO	-0.00566	1.33477*	0.156602	0.15011
SGPR	0.00124	1.11549*	0.392477	0.38780
KOR	-0.00142	1.56122*	0.271692	0.2661
	Regression - PRE Sample Jan97 - Apr98			
	A	b	R <sup>2</sup>	Adj R <sup>2</sup>
MSIA	-0.11228*	2.65656*	0.400504	0.35768
THAI	-0.11879*	2.901426*	0.496018	0.46002
INDO	-0.15191*	3.220583*	0.352159	0.30589
SGPR	-0.05343*	1.73622*	0.525667	0.49179
KOR	-0.08291	1.652113	0.08382	0.01838

Regression - POST Sample May98-May01				
	A	b	R <sup>2</sup>	Adj R <sup>2</sup>
MSIA	-0.00366	0.76426	0.074057	0.04760
THAI	-0.01395	1.75156*	0.331246	0.31214
INDO	-0.01423	1.6535*	0.207923	0.18529
SGPR	0.00115	1.17199*	0.364434	0.34628
KOR	0.00873	2.03323*	0.439856	0.42385

The adjusted R<sup>2</sup> for full sample size varies from 11% to 39%, 1.8% to 49% for pre-sample, and 5% to 42% for post-sample. Thus, MSCI world index returns account for those ranges of variance of the country returns. World index generally has very low explanatory power to those with low adjusted R<sup>2</sup>. Pre-sample has the highest and lowest adjusted R<sup>2</sup>, highest coefficient of world index, and lowest intercept.

None of the intercepts are significant in full-sample and post-sample. All the four ASEAN countries intercepts are significantly different from zero at 5% significant level for pre-sample period. This shows that the four markets are still segmented before the subsequent stock market liberalization and been integrated after the liberalization. Parameters for world index are all significantly deviate from zero at 5% significant level in full sample period. However, there is only 1 country's world index parameter that is not significant in pre-sample (Korea) and post-sample (Malaysia).

## 2) Correlation Coefficient

The correlation coefficient above shows the simple association or short-run correlation between the two countries. The average correlation of all the 6 countries (including MSCI-world index) for full sample is 0.51, which is quite significant correlation. The lowest average correlation is the pre-sample, which is 0.46. Post-sample shows the highest average correlation between the two countries, which is 0.55. Correlation between Singapore and Thailand after the liberalization is the highest (0.80), and the correlation between MSCI-world and Malaysia is the lowest (0.27). 2003 onwards, the whole market indices had been recovering.

TABLE XIII  
CORRELATION MATRIX IN THREE SAMPLES

Correlation Matrix	Full Sample Jan1997 - Dec2007					
	INDO	KOR	MSIA	SGPR	THAI	MSCI
INDO	1	0.44026	0.47180	0.61895	0.60285	0.39573
KOR	0.44026	1	0.28861	0.45382	0.63393	0.521241
MSIA	0.47180	0.28861	1	0.51041	0.51435	0.344089
SGPR	0.61896	0.45382	0.51041	1	0.69281	0.62648
THAI	0.60285	0.63393	0.51435	0.69281	1	0.499764
MSCI	0.39573	0.52124	0.34409	0.62648	0.49976	1

Correlation Matrix	PRE-Sample Jan97 - Apr98					
	INDO	KOR	MSIA	SGPR	THAI	MSCI
INDO	1	0.06213	0.63893	0.44578	0.39435	0.59343
KOR	0.06213	1	0.123939	-0.02409	0.56302	0.28951
MSIA	0.63893	0.12394	1	0.54222	0.65418	0.63285
SGPR	0.44578	-0.0241	0.542216	1	0.60312	0.72503
THAI	0.39435	0.56302	0.654175	0.60312	1	0.70429
MSCI	0.59343	0.28952	0.632854	0.72503	0.70429	1

Correlation Matrix	POST-Sample May98 - May01					
	INDO	KOR	MSCI	MSIA	SGPR	THAI
INDO	1	0.67342	0.45599	0.28286	0.71485	0.73069
KOR	0.67342	1	0.66322	0.30064	0.63379	0.70138
MSCI	0.45599	0.66322	1	0.27213	0.60368	0.57554
MSIA	0.28286	0.30064	0.27213	1	0.34942	0.44962
SGPR	0.71485	0.63379	0.60368	0.34942	1	0.79979
THAI	0.73069	0.70137	0.57554	0.44962	0.79979	1

## 3) Johansen Cointegration Test

There are only two samples, full-sample and post-sample, to run Johansen cointegration test since there is insufficient number of observation in pre-sample. Full sample result shows that both Trace test and Max-eigenvalue test indicate 6 cointegrating equations at the 0.05 level. However, the post-sample test result shows that there are only 5 cointegrating equations at the 0.05 level for both Trace test and Max-eigenvalue test. Therefore, the ASEAN 4 + Korea are cointegrated in the long-run, with all the 6 cointegrating relationship in the full sample and 5 cointegrating relationship in the post sample.

TABLE XIV  
CORRELATION MATRIX IN TWO SAMPLES

Full Sample Hypothesized No. of CE(s)	Trace Statistic	Prob.**	Max-Eigen Statistic	Prob.**
None *	185.4154	0	59.72712	0.0001
At most 1 *	125.6882	0	40.50337	0.007
At most 2 *	85.18488	0	35.29987	0.0042
At most 3 *	49.885	0.0001	28.32708	0.0041
At most 4 *	21.55792	0.0054	14.5623	0.0449
At most 5 *	6.995622	0.0082	6.995622	0.0082
Post-Sample Hypothesized No. of CE(s)	Trace Statistic	Prob.**	Max-Eigen Statistic	Prob.**
None *	188.8924	0	56.92383	0.0003
At most 1 *	131.9686	0	52.4392	0.0001
At most 2 *	79.52941	0	32.34596	0.0113
At most 3 *	47.18345	0.0002	24.25954	0.0175
At most 4 *	22.92391	0.0032	19.09952	0.008
At most 5 *	3.824394	0.0505	3.824394	0.0505

## V. DISCUSSION & CONCLUSION

The monthly price indices for ASEAN-4 and Korea seem similar. The whole region had been experiencing bearish market during 1997 currency crisis through out 2000. Indonesia, Malaysia, and Thailand, however, suffered more than Singapore and Korea. On contrary, the world index has been experiencing bullish market during the period. After 2000, the whole markets indices declined due to economic recession and the world index had been experiencing the greatest impact. Throughout 2007, the two more developed countries, Singapore and Korea, have been performing a lot better than before the crisis.

On the performances of the cumulative monthly returns, all the 5 countries and the world market indices report similar results. The average and dispersion of monthly returns for all countries are close to zero. The series are stationary, with no unit root and not spurious. The time series residuals are homoscedastic, normally distributed, and have no serial correlation.

Based on 12 months before and 12 months after stock market liberalization, the average performance of monthly stock returns for all the 5 countries before the liberalization is lower than the average performance after the liberalization. In reference to the regression model,  $R_{it} = \alpha_i + \gamma \text{Lib}_{it} + \varepsilon_{it}$  (1) by using  $\pm 12$  months event window, Indonesia, Korea, and Thailand have higher coefficient of liberalization (8% to 15%) as compared to Malaysia and Singapore (1.3% and -7%). This may be due to lower percentage change of foreign ownership allowed by those two countries (only up to 49%), which may not be able to initiate the investors much. Interestingly, Singapore has negative coefficient of liberalization which means that there is a negative relationship between stock market performance and stock market liberalization. Relaxation on foreign equity ownership seems to have negative impact on stock market returns. Singapore may assume that having more open market would increase risk sharing, which then would decrease country's stock prices. The other four countries experience a revaluation of equity

prices due to the subsequent stock market liberalization. The correlation ( $R^2$ ) is small, which is in the range of 4% to 15%. F statistics and t-statistics of the coefficients are not significant.

Based on event window of T-7 to T, where the period of 7 months for the announcement and information leakages is considered together with the liberalization implementation month itself, Malaysia and Singapore have positive coefficient of liberalization. The other three countries have negative coefficient. Considering the announcement and information leakages before the implementation month of the liberalization, the stock returns of Thailand, Indonesia, and Korea seem to decline due to such policy. The devaluation of equity prices may be resulted from lack of anticipation until the subsequent stock market liberalization is actually being implemented. However, this is not the case for Malaysia and Singapore, where the investors have been anticipating the liberalization once announced or heard. The  $R^2$  correlation is lower than the  $R^2$  of  $\pm 12$  month event window.

In controlling the effects of world stock market fluctuations, by using the  $\pm 12$  month event window, the regression fit ( $R^2$ ) has improved. Monthly returns with liberalization are higher by around 3%, which is in the range of -4.7% to 18%. Monthly returns with world market index are also higher, with the range of -0.58% to 2.52%, as compared to those without having the effects of world stock market fluctuations in control. The coefficient of liberalization for Malaysia and Singapore are still the lowest and only the Indonesian coefficient is significant. All countries' coefficients of world index are significant and Malaysia has the lowest impact. Therefore, the association of subsequent stock market liberalization with a revaluation of equity prices is greater with the inclusion of world stock returns.

In reference to the second event window, the regression fit has improved too, when world stock market fluctuations are included. Only Indonesia stock returns have been devalued due to liberalization. Monthly returns with world market index have been improved too, with the range of 0.49% (Malaysia) to 4.95% (Thailand).

Generally,  $\pm 12$  month event window analysis shows that stock market liberalization has minor positive effect on stock market returns, except for Singapore. The association of market returns and the stock market liberalization improves with the inclusion of world stock returns. The T-7 to T event window analysis on the other hand indicates that the stock market liberalization has minor negative effect on countries' stock returns, except for Malaysia and Singapore. However, the inclusion of world stock returns has resulted in higher positive effect of stock market liberalization on countries' stock returns, except for Indonesia.

In terms of stock market integration, the post-sample for most of the countries (excluding Korea), has intercepts in a regression closer to zero than the pre-sample intercepts. This implies that the stock markets for those countries are becoming more integrated, as compared to the periods before the subsequent stock market liberalization. The lower coefficients of world index in the post-sample also indicate that the markets are closer to integration. The correlation coefficient also proves that subsequent stock market

liberalization creates better integration within the region as the average correlation after the liberalization is higher than the average correlation before liberalization. Generally, the countries are more correlated to each other once the subsequent liberalization took place. Johansen cointegration test further proves that the ASEAN-4 and Korea are cointegrated in the long-run.

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