Financial Market Interdependency among ASEAN+3 Economies: Markov Switching Approach

Md. Saifur Rahman*, Mohamed Aslam, and Wee-Yeap Lau

Faculty of Economics and Administration, University of Malaya
Kuala Lumpur, Malaysia

Abstract: This paper aims to examine the degree of interdependency among ASEAN+3 stock markets employing Markov Switching (MS) approach which presents the followings: 1) the changes of mean-regimes and transition probabilities during pre-agreement period is slow, 2) high income economies are more influential compared to low income economies in changing the regimes, and 3) the regime influences among the member economies during post-agreement period is higher than that of pre-agreement period. The findings have great implications for the regional policy makers.

Keywords: Market Interdependency, ASEAN+3, Markov Switching Approach

1. Introduction

The Asian 1997/1998 financial crisis causes the regional stock markets fall where the financial institutions suffer and affect the whole economies in Asia region. The domestic investment collapses and regional stock value goes down about 100%. It slows down the regional economic growth along with the increasing of unemployment rate in the Asia economies (Janor and Ali, 2007). The policy makers of this region felt to have a formal institution that would protect them from any form of future financial crisis and cooperate and coordinate them in the case of liquidity shortage, financial trap, speculation attack, etc. The formal institution was established in April, 1999 consisting ten ASEAN members and three northeast countries; China, Japan and Korea. Since the establishment of APT group, several initiatives such as Chiang Mai Initiatives (CMI), Asian Bond Market (ABM), Economic Review and Policy Dialogue (ERPD) etc have been taken as a tool to strengthen the mutual cooperation among the regional financial markets.

This study is used to investigate whether the formal institution of ASEAN+3 are successful today in strengthening the regional economies and having mutual cooperation. Besides, the findings of this study contribute in several perspectives, firstly, the policy makers feels the effectiveness of ASEAN+3 financial cooperation agreement as it indicates whether the regional financial markets respond to each other and works in a cooperative way to protect the regional economies from potential financial crisis. Secondly, the previous study investigated the stock market integration employing

* Corresponding author. Email: masai@ yahoo.com
Johansen and Juselis (1990) or GARCH technique but none of the previous studies used Markov switching techniques in findings degree of interdependency among regional economies. The Markov switching technique indicates whether the regional financial markets maintain the inter-relationship in both of regime-1 and regime-2. Finally, the findings of data segmentation between high income and low income economies indicates whether the regime changes of high income economies have dominations on that of low income economies or they are equally interdependent referring to the study of Guillaumin (2009) and Yuhn (1997). Along with that this study answers of the following questions:

1. Do the ASEAN+3 economies develop the degree of interdependency during post-agreement period?
2. Do the member economies have one-sided dependency or maintain the equal despondences between both of high and low income economies?
3. Do the financial markets of ASEAN+3 economies are protected from future crisis.

The organization of this paper is as follows: An in-depth review of past literature is presented in Section 2.0 followed by data and variables in Section 3.0. Details of methodology and model specification are discussed in Section 4.0 followed by an analysis of findings in Section 5.0. Concluding remarks along with suggestions and implications of the study are described in Section 6.0

2. Literature Review

The studies of stock market in the previous literatures focus on the stock market integration and market comovement in different parts of the worlds. The literatures are segmented into five groups of studies. The first group of studies examine the degree of stock market integration among developed economies, Morelli (2010), Guillaumin (2009), Aggarwal and Kyaw (2005), Vo and Daly (2005), Pascal (2003), Swanson (2003), Braun and Traichal (1999), Kessler (1999), Gould (1998), Chung and Liu (1994), Viallet (1989), Jorion and Schwartz (1985), Stehle (1977). Few of them found the stock markets in these regions less or lack of integration but majority of the researchers found that the stock markets of developed economies are more organized, regulated and more integrated compared to emerging economies. The second group of studies; Beiney and Candelon (2011), Chambet and Gibson (2008), Aizenmann and Noy (2004), Aizenmann (2003) focus on the non-East emerging economies where majority of the researches do not provide evidence of stock market integration. Few of them found the weak integration where the trade integration and capital market openness contributed in the integration process. These findings are supported by Eizaguirre and Biscarri (2006) that indicated that the stock markets of emerging economies are positively volatile due to capital market liberalization.
The third group of studies; Yu et al (2010), Oh et al (2010), Lim (2009), Majid et al (2009), Chen et al (2009), Valadkhani and Hancharat (2008) and Saini et al (2002) investigated the stock market integration in the East Asia regions before Asian financial crisis where they found that the stock markets in these regions are weakly integrated. The fourth group of studies found that the stock markets of these regions are more integrated compared to pre-financial crisis, Guidi and Gupta (2013). The market integration in this region develops after financial crisis. According to Oh, et al (2010), Mukherjee and Mishra (2010), Gee et al (2010), Ibrahim (2009) and Rim and Setaputra (2008) the stock market integration develops due to the spillover and contagion effects, while the market integration develops due to capital market liberalization according to Janor and Ali (2007), Phylaktis and Ravazzolo (2002). The final group of study compared the stock market integration between developed and developing economies, Horvath and Poldauf (2012), Syriopoulos (2011), Karim and Majid (2010), Worthington and Higgs (2007), Kim et al (2006). They found that the stock markets of developed countries are in long-run relationship but the markets of developed and developing countries are weakly integrated where the stock markets of developing countries are dominated by that of developed countries.

3. Data and Variables

This paper uses stock indices in order to investigate the stock market interdependency among ASEAN+3 regional economies. The monthly stock indices of China, Japan, Korea, Malaysia, Indonesia and Philippines are collected from Shanghai stock exchange, Tokyo stock exchange, Korea stock exchange composite, Bursa Malaysia KLCI, Jakarta stock exchange composite and Philippines stock exchange composite while the stock indices of Thailand and Singapore are collected using MSCI. The data series have been segmented based on income level facilitated by World Bank and agreement period, before (March, 1992- November, 1997) and after (April, 1999-September, 2013). Singapore, Japan and Korea are considered as high income economies while China, Malaysia, Indonesia, Thailand and Philippines are considered low income economies.

The mean returns of stock indices of ASEAN+3 regional markets indicate that the average returns of Japan, Korea and Thailand are negative during pre-agreement period but it improved during post-agreement period where stock return of every member economies is positive. Besides, the stock returns during this period are little higher than that of pre-agreement period. Furthermore, the cross-correlation indicates that the stock return of Malaysia maintains high correlations with that of Philippines (0.704) and Singapore (0.710) while Japan maintains the least correlation with Malaysia (0.075) and Thailand (0.038). This result indicates that the stock prices of neighboring countries are highly linked and non-neighboring markets such as Korea and Japan does not maintain
significant relations with that of other markets. The findings of this research have been processed through econometric techniques Markov switching. The robustness of the findings is tested through correlation, partial autocorrelation, and normality and heteroskedasticity tests. The null hypothesis of autocorrelation and heteroskedasticity are not rejected which means the models used in this research are correctly specified.

4. Methodology

The Markov switching model is used in this estimation process based on bivariate regime switching techniques. Two stock returns (observed variables) are employed during each estimation. Total 112 peers of stock indices are employed in the estimation process in both of pre and post agreement periods. The observed variables vary due to the existence of unobserved regimes, $S_t$, and white noise elements, $\varepsilon_t$. The values of unobserved variables depend on economic circumstances; either recession or expansion. The bivariate model is formed as follows:

$$y_{1,t} = \beta_1 (1 - S_t) + \beta_2 S_t + \omega (y_{1,t-1} - \eta_1 (1 - S_{t-1}) - \eta_2 S_{t-1}) + \Phi (y_{2,t} - \delta_1 (1 - S_t) + \delta_2 S_t) + \varepsilon_{1,t}$$

Assume, $S_t = 1, 2$ ; and $t = 1, 2, ..., T$

where, $y_{1,t}$ and $y_{2,t}$ refers to stock indices of a single peer stock markets. $\omega$ and $\Phi$ are the coefficients of first-order autoregression and stock indices $y_2$ respectively. The regime changes of stock index, $y_1$ is influenced by the response of own lagged value and stock index $y_2$ at time $t$ respectively. According to Nelewaik (2007), the noise elements of two stock indices are correlated; Correlation $(\varepsilon_{1,t}, \varepsilon_{2,t}) = \rho_{12}$ and $\varepsilon_{1,t} \sim N(0, \sigma_1^2)$ and $\varepsilon_{2,t} \sim N(0, \sigma_2^2)$. The constant transition probabilities ($P_{11}$ and $P_{22}$) of unobserved states can be shown through the following technique:

$$\text{Prob}(S_t = 1 | S_{t-1} = 1) = p_{11} \quad \text{and} \quad \text{Prob}(S_t = 2 | S_{t-1} = 2) = p_{22}$$

The filtered probabilities during recession and expansion are denoted by $P_1$ nad $1-P_1$ respectively, where, $\text{Prob}(S_t = 1 | \Omega_t) = P_t$

5. Analysis of findings

The findings in Table-1 shown at the appendix indicate the degree of interdependence among the stock markets of ASEAN+3 economies, where the mean-regimes of one economy’s stock return are dependent on that of other economy. The significant switching coefficients indicate the non-linear interdependences between two mean-regimes of the member economy’s stock returns.
Table 1: Switching coefficients

<table>
<thead>
<tr>
<th></th>
<th>High income countries</th>
<th>Low income countries</th>
<th></th>
<th>High income countries</th>
<th>Low income countries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reg-1</td>
<td>Reg-2</td>
<td>Reg-1</td>
<td>Reg-2</td>
<td>Reg-1</td>
</tr>
<tr>
<td><strong>Japan</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td>2.906 (0.016)</td>
<td>0.287 (0.019)</td>
<td>0.354 (0.016)</td>
<td>2.896 (0.000)</td>
<td>0.833 (0.000)</td>
</tr>
<tr>
<td>Singapore</td>
<td>0.742 (0.016)</td>
<td>0.073 (0.485)</td>
<td>-0.036 (0.698)</td>
<td>1.428 (0.0327)</td>
<td>0.056 (0.000)</td>
</tr>
<tr>
<td>Malaysia</td>
<td>-0.014 (0.001)</td>
<td>1.470 (0.032)</td>
<td>0.978 (0.059)</td>
<td>-0.138 (0.290)</td>
<td>0.915 (0.000)</td>
</tr>
<tr>
<td>Thailand</td>
<td>-0.175 (0.281)</td>
<td>6.431 (0.000)</td>
<td>6.047 (0.000)</td>
<td>-0.124 (0.383)</td>
<td>-1.136 (0.032)</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.156 (0.015)</td>
<td>3.765 (0.000)</td>
<td>0.156 (0.015)</td>
<td>4.642 (0.000)</td>
<td>3.376 (0.000)</td>
</tr>
<tr>
<td>Philippines</td>
<td>-0.016 (0.001)</td>
<td>1.382 (0.000)</td>
<td>-0.376 (0.657)</td>
<td>1.837 (0.000)</td>
<td>1.044 (0.000)</td>
</tr>
<tr>
<td>China</td>
<td>-4.157 (0.000)</td>
<td>-0.172 (0.715)</td>
<td>-0.232 (0.552)</td>
<td>-0.393 (0.336)</td>
<td>-0.907 (0.015)</td>
</tr>
</tbody>
</table>

During pre-agreements

During post-agreement period
The findings indicate that the Singapore stock market maintains its interdependent relationship with both of high income economies (Japan and Korea) and low income economies especially neighbor economies (Malaysia, Indonesia and Philippines) in both of regime-1 (booming) and regime-2 (recession) during pre-agreement period. It implies that the stock prices movement of Singapore fluctuates by other developed economies due to the similar market structures by neighboring countries due to the geographical location. This results specifically focuses that the income level is important of having markets interdependency especially during pre-agreement period, where high income economies versus high income economies and low income economies versus low income economies prioritize in maintaining the interdependency, for example the stock prices of Philippines are codependent with that of Malaysia and Indonesia in regime-2. The result complies with the findings of Guillaumin (2009) and Yuhn (1997) who indicate that high income countries are more interdependent compared to low income economies. Furthermore, the stock market of Singapore is the most influential in both of regime-1 and regime-2 in influencing the stock returns of other member economies. The regime-changes of Chines stock markets respond negatively to that of Japan, Korea and Thailand in both of regimes reflecting the findings of descriptive statistics. It indicates that Chines stock return is segmented from the regional economies during pre-agreement period because of restrictions on domestic capital market openness.

The findings during post-agreement period indicate that Japan, Korea, Singapore and Malaysia maintain the interdependent relationship with majority of countries in either or both regimes. The couple of countries that have bidirectional influences are Japan-Korea, Japan-Singapore, Japan-Malaysia, Japan-Thailand, Japan-Indonesia, Korea-Singapore, Korea-Malaysia, Korea-Indonesia, Korea-Philippines, Singapore-Thailand, Singapore-Indonesia, Singapore-Malaysia, Singapore-Philippines and Malaysia-Thailand. This findings indicate that the financial agreement play the key role for the ASEAN+3 economies in having bidirectional despondences among member economies. It further indicates that both of high and low income economies respond regardless of income levels. The findings implies that stock prices of a member economies considers that of other member economies in changing the prices in both of booming and recession economic period. Moreover, the stock market of China was segmented during pre-agreement period but it is being influenced by that of Korea in regime-1, Thailand in regime-2, Indonesia in regime-2 and Philippines in regime-1. The findings imply that the ASEAN+3 stock markets improved interdependency among the member stock markets during post-agreement period in both of regime-1 and regime-2.

The study further indicates that even the progress of developing the interdependency among the member economies is better during post-agreement period but still needs to move forwards for the sake of regional economic protection. Some of the stock markets
such as China, Thailand are not co-interdependent which means they are not working in a cooperative way. The stock markets of these countries will face in the case of financial speculation attacks.

6. Conclusion

In order to investigate the interdependency, this study employs the Markov Switching (MS) technique that presents the degree of interdependency in two regimes. It indicates how two stock markets are interdependent during booming (regime-1) and recession (regime-2) of the economy. The summary of the findings are: 1) the regimes changes of ASEAN+3 stock indices are slight by that of member economies during pre-agreement period, 2) the level of influences in stock returns in both regimes are higher during post-agreement period, 3) the high income economies present the strong interdependency compared to low income economies that comply with the findings of Baele (2005) and Schroeder (2000) and finally, 4) the overall interdependency among the member stock markets has improved except China compared to pre-agreement period but still away of achieving the complete interdependences.

The policy implication of this study is towards development of regional economic cooperation and protection. The APT group has initiated number of actions to increase the degree of interdependency but needs further actions in order to achieve the objective of cooperative economies. They have to increase the intra-regional economic activities such as intra-trades, intra-investments, etc. Moreover, APT countries are involved with multiple agreements with different commitments. In order to achieve the objective of financial cooperation and protect the regional economies from future crisis, they have to prioritize APT. Finally, they have to identify the country-specific barriers that hinder to cooperate among the markets and impose the policy actions to remove them.

References


Beiney B. and Candelon, B., 2011, Liberalisation and stock market co-movement between emerging economies, Quantitative Finance, 11, 2, 299–312,


Oh, S.L. et al., 2010, Volatility co-movement of asean-5 equity markets,.Journal of advanced studies in finance, 1(1).


