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**THE IMPACT OF CRISES, LIQUIDITY AND CONTAGION ON  
STOCK MARKET DEVELOPMENT:  
EVIDENCE FROM ASEAN – 5 COUNTRIES**



**DOCTOR OF PHILOSOPHY  
UNIVERSITI UTARA MALAYSIA**

**THE IMPACTS OF CRISES, LIQUIDITY AND CONTAGION ON STOCK MARKET  
DEVELOPMENT:  
EVIDENCE FROM ASEAN – 5 COUNTRIES**



**Thesis submitted to  
School of Economic, Finance and Banking  
Universiti Utara Malaysia  
In fulfilment of requirement for degree of  
Doctor of Philosophy (Finance and Banking)**

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## ABSTRACT

This study examines the effect of financial crises, stock market liquidity and contagion on stock market development (*SMD*) in the ASEAN – 5 countries using aggregate panel data over the period of 1990 – 2014. Mean comparison analysis is employed to test the *SMD* differences for pre – and post – crises period. Traditional panel analyses; Random Effects Model is utilized to test the effect of stock market liquidity on the *SMD*. Then, the Seemingly Unrelated Regression Analysis (SUR) is applied to examine the contagion effect of the United States' stock market performance on the *SMD* of ASEAN – 5 countries. Results of mean comparison analysis show that the *SMD* of Malaysia, Thailand and Singapore are significantly different after Asian Financial Crisis in 1997 – 1998, reduction were also displayed in the *SMD* of Malaysia and Singapore after the Global Financial Crisis in 2008. Moreover, results of Random Effects Model signify that stock market liquidity has a significant effect on the *SMD* of ASEAN – 5 countries. On the contagion effect, SUR estimation results show that stock market performance of the United States significantly affects the *SMD* of Malaysia, Singapore and Thailand while the *SMD* of Indonesia and Philippines are affected by considering interaction term. Based on the findings, this study proposes to the policymakers the use of financial institutions reformation, bilateral banking integration, financial support mechanism and revision on crisis management frameworks as the precautionary measures against financial crisis. Moreover, ASEAN – 5 should encourage long – term investment, lowering investment costs and reforms the corporate governance in enhancing stock market liquidity. To reduce the contagion effects particularly from the US, macroeconomic policies responses, trade openness and the inspiration towards an integrated stock market are suggested for ASEAN – 5 countries.

**Keywords:** stock market development, ASEAN – 5, crises, stock market liquidity, contagion.

## ABSTRAK

Kajian ini mengkaji kesan krisis kewangan, kecairan pasaran saham dan penularan ke atas pembangunan pasaran saham (*SMD*) di negara-negara ASEAN – 5 menggunakan data panel agregat bagi tempoh 1990 – 2014. Analisis perbandingan min digunakan untuk menguji perbezaan *SMD* bagi tempoh pra – dan pasca – krisis. Analisis panel tradisional digunakan untuk menguji kesan kecairan pasaran saham ke atas *SMD*. Seterusnya, Analisis *Seemingly Unrelated Regression* (*SUR*) digunakan untuk mengkaji kesan penularan prestasi pasaran saham Amerika Syarikat ke atas *SMD* negara – negara ASEAN – 5. Keputusan analisis perbandingan min menunjukkan perbezaan signifikan bagi *SMD* di Malaysia, Thailand dan Singapura selepas Krisis Kewangan Asia pada tahun 1997 – 1998, penurunan juga turut dipaparkan di *SMD* Malaysia dan Singapura selepas Krisis Kewangan Global pada tahun 2008. Selain itu, keputusan analisis Model Kesan Rawak menunjukkan kecairan pasaran saham mempunyai kesan signifikan ke atas *SMD* negara ASEAN – 5. Berkenaan dengan kesan penularan, anggaran model *SUR* menunjukkan prestasi pasaran saham Amerika Syarikat mempunyai kesan yang signifikan ke atas *SMD* di Malaysia, Singapura dan Thailand manakala *SMD* di Indonesia dan Filipina terkesan dengan mempertimbangkan terma interaksi. Berdasarkan penemuan, kajian ini mencadangkan kepada penggubal dasar untuk melaksanakan reformasi dalam institusi kewangan, integrasi perbankan dua hala, mekanisme sokongan kewangan dan semakan rangka pengurusan krisis sebagai langkah bagi menghadapi krisis kewangan. Selain itu, ASEAN – 5 juga harus menggalakkan pelaburan jangka panjang, mengurangkan kos pelaburan dan memperbaharui tadbir urus korporat untuk meningkatkan kecairan pasaran saham. Bagi tujuan mengurangkan kesan penularan terutamanya dari Amerika Syarikat, maklum balas dasar makroekonomi, keterbukaan perdagangan dan inspirasi ke arah pasaran saham bersepadu adalah dicadangkan untuk negara – negara ASEAN – 5.

**Kata Kunci:** pembangunan pasaran saham, ASEAN – 5, krisis, kecairan pasaran saham, penularan.

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## LIST OF ABBREVIATIONS

| <b>Abbreviation</b> | <b>Full Meaning</b>                                       |
|---------------------|-----------------------------------------------------------|
| AFC                 | Asia Financial Crisis                                     |
| ARCH                | Autoregressive Conditional Heteroskedasticity             |
| ASEAN               | Association of South East Asian Nation                    |
| CRT                 | Credit to Private Sector by Banks                         |
| DUM                 | Dummy                                                     |
| EAS                 | East Asia Summit                                          |
| EU                  | European Union                                            |
| FEM                 | Fixed Effects Model                                       |
| GARCH               | Generalized Autoregressive Conditional Heteroskedasticity |
| GDP                 | Gross Domestic Product                                    |
| INF                 | Inflation                                                 |
| INT                 | Interest                                                  |
| IPO                 | Initial Public Offering                                   |
| LIQ                 | Stock Market Liquidity                                    |
| MCAP                | Market Capitalization                                     |
| MRI                 | Market Index                                              |
| REM                 | Random Effects Model                                      |
| SAV                 | Total Saving                                              |
| SMD                 | Stock Market Development                                  |
| SUR                 | Seemingly Unrelated Regression                            |
| TAC                 | Treaty of Amity and Cooperation                           |
| UK                  | United Kingdom                                            |
| US                  | The United States of America                              |
| USD                 | United States Dollar                                      |
| VAR                 | Vector Autoregressive                                     |

# **CHAPTER 1**

## **INTRODUCTION**

### **1.0 Introduction**

This chapter explains the background of the study. In Section 1.1, the overview of the Association of South East Asian Nations – 5 (ASEAN – 5), the Asian Financial Crisis (AFC) and Global Financial Crisis (GFC), macro facts of stock market development (SMD), stock market liquidity and contagion effects are described. Then, Section 1.2 serves the problem statement; Section 1.3 presents the research questions which are then translated into research objective in Section 1.4; Section 1.5 highlights the scope and significance of the study; while the organisation of the study is explained in the last section.

### **1.1 Background of the Study**

Stock market is a part of the financial market in the overall financial system. It provides different sources of financial instruments to the country through stock trading activities. Also, stock market can be used by the government and private firms for sourcing new and additional finances for new and expanding commercial or industrial projects. It is one of the most sensitive markets which affects the economic conditions of a country such that any aggressive changes in the stock market could give a significant implications to the economy (Barakat, Elgazzar, & Hanafy, 2016). Thus, stock market should be continuously developed for increasing capital formation, improving domestic financial resource mobilization, enhancing supply of long-term capital and achieving competent allocation of capital (Chipaumire & Ngirande, 2014).

The ASEAN – 5 financial markets is among active financial systems in emerging markets. It has gradually developed since it was initiated in 1967. Through various initiations such as the ASEAN Free Trade Area (AFTA), which was formed in 1993, and initiation of ASEAN Economic Community (AEC) in 2009, ASEAN – 5 has been able to strengthen the regional financial markets. As a result, seven stock markets from six countries; namely the Stock Exchange of Thailand (SET), Bursa Malaysia, Philippines Stock Exchange (PSE), Indonesia Stock Exchange (IDX), Singapore Exchange (SGX), Ho Chi Minh Exchange (HSX), and Hanoi Stock Exchange (HNX) comprising 3,613 listed companies were collaborated (Masih & Masih, 1999).

#### **1.1.1 Overview of ASEAN – 5 Countries**

The ASEAN was formed on 8<sup>th</sup> August 1967. The virtue of the agreement, known as ASEAN Declaration, was signed by five foreign ministers; comprising Malaysia, Indonesia, Thailand, Philippines and Singapore to form an inter – governmental organization. Therefore, the first five countries which joined the ASEAN are located as displayed in Figure 1.1. Then, the membership of ASEAN has increased with the acceptance of Brunei, Laos, Myanmar, Cambodia and Vietnam, between 1984 and 1999. The aims and purposes were centred on economic, social, technological, cultural, and educational cooperation, as well as other aspects concerned with the development of the region. As a result of gradual development and transformation shown in ASEAN countries, starting from the 1990s, it is riding a strong growth in the economic and investment flows into the region, and became a regional trade and investment hotspots. With a combined

GDP of USD2.4 trillion, 1.7 million square miles of landmass and 630 million populations, ASEAN is in the pursuit of regional stability and sustainable economic growth.

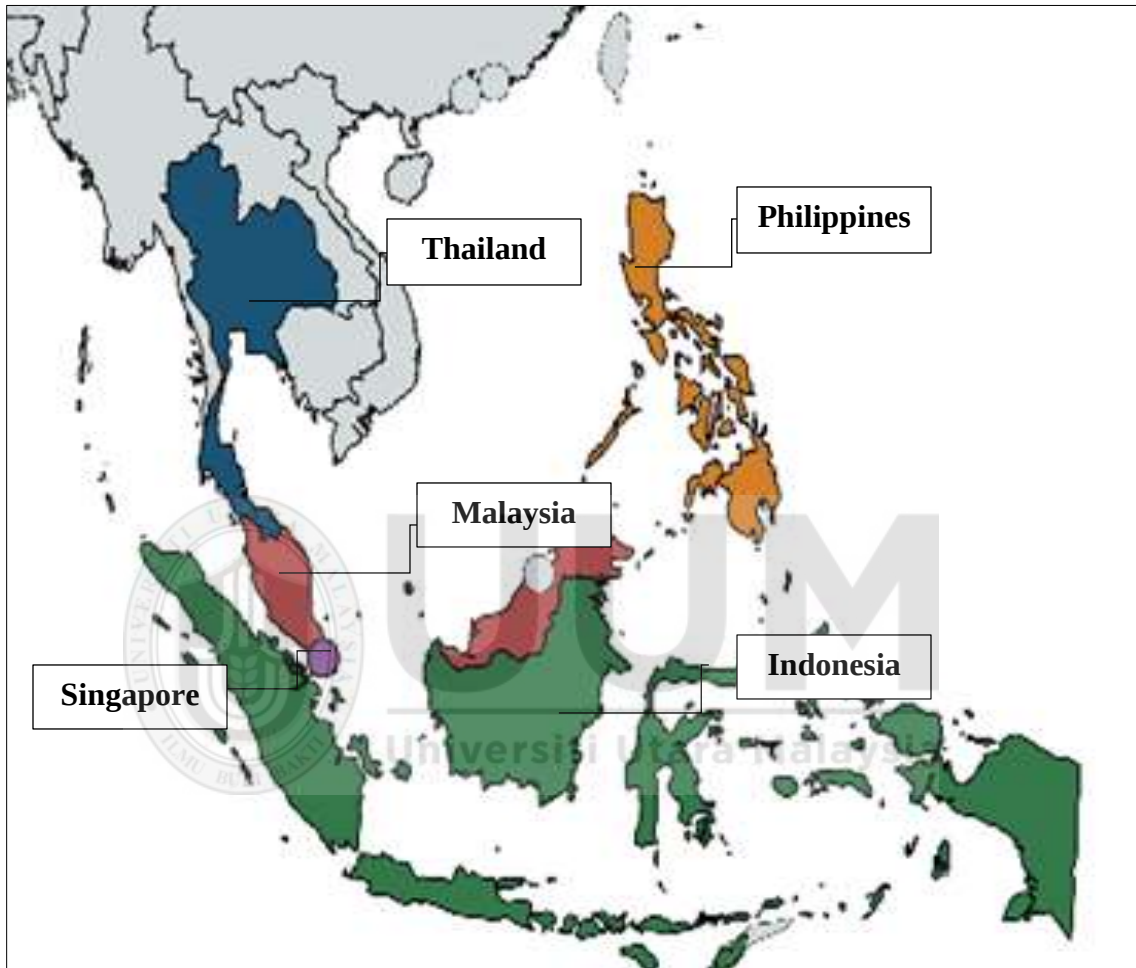


Figure 1.1  
*Location of ASEAN – 5 Countries*

Besides, the formation of ASEAN Economic Community (AEC) makes this region the third fastest growing economies, after China and India. Also, AEC pursues the reduction of trade and investment barriers within the region, which enhances free movement of goods, services, skilled labour and capital.

Moreover, towards establishing a position in a global market, ASEAN has five regional free trade agreements (FTAs) with Australia and New Zealand, China, South Korea, Japan and India. Singapore is the only member-country that forms the FTA with the United States of America (US) and European Union (EU).

Before the Asian Financial Crisis (AFC) in 1997, ASEAN had attracted almost half of the total capital inflows into the region. This was as a result of high interest rates, which were attractive to foreign investors who mostly consider high rates of return on their investment. Simultaneously, ASEAN – 5 countries have experienced high growth rates, between 8 and 12 percent in the early 90s, which was largely acclaimed, as part of Asian Economic Miracles, by the International Monetary Fund (IMF) and the World Bank. However, the AFC which started in mid – 1997 affected the regional currencies, asset prices and stock markets. Triggered by the crisis in Latin America, particularly Mexican Peso Crisis in 1994, the investors, especially from the Western countries, had lost confidence in ASEAN markets; thus, resulting in a domino effect, because of massive capital flight.

### **1.1.2 Asian Financial Crisis, 1997 - 1998**

The AFC began in July 1997 due to the floating in Thai Bath. The crisis then spread to South Korea, Indonesia, Singapore, Philippines and Malaysia which resulted in severe currency depreciation and recession; hence, wiping out economic progress in the region, particularly ASEAN countries. In mid-1997, Thailand took a desperate action by devaluing its currency relative to the US dollar (USD). This action was followed by speculative pressures, which resulted in the depletion of her foreign exchange reserves and deeper

financial crisis across ASEAN countries. Subsequently, Thailand's currency, property and equity market experienced decline, followed by other countries in the region because of market pressures. As a result, ASEAN countries have experienced a downturn in capital inflows, slow growth, declining levels of investment and economic recession.

In July 1997, IMF responded to the crisis by mobilizing funds in the sum of USD118 billion for Thailand, Indonesia and South Korea; besides providing supports in the stabilization process of most of the affected countries. Similar supports were rendered by the World Bank, Asian Development Bank, and governments from the other countries including Europe and the US. Through these supports, the ASEAN countries could rebuild their official reserves and run some policy adjustments in order to regain the confidence of foreign investors and reconstruct their economies. In the next stage, by mid-January 1998, the currencies in term of the USD for Thailand, Indonesia, South Korea, Philippines and Malaysia were depreciated until half of their pre – crisis values.

The crisis did only affect the countries within the region, but Russia's financial system was also stretched as it affected Russia's foreign exchange reserves. In the following month, Russia stock market crashed and the cash reserves declined to USD14 billion while attempting to settle the burgeoning debts. The IMF then announced a monetary package of USD23 billion as emergency loan for Russia. While in August 1998 the Russian market collapsed, stock trading was suspended and global stock markets were shaken by the financial meltdown in Asia and Russia. As a result, the Wall Street reacted to the deepening

crises and the Dow Jones plunged about 300 points which was considered part of the biggest losses in history.

### **1.1.3 Global Financial Crisis, 2007 – 2008**

The global financial crisis of 2007 – 2008 (GFC) is a financial crisis that started in 2007 with deterioration of main macroeconomic indicators such as GDP, production levels, FDI and inflation for majority countries. The GFC is the result of both market and regulatory failures which triggered by the eruption of the US subprime crisis in the summer of 2007 and the subsequent liquidity and confidence crisis that has spread on a global scale and peaked in September and October 2008.

Before the crisis begin, the US housing market started to collapse and prices fell tremendously in 2006. Consequently, economy as well as for US citizens had been severe as they unable to serve their mortgages and they had to leave their homes for sale. Besides, the building industry and the real estate sector also facing hard times as there was no longer enough demand after the bubble busted. Then, the first mortgage lending companies were sliding into bankruptcy and the subprime mortgage crisis turned into a financial crisis.

Following events in 2008, particularly the collapse of Lehman Brothers in September, risk loving banks and investors around the world rapidly reversed their perceptions. Due to the complexity of the mortgage – backed securities. However, they unaware the true extent of the liabilities linked ultimately to a rapidly deteriorating US housing sector. Consequently, liquidity quickly dried up, almost bringing the global financial system to its knees. Some

commentators even questioned whether American – style capitalism itself had been dealt a death blow.

Determined to avoid mistakes made by policymakers during previous crises, governments in both advanced and developing countries reacted aggressively by injecting massive amounts of credit into financial markets and nationalizing banks, slashing interest rates, and increasing discretionary spending through fiscal stimulus packages. This response helped avoid a catastrophic depression in many countries though the effectiveness of policies has varied depending on the magnitude of the response and vulnerabilities of the domestic economy. However, despite these interventions, the global financial crisis quickly evolved into a global jobs crisis, as the crisis-induced credit crunch strangled the real economy and trade flows collapsed. Unemployment in The Organisation for Economic Co – operation and Development (OECD) countries has surged, while in countries without social security schemes, the downturn has threatened to push millions into poverty (Verick & Islam, 2010).

Subsequently, many developing and emerging economies felt the deleterious effects of the US recession by the end of 2008. The typical outcome was a growth deceleration which ranging from mild to major in many parts of the developing world, but there were cases of outright recessions too. For instance, hard – hit countries in Asia include China has in particular managed to keep their economy growing in 2009 at a rate of 8.7 per cent, which was supported by the massive stimulus package put together by the Chinese authorities amounting to USD585 billion (Liu, 2007).

As for the ASEAN region, the GFC hardly hit this region through two ways; Firstly, capital fled the region. According to Jeasakul, Lim and Lundback (2014), cross – border claims on Asia declined by 15 percent between the third quarter of 2008 and the first quarter of 2009. This was roughly twice reduction compared to the other regions and surpassed the decline seen during the AFC. This deleveraging was mostly carried out by European banks in all Asian countries. Secondly, GFC affect ASEAN through fell in Exports. Between September 2008 and February 2009, exports plummeted by 30 percent (Nakaso, 2015). This was three times severe than the other region during the AFC. Also, industrial production for highly export dependent economies such as Hong Kong, Malaysia, Singapore, and Thailand, was sharply declined.

Based on the timeline, due to these crises effects, investors will search for the opportunities in diversifying their international portfolios. As large numbers of investors are competing to earn the highest possible returns, the movement of the investors either to enter or to leave the markets would affect the development of the stock market in a particular country. Consequently, the stochastic trends of stock market could also mirror the performance of other stock markets. Therefore, the development of the stock market plays a significant role in fostering and advancing the economic development of a country, particularly emerging markets such as ASEAN – 5.

#### **1.1.4 Macro Facts of Stock Market Development and Stock Market Liquidity**

The improvement in the ability of stock market to satisfy the needs of financial players in the traditional sub – sectors, including the capital markets, is the general definition of the stock market development (*SMD*). This definition is also shared by Balogun, Dahalan, and Hassan (2016), Capasso (2006), Nowbutsing and Odit (2009) and Sezgin and Atakan (2015). Besides, Barro (2012) described *SMD* as a process of stimulating the role of financial intermediaries to support the market through capital supply. Meanwhile, Balogun *et al.* (2016) suggests that a developed stock market could be attained through higher stock market liquidity.

Given the above definitions, this study defines *SMD* as the process of improving the ability of the stock market to satisfy the needs of traders by enhancing the roles of financial intermediaries in providing efficient capital supply, higher stock market liquidity position, and contribution to the economic growth of a country. Based on the multi – dimensional concept of *SMD*, various financial indicators may be used in the measurement of *SMD*; such as are market size (market capitalization), volatility concentration and integration of global stock market (Garchia & Liu, 1999).

To understand *SMD* in ASEAN – 5 financial markets, this study uses the aggregate trend of market capitalization to gross domestic product (*MCAP*). This measurement was also applied by Balogun *et al.* (2016), Bayraktar (2014), Nowbutsing and Odit, (2009) and Butsa (2008) in the measurement of *SMD*. Also, according to Demirgui – kunt and Levine

(1996), this measurement is less arbitrary than other measurements and indexes of stock market.

Moreover, due to the fact that any aggressive changes in the stock market could give a significant implication to the economy, stock market should be continuously developed (Barakat *et al.*, 2016). Thus, more capital inflows are needed to narrow the development gap between the counterparts in the region. Given this, more trading volumes, which relates to stock market liquidity, is important to ensure the inflow of capital which also represents the attractiveness of the stock market.

Given the different approaches to the measurement of stock market liquidity, there is no single agreement in its definition. This is explained by Baker (1996), who upholds that *‘there is no single unambiguous, theoretically correct, and universally accepted definition of liquidity’*. Researchers have defined stock market liquidity in different ways, based on the pioneering work of Amihud and Mendelson (1986). These authors define stock market liquidity as the ability to trade large quantity of securities quickly, at low cost, and without substantially altering the stock prices. Meanwhile, Sarr and Lybek (2002) define stock market liquidity as the ability of an investor to purchase assets without causing a drastic change in their prices.

Given these definitions and dimensions, various measurements have been employed in the measurement of stock market liquidity. For instance, Price-Based measures (Amihud & Mendelson, 1986; Hasbrouck & Seppi, 2001; Chordia & Subrahmanyam, 2005) and

Volume-Based measures (Datar, 2000; El-Wassal, 2013; Kumar & Misra, 2015) are two measurements which are widely used for measuring the stock market liquidity. The price-based measures normally utilize the bid – ask spread. Technically, the bid – ask spread measures the absolute difference between bid and ask prices. The volume-based measures, on the other hand, use trading volume (Amihud & Mendelson, 1986; Bogdan, Bareša, & Ivanović, 2012); which is equally applied in this study.

This measurement approach is also applied in previous studies, such as Augusto *et al.* (2011), Chipaumire and Ngirande (2014), Demirgüç-kunt and Levine (1996), Hegde and Paliwal (2011), Naceur *et al.* (2005) and Sezgin and Atakan (2015), as it measures the activeness of the overall stock market. Similarly, Amihud and Mendelson (1986) supposes its inverse relationship with bid – ask spread such that higher trading volume signifies a lower bid – ask spread, thereby explaining a better stock market liquidity position.

In this study, the pattern of *MCAP* and trading volume of the SET, SGX, BM, IDX and the PSE are presented to describe the relationship between stock market liquidity and *SMD* in ASEAN – 5. The trends are illustrated in Figure 1.2 to Figure1.6. Figure 1.2 shows the trend of stock market liquidity and *MCAP* for Malaysia during 1990 – 2014. The figure illustrates that, there is no harmonious pattern between stock market liquidity and *MCAP*. In general, stock market liquidity shows an increasing trend throughout 1990 – 2014. Some unavoidable fluctuations over the specified periods, as in the AFC of 1997 – 1998, 2001, and 2008, were illustrated for stock market liquidity. On the other hand, *MCAP* displays a

mixed trend and seems relatively stagnant from 1998 onwards. Despite an extreme downturn from 1993 – 1997, there is a slight increase in the overall *MCAP* content.

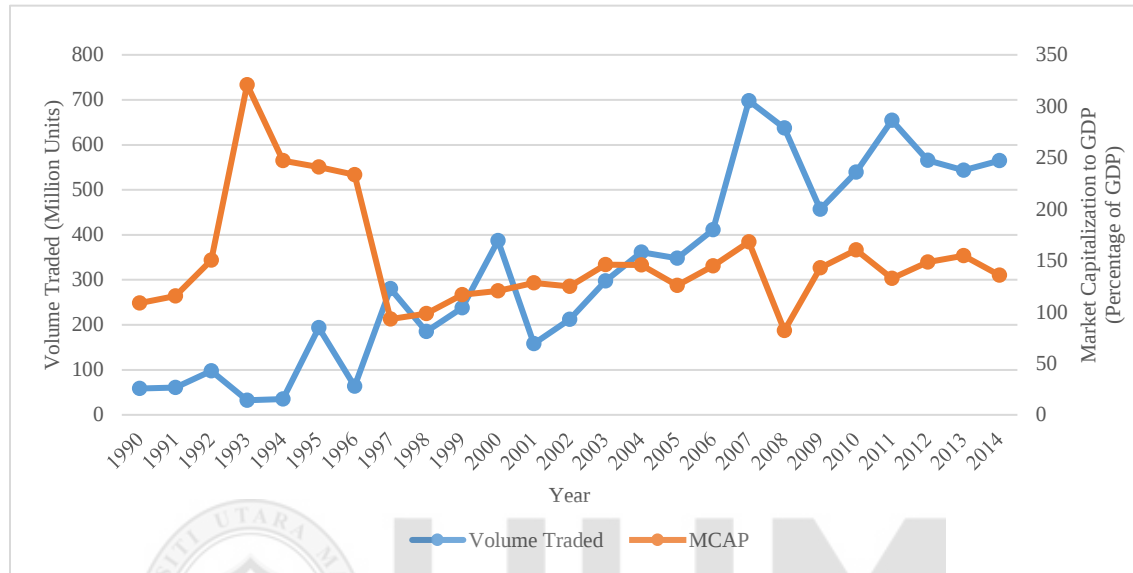


Figure 1.2  
*Trend of SMD and Stock Market Liquidity in Malaysia, 1990 – 2014*

Interestingly, a contrast pattern between stock market liquidity and *MCAP* also prevailed during the 1998 AFC, as rooted from the emerging illiquidity shock. During this period, many investors attempted to replace illiquid risky securities with liquid alternatives, since the illiquid stocks would have significant impacts on the investors' portfolio allocation (Charoenwong, Ding, & Yang, 2012; Nsofor, 2016).

Later, stock market liquidity and *MCAP* dropped during the 2008 US Financial Crisis. This inevitably drops *SMD* and stock market liquidity contents were mainly influenced by significant contagion effects from the US – subprime crisis (Chunxiu & Masih, 2014).

Hence, there were speculations by investors on further drop in the global stock market, which then affected the trading activities, particularly in the emerging markets.

In the same way, Figure 1.3 shows no synchronize pattern between stock market liquidity and *MCAP* in Indonesia's stock market between 1990 and 2014. Nonetheless, both stock market liquidity and *MCAP* are empirically observed to be volatile and have undergone series of inevitable fluctuations over the specified period.

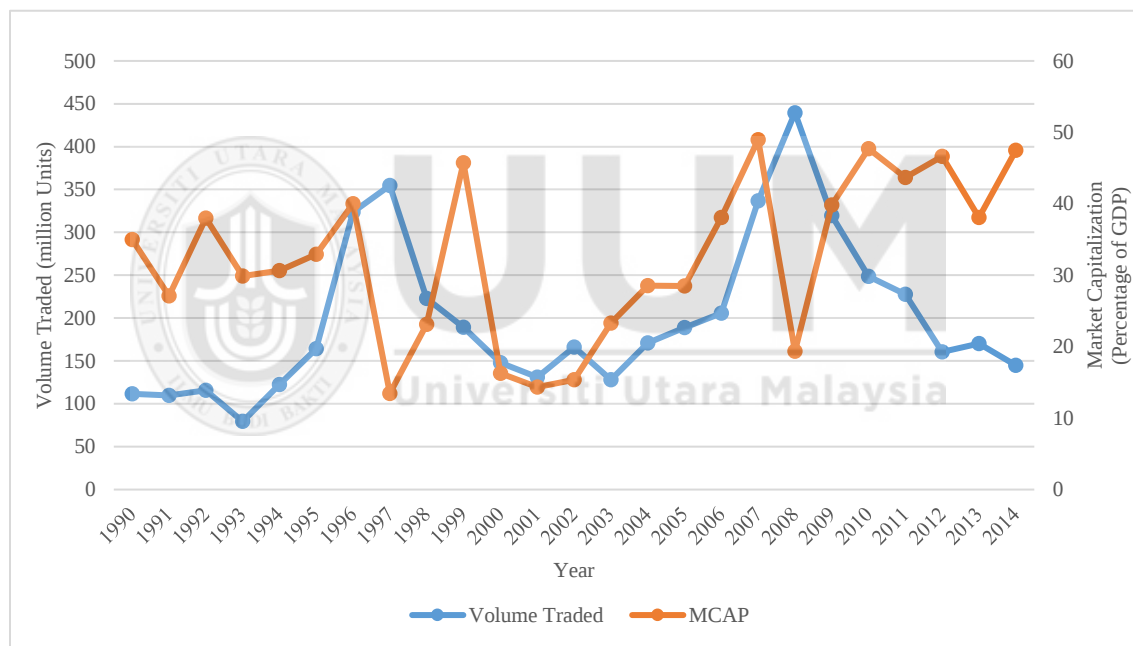


Figure 1.3  
*Trend of SMD and Stock Market Liquidity in Indonesia, 1990 – 2014*

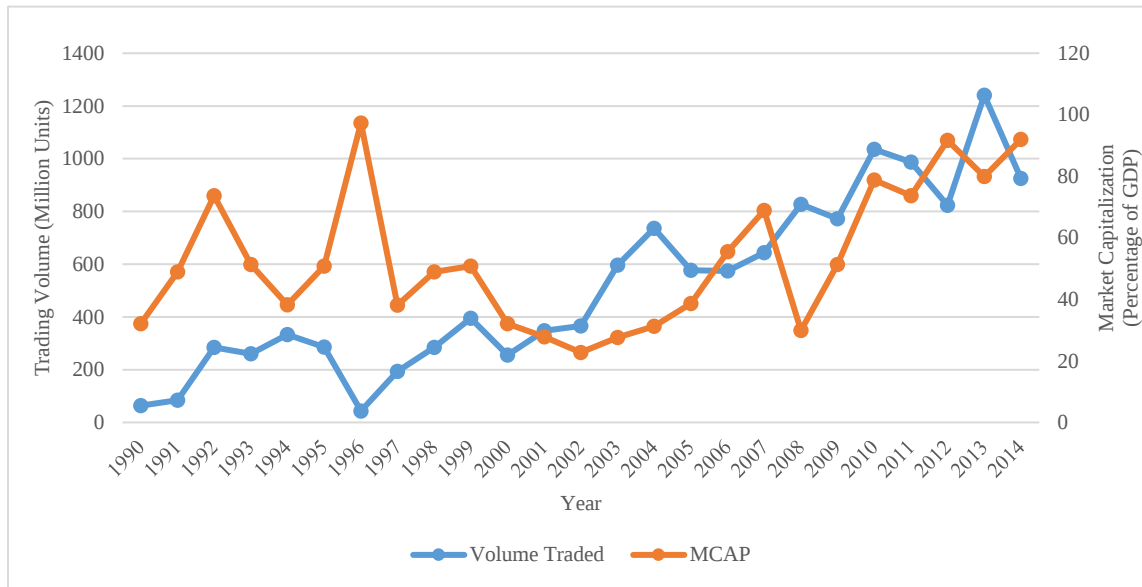
Generally, there is an increase in the stock market liquidity content over the 1990 – 2014 period. Similarly, *MCAP* has experienced a reasonable jump in its content over these periods. Further, the disclosure of a big gap in the pattern of stock market liquidity and *MCAP* was illustrated during the two unforgettable financial episodes: 1998 Asian

Financial Crisis and 2008 US Financial Crisis; which was heavily underpinned by the prevailing illiquidity shock through which many investors sought to reduce their possession of illiquid risky securities in favour of liquid alternatives.

Despite the drop in the *MCAP*, particularly during the AFC in 1997 – 1998, the traded volume still rose up to 354 million units in 1997. This is due to the fund injection by the IMF, which largely sustained the confidence of the investors to trade their stock in this market (Han & Lee, 2012). In the following years, stock market liquidity declined until its minimum point in 2003, due to the overflow of the external fund into Indonesia, which led to increases in price and interest rate.

Given this, most of the investors pulled – back their funds from the stock market in search of a better and prosperous market. Moreover, although a peak point was achieved in the stock market liquidity content in 2008, this solid growth was mainly dependent on the global sentiment and foreign investors (Chow, Huang, & Niu, 2013). Thus, country's economy became vulnerable to the global risk appetite. As such, the *MCAP* dropped significantly due to the US crisis, which further affected the speculators' investment strategies.

Similar to the cases of Malaysia and Indonesia, as illustrated in Figure 1.4, it can be concluded that there is harmonious pattern between stock market liquidity and *MCAP* for the stock market in Thailand.



**Figure 1.4**  
*Trend of SMD and Stock Market Liquidity in Thailand, 1990 – 2014*

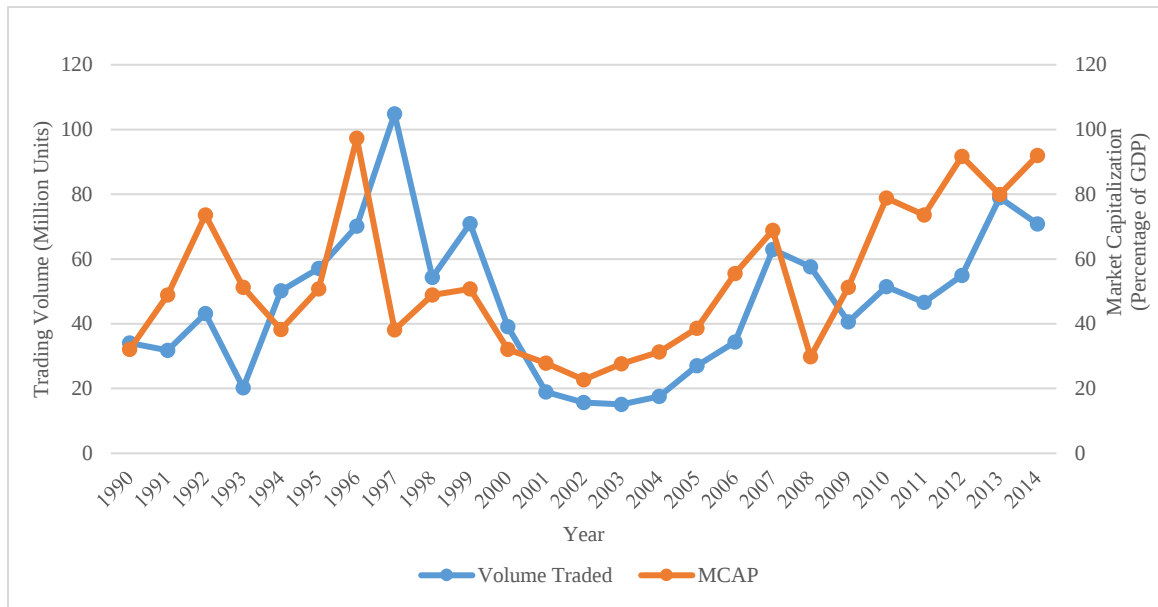
Based on the illustrated trend, both indicators have demonstrated an increasing trend throughout the 1990 - 2014 outlook; hence, stock market liquidity depicts an increasing trend. Despite the inevitable fluctuations within the outlook, such as during the AFC and 2012, Thailand was able to restore investors' confidence, which created a boost in the trading volume in the following years. Even though, *MCAP* is characterized to be relatively volatile, there was, nevertheless, an increment in the overall *MCAP* level; as it was elevated from about 32 percent in 1990 to 92 percent in 2014.

Empirically, although previous studies such as Garcia and Liu (1999) and Nsofor (2016) suggested the conventional wisdom that improving stock market liquidity contributes to fostering the *SMD*, a negative relationship between the indicators was disclosed during the AFC in 1997 – 1998 and 2008 US Financial Crisis thereafter. A wide gap between the stock market liquidity and *MCAP* during the AFC is mainly due to the support by the IMF,

which sustained all the sectors in Thailand. Consequently, *MCAP* was hiked up to its peak, even during the crisis period (Ibrahim, 2011). However, due to the baht depreciation which gave a signal towards financial crisis, most of the investors pulled back their investment and sought for safer market environments; therefore, trading volume for Thailand dropped during the AFC. Another drop in *MCAP* in 2008 was mainly due to the US financial crisis. This crisis period rapidly spread to many sectors which was triggered by the worldwide economic slowdown.

Also, Thailand has experienced some conflicting issues, such as internal political instability, lift in the reserve requirement, as well as bankruptcy of many financial institutions. Due to these unavoidable events, stock market was negatively impacted, as least investment funds are available for investment while investors repatriated their funds to meet the margin calls and fund redemptions.

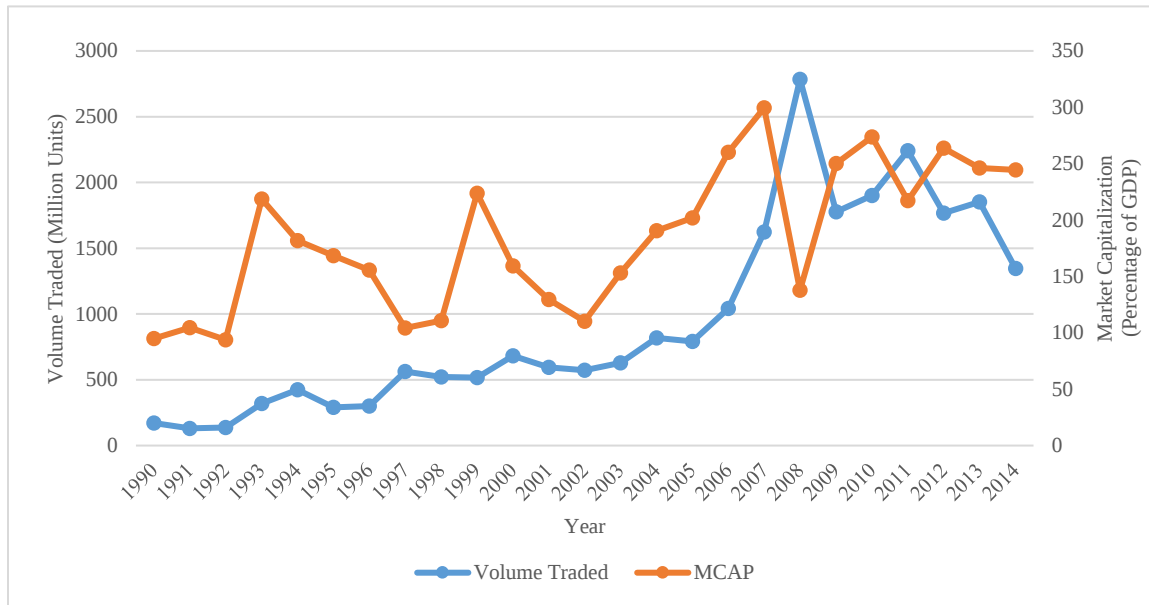
On the other hand, a synchronized pattern between stock market liquidity and *MCAP* is being observed in the Philippines' stock market for the 1990 – 2014 period. The pattern are displayed in Figure 1.5. Based on the pattern displayed, although both indicators have experienced multiple fluctuations throughout the 1990 – 2014 period, there was an overall increase in the stock market liquidity and *MCAP* contents. For instance, stock market liquidity was raised from 34 million traded units in 1990 to 71 million traded units in 2014. Also, *MCAP* increased from about 24 percent in 1990 to 106 percent in 2014. In particular, a negative relationship between stock market liquidity and *MCAP* was spotted during the AFC event.



**Figure 1.5**  
*Trend of SMD and Stock Market Liquidity in the Philippines, 1990 – 2014*

Due to the prevalence of illiquidity shock, many investors accordingly secured their market positions by buying more liquid securities from another stock market, whilst gradually reducing the number of illiquid shares in Philippines (Chow *et al.*, 2013). Later, a positive relationship between stock market liquidity and *MCAP* was also disclosed, notably during the 2008 US Financial Crisis.

As such, an unavoidable decline in both contents contributed to significant contagion effects from the US subprime crisis (Chunxiu & Masih, 2014). As in PSE, there is a contradictory pattern between stock market liquidity and *MCAP* for the Singapore's stock market, even though both indicators show increasing trend in the 1990 – 2014 outlook, as illustrated in Figure 1.6.



**Figure 1.6**  
*Trend of SMD and Stock Market Liquidity in the Singapore, 1990 – 2014*

At the individual level, stock market liquidity exhibits an increasing trend. Despite inevitable fluctuations over the specified period, there was an overall rise in the *MCAP* content over the period. However, a contrasting pattern was illustrated, particularly during the AFC, whereby as the stock market liquidity rose, *MCAP* illustrated a downturn. Another sharp increase was also displayed after the AFC. This increment is due to the policy implemented by Philippines' government wherein most of the external loans were injected into the productive sectors of the economy. This availability of credit, especially for corporate investors, strong export growth, and stronger trading with the US stimulated *MCAP* for this country after the AFC.

Moreover, the empirical evidence of a negative relationship between stock market liquidity and *MCAP* was portrayed during the 2008 US Financial Crisis. Clearly, there is a huge gap between *MCAP* and stock market liquidity during this year. The increasing pattern of stock

market liquidity was due to the fact that the peso was not pegged against the USD; hence, trading volume in Philippines was not significantly affected. However, as this crisis resulted in the global economic downturn, the *MCAP* was affected mainly due to the contractionary monetary policies implemented by the government; which also led to a drop in *MCAP*.

#### **1.1.5 Macro Facts on Contagion Effects on ASEAN – 5**

The relationship between the US and the ASEAN, particularly the first five members, began in 1977. After the Treaty of Amity and Cooperation (TAC) had been signed in 2009, the US was the first non – ASEAN country which has the resident ambassador and permanent mission to collaborate with the ASEAN members. Then, stronger relation was formed after the US had joined the East Asia Summit (EAS) in 2011 and the ASEAN – US Summits in 2012.

In addition, in terms of trading partners, ASEAN – 5 was ranked as the fourth biggest export market for the US; after Canada, Mexico and China. Conversely, though the value of export amounted USD75 billion in goods and USD27 billion in services into the ASEAN countries, the US was the fourth largest trading partner for ASEAN since 2004. In terms of investment, according to the US – ASEAN Business Council Report (2017), the value of investment from the ASEAN into the US has increased from USD2.3 billion to more than USD26 billion in 2015. Meanwhile, the ASEAN has received USD274 billion cumulative investment from the US, starting from 2004. Supported by the ASEAN Business Outlook Survey in 2017, the level of trade and investment from the US to the

ASEAN countries is expected to increase by 87 percent over the next five years. This is particularly due to AEC initiative, which convinces most of the US companies in establishing their future investment plan in the ASEAN.

These evidences show a significant increase in the economic ties between the US and the ASEAN markets. Given this connectivity, any shock in the US could affect the economies of the ASEAN – 5. This situation is also known as *contagion effects*. Forbes and Rigobon (2002) and Claessens and Forbes (2004) defined contagion as a significant increase in cross – market linkages, after a shock to one country or group of countries. Contagion effects are also related to the shocks; any exogenous shocks or adverse economic shocks occur in one country or region will affect other countries or regions. Some exogenous shocks are characterized by sharp price decline, increased stock return volatility and reduced trading liquidity.

Stock market interaction can be applied to describe the contagion effects in ASEAN – 5. This interaction has been applied by previous studies, such as Claessens and Forbes (2004), Dornbusch *et al.* (2000) and Serwa (2005). To describe the situation, the market index movement in ASEAN – 5 is referred. Figure 1.7 displays the market index movement in ASEAN – 5 and US stock markets for the period of 1990 – 2014.

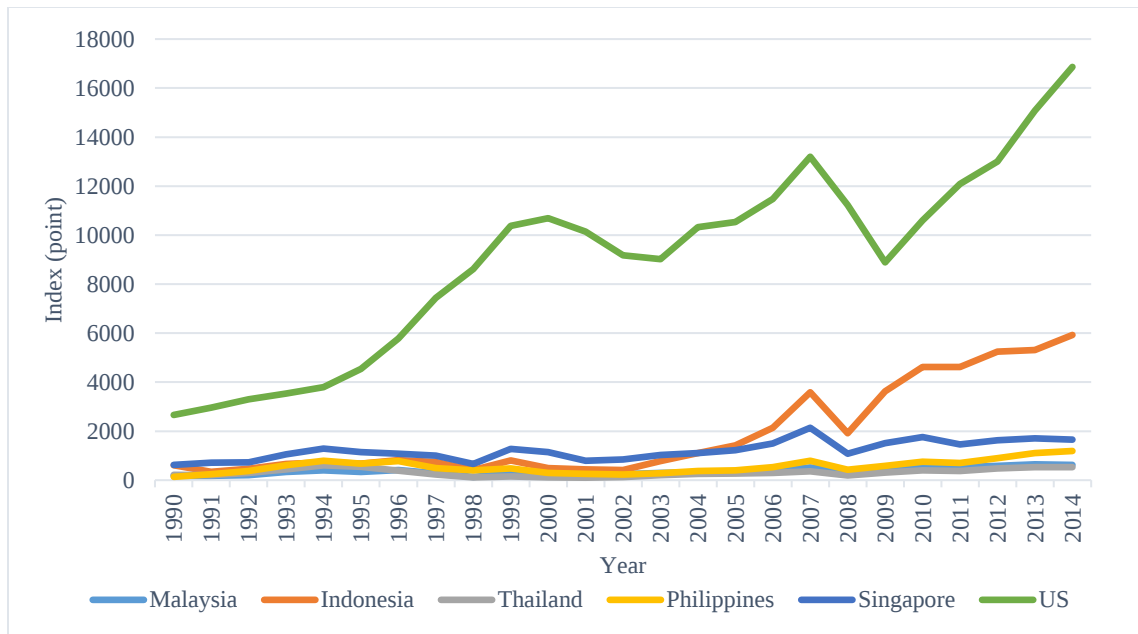


Figure 1.7  
Market Index Movement of ASEAN – 5 Countries and the US

In Figure 1.7, at the beginning, all ASEAN – 5 countries posted a relatively similar pattern in their market indexes, between 1990 and 2003. Interestingly, in the later years, it is worth highlighting, from Figure 1, that there is a clear evidence of the positive relationship between the stock market movements for the ASEAN – 5 and the US, particularly in the 2007 – 2008 period. Therefore, it can be concluded that there is a possibility of market interaction, at a certain degree, to prevail between the stock markets for the ASEAN – 5 and the US.

In 2008, giant financial institutions such as the Lehman Brothers, Goldman Sachs, JP Morgan, Citibank and the Bank of America broke down following the economic recession in the US. Subsequently, these phenomenon leads to a contraction in the industrial sector as well as an increase in the unemployment growth rate. Unfortunately, the crisis in the US

does not stop there; it spreads from one country to another via various channels such as via trade, financial markets, bank lending or monetary transmission mechanism. In fact, the financial vagaries in the US had affected most of the countries in the Asian region due to immense trade, investments and financial links (Rahman, Sidek, Zahirah, Sidek, & Abdulrahman, 2011). Besides, the collapse of output in the Asian economies impacted world commodity prices, undermining export income and public finances in Latin American countries. In addition, those Latin American economies that maintain close commercial ties with Asia or compete with Asian exports in third markets, were negatively affected by the fall in Asian demand and the depreciation of Asian currencies (Charoenwong et al., 2012)

In the stock market, the global financial crisis has increased the risk of financial contagion and recession in ASEAN – 5. There is a growing lack of dollar liquidity in financial markets in this region as capital retreats from countries in the region to safe havens abroad. As a result, there has been a significant increase in risk aversion against emerging market assets and bond spreads have widened. Also, there has been a flight of capital to safe havens elsewhere. Both of these have drastically reduced the values of assets held by banks in Asia and credit has become tighter and economic growth in many economies is beginning to slow down (Kim & Nguyen, 2009; Garcia, 1989)

Given this, any change in the US stock market could affect the stock market in ASEAN – 5 in such a way that the price of the stocks in ASEAN – 5 would be reflected. Thus, it would constitute a risky market for ASEAN – 5 investors as contagion effect could affect

their future cash flow, as well as the expectation towards the market. Also, traders who possess any information would initiate orders to sell their stocks, given the possibility of price depreciation. When the traders understand their roles, the available information regarding the contagion effects could be utilized in setting up their investment strategy in order to secure their position. As these investors' behaviour is concerned, the contagion effects from the US stock market may affect *SMD* in the ASEAN – 5.

## **1.2 Problem Statement**

There have been efforts by economists and financial analysts geared towards explaining the issues of *SMD* but it is often inadequately defined and poorly measured. Similarly, traditional researches have mostly focused on the *SMD* in developed countries. Hence, the explanations among emerging markets, such as ASEAN – 5, become very limited.

Conventional facts regarding the accelerating pace of economic development suggest that ASEAN – 5 started the catch up towards matured economies, and experienced a staggering economic growth since late 1990s. Therefore, towards a developed economy, *SMD* plays an important role as an alternative financial service to banking sector in a country (Chang, 2001; Ksantini, 2014; Wyman, 2016). However, concentration on the *SMD* in this region is not as encouraging as attention given towards economic development (Atje & Jovanovic, 1993). Particularly, there are limited common benchmarks for *SMD*, which have been pointed out, and which could be used as a signal for the market players in making an appropriate investment decision in ASEAN – 5. As a result, it leads to financial mismatch, which also accounts for stagnancy of *SMD* due to speculative activities of investors.

In addition, towards a developed and integrated economy, narrowing the *SMD* gap has been the key issues for discussion in the region.

Furthermore, previous studies, such as Ksantini (2014), Rizvi and Arshad (2015), Serwa (2005), Yang and Hamori (2014) and Yang and Shimada (2011) suggested that, financial crisis can give a negative impact to the *SMD*. Based on the assessment of *SMD* pattern in Figure 1.2 – Figure 1.6, there are uneven patterns of *SMD* among ASEAN – 5 countries, which were displayed during pre – and post – crisis period. Further clarifications were provided by Sukcharoensin and Sukcharoensin (2013), who found that stock market of Malaysia, Singapore and Thailand are well – developed, while the other stock market remained developing. Indonesia has advantage in size but less efficient; while the Philippines was ranked the lowest in most of the *SMD* aspects.

In contrast, Chaisrisawatsuk (2016) claimed that, stock markets in ASEAN – 5 have been recovering consistently, particularly after the AFC, due to market liberalization policy. They also claimed that, the *SMD* of Singapore, Thailand and Indonesia relatively recovered faster than those of Malaysia and Philippines. Another study by Chen, Leng and Lian (2005) found that before the crisis, Singapore and Malaysia led the market, after which (during the crisis period) Indonesia took over the market control. Based on the illustrated patterns of *SMD* and previous evidences, although ASEAN – 5 countries are sharing the same market environment, there is still an inconclusive explanation on the *SMD* pattern during the pre – and post – crisis periods.

In identifying the determinants of *SMD*, some previous studies found mixed explanation pertaining the impacts of stock market liquidity on *SMD*. For instance, Balogun *et al.* (2016), Garcia and Liu (1999), Sukcharoensin and Sukcharoensin (2013) found that stock market liquidity positively affects the *SMD*; while negative impacts of stock market liquidity on *SMD* were obtained by Levine (1991) and Bernstein (1987). Another inconclusive result was found in Yartey and Komla (2007). As these empirical studies were mainly focused on the developed markets, using price-based measures as liquidity benchmark, the explanations on volume-based measures of stock market liquidity in the emerging markets, such as ASEAN – 5, is limited.

In addition, the theoretical relationship between stock market liquidity and *SMD* proposes that higher stock market liquidity could stimulate the *SMD*. By using the volume-based measure of stock market liquidity, Figure 1.2 – Figure 1.6 illustrate that, during the AFC and global financial crisis in 2008, the pattern of stock market liquidity is increasing while *SMD* is decreasing. Specifically, only stock market in Thailand and Singapore are in line with the theory, while others illustrate contrast evidences during the AFC. Therefore, these trends illustrate a large unpredictable or random component for the investors and policy makers. As a result, it leads to an inappropriate policy implementation, which then led to complex economic and financial consequences due to these unpredictably forces.

Also, some policies implemented in this region do not support the theoretical relationship between stock market liquidity and *SMD*. For instance, while the pattern explains a positive co – movement between stock market liquidity and *SMD* in Philippines, the tax

costs are still high; which is associated with transaction cost in a trading activity. According to Amihud and Mendelson (1986), Balogun *et al.* (2016) and Vayanos and Wang (2013), high transaction cost would discourage the investors from unloading their securities to enjoy the realized capital gains. Meanwhile, in Malaysia, the tax treaties have been doubled with over 70 countries. Consequently, these policies discourage foreign investors and drop the trading volume. Based on these circumstances, there is a widely circulated issue on the conflict between the theory and policy implemented in relation to the impacts of stock market liquidity on *SMD* in ASEAN – 5.

On the other hand, the 1990 global financial markets were largely affected by severe global financial crisis, such as the Exchange Rate Mechanism in 1992, Collapse of Mexican Peso in 1994, AFC in 1997, Russian Collapse in 1998 and Devaluation in Brazil 1999 and GFC in 2008. These crises describe how financial crisis were transmitted to other regions that have different sizes and structures, in relation to contagion effects. As for the ASEAN – 5 countries, Dungey and Vehbi (2015) claim that shocks, originating from the US, continually affect the *SMD* particularly through the GFC.

As the saying goes, “when US sneezes, the world catches a cold”, knowing that during US subprime crisis, the ASEAN stock market index dropped by 17 percent, where the largest stock market declines over the crisis period. Specifically, according to Chunxiu and Masih (2014), stock index of Singapore was declined by 27 percent while Thailand and the Philippines were declined by 21 percent. Given these, there are mixed views on whether the volatility transmitted during the crisis constitutes contagion. In other words:

transmission of a large shock during a crisis is the contagion effect or it is just a continuation of the same cross-market linkages known as interdependence that exists during more tranquil periods. Also, these evidences show that any shock in US could retain its role as the key source of disturbance for the international market movement in ASEAN – 5. Also, this critical role played by the US also acts as a source of international financial market changes through reflection on investment choice.

Furthermore, according to Forbes and Rigobon (2002), higher interaction between markets, especially after a crisis, would constitute contagion effects. As shown by the market index trend in Figure 1.7, there is a possibility of contagion effects due to higher interaction between stock market in US and ASEAN – 5. However, some initiatives implemented by ASEAN – 5 countries do not support this theory. For instance, based on the US Investment Climate 2016 report, Malaysia has bilateral investment treaties with over 36 countries, but not with the US; Indonesia neither have any bilateral investment treaty with the US. Meanwhile, inefficiency and uncertainty of the judicial system became a significant disincentive for foreign investors to invest in Philippines; accounting for the ranking of the country as the weakest among ASEAN – 5, in terms of their attractiveness to foreign investors.

### 1.3 Research Questions

Given the problems identified above, this study seeks to provide answers to the following questions:

- i. Does AFC and GFC lead to a different effect for *SMD* among the ASEAN – 5 countries?
- ii. how does stock market liquidity affect the *SMD* in the ASEAN – 5 countries?
- iii. to what extent can the contagion effect from the US stock market affect the *SMD* in the ASEAN – 5 countries?

### 1.4 Objectives of the Study

The general objective of this study is to examine the effects of stock market liquidity and contagion effects on *SMD* in ASEAN – 5 countries. The specific objectives for this study are:

- i. to evaluate the difference of *SMD* among ASEAN – 5 during pre – and post – crises specifically Asian Financial Crisis and Global financial Crisis period.
- ii. to determine the effects of stock market liquidity on *SMD* in ASEAN-5 countries;  
and
- iii. to examine the effects of contagion of the US stock market on the *SMD* in the ASEAN – 5 countries.

### **1.5 Scope of the Study**

This study examines the *SMD*, stock market liquidity and contagion in the ASEAN – 5 countries; comprising Malaysia, Indonesia, Thailand, Philippines and Singapore. These countries are the founding members of ASEAN; ASEAN is the fastest growing regions among emerging markets in the world based on the export and foreign direct investment inflows (Sun, 2015). The study covers the period between 1990 and 2014. This period is considered where two main crises hit ASEAN – 5 and it is the maximum data availability. To study on the effects of crises, this study considers the AFC in 1997 – 1998 and GFC in 2008 as the main crises which affect the ASEAN – 5.

### **1.6 Significance of the Study**

In conducting this study, several contributions are considered. Such contributions include theoretical, methodological and practical contributions. Theoretically, driven by the fact that several researches have drawn inconclusive results on the relationship between the stock market liquidity and *SMD*, this study contributes to the body of knowledge by filling the gap on the ambiguous effects of stock market liquidity and contagion effects on *SMD*. Although studies on the *SMD* and stock market liquidity are quite numerous, very few of such studies have been conducted on emerging markets, especially the ASEAN – 5 countries as most of the studies were particularly focused on the developed economies, such as the US and UK. This could result in selection bias, with respect to the emerging regions, due to the data scarcity and time depth. Thus, the findings of those studies are not applicable to the emerging markets grounded on the economic structure and policy differences.

Also, as previous studies mostly utilized the price – based measures, which is bid – ask spread in measuring stock market liquidity, this study provides an alternative through utilizing the volume – based approach. This measurement gives a different view on the impacts of stock market liquidity on *SMD*, particularly in ASEAN – 5.

Besides stock market liquidity, contagion effects are also considered. As there is no consistent theoretical prediction regarding the effects of contagion on the *SMD*, the nature of shock effects from developed countries *SMD* of emerging markets are explained in this study, by considering the US stock market. Given that contagion is an integral moment for studying resiliency of a country, this study provides a baseline for examining the impact of globalization.

On the methodological contribution, as data availability is the main constraint in emerging markets, this study uses the aggregate data in measuring the stock market liquidity, which could handle this limitation. Although there are several attempts to measuring stock market liquidity, using the bid – ask spread, this study measures another dimension of stock market liquidity which covers the breadth and depth dimensions through the utilisation of the traded volumes. This is called ‘volume-based measure’, and is more realistic to be employed. Furthermore, by considering the traditional panel as a tool of analysis, empirical results obtained from this study are applicable in other panel contexts for other equity markets, particularly for emerging economies, in accessing the financial market phenomena. Besides, this study also considers contagion as one of the determinants of the

*SMD* in ASEAN – 5 countries. As there are limited analysis employing interaction term as a tool of analysis, this study contributes to the methodology side through the explanations of these analytical procedures.

On the other hand, the practical contributions through this study suggests that investors, policymakers, and government could benefit. For investors, understanding on how stock market reacts to certain crisis or shock would be a useful tool in risk management. For instance, by understanding the interaction between the market, any contagion effects and negative macroeconomic news could be utilized in determining the portfolio diversification strategy which minimizes the risk of loss. Moreover, as this study focus on the impacts of crises, stock market differences can be used by the policymakers in determining the precautionary action against downturn in the *SMD* performance and keep the attractiveness of the stock market as portfolio diversification hub.

As for the policymakers, motivated by several crises from developed countries, this study provides an understanding of tools regarding the relationship between the market and how they are integrated. This subject would be of interest to policymakers and researchers in determining the appropriate policies, assessing the investment frameworks and identifying the risks and cost of capital for investment product. Besides understanding the effects of crisis, contagion and liquidity helps the government and central banks in identifying the needs of the stock markets' participant and industries in sustaining the development of the stock market.

## 1.7 Organization of the Thesis

This study considers the effects of stock market liquidity and contagion with the US to the *SMD* in the ASEAN – 5 countries. In Chapter One, the background, problem statement, research questions, objectives of the study, significance of the study, scope and limitations of the study are clarified. Chapter Two explains the details regarding the theoretical and empirical reviews of *SMD*, stock market liquidity and contagion effects; while Chapter Three explains the methodology employed in achieving the stated objectives; followed by the discussion of results in Chapter Four. Finally, conclusions and policy implications are provided in Chapter Five.



## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

This chapter discusses the theoretical and empirical reviews of *SMD*, stock market liquidity and contagion effects. Specifically, it is divided into four main sections. Section 2.1 explains the concepts of *SMD*, stock market liquidity and contagion effects. Section 2.2 provides the theoretical explanations of the effects of stock market liquidity and contagion effects on *SMD*. Section 2.3 is devoted to the empirical reviews pertaining to the differences in *SMD*, the effects of stock market liquidity on *SMD*, and the contagion effects on *SMD*. Before concluding the chapter, Section 2.4 identifies the existing gap in the literature.

#### **2.1 Concepts of Stock Market Development, Stock Market Liquidity and Contagion**

This section deals with the concepts and definitions related to stock market development, stock market liquidity, and contagion effects. Specifically, it is divided into three main sections. In Section 2.1.1, the concepts of *SMD* are discussed. Subsequently, the concepts of stock market liquidity, and contagion effects are discussed in Section 2.1.2 and Section 2.1.3, respectively.

### 2.1.1 Stock Market Development

The stock market represents the economic strength of a country. Constituent with the financial system, stock market acts as a medium where new ventures can be financed. Also, *SMD* plays an important role as it is related to the general financial sector growth of a country by strengthening the evolution of the financial system. Thus, *SMD* plays a vital function in economic development. Going by the above, *SMD* may be defined as the ability to promote the mobilization of foreign and domestic resources, as well as encouragement of greater investment, (Agrawalla & Tuteja, 2007; Kanasro, Junejo, & Rohra, 2009; Sezgin & Atakan, 2015), providing opportunities for companies to raise capital at low cost (Rahman & Salahuddin, 2010), and reducing the dependence on bank finances which are subject to the changes in interest rate (Owiredun, Oppong, & Asomaning, 2016; Rahman & Salahuddin, 2010).

The growing importance of *SMD* has reinforced a broader range of concepts. However, according to Demirgüç-kunt and Levine (1996), *SMD* is complex and multifaceted. In principle, a well – developed stock market can be identified through improvement in savings mobilization and efficient capital allocation for investment, which lead to an increase in economic growth rate (Nowbutsing & Odit, 2009), could provide an important source of capital for the investment purposes at low cost (Dailami & Atkin, 1990), have a relatively large market size relatively to the size of economy (Balogun, Dahalan, & Hassan, 2016), and greater stock market liquidity (Balogun *et al.*, 2016; Nowbutsing & Odit, 2009).

These characteristics of developed stock market are also explained by El-Wassal (2013), who stated that *SMD* is the process of functioning the stock market as a mechanism to transform the savings into financing for the real sectors, accelerating the economic growth through quantity and quality investment tools and promote the efficiency of the financial system. Based on these definitions, the *SMD* is the process of expanding the stock market which have an efficient capital allocation at a relatively low cost, large and greater stock market liquidity position which could contribute to the economic growth in a particular country.

On the other hand, Augusto, Forti, and Yen-tsang (2011) defined the *SMD* through different dimensions. The dimensions comprise of origin of the legal system, law enforcement, accounting patterns, transparency, corporate ownership structure, and level of creditor and protection of minority investors. Also, La Porta, Lopez-de-Silanes, Shleifer, & Vishny (2000) explained another two dimensions which are transparency and accounting standard and volume of Initial Public Offerings (IPOs). These dimensions should be good for a well – developed stock market. Meanwhile, Sukcharoensin and Sukcharoensin (2013) discussed the dimension of size, access, efficiency and stability for a well-developed stock market. Larger stock market size could provide an important source of investment capital at relatively low cost. Thus, size of the market explains the development level of a stock market. The accessibility describes the ability of the investors and firms to compete fairly in the market which are not only focused on the large firms. The third dimension, which is efficiency, clarifies that a well-developed stock market should have a low degree of co-movement between the individual stock, high price

movement frequency, and low transaction cost. The last dimension is stability that is related to the skewness of the stock returns and percentage of earning manipulation, which should be low for a well-developed stock market. Moreover, Cihak, Demirgüç-Kunt, Feyen, and Levine (2012) introduced the *SMD* gap measures through several dimensions. Such dimensions include the size of financial institutions and market (financial depth), degree of financial institution utilization in a market (access), efficiency of the financial intermediaries in facilitating resources and transactions (efficiency) and stability of the market and financial institutions (stability). As those dimensions are well monitored, then a stock market could be categorized as developed stock market, which could attract more investors and more capital injections are gained.

The *SMD* can also be explained through different stages. For instance, Capasso (2006) explained the three stages of *SMD*. At the first stage, which is beginning of the transition process, stock market is undeveloped and dominated by banks or any financial intermediaries. Also, stock market does not exist at all which means their size does not allow for any significant effect on the economy at this stage. In the second stage, the accumulation of the capital stimulates the development of financial intermediaries which increases the number, sophistication and complexity of the financial instruments. As a result, the size of the stock market increases and begins to grow in term of *MCAP* and number of listed companies. In the last stage, *SMD* continue to move together with the economic growth in general.

Rahman and Salahuddin (2010) added another stage, which is stage four whereby the stock market appears to develop in a non – monotonic way. They also suggested that the capital accumulation seems to be followed by increase in bank share in the financial system until a reasonable size has been reached, then it will lead to an increase in equity market shares. This situation is evidenced by the decrease of equity to debt ratio at the beginning of the development process; and only with further development, this ratio increases.

Furthermore, Barro (2012) explained two stages of *SMD*. At the low stage of *SMD*, in a poor economies and rudimentary financial system, financial intermediation is rare and only basic financial instruments are available. At this stage, stock market is completely absent. Then, as the economies is developed, in the second stage more complex and articulated financial instruments are appear in the market and stock market emerged. Demirgüç-Kunt & Maksimovic (2016) also argued that in the initial stages of *SMD*, the opportunity for risk sharing and flow of information in the market are expanded. These situations would allow the firm to access for an easy and cheap bank loans which increase the leverage level.

At the later stage, the issuance of equity becomes more convenient as the cost declined and substitution of equity for debt. Generally, the stages explained represent the general regularities and define the broad terms of the *SMD* capital accumulation. Those features might be different based on the countries and periods.

### 2.1.2 Stock Market Liquidity

There are various definitions of stock market liquidity that have been proposed in the previous studies. Amihud and Mendelson (1986), Easley and O'hara (2004), and Kumar and Misra (2015) concluded that liquidity is hard to be defined but easy to be felt. In explaining the distinction of the liquidity concepts, Datar (2000) explained the monetary liquidity which relates to the availability of the cash and near cash and its relation with the general demand. The commonly used definition of stock market liquidity is related to the easiness of trading the stocks without substantially affect the price which also proposed by Amihud and Mendelson (1986).

The definition of stock market liquidity proposed by Chordia *et al.* (2005) and Easley and O'Hara (1996) were the ability to quickly buy and sell a large quantities of stocks at low cost. Those definitions were supported by Sarr and Lybek (2002) and Watanabe (2004) which explained that in the microeconomic perspective, the concepts of stock market liquidity are multifacets as the market participants characterized a liquid stock as it can quickly be sold in a large amount without affecting the price. Thus, liquid financial assets are characterized by having a small transaction costs, easy trading, short settlement time and large trading will give a small impact on the market price.

Besides Amihud and Mendelson (1986), among the earliest definition of stock market liquidity was proposed by Kyle (1985) which suggested that a liquid market could be explained based on depth, tightness and resilience dimensions. Prior to this study, later study such as Eickmeier, Gambacorta and Hofmann (2014), Lee, Karolyi, and Werner

(2006) and O' Hara (2004) also recognized those dimensions. They suggested that width and immediacy are another dimensions of stock market liquidity.

Moreover, Baker (1996) and Wyss (2004) proposed the properties of stock market liquidity comprise of trading time, depth, breath and resiliency. Trading time indicates the ability of the stocks to be executed immediately at a prevailing price in a trading activity. Depth explained the market deep which the orders are higher than the trading price. Breath specify broadness of a market whereby a liquid stock market would have a large buying and selling orders and resiliency will indicate the low-price impact due to the high orders of the stocks. The definitions are generally circulated under four categories of stock market liquidity scopes known as trading volume, trading speed, trading cost and price impact based on how the liquidity being measures which also shared by Ramlee and Ali (2012).

Another dimension of stock market liquidity was proposed by Gabrielsen, Marzo, and Zagaglia (2011) which focused on transaction time and trading activities. Transaction time explains the speed of executing a transaction and demand pressure that affect the price of an asset. In other words, an asset is liquid if it can be transacted at a minimal cost. This concept can also be applied to the stock market as a whole whereby a stock market is liquid if a trading activities can be conducted at a minimal cost without delay from order placement which also shared by Wyss (2004). The second concept is trading activity which related to the order flows and amount of transaction. In a liquid market, transaction cost does not determine the price variation but it determines the transactions size which minimal price impact usually considered. However, it is crucial to elaborate the extent of which

transaction amount or size could be used in determining a large investment swings as in a small market by an investor. This is because, the trade size can highly affect the price in a large market and the order flow only give a minor extent to the changes in price of the stocks.

Consistent with the compensation for the higher transaction costs bear by investors in less liquid market, variety of stock market liquidity measures have been used. As there are multi – dimensional dimensions of stock market liquidity, the results of different measurement could result to a different conclusion. This is because, different stock market liquidity measures are captured at different frequency.

### **2.1.3 Contagion Effects.**

Various definitions have been introduced in explaining the contagion. Among the most applicable definition that proposed in the Thornton's Contagion Theory which was cited in Garcia, (1989), Moser (2003) and Werner (2014). Based on this theory, contagion can be defined as the transmission of crisis from a country to another country or region. Also, this theory suggested that, the previous episodes of financial crises could be transmitted into a different size and structure of a market (Cheung, Tam, & Szeto, 2009).

Meanwhile, Claessens and Forbes (2004) suggested that the term contagion was usually referred to the spread of disease in medical term before 1997. But, it was changed in July 1997 due to the AFC which originated by the currency crisis in Thailand which quickly spread into the other regions including East Asia, Russia and Brazil. Moreover, the term

contagion is argued to be applied for a crisis between two countries which share similar characteristic and closely linked. Countries that are sharing same geographical characteristic or located in the same region with many similarities in term of structure and history besides having a strong directly linkages in trade and finance might be closely connected even in a stable period (Cheung *et al.*, 2009; Claessens & Forbes, 2004). Thus, the any significant increase in the cross – market linkages is not necessarily exhibit a contagion but it might be determined by the continuation of the cross – market linkages during the crisis.

On the other hand, Forbes and Rigobon (2002) differentiated between contagion and interdependence. Contagion effects can be defined as a significant increase in the cross – market linkages after a shock to one country. Thus, contagion effect is constituted if there is an increment in cross-market co-movement after the shock. Otherwise, if a high degree of co – movement still happens during the stable period, it might not constitute as contagion but it is referred as interdependence.

As the abovementioned definitions of contagion are described, Cheung *et al.* (2009) explained those definitions in more specific ways. Since contagion is related to the transmission of shocks. They defined contagion by dividing the countries into two categories. The first category is the countries which have some identified linkages. In this category, the contagion effects exist through the spill-over in the trade linkages, financial linkages and any economic similarities shared between the countries. Meanwhile, the second category is the countries which have no identified linkages. In this category, the

definitions of contagion can be explained in three ways. First, contagion is the anticipated effects of shocks across the asset markets during the crisis period which related to the changes in the investors' belief and expectation. Second, high correlation and co – movement in the equity market returns during the turmoil period. The last category is the increase in the probability of crisis in one economy due to increase in the probability of crisis in another countries or region.

Given by the abovementioned definitions, contagion is caused by several factors. For instance, Claessens and Forbes (2004) divided the causes of contagion into two broad groups consist of fundamental causes and the behaviour of investors. In the first group which is the fundamental causes, contagion is generally caused by global shocks including common shocks, trade linkages and some financial linkages between the countries. These causes might lead to large capital outflows from a country especially emerging markets and increase in asset prices co-movements. Meanwhile, the second group explained the behaviour of the investors in term of liquidity problem, information asymmetric, incentives problems, market coordination, and reassessment by the investors.

Furthermore, Moser (2003) explained the causes of contagion through financial crises which are divided into currency crises, banking crises and debt crises. Currency crisis was defined as a period of large changes in the exchange rate or index due to the market pressure which additionally affect the foreign reserves or interest rates. Meanwhile banking crises is circulated on high ratio of non – performing assets to total assets in the banking system. As for the debt crises, it is normally identified through the default or debt restructuring

agreements. Thus, the propagation of the adverse shocks which trigger to the financial crises could be transmitted into other countries can explain the contagion effect but the crises that simultaneously occur between two countries are not necessarily represent contagion because contagion requires causal connection.

The causes of contagion were also described by Calvo, Leiderman, and Reinhart (1993) and Lipsey (2001) through asymmetric information. They suggested that the monetary policy such as reserve requirement of the financial institutions and interest rate could affect the funding availability of a country especially emerging market economies. Thus, the monetary policy changes can cause a contagion through exacerbating asymmetric information among investors which then trigger them to alter their portfolio in a stock market. It is associated with the risk of trading with informed traders. Also, monetary policies will adversely affect the fund flows through increment in financing cost and lowering the creditworthiness of a trader. Additionally, Kim and Nguyen (2009) suggested that the dominant markets such as the US and UK play an important role as a lead market to the other regions. Any monetary policy changes might have direct or indirect impact on the other market.

In addition, Hegde and Paliwal (2011) proposed the causes of contagion through dynamic interaction between financial liquidity and market liquidity. They suggested that investors will liquidate their portfolios due to the margin calls, increased in the risk aversion and information asymmetry due to the economic crisis. Given this, financial contagion can be explained by the idiosyncratic shocks which turn into contagion by affecting volatility of

the stocks, returns, liquidity and correlation of returns across assets, market and region. Moreover, they suggested that the effect of crisis could be spread although the regions are fundamentally not correlated.

Similarly, Moser (2003) claims that, in the new global market, economic policies might not be enough in preventing the effects of financial crises. Hegde and Paliwal also point out that the contagion could happen for many reasons including increased in risk aversion, borrowing constraints, hedging demand, information asymmetry and irrational behaviours of the traders.

Another straightforward explanation regarding the cause of contagion is through financial linkages (Marshall, 1998). The cross – border transmission due to high exposure on private and sovereign debtors could lead to contagion effects. This failure transmission likely to happen if banks are among the major creditors. Due to low capital to asset ratio, a bank crisis could occur if a major bank suffers huge losses from foreign loans default. Concern on the loan default would then represent the policy implemented by the financial intermediaries in a country. Also, it will represent the capacity of the bank to provide another financial support for the foreign trader in acquiring the investment fund. Thus, it is related to the attractiveness of the country and financial market based on the corporate governance and monetary policies.

## **2.2 Theoretical Review of Stock Market Liquidity Effects on Stock Market Development**

This section discusses on theoretical effects of stock market liquidity to *SMD*. In Section 2.2.1, the underpinning theory regarding liquidity effect on the *SMD* is disclosed. Subsequently, channels of liquidity effects on the *SMD* are discussed.

### **2.2.1 Underpinning Theory of Liquidity Effects on Stock Market Development**

The theoretical set up that is used in this study has been built upon a behavioural model of stock market development which is introduced by Rossell (1991) and is later developed by Yartey (2008). The main hypothesis of the model is that the level of economic development, which is captured by output growth, and market liquidity, determines stock market development. The classical Calderon – Rossell Model states that stock market capitalization is a function of the number of firms listed in a stock market and the value of those companies.

According to the basic model, the prices of listed companies depend on number of listed companies and yearly output which generally measured by *GDP*. The number of listed companies are function of output and liquidity available for the financial transactions. Thus, according to the basic Calderon – Rossell Model, the sophistication level of an economy and availability of liquidity sources determine development of stock markets (Sezgin & Atakan, 2015). However, according to (Owiredu *et al.*, 2016), the Calderon-Rossell model was modified to incorporate other financial and economic variables that might affect stock market development. The modified model examines the role of banking

sector development, and private capital flows in explaining stock market development in Emerging Countries.

The Calderon – Rossell Model also supported by Levine (1991). Based on his study, a positive relation between financial stock market and economic growth by issuing new financial resources to the firms. The financial stock market facilitates higher investments and the allocation of capital, and indirectly the economic growth. Sometimes investors avoid investing directly to the companies because they cannot easily withdraw their money whenever they want. However, through the financial stock market, they can buy and sell stocks quickly with more independence. Also, an efficient stock market contributes to attract more investment by financing productive projects that lead to economic growth, mobilize domestic savings, allocate capital proficiency, reduce risk by diversifying, and facilitate exchange of goods and services (Eickmeier *et al.*, 2014).

Another study by Balogun *et al.* (2016) suggested that the development of stock market ensures that the size of the market must be relatively large to the size of the economy. The size of the market is measured by market capitalization which is the number of listed securities scaled by *GDP*. Size is not the only means of measuring a vibrant market since large but illiquid market does not imply that the market is vibrant. Large size must be complemented with greater liquidity for the stock market to be developed. Market liquidity avails the investors the opportunity to transact easily and cheaply in securities which implies that investors can easily buy and sell shares in the market at little or no cost. Therefore, this theory supports the theoretical model of Calderon – Rossell which claims

that the *SMD* is determined by the number of listed company and liquidity which is the trading frequency in a stock market.

Moreover, other theoretical explanation suggested by Abdelbaki (2013) also support the Calderon – Rossell model as he claims that the *SMD* can the effects economic growth by several ways. The first one is to raise the proportion of savings invested. The proportion of saving depends on the efficiency of financial intermediation in the economy. Also, the effects of stock market on investment, through changes in stock prices that reflect the marginal productivity of capital should be positively correlated with investment growth. An increase in the marginal productivity of capital is directly linked to an increase in investment activities. The second way is to affect the private saving rate, which works by improving the allocation of capital through information pooling or risk pooling. The third way is to raise the social marginal productivity, which can be done since saving may go either way. Given these, the *SMD* can be affected by the development of the financial institution which then affect the attractiveness and investment activities in a stock market.

### **2.2.2 Marketability of the Stock**

Through this channel, stock market liquidity can be affected by the marketability of the stock listed in a stock market in the sense of attractiveness of the stock market to be chosen as a long – term investment hub by investors. A high value, well – perform and good corporate governance of the listed firms will attract investors which then increase the trading activities in a stock market (Wyss, 2004). Also, high trading volume of a stock market indicates a sustainable growth rate of the industry which then explains the stock

return for investors. According to Claessens and Forbes (2004), macroeconomic frameworks, and especially with sustainable debt burdens, flexible exchange rates and labour markets, and strong financial systems, are less vulnerable to shocks originating in neighbouring countries or the global economy. Given this, a country with less vulnerability index against any financial crises would be able to have a sustainable economic growth. Also, any companies listed in sustainable growth countries can maintain their performance which then enable them to fulfil their obligation to their shareholders. Thus, investors will be much more attracted to invest in that country.

On the other hand, Amihud and Mendelson (1986) proposed that a liquid stock market would increase the value of the firms. It is in – line with the theory proposed by Calderon – Rossell which claims that the prices of listed companies depend on number of listed companies and yearly output which generally measured by gross domestic product, and the number of listed companies are function of output and liquidity available for the financial transactions. Consequently, many investors will be attracted to buy the stock from higher value firms which also illustrate potential higher return for investors. Thus, it would also boost the *SMD* through increase in trading activities. The ideas given by Amihud and Mendelson also support the previous study by Kyle (1985) which suggested that a liquid stock market could be resulted from a well corporate governance of the listed firms.

Also, if investors do not have to search or wait for a suitable buyer to execute a transaction, Zhang (2010) suggested that a high speed, high turnover rate and high order to trade ratio will also increase trading volume in a stock market. Also, a high frequency trading firm

which act as market maker will place a limit order to sell or buy to create a low bid – ask spread. By doing so, market maker will attract more market order from its counterpart which then increase the trading volume in a stock market and increase the *MCAP* which represent the *SMD* of a country.

Furthermore, Chipaumire and Ngirande (2014) and Majid, Meera and Omar (2009) suggested that easy access to investors' wealth which can easily be sold without any effect on the price will also lead to higher liquidity. As more savers will turn their saving into stock market investment, more trading activities can be executed. Moreover, this easy access and higher distribution of profits would encourage the investors to invest in a long – term investment. Simply, normal saving can be substituted through a competitive rate of return and easy access of the stock investment. In addition, Dalsenius (2007) suggested that, high marketability of a stock market will attract financial institutions to invest the deposit as long term investment in a stock market. As a result, it would encourage a capital accumulation and economies of scale which helps to develop a stock market and a country.

### **2.2.3 Monetary Policies**

A well monetary policy implemented by the country will also affect the liquidity of a stock market. Specifically, Nowbutsing and Odit (2009) suggested that an expansionary monetary policy such as lowering the interest rate and federal reserve requirement can increase the ability of the bank to supply the fund especially investment fund to the investors. Conversely, a contractionary monetary policy will drop the capital availability and financing ability of financial institution. Also, rise in interest rate might reflect the expectation of investors about future economic performance of a country which also

interpreted as a sign of financial stress (Grimaldi, 2010). Therefore, any monetary policy will be used by investors and managers to predict their future return and setting up their portfolios diversification strategy.

In addition, according to Fern, Martin, Larch, Peter, and Fern (2011) suggested that, a stock market is expected to be liquid if the traders are able to trade their stock cheaply and perceive a low risk of holding assets. Since monetary policy can shift both financing costs and risk of holding asset, it might also affect the stock market liquidity. Similarly, Brunnermeier and Pedersen (2009) addressed that, capital constraints resulted from a contractionary monetary policy can cause to a difficulty for trader to meet margin requirement and fail to provide liquidity to the market. Also, illiquid stock market reduces the quantity of trader who provides liquidity due to higher margin requirement.

On the other hand, Devereux and Smith (1994), high saving rate provided by financial institution will also increase liquidity. A high saving rate will attract more depositor and higher fund can be utilized to finance the project of a firm through saving mobilization. Also, an efficient capital allocation and resources mobilization by the financial intermediaries in a country will also boost trading activities in a stock market (Barro, 2012; Talla, 2013). Particularly in the emerging countries, external equities only represent a small proportion of the financing used by the corporations as most of the capital are utilized through domestic sources. This efficient utilization of fund will then attract foreign investor to invest into these countries.

Moreover, saving and lending amount held by financial intermediaries can be described through lending – deposit spread which the difference between financing is provided by the financial intermediaries and amount of deposit. According to Garcia and Liu (1999), a relatively greater lending – deposit spread would also indicate a more efficient banking system as the bank can provide more lending through less amount of deposit (Chaisrisawatsuk, 2016). This situation was affect the investors' confidence and threaten the *SMD*. This idea also supported by Naceur *et al.* (2005) and Rahman and Salahuddin (2010) which claimed that the financing facility particularly credit to the private sector by bank could help in the process of *SMD* and economic activities by providing more financing to the investors which in turn increased the market capitalization of the firm and boost *SMD*.

#### **2.2.4 Investment Cost**

Investment cost is the payment need to be executed by investors in a stock trading activity. According to Butler, Grullon and Weston (2005), lower floatation cost associated with seasoned equity offering which is the cost faced by the investment banking group will stimulate trading volume. A reasonable floatation cost must be in – line with the requirement or market marker such as dealers, trading specialists or block traders who manage stock buyers and sellers and facilitate toward an immediate process of intermediation activities. Also, an easy process for investment bank to place a new issue and reduce the intermediation costs will result to a liquid stock market which then attract more investors into a stock market and boost the *SMD*.

Additionally, Bencivenga *et al.* (1996) and Yartey and Komla (2007) states that, lower downside risk and investing cost in a projects and encourage more investors. As the liquid market could secure the saving access of investor during the project implementation, they can easily, quickly and sell their stake in a company with a low cost. Therefore, a liquid stock market will encourage long – term investment and profitable projects which then improve the capital allocation and long – term growth of a stock market.

Moreover, lower information and transaction costs in the financial market can also stimulate stock market liquidity. Lower asymmetry information cost between the managers and stockholders during the investment strategy set – up processes can stimulate liquidity. When there is only one or minimum long – term investment manager is dealt in controlling their investment, minimum agency cost occurs. However, this action would reduce the absorbability for more diversified portfolio in a liquid stock market. The idea is, by accessing the market capitalization and dividend policy for investment in stock would help the investors to reduce the asymmetry and agency cost instead of obtaining all the information directly from the managers (Chipaumire & Ngirande, 2014; Dalsenius, 2007).

Besides that, a low cost of ownership transfer in a stock market also considered by investors in diversifying their portfolio in a stock market (Bencivenga *et al.*, 1996). In a poorly developed stock market, transfer or capital ownership is expensive. Thus, an investor must face a longer pay out and holding period. This situation will prevent a stock from being undertaken. In contrast, if transfer of ownership is economically allowed, investor can make the decision regarding the maturity of their investment. Hence, a cheaper capital

ownership cost will permit investor to choose for their own maturity period in maximizing yield. Based on this circumstance, cost of ownership transfer plays a great important role which affect not just level of investment but kind of investment chosen by investors.

### **2.2.5 Protection of Investors**

Protection of investor is associated with the reliability of investment disclosure, investment regulatory framework and high enforcement of legal rules in a stock trading environment (Butsa, 2008; Chan, Hong, & Subrahmanyam, 2008; Vagias & Dijk, 2010). It is also related investment information disclosure which vitally important in making portfolio diversification strategy (Balogun *et al.*, 2016). These criteria would also affect the attractiveness of the investors to invest into a stock market.

Moreover, according to Pagano (1993), a well – functioning stock market can be described through regulatory and institutional factors. It is associated with the compulsory disclosure regarding the reliable information and financial data on the market. A good disclosure can increase the participation by the investors and enhance the investors' confidence to invest in a stock market. In addition, La Porta *et al.* (2000) suggested that legal tradition of a stock market. It is also related to the degree of protection to the shareholders and creditors regarding the efficiency in the contract enforcement. Thus , higher protection will result to a higher trading volume especially by foreign investors portfolios.

Additionally, a good governance in a firm can also affect trading volume (Fong, Holden, & Trzcinka, 2017). An efficient equity market requires a higher enforcement for a firm to conduct a good governance. The ability of an equity market to have a good governance is closely related to the stock market liquidity position of a firm. As a stock market can provide a good guideline and trading procedures to the traders, the stock market liquidity of the stocks listed by a firm would be sustained which then provide a good reason for the other investors to invest into that stock market. Thus, a good governance having a real economic value to the firms (Hagstrom, 2001). This idea was supported by Tadesse (2005) who claims that a good governance would increase the market transparency and efficiency through trade reporting and order handling rules. Thus, the efficiencies would promote better stock market liquidity in a stock market which then stimulate the *SMD* of a country. Nevertheless, lower level of insider trading will also lift stock market liquidity (Kyle, 1985). More insiders trading would drop the stock market liquidity due to greater adverse selection by the uninformed traders. This statement was also supported by Fong *et al.* (2017) which claimed that the prosecution against insider trading would increase market quality and improving the stock market liquidity performance and help the *SMD*.

Based on the literature, stock market liquidity could affect the *SMD* through several ways. First, high marketability of a stock market will attract more investors and boost the *SMD*. Second, good policies implemented by the country which affect the fund availability and encourage more investors to invest into a stock market. Third, the investment costs which determined by the number of listed company and the number of listed companies. It is also

linked with the lower transaction and information cost. Knowing this, investors would be attracted and stimulate the *SMD*. Lastly, a safer market through market disclosure can affect stock market liquidity which associated with the risk of investment. Thus, it is also related to the investors' confidence to invest into a stock market.

Generally, theoretical explanation on the effect of stock market liquidity to *SMD*, the main concern is speculation by the investors. As certain volume is needed for stock market liquidity sustainability and price efficiency, concerns are mostly expressed that the confidence of the investors on any stock market could cause to the destabilization and disrupt the *SMD*. Given this, stock market liquidity plays a role to ensure an open and fair price formation. Also, stock market liquidity could disclose and disseminate a vitally important information to the traders and fund managers in determining a wise portfolio investment strategy.

### **2.3 Theoretical Review of Contagion Effects on Stock Market Development**

This section discusses on the theoretical review of contagion effects on the *SMD*. In the first part, underpinning theory is discussed which then followed by the theoretical channels of contagion effects on the *SMD*.

### **2.3.1 Underpinning Theory of Contagion Effect on Stock Market Development**

This section provides the underpinning theory regarding contagion effects on the *SMD*. Based on the concepts and definitions proposed by previous studies such as Henry Thornton (1802) which have been cited by Garcia, (1989), Moser (2003), Werner (2014) and Forbes and Rigobon (2002), contagion generally be defined as the propagation of shocks among markets in excess of the transmission explained by fundamentals. However, the term contagion proposed by Thornton is related to the spread of crisis in a banking system. His theory concerned on interest, circulation of money, prices, and the effects of banking on currency. The very first Contagion Theory proposed by Henry Thornton was associated with the money supply in the economy through the banking regulation. He suggested that, heavily reliant on the gold stock of the country would cutting back the excess banknotes issues when the gold moving out from the economy. He believed that, this policy will cause to high deflationary effects which undesirably generate contagion in the banking environment. Before the term contagion was widely used in the financial market, it was broadly applied in the medical area to describe the spread of disease.

According to Claessens and Forbes (2004), before year 1997, the term contagion usually referred to the spread of a medical disease. This changed in July of 1997 when currency crisis in Thailand quickly spread throughout East Asia and then on to Russia and Brazil. Even developed markets in North America and Europe were affected, as the relative prices of financial instruments shifted and caused the collapse of Long-Term Capital Management (LTCM), a large US's hedge fund. These global repercussions from what began in the

relatively small Thai economy have sparked the widespread use of a new meaning for the term contagion.

Corsetti, Pericoli, & Sbracia (2005) suggested that, major definition since mid – 1997 defined the term contagion as the spread of financial market turmoil across countries. Although concern about contagion has declined, the term contagion has become standard language in the vocabulary of international economists and policy makers. Although analogies comparing the spread of financial crises to the spread of a medical disease can be overdone, this comparison is useful on several levels. Thus, contagion incorporates many different ideas and concepts. At one level, contagion is a disease.

Moreover, the financial crises of the late 1990s which led to sharp contractions in income levels and standards – of – living in many emerging markets were certainly as devastating as many diseases (Cheung *et al.*, 2009). Thus, contagion specifically refers to the transmission of a disease. However, as the Thai crisis spread across the globe, it became clear that the original crisis spread was just as important as understanding what prompted the initial events. This definition of contagion also emphasizes that it can occur through direct or indirect contact. This has also been a key aspect of the ongoing debate on international financial contagion.

Even the earlier non – medical definitions of contagion, which the above dictionary definition includes as usages two through four, are highly applicable to turmoil in international financial markets. Some of the leading explanations for financial contagion,

especially after the Russian default in 1998, were based on changes in investor psychology, attitude, and behaviour (Ehrmann & Fratzscher, 2009). According to Claessens and Forbes (2004), many countries subject to contagion in the late 1990s, and especially countries with relatively strong fiscal and current account balances, argued that the spread of contagion to their economies was unwarranted given their strong economic fundamentals. Many blamed their subsequent difficulties on the harmful corrupting influence of investors in other countries instead of on their own characteristics and policies. Finally, the last dictionary usage of the term contagion is the tendency to spread which captures the heart of the debate about contagion.

Nevertheless, Billio, Duca, Pelizzon (2005) suggested that, the plethora of definitions can be classified into two broad categories. In the first category, the definitions are related to contagion as a change in the propagation mechanism around the crises. In other words, an increase in the strength of how shocks are transmitted across countries is evidence of contagion. In the second category, the definitions focus on the type of propagation mechanism driving the transmission. Proponents of this definition are concerned with how much of the shock is propagated through trade, how much by investor behaviour, and so on. In general, the proportion of shock that is not transmitted through the standard channels such as trade links is considered contagion.

Moreover Claessens and Forbes (2004) further explained that most people agree that when two economies are located in separate geographic regions, have very different structures, and have virtually no direct linkages through channels such as trade, the propagation of a

crisis from one to another is contagion. Some economists have proposed using the more specific term “shift-contagion” to describe this scenario, where shift – contagion is a significant increase in cross-market linkages after a shock to an individual country or group of countries. On the other hand, there is some disagreement on whether the term contagion applies to the spread of a crisis between two countries that are similar and closely linked. If two countries are located in the same geographic region, with many similarities in terms of market structure and history, and with strong direct linkages through trade and finance, they tend to be closely connected during stable periods as well as crisis periods. Transmission of a large shock during a crisis is just a continuation of the same cross-market linkages or “interdependence” that exists during more tranquil periods.

Based on the underpinning theory regarding the contagion effect, this study investigates the contagion effects on the *SMD*. The following sections explain on the channel of how contagion can affect the *SMD*.

### **2.3.2 Portfolio Adjustment**

The first channel is related to portfolio adjustment activities. It explains diversification strategy implemented by investors to match with the information obtained regarding the shock or crisis. Given by the fact that any changes in the international correlation patterns would call for an adjustment of portfolio, policy makers would concern on the implications towards stability of the financial system (Billio et al., 2005). Thus, the correlation of international stock market return is crucially vital for the investors in constructing a well – designed portfolio. Also, the economic policy implemented in a country and stock market

are also affected by the contagion effects. As a result, any policies which have been determined in a country particularly contractionary policy will reduce the attractiveness to the investors as it could affect their portfolio diversification strategies and investment returns.

Moreover, although an investor has only a small fraction of the portfolio in any stock market, this proportion would still represent a significant role for a relatively small stock market in those countries (Atiase, 2011). Therefore, any portfolio adjustment due to contagion effects might cause a significant capital flows. Particularly, financial institutions and international investors, such as hedge funds, mutual fund, and pension funds which diversify their portfolio over financial assets in numerous countries must adjust their portfolio to ensure a sustainable return for their stakeholders. Moreover, international investors would rebalance their portfolio in upon a crisis. It thereby troubled emerging economies due to capital reduction as most of the investors would sell their stock and search for a safer stock market (Beirne & Gieck, 2012).

Furthermore, Claessens and Forbes (2004) suggested that the transmission of crisis from a country to another country can be explained by basic portfolio theory which also related to portfolio rebalancing activities. They proposed that any adverse shock which affect a single asset's return could lead to a reduction in any other position of risky assets. The idea is, an investor will rearrange their portfolios due to optimal response regarding realized loss which also associated with the parameterization of the asset return's distribution. Thus,

deleverage and reduce the position in a risky asset would be a worth consideration by the investors. As a result, market capitalization which related to the *SMD* would also drops.

In addition, Moser (2003) pointed out that reduction in asset position is triggered by the liquidity which forcing investors to unwind their position in any other stock market in search of better liquidity position. This action would be triggered by the need of margin calls or any other collateral requirements especially in case of mutual fund to fulfil the redemptions of investors. It was also supported by Bekaert *et al.* (2005) which suggested that liquidity need also considered by the investors if there is a sharp decline in the liquidity position of a stock market as market participants were hurt by the large losses which cause to a large fund withdrawal. As the traders would search for a better prospect market particularly in term of liquidity, it would affect the market capitalization which then slow – down the *SMD*.

Furthermore, Bookstaber (2000) suggested that the contagion can cause to illiquidity of market and portfolio risks which then cause to a cascade of prices drop. Continuous decline in prices triggered by less liquid stock market would then lead to additional margin call and portfolio liquidation by the investors. The general implication of this circumstances is that the contagion effects of any exogenous shocks would lead to financial liquidity shock which result to portfolio re – composition. This idea was also shared by Hegde and Paliwal (2011) which claimed that portfolio rebalancing would cause to contagion in market liquidity.

### 2.3.3 Monetary Policies

The second ways on how contagion affect the *SMD* could be explained by the monetary policy. It is related to the contractionary or expansionary policies implemented by the government. Specifically, contagion can result to a contractionary monetary policy which also linked to funding constraints by investors. Upon any shock, government and financial intermediaries would run a contractionary monetary policy in order to stabilize the country. This factor could impose a greater impact than asset reduction by the investors prompted by any crisis. Thus, the issuance of new equities might be difficult during the crisis due to tight policies implemented by the banks and financial institutions.

Besides, the contagion effects can also cause to funding constraint due to the changes in the financial intermediaries' position during the crisis (Brunnermeier & Pedersen, 2009). The fact is that funding constraint contribute to a large impact on the prices of a volatile stock as more collateral is needed. As the financial institutions were affected by the contraction monetary policy implemented by the government, they will reduce the financing facilities. Given this, it causes to a capital constraint for the investors. Also, funding constraints are also derived from the value at risk requirement of banks (Danielsson, Shin, & Zigrand, 2011). Following any shocks, financial intermediaries would reduce their position in the market as they become risk adverse.

Additionally, funding constraints would also lead to market imperfections (Cheung *et al.*, 2009; Dungey & Gajurel, 2013; Moser, 2003). Due to any crisis, the contagion can cause to prices drop. As informed traders face this risk, prices would be less informative which

then resulted to volatility in the price. Consequently, as there is high volatility in stock prices, a particular stock market would be less attractive to the foreign investors which then slow down the trading activities which also related to the process of *SMD*.

According to Vayanos and Wang (2013), fund availability constraint would shorten the traders' position which consequently affect the stock prices. Also, Long, Shleifer, Summers, and Waldmann (1990) suggested that short position will cause to deviation from the law of one price. Based on their argument, the short position of the trader would then cause to two equilibriums; one during the assets are traded at the same price and another one is at different prices. Later, the intuition of the equilibriums would influence the traders to not trade aggressively. As consequences, demand shocks would lead to price discrepancies which also associated with risk. Higher risk would then affect the herd behaviour of the risk adverse investors to trade in a stock market which then slowing down the *SMD*.

#### **2.3.4 Trade and Financial Linkages**

The third channel of contagion effects on *SMD* is related to trade and financial linkages. This channel explains on the contagion effect due to any policy adjustment implemented by government and loss faced by the firm in the shock origin country. According to Poldauf (2011), international stock market co – movement could be triggered by several fundamental causes including trade and financial linkages. Given that trade linkages increase the interdependencies of the individual firms or sectors, if a country was affected by an adverse shock, another country which has trade linkage such as import and export

would negatively be affected. Particularly in term of revenues, cash flows and financial performances, firms in the country which the shock originated would be affected due to the local economic instability. Consequently, these firms would reduce the quantity of import which then cause a contagion effect to another country. Thus, significant trade linkages across countries could analogously affect the stock indices performances or industries due to the changes in the investors herd behaviour which alter their portfolios in searching for a handsome return.

Moreover, the liberalization of global financial markets would cause to an irrational behaviour among investors (Claessens & Forbes, 2004). Market liberalization or trade openness allow a country to open their financial market, investors would trade their portfolio globally. Consequently, if there is a liquidity risk in a stock market, investors may induce to sell their stocks to meet the required returns. This liquidity risk could explain the co – movement between the stock market due to the herd behaviour and risk aversion of the investors. Also, according to risk management under Value at Risk (VaR) measures, any unexpected loss would force an investor to avoid from investing in different risky assets, given by any increase in liquidity risk, investors had to sell their more liquid assets to meet the margin calls which cause to a market stress. Besides, a crisis in one country usually link with contractionary monetary policies and exchange rate devaluation (Moser, 2003; Huang, 2015). These factors would affect the confidence of the traders to invest into a particular stock market which then affect the *SMD*.

However, the capital flows and asset prices do not only react on the trade shocks (Moser, 2003). The interdependence of financial linkages could be either direct cross – border investment or indirect link through common investors. An example of direct link is during the Argentine crisis in 2002 whereby many investors withdraw the dollar deposited in Uruguay. Consequently, banks in Uruguay have to withdraw the required reserves to cover for the decline in central bank reserves which then lead to floating in peso. Meanwhile, the indirect link is through the investment by the bodies such as mutual funds and pension funds. They diversify their portfolio in numerous countries. Thus, any proportion invested in a stock market although it is just a small portion, it will cause to significant flows of fund to a relatively small capital market. These linkages would then affect the market capitalization of the stock market which also related to *SMD*.

### **2.3.5 Information Asymmetry**

Alternatively, contagion could affect *SMD* through information asymmetry. It is related to the relevant information disclosed during a crisis period which significantly affect the stock market. According to Poldauf (2011), information asymmetry would affect the herd behaviour of investors. When an investor invested into a stock market especially in distant emerging market, it causes to a high cost of getting information regarding the position of banks and companies in a country for investment fund and portfolio diversification strategy. Therefore, by just rely on the big players' action, uninformed trader would just follow the action taken which then causing co – movement. As a result, the seemingly related stock market would fall together.

This explanation support the idea proposed by Diamond and Verrecchia (1981) whereby any negative information especially related to the short sell activities would give a negative signal to the investors to recompose their portfolio. Besides, this action would particularly take by the uninformed traders as they just follow the big player in the stock market. Subsequently, the short sale activities would result in under-pricing of stocks as it creates the uncertainty about the negative private information. The speculation made by the investors would then associated with information risks in a stock market which either stimulate or slow – down the development of stock market.

Additionally, any uncertainty regarding the information which state the real position of a countries' fundamental lead to a misjudge on the assessment of the investment opportunities (El-Wassal, 2013; Moser, 2003). Pertaining to the information about the crisis, investors will reassess the fundamentals of other countries which trigger them to sell their stocks in their current stock market, call for a loan or stop investing in those countries although there are no significant changes in those fundamentals. On the other sides, an incomplete information cause to uncertainty for the investors and possibly cause to fictitious interdependence assumption. Market participants would falsely assume any interdependence or overestimate the extent of interdependency between the stock market which affect their portfolio diversification. As a result, prior to the incomplete information regarding the crisis transmission, the stock market in the country which do not affected by the crisis will also be affected. Thus, the contagion effect is indirectly transmitted which then affect the overall performance of unaffected stock market (Kodres & Pritsker, 2002).

In addition, Barro (2012) and Bebczuk (2003) pointed out that the level of asymmetry information does not fixed. In many countries, asymmetry information level depends on communication technology advancement. Therefore, the diffusion of the information for traders particularly regarding the economic growth and capital accumulation would modify the financial security costs which then spur the *SMD*. Following this argument, the emergence and development of the stock market could be seen as a result of reduction in the severity of the information problem, information risks and costs of gaining information.

Bebczuk (2003) also suggested that asymmetry information could tailor the dividend policy. Due to any irrelevant information, particularly regarding the financial diseases, the dividend policy would also be irrelevant. Theoretically, investors would be attracted with the stocks which provide the highest dividend. However, a false impression towards a market would result to ignorance of the other important aspects to be considered before investing such as liquidity position, volume of retained earnings and cash flows. Given this, negative information regarding the dividend policy implemented by a firm would discourage investors to invest into a stock market. As a result, it will slow down the *SMD*. Also, this negative impression would trigger the investors to move into another stock market which cause a contagion effect. If a country was affected by the disclosure of a false information, another country would be benefited. The other possibility is, if the affected country is a big player among the region and has a strong correlation with another country in the region, the contagion effects could cause to drop in regional *SMD* due to the bad impression by the investors towards the region.

## **2.4 Empirical Review of Stock Market Development, Stock Market Liquidity and Contagion Effects**

This section provides the empirical review pertaining to the studies on *SMD*, stock market liquidity and contagion effects. Specifically, this section is divided into three sub – sections. In Section 2.4.1 – Section 2.4.3, the empirical measurements of *SMD*, stock market liquidity and contagion are discussed, accordingly. Section 2.4.4 devotes to previous studies on the *SMD*'s differences. Section 2.4.5 reviews on the effects of stock market liquidity on *SMD*. Subsequently, Section 2.4.6 is devoted to the effects of contagion on *SMD*.

### **2.4.1 Measurements of Stock Market Development**

This section discusses on the measurements have been used by in measuring *SMD*, stock market liquidity and contagion effects. As the concepts of *SMD* has been discussed, there is no single measure could capture the level of *SMD* for a country or region (Demirgü-kunt & Levine, 1996). Thus, numbers of quantitative and qualitative measures are proposed including number of listed companies (Butsa, 2008; Naceur *et al.*, 2005; Sukcharoensin & Sukcharoensin, 2013), volatility (Balogun *et al.*, 2016; Butsa, 2008; Garcia & Liu, 1999), market concentration (Balogun *et al.*, 2016; Butsa, 2008; Chipaumire & Ngirande, 2014; Demirgü-kunt & Levine, 1996; Garcia & Liu, 1999) and *MCAP* (Balogun *et al.*, 2016; Butsa, 2008; Rossell, 1991, Demirgü-kunt & Levine, 1996; Nowbutsing & Odit, 2009; Sukcharoensin & Sukcharoensin, 2013; Yartey & Komla, 2007).

Moreover, Dailami and Atkin (1990) suggested that in an emerging capital market, increase in the number of listed companies to the public or ability to enhance the offers of seasoned shares are the characters of early expansion of the stock market. Butsa (2008) also suggested that number of listed companies could be used to measure the market size as it is varied across countries due to specific features during the *SMD* process. However, as the development of the stock market is related to the level of economic development and accumulation of capital, the idea of expansion in number of listed companies has not indicate a monotonic expansion of the stock market in the financial market (Rahman & Salahuddin, 2010). In fact, the *SMD* always accompanied by the general expansion of the financial system efficiency. This argument also supported by Demirgui-kunt and Levine (1996) which claimed that this measurement is uninformative unless there is a large changes or extreme values are recorded. Also, as for a comparative analysis, a huge different are needed in accessing the *SMD* across countries especially for those that share the same market environment (Sukcharoensin & Sukcharoensin, 2013).

Another indicator that received a significant attention in the literature is stock return volatility. Greater volatility could not represent a sign of more or less *SMD*, but Demirgui-kunt and Levine (1996) suggested that less volatility in stock return represent a greater development. Balogun *et al.*, (2016) suggested that stock return volatility could reveals the changing values among the fundamentals of economic which used for better resource allocation. Greater volatility is unhealthy for a better *SMD*. Theoretically, investors will be discouraged due to a high volatility which then inhibits investment. Investors will request for a high risk premium for a higher stock price volatility as their cost of capital increased

(Bekaert, Harvey, & Lundblad, 2007). Finally, excessive volatility in some economic fundamentals such as inflation and interest rate would cause to an instability to the stock price changes (El-Wassal, 2013)

The alternative measurement of the *SMD* proposed by Demirgui-kunt and Levine (1996) is market concentration which is the highest capitalization of a company owned by some number of companies in the total market capitalization. The highest degree of concentration indicates poor liquidity and tend to control the market activities (Butsa, 2008; Demirgui-kunt & Levine, 1996). Also, according to Kanasro, Junejo, and Rohra (2009), high concentration could adversely affect the stock market liquidity and this situation could cause to difficulties for the investors in diversifying their portfolio or minimizing their risk. As a result, the investment will be riskier and market will be not attractive to the portfolio manager and potential investors in the long term. This argument is in-line with the dimensions proposed by Sukcharoensin and Sukcharoensin (2013) whereby a well-developed stock market would give a fair investment opportunities to the small and large firm.

However, *MCAP* is often utilized in measuring the size of the market as it shows the relative weight of the stock market in the economy (Rossell,1991, Balogun *et al.*, 2016; Butsa, 2008; Nowbutsing & Odit, 2009; Sukcharoensin & Sukcharoensin, 2013). Also, this measure is less arbitrary than the other measures (Yartey & Komla, 2007) as the other measures of *SMD* are mostly highly correlated (Demirgui-kunt & Levine, 1996). The assumption of this measurement is that the size of the overall market is positively correlated

with the capital mobilization ability and portfolio risk diversification (Nowbutsing & Odit, 2009; Owiredu *et al.*, 2016). Therefore, a relatively higher *MCAP* would signify a better capital mobilization ability and low portfolio diversification risk of the stock market in a country. Also, *MCAP* explains the economic output in a country relative to its stock market position which also represents the overall development of a stock market.

The application of *MCAP* could signify the relationship between the *SMD* and economic growth. As such, it represents the attractiveness of a stock market by the investors in diversifying their portfolios in that stock market by identifying that the stock is undervalued or overvalued (Demirgüç-kunt & Levine, 1996; Yartey & Komla, 2007). An undervalued stock is offered at discount while overvalued stocks are traded at premium. This valuation can be used by the investors whereby the overvalued stocks could be ideal for the investors in a short position which is selling those share with intention to buy those stocks during the prices are in line with the market. Also, the overvalued stocks are traded at premium due to its brand, better governance and companies' earnings and goodwill. Meanwhile, the undervalued stocks are the stocks which are below the investment intrinsic value, these undervalued stocks are evaluated based on the companies' financial statement and performance. Thus, it would be less attractive for the investors.

Moreover, Rahman and Salahuddin (2010) and Demirgüç-Kunt and Maksimovic (2016) suggested that the value *MCAP* can be used to describe the improvement, efficiency and size of the stock market which circulated along the process of *SMD*. Also, an increase in the *MCAP* value is a function of valuation of the existing listed stock and global stock

market. As more firms approach the market and issue IPOs, *MCAP* would increase accordingly as more corporate and institutional investors are invested into the stock market. As such, *MCAP* can be used to evaluate the stock market contribution to the development of the economies. It was supported by Filer (2000) who suggested that *MCAP* can represent the growth of the stock market relative to GDP. Basically, higher *MCAP* belongs to the higher income countries as they have more established financial institutions and the better credit availability which could support the firms to invest into the stock market. Furthermore, *MCAP* could also measure the capital of the listed firms in a stock market at the market price. As such, it represents the depth of the stock market in term of liquidity and capital expansion ability (Crisostomo, Padilla, & Visda, 2013). Besides, the utilization of *MCAP* could remove the effect of country size which allow for real measurement of stock market contribution to the economy of a country (Butsa, 2008).

#### **2.4.2 Measurement of Stock Market Liquidity**

This section prides the discussion on the empirical measurement of stock market liquidity. Sarr and Lybek (2002) classified the measurements of stock market liquidity into four categories. The categories are based on characteristics which are transaction costs measures, equilibrium price based measures, volume – based measures and market impact measures. Due to multi – dimensional concepts of stock market liquidity, it different measurement can produce different conclusion (Easley & O’hara, 2004; Kyle, 1985). This is due to the reason that, the measurements of stock market liquidity are captured at different frequencies such as minutes or second for high frequency and daily, monthly or yearly for low frequencies based on data availability.

Likewise, Amihud and Mendelson (1986) suggested that bid – ask spread can be used as it capture nearly all the costs related to the trading activity or transaction cost. Also, the bid – ask spread could capture the order processing costs, and asymmetric information costs. Higher competition between the intermediaries allows for a reduction in the order processing costs which also improve the stock market liquidity. Moreover, the bid – ask spread is the difference between the bid and ask (offer) prices quoted by a dealer who makes a market in a stock and bridges the time gaps between asynchronous public buy and sell orders. The ask (offer) price quoted for a security includes a premium for immediate buying, and the bid price reflects a price concession for immediate sale. The bid – ask spread may thus be viewed as the price the dealer or market maker demands for providing liquidity services and immediacy of execution

Also, when the dealers revealed the asymmetric information through bid – ask spread, there will be numerous participants attracted to them, thus, the need of any agent in negotiating the transaction will be terminated. Moreover, the informational component in the bid – ask spread discloses the efficiency due to the hidden information hold by the insiders trading. As such, a careful analysis regarding the stock market liquidity position would be an important step in designing well regulatory activities for the exchanging parties and intermediaries in a transaction. Another earlier indicator of stock market liquidity is Hui – heubel liquidity ratio which has been cited by Gabrielsen *et al.* (2011) and Kumar and Misra (2015). This measurement is also measure the price impact and volume based measures of stock market liquidity.

Furthermore, in estimating the effects of spreads and the returns, higher spread will contribute to the higher returns. It means that by holding a less liquid asset, investors are looking for a better return in a long holding period (Beaupain & Petitjean, 2007). Also, when the expected returns to the trading costs and the spread are increased or relatively higher than the holding period, higher return will be expected by the holders. Thus, in long holding period, investors may gain a profit by holding a higher spread asset. As suggested by Keynes (1930), an asset is liquid if it can immediately be realized without any loss. An investor may insist to execute the asset at the current bid or ask price or wait to transact at a favourable price. Thus, the quoted ask price would include a premium for an immediate buying and the bid price would similarly be reflected due to the concession required for an immediate sale. Thus, the difference of bid and ask which is known as bid – ask spread will be used as the measurement of illiquidity.

However, Pastor and Stambaugh (2003) argued that bid – ask spread does not necessarily translate the actual transaction cost. This is because bid – ask spread is obtained during pre – trade which means the agreed price of the transaction. Thus, it does not represent the actual cost of the trading execution. Also, although bid – ask spread is demonstrable for overall liquidity position, but the closing prices are often deviate from the quotes as the transaction is concluded at different sources including outside sources. Moreover, quoted spread are not always available in all stock markets for all time periods (Lesmond, 2005).

Due to the limitation of using bid – ask spread, Amihud and Mendelson (1991) captured the stock market liquidity by dividing daily return with daily dollar volume. This measurement called illiquidity (*ILLIQ*) which measure the price shock caused by changes in a unit of dollar volume. Fong, Holden and Trzcinka (2011) concluded that Amihud measure stock market liquidity is better than quoted spread as it is a robust test of stock market liquidity as is measure the regime changes such as the changes in minimum tick size to decimals. Also, *ILLIQ* is obtained by estimating every share utilizing daily data and the impact of each share is weighted through free float rate and *MCAP*.

Another measurement of stock market liquidity introduced by Cooper, Groth and Avera (1985) called Amivest measure. They compare daily returns with daily volume which is number of shares. Although *ILLIQ* and Amivest were constructed in similar way, these measurements are still different in some aspect. For instance, the utilization of dollar volume and share volume. Besides, *ILLIQ* measure the illiquidity while Amivest measures liquidity. Also, the measurement of *ILLIQ* does not consider the days without trading while Amivest consider this limitation which include the days with zero return.

Another type of stock market liquidity measurement is volume based measures. Trading volume and turnover ratio are commonly used for this measurement (Balogun et al., 2016; Bogdan, Bareša, & Ivanović, 2012; Datar, 2000). Market is said to be liquid if there are more stocks are traded in a stock market while turnover ratio explains the changes in one percent in price of stock or comparing the volume of stocks traded to the absolute price change in a particular period. Simply, it measures how much trading volume can change

one percent of price. However, turnover ratio is much appropriate in measuring the efficiency of the trading process which affect the economic performance of the country.

As for the trading volume, it could capture the shares quantity per time and quantify the breadth and depth dimensions of stock market liquidity. Given this, lower stock volume represents an illiquid stock market (Bogdan, Bareša, and Ivanović, 2012; Datar, 2000). Also, trading volume could capture the real stock market liquidity position of a stock market as stocks are traded based on the quoted prices. Thus, a competitive quoted price is also disclosed through high trading volume. Supported by Gabrielsen *et al.* (2011) trading volume will disclose the price impact of the transactions. If properly aggregated, a synthetic measures of stock market liquidity in a stock market could be presented and it discloses the entire stock market liquidity position. In addition, according to Easley, Kiefer and O'Hara (1996), trading volume provides important information which are usually not released by simple price based measures as it is related to the real quantity and trading activities in a particular stock market while price based measure just signifying the pre – trading information of a stock market. Also, as the data are widely available, trading volume became a sort of preliminary step in analysing the overall stock market liquidity completely.

Furthermore, trading volume is one of the determinants of the pricing structure. The advantage of applying trading volume as stock market liquidity measurement is that the ability to capture the quantity of stocks per time and measure the depth dimension of liquidity. As higher volume indicates a better stock market liquidity, it shows that a stock

has a lower spread. Therefore, by using the volume traded, the spread based measures can also be captured (Lesmond, 2005). Noted that reduction in transaction cost would increase the volume of stocks traded, the application of volume traded would represent a genuine resource of losses as it would represent a safer stock market environment for the traders (Bencivenga *et al.*, 1996).

Other than that, all features related to the price of the stock including the costs were considered under volume based measures. Thus, when the trading activities were executed, it represents the real stock market liquidity position of a particular stock market. So, trading volume indicates that the stock traded in and out in a day at specified prices agreed by buyers and sellers in a stock market. As volume traded are closely linked with the bid – ask spread, it makes sense that a tight bid – ask spread would provide a better chance towards an agreeable price of the stock. In contrast, a wide bid – ask price would unlikely agreeable to be executed.

Moreover, as suggested by Kyle (1985) and Admati and Pfleiderer (1988), the intensity of the stock traded by the informed traders is positively related to the stock market liquidity. The feedback loop between the volume traded and stock market liquidity could be used to explain the market concentration at a particular time. The idea is, if the traders have the discretion over the trading time, they would tend to bunch their stock as they expect the other traders will execute their stocks as well. As such, trading volume would signify the most liquid time in a stock market.

Furthermore, Cooper, Groth, and Avera (1985) suggested that stock market liquidity can be measured by comparing daily return with daily volume. As such, the effect of the daily volume traded on the daily return of the stock could be accessed. Also, as trading volume is highly correlated with the size of firm, it has a strong predictive power of the future returns for the listed stocks (Bogdan *et al.*, 2012). It may be agreed that unless stock trading is widespread and deep as signified by higher volumes, the beneficial impact of well – functioning capital market would remain limited to a few scripts where trading is frequent and deep. This would also result in dual equity markets wherein a small number of scripts attracting large trading interest while large number of scripts show low and infrequent trading volumes (Datar, 2000).

Another measurement which also applied in the previous studies include trading volume scaled by the security return (Amihud *et al.*, 2005). This measurement is a proxy for market depth which also explain the return differential. Besides, Modigliani and Miller (1958) suggested abnormal return of the depository receipts can also be used to access the illiquidity. However, data is not widely available in emerging markets.

Pastor and Stambaugh (2003) developed the Pastor and Stambaugh (PS) measure of stock market liquidity. This measurement is obtained through regressing the daily returns in excess of daily market index returns on the daily dollar volume. Based on this measurement, high frequency benchmarks are categorized as spread benchmarks and price impact benchmarks. To obtain this, the different between quoted bid and ask spread are divided with the average of two quoted prices in a time. However, this measurement

quantifies the pre – transaction stock market liquidity position as it utilized the bid – ask spread. Although it contain the information regarding the transaction costs, it not translate the actual transaction costs as the actual transaction costs are could be measured by effective spread (Kumar & Misra, 2015).

### **2.4.3 Measurement of Contagion Effects**

This section discusses on the empirical measurement of contagion effects. There are various measurements have been proposed in measuring contagion. For instance, correlation between the countries market returns was introduced by King and Wadhwani (1990). Based on this measurement, increase in the correlation coefficient after an important turmoil period would represent the contagion effects. Otherwise, if the correlation does not constitute any increment, then any high level of correlation would suggest a strong linkage called interdependence.

The correlation analysis was also suggested by Forbes and Rigobon (2002). They suggested that, cross – market correlation are conditionally depend on market volatility. Thus, higher volatility of the matket during the crisis period, the correlation coefficient would increase and bias. As the test does not adjusted for this bias, it would traditionally confirm the existance of contagion effects. Besides correlation in market returns, Longin and Solnik (1995) suggested that the correlation in the exchnage rates, stock prices, capital flows and sovereign spread can also be used to test contagion effect and long run relationship between the markets.

Another measurement of contagion effect is volatility of stock prices and returns. This measurement has been proposed by Celik (2012). The major benefit of utilizing this approach is the ability to detect conditional correlation over time. So, the dynamic of investors and their behaviour to respond to a news and innovation could be attained. Also, this measurement can identify the herding behaviour in the asymmetric information during a crisis period. However, according to Bekaert, Harvey, and Ng (2005), higher volatility not easily be captured especially in the bear markets. Therefore, volatility will potentially affect the correlation during the crisis periods which cause to bias in identification of contagion.

Alternatively, Billio, Duca, and Pelizzon (2005) and Bekaert *et al.* (2005) proposed that contagion can be measured through the break produced by the non – linearity in the linkages between the financial markets. Thus, contagion effect can be identified if there is a break in linkages between the market particularly during crisis period. This approach assumes that the crisis period is endogenous for each country. Also, the linkages break can identify the cross – relationship during crisis period.

Conversely, Cheung *et al.* (2009) suggested that the contagion could also be identified based on its definition. As their study proposed two different dimensions of contagion, they suggested latent factor models, co – movement analysis and non – linearity models to identify the contagion. As for the latent factor models, the identification of shock is through simple asset return model which triggered by the changes in the expectation of the investors in the regime switching models.

Meanwhile, the co – movement analysis is used to identify the transmission of exogenous shock from the first victim to the other countries. This analysis assumes that the subsequent counties will also respond in a similar way as the first victim which cause to a co – movement. Thus, the asset return, market index and volatility of the stock prices could be used as the hint of contagion effects. Besides that, Cheung *et al.* also proposed a non – linearity model which also proposed by Bekaert *et al.* (2005). The rational of using this model is the application of the assumption regarding the relationship between the asset returns and foreign shock which could be used in identifying the contagion effects. However, this measurement is more suitable to identify the contagion into micro types of data which are firm, organization or single unit of corporate sector. In contrast, Beirne and Gieck (2012) proposed the measurement of contagion through the identification of transmission mechanism using cross – market changes particularly during the turbulence in the financial market. They suggested that the stock price could be used to represent a stock market as it will represent the overall stock market performance.

Among the measurement of the stock market interaction, the correlation and co – variance analysis are the most straightforward approach. Serwa (2005) and Forbes and Rigobon (2002) proposed that any increase in the cross – market correlation during the pre – crisis periods and post – crisis would be a hint of market interaction. The correlation during and before the crisis period could be used in measuring the effect of market interaction. Furthermore, Baig and Goldfajn (1999) also suggested that financial market of the subsequent victim would respond in the similar way as the first country which affected by the crisis. Thus, the co-movement of the financial market would occur which measured by

the asset return, price index and volatility of the stocks. Dornbusch *et al.* (2000) proposed that, market index interaction can be used in measuring the economic integration in an individual country and the global market which involve both trade and financial links. Thus, the financial linkage could be identified through reduction in trade credits, foreign direct investment, capital flows into a particular country and increase in the price index interaction. Cheung *et al.* (2009) suggested that this measurement can be applied to those countries which do not have a trade linkage but affected by events or changes in financial market of another country.

Corsetti *et al.* (2005) also suggested that asset return, market index and volatility can be used in identifying the market interaction. But, they argued that although a crisis is driven by the increase in variance of the common factor and caused to higher volatility than usual in several markets, it might be caused by a bigger shocks effect. Thus, an increase in the cross-country correlation during the crisis periods not necessarily evidence of contagion but more towards interdependence. The market interaction could be identified by the too strong or too weak pattern of co – movement in index price relative to the international transmission effects.

However, the fundamental measurement of identifying the market interaction is based on the correlation and co-movement as proposed by Serwa (2005). Also, this measurement is attractive since the assumption of any specific structure of financial spill over is not applied and straightforwardly interpret the market interaction effects. Based on the measurement

suggested by the literature, price index correlation is the suitable in measuring the contagion effect of a country particularly in ASEAN-5 region.

Based on the literature, this study found that the most common method to identify the contagion effects is through the correlation between the countries. The correlation of the stock market index, prices or returns could be used in measuring the contagion effects. Although there are many suggestions regarding the measurements of contagion, the basic measurement is the traditional approach which utilized the correlation coefficient between the countries.

#### **2.4.4 Stock Market Development Differences**

This section discusses on the previous studies pertaining to *SMD* differences. A closer view at the literature on *SMD* would lead to one conclusion that more countries are not emphasize on the *SMD* as good as they speeding up their economic development (Atje & Jovanovic, 1993). In investigating the stock market development differences, researchers commonly applied the pooled data analysis comprise of both developed and developing countries. For instance, study conducted by Butsa (2008) utilized quantitative and qualitative measurements of *SMD* in Eastern Europe countries. Under quantitative measurements, market capitalization and number of listed companies in the stock market are used. Meanwhile, market turnover, volatility and market concentration are used for qualitative measurements. Results from pooled panel analysis which considering the time dummies show that, there are differences in *SMD* in these countries. The most developed stock market belongs to the Polish's stock market followed by the stock markets of

Hungarian, Russian and Ukraine. Based on the results, Butsa suggested that the Russian stock market is attractive by the speculators due to low liquidity and high volatility. Besides, Ukraine's stock market demonstrated among the highest growth rate in the world but still in the initial stage of *SMD*.

Additionally, study conducted by Bayraktar (2014) suggested that *MCAP* could be used in assessing the capacity of the stock market and country characteristics. By employing panel study of 104 developing and developed countries for the period of 1990 – 2012, a cross – countries comparison was conducted. Results suggested that a higher income country tend to have larger *MCAP*. Besides, period of 2008 – 2009 has also used as the benchmark for global economic and financial crises by Bayraktar. This empirical methodology also applied in the previous public finance literature especially in estimating the capacity of the developed and developing countries. Such studies include Tanzi and Davoodi (1997) and Le, Moreno-dodson, and Bayraktar (2012). Based on these studies, the cross – countries comparison requires regression estimations in order to construct a benchmark especially in in a sense of comparing the capacity of the stock markets.

More comprehensive methods were offered in the studies of Beck and Demirgüç-Kunt (2009) through gap measure which also explained in detail by Cihak, Demirgüç-Kunt, Feyen, and Levine (2012). Based on these studies, the *SMD* gap can be measured through several dimensions. Such dimensions include financial depth, degree of access, efficiency and stability. The authors documented that, there are differences in *SMD* in a time series trend in developing countries. Also, these countries tend to pay less attention on the

efficiency and access. Besides, most of the financial systems have been affected by the global financial crisis in 2000s. Moreover, these studies found that financial sectors in countries which have medium and low incomes were more isolated from global turmoil and less affected by the global liquidity shocks. Also, on average, those countries are recovered faster than the developed countries. This is possibly due to the policies implemented which concentrates on the depth and efficiency after the crisis.

Another related study by Click and Plummer (2005) found that, significant different in *SMD* among ASEAN countries except for Singapore are due to under – developed financial systems. This factor could limit the potential gains through capital account and causes to a higher vulnerability to financial shocks. Also, difficulty of financial intermediaries' policies in ASEAN has encourage short – term investment. Similar in the study carried by Torre, Feyen, and Ize (2011) suggested that financial frictions could retard the *SMD*. However, their study using the estimated coefficient of panel regression does not rank or classify either underdeveloped or developed stock market.

In the recent study on *SMD* in ASEAN – 5 was conducted by Sukcharoensin and Sukcharoensin (2013). Covered on the dimensions proposed by Beck and Demirgüç-Kunt (2009) and Demirgüç-Kunt *et al.* (2012), the results signify that, there are distinction among these stock markets. Stock market in Singapore, Thailand and Malaysia have higher development compared to the other counterparts. The main strength in these stock markets are the accessibility. Also, stock market of Singapore exhibited the highest level of *SMD* in all dimensions particularly in size which measured by *MCAP*. Besides, Malaysia's stock

market dominates in the access dimension while Thailand outstanding in the stability dimension. A weak investment climate was characterized in Philippines' stock market.

In addition, study by Haydarov (2011) claims that, major constraints towards a well – developed stock market for Philippines include corruption, weighty business procedures, poor tax and customs governance, inadequate infrastructures, barriers of market entry and lack of regulation enforcement. Supported by the study of Yusoff and Hassan (2017), the analysis of mean comparison signify that, there is a significant downturn in the *SMD* of Malaysia after the AFC. Meanwhile, significant improvements in *SMD* were illustrated in Thailand and Singapore.

Study in ASEAN region was also conducted by Chaisrisawatsuk (2016). This study found that ASEAN region has experienced an increasing trend of financial depth. Singapore, Malaysia and Thailand have led this dimension of *SMD* while Vietnam catching up through a greater step. Also, study suggested an upward trend in *SMD* of Cambodia, Lao PDR and Myanmar. This improvement is mainly due to the development in the financial environment particularly in domestic banking system which attract more investors into this region. Moreover, over the last decade, ASEAN has significantly improvised their accessibility of the market domestically and internationally. Some technical guides and supports from the countries which have advance financial market led to this advancement to meet greater demand.

Related to the crisis, Butsa (2008) found that stock markets do not develop equally during the transition process. By using the data from former Union of Soviet Socialist Republics (USSR) countries, outcomes show that countries which have a similar pre – transition condition would have a very different performance and size of stock markets. Besides, some of the former USSR countries are outperform than developing countries which launched their process of transition earlier. Given this, the difference of SMD could also triggered by the vulnerability of the countries to the crisis (Dungey & Gajurel, 2013). Thus, countries which have solid policies would be less affected by the crisis.

In the other regions, study conducted by La Porta *et al.* (2000) shows that English countries have a well – developed stock market due to the attention paid on the dividend policies, access to the external finance and protection for the creditor and investors against expropriation by managers. Supported by earlier study of Greenwood and Smith (1997) who claimed that the superiority of this region was attributed by innovation and new technology injection which give a long – term effects on *SMD*. Besides, market liquidity, profitability and banking efficiency also have the explanatory power in describing the *SMD* in this region.

#### **2.4.5 The Effects of Stock Market Liquidity on Stock Market Development**

Started with the work of Amihud and Mendelson (1986) which examined whether the stock market liquidity level is an attribute of individual securities that significantly affects their required rates of return. By using the bid –ask spread as the measurement of stock market liquidity the New York Stock Exchange (NYSE) for the year of 1960 - 1979, results

suggested that investors with different expected holding periods will trade their assets with different stock market liquidity position. Also, stocks with higher stock market liquidity are held by the investors for a longer period which then reflect the rational response by the investors in an efficient market to deal with trading friction and transaction costs. Moreover, higher yield which required by the higher spread position of a particular stock would give the incentive to the firm to increase the stock market liquidity position of their stocks and reduce the opportunity cost of capital.

Similarly, by utilizing panel data of 47 countries from 1976-1993, Levine and Zervos (1998) found a strong correlation between the size of the market, volatility, stock market liquidity with *SMD*. Their study also investigates the effect of bank policy to the stock market. Results show that stock market liquidity and bank policy are significant in determining the *SMD*. However, as Levine and Zervos just used the cross –sectional approach, the results limit the robustness regarding country specific effects and time related effects.

Additionally, Naceur *et al.* (2005) also found the same results. They used an unbalance panel data from 12 Middle-East and North African (MENA) countries. By using market capitalization to *GDP* as the measurement of *SMD*, the analysis of FEM and REM suggested that saving rate and financial intermediaries' policies could affect the stock market liquidity which then determine the *SMD*. This estimation model is recommended as it has less procedure. Besides, this method could consider the entities' heterogeneities and suitable for the analysis within the region which share the same economic

characteristics. Another study by Garcia and Liu (1999) used the pooled data from 15 industrial and developing countries in 1980-1995. Results from Autoregressive Distributed Lag (ARDL) analysis show that, in the long run, *SMD* which measured by stock market capitalization is positively affected by stock market liquidity and economic growth. Meanwhile, inflation provides a negative impact on *SMD* in the long run.

On the other hand, study of Bayraktar (2014) found that financial system effectiveness is one of the important determinant of *SMD*. Panel data analysis of 104 developing and developed countries from 1990 – 2012 observes that stock market capitalization which signify the countries' specific characteristics and capacity are attributed by the efficiency of the financial intermediaries. Since efficiency of the financial system could affect the fund allocation, saving mobilization towards investment in the stock market. Given this, the *SMD* would be affected through higher stock market liquidity and investment fund availability.

Instead, Chipaumire and Ngirande (2014) used the quarterly data from South Africa Stock Exchange over 15 years which is from 1995 – 2010. By using ordinary least square (OLS), they suggested that the risk adverse savers are not willing to renounce their assets or wealth for a long term. The saving rate could affect the stock market liquidity which trigger the savers to stay with long term saving instead of investing into stock market. So, trading volume in a stock market would be affected. Those evidences were also supported by Dailami and Atkin (1990) who found that development of the financial institutions particularly unit trust and contractual saving institution would affect the herd behaviour of

investors. These institutions play an important role in determining the *SMD* which compete with the stock return. These arguments are in line with Yartey and Komla (2007) as they suggested that financial intermediaries development would increase the *SMD* by controlling the macroeconomic stability, economic development and legal and political stability of a country.

Circulating on the financial intermediaries' roles for *SMD*, a study on the ASEAN region by Chaisrisawatsuk (2016) found that the efficiency of the banking system, changing in the banking landscape through merger and acquisition leads to a lower interest rate spread and promote competition in the market. This situation would stimulate to a larger financing availability in the market which encourage more investment in the stock market. Thus, this study support the studies by Levine and Zervos (1998), Garcia and Liu (1999), Naceur *et al.* (2005) and Rahman and Salahuddin (2010) which found that policies determined by the financial intermediaries related to investment fund availability would trigger to higher trading volume which then stimulate the *SMD*.

Besides, Garcia and Liu (1999) investigates the macroeconomic determinants of *SMD* by using the sample of Latin American and Asian countries. The estimation using Fixed Effects Model (FEM) proved that the stock market liquidity which measured by total value traded to GDP, turnover ratio and ratio of liquid liabilities to GDP have a positive significant effect on *SMD*. Besides, *GDP* growth, financial intermediaries' development and domestic investment could also boost the *SMD* in a country. Also, higher trading volume would signify a higher liquidity of the stock market (Zhang, 2010). Due to the

lower bid – ask spread, the traditional institutions investors would easily adjust their portfolio which affect their fundamental based view pertaining to the firms' performance. Given this, higher stock market liquidity would result to lower transaction costs and sustain the stock price towards the fundamental value.

Supported by the studies conducted by El-Wassal (2013), Balogun *et al.* (2016), Dailami and Atkin (1990) and Naceur *et al.* (2005). They found that, high inflation level is associated with less stock market liquidity and smaller financial market. This is because the financial intermediaries tend to lend less fund for investment and allocate less efficiency of the stock investment. Given this, the availability of fund to be used for investment purposes is affected. Besides, Naceur, Ghazouani, and Omran (2007) investigated the determinants of *SMD* in Middle – Eastern and North African using REM specifications, results observed that stock market liquidity, financial intermediaries, saving rate are among the important variables which complement the *SMD*.

In a related study, Balogun *et al.* (2016) examined the long run relationship between stock market liquidity and *SMD* in Sub – Saharan Africa using time spans of 1990 – 2013. By utilizing dynamic heterogeneous panel data analysis, results suggested that there is a long run relationship between stock market liquidity and *SMD*. Also, study found that stock market liquidity would signify a safer market and high protection of the investors. It is connected to the reliability of the disclosure of investment information which vitally important in making portfolio diversification strategy. As stock market liquidity illustrates

a safer or risky market to the investors, it would also affect the attractiveness of the investors to invest into a stock market.

Supported by Fong *et al.* (2017), they claimed that the prosecution against insider trading would represent the market quality and stock market liquidity performance which help the *SMD*. Using the various measures of stock market liquidity such as effective spread, percent quoted spread, percent realized spread, and percent price impact comprise of low frequency and high frequency data for 18,472 firms around 43 exchanges from 1996 – 2007, this study also found that lower synchronicity, higher trading information disclosure and higher prosecution against insider trading would be represented by higher trading volume in the market which then lead to better *SMD*.

Aligned with the studies by Pagano (1993) and Agrawalla and Tuteja (2007), transparency of the regulation disclosure in a stock market except for traders' identities are related to revelation of trading regulation. It induces the investors not to trade aggressively and follow the traditional mixed strategy. Also, La Porta *et al.* (2000) found that legal tradition would influence the degree of protection to the shareholders and creditors and promote the efficiency in the contract enforcement. This higher trading protection could be seen through higher trading volume in the stock market. Thus, these ideas support the theory applied in this study which proposed that higher stock market liquidity could represent better information disclosure which then stimulate *SMD*.

Furthermore, Lee and Takagi (2015) and Yan and Ferris (2004) found that stock market liquidity could affect the *SMD* through information asymmetry. Yan and Ferris utilized the measurement of market trading activities including trading volume, bid – ask spread and quoted spread. They found that information disclosure particularly through online trading are positively cause to market volatility. However, once they control the trading activities by the small traders, online disclosure are no longer affect the volatility of the stock prices. Also, they found that, online trading have a positive relationship with contemporaneous market returns and stock market liquidity. Most importantly, results obtained propose stock market liquidity could be affected by the information disclosure through online trading. They suggested that information disclosure could benefit the institutional investors to place a large orders as it could lowering the informational costs.

In the view of Lee and Takagi, *SMD* in ASEAN markets was affected by the information regarding the financial integration. Their study suggested that transaction between lender and borrower would signify an asymmetry information regarding the policies implemented by the financial intermediaries. Given this, financial integration requires more sophisticated institutions to be cooperated for economic activities. Thus, stock market liquidity in this region are affected by the investor's expectation towards an efficient financial intermediaries' operation which then attract the attention of investors to invest into this region.

However, according to Wongswan (2006), the analysis using low frequency data makes has weaken the evidence of information transmission effects on *SMD* particularly into the

emerging markets. Since most emerging economies are heavily depend on the developed market especially in term of underlying instruments performances, result using high frequency intraday data suggest that, there is a large and significant impact of macroeconomic announcements in the developed markets with the stock market liquidity and *SMD* in emerging market. Investors in emerging markets would hold their stock prior to the information on the macroeconomic changes in the developed countries. Given this, trading volume will be slower. Besides, it will also cause to stock price volatility due to the speculators' herd behaviour. Thus, *SMD* would be affected caused by the changes in investors' speculation and risk aversion.

On the other hand, many other studies have documented a positive relation between stock price volatility and stock market liquidity. For instance, Brunnermeier and Pedersen (2009), Fernando (2003) and Kulathunga (2014). Various data frequencies from different stock market have been applied. Consequently, the results suggested that in the short run, volatility of the stock would represent the higher risk, as the traditional investment theory proposed that higher risk contributes to higher return; volatility of the stock price would then encourage them to invest more in that market. Given this, increase in the trading volume would boost the *SMD*.

Conversely, older study by Levine (1991) argued that the stock market liquidity could determine the *SMD*. This is because, although any long – term investments need a long – term commitment in term of capital, investors do not prefer to lose their control of the saving or capital for longer period. Further study conducted by Yartey and Komla (2007)

which applied the same model found that the empirical finding is not conclusive in selected African countries. Furthermore, study by Bernstein (1987) examined the effect of stock market liquidity to the stock market. Results suggested that, stock market liquidity and efficiency are not compatible to each other. This is due to the reason that a new information to liquid market will keep minimal noise and price changes. On the other hand, price moves faster in an efficient market upon arrival of new information. Thus, stock market liquidity would lead to a less efficient market. High sensitivity of the stock price upon receipt of any information will affect the risk of portfolio investment by investors. For risk adverse investors, they tend to move their investment into lower risk market which then affect the *SMD* due to the changes in market capitalization.

However, Pistor, Raiser and Gelfer (2000) highlight that the effectiveness of the corporate governance is also important for *SMD*. Based on their study, better institutional framework would reduce the volatility of the stock return especially in the emerging markets due to the operational efficiency which affect the investors' confidence to invest into a firm. However, Yartey and Komla (2007) argued that the corporate governance or the institutional factors are negatively affected by the stock market liquidity since a very liquid market will promote investors myopia. Further argument was mentioned by Levine and Zervos (1998). They state that, the liquid stock market could negatively affect the stock market development if it causes a significant reduction in the corporate control of a country.

On the other sides, Vu, Chai, and Do (2014) applied the model of Acharya and Pedersen (2005) in exploring the impact of liquidity risk measures on stock returns on Australia

market during 1991 – 2010 data. A strong evidence of interaction between individual stock illiquidity and market illiquidity, stock returns and market illiquidity; and between stock illiquidity and market returns. The overall results indicate that the liquidity co – movement net value is significantly priced in Australia.

Fernando (2003) examined the causes and consequences of commonality in liquidity by using the model of liquidity trading which also encompassed the liquidity shocks into systematic and idiosyncratic components. Result shows that trading volume is independent of systematic liquidity risk which priced irrespective of market liquidity. In contrast, the demand and volume of the stock traded is affected by the idiosyncratic liquidity shocks which allow the investors to diversify their trading risk. Based on these arguments, stock market liquidity would affect the investment strategy related to portfolio diversification. Investors would look for a lower liquidity risk and higher return for their investment. Given this, higher liquidity risk would make the stock market less attractive and slow down the *SMD*.

Furthermore, Zhang (2010) examined the impacts of high trading volume on stock market. The utilization of FEM on the US capital market data suggested that high trading volume would cause to some harmful effects on the US capital market. Also, high trading volume is positively correlated with volatility of the stock prices prior to the firm fundamental volatility and other exogenous determinant control. Also, strong positive correlation was found in the top 3,000 market capitalization firms and organizations. The positive correlation was also found during the uncertainty of the market. Based on this study, higher

trading volume would cause the stock price to be overreacted to the fundamental news. Thus, higher trading volume leads to higher sensitivity of the stock price which associated with higher risk of investment. It will then affect the investment strategy which then affect the *SMD*. Further investigation by Charoenwong, Ding, and Yang (2012) confirmed that higher volatility would result to higher risk on return bear by investors. Thus, higher trading volume would result to risky market and drop the market capitalization in a country.

#### **2.4.6 Contagion Effects on Stock Market Development**

This section provides the empirical evidences where contagion effects are nominated as the determinant of *SMD*. The discussions are based on the definition proposed in the Thornton's Contagion Theory which were cited by Ehrmann and Fratzscher (2009), Ehrmann, Fratzscher, and Rigobon (2011), Garcia (1989), Moser (2003) and Werner (2014).

Ehrmann and Fratzscher (2009) found that, transmission of contagion effect particularly from the US could cause to cross – country heterogeneity. By using cross – section of 50 equity markets globally, they found that, the key determinants of contagion are triggered by tighten monetary policy with the US and financial integration. This result also found by Ehrmann, Fratzscher, and Rigobon (2011). They found a substantial international contagion in the financial transmission including money, bond, exchange rate and equity markets within and between the US and Euro region. Also, they discover that, the contagion affects asset prices which then cause to the shock within and across asset classes. In addition, results found that the US stock market is the main driver for Euro financial

markets which explain on average more than 25 percent movement of the financial asset prices.

Instead of spill over effects, market interaction is also used to explain the contagion effects. For instance, study by Dailami and Atkin (1990) suggested that the stock market development can be explained by the interaction of two mutually reinforcing markets through two ways; increase in level of real investment and decrease in the cost of equity due to the higher share price. Another study by Hashmi (1997) used Vector Autoregressive Model (VAR) shows that, New York stock market led almost every region globally including ASEAN countries. Also, New York stock market affects the ASEAN markets both pre – and post – AFC periods. Study also found the inter – linkages among ASEAN markets and it was generally increased after AFC in 1997 – 1998. Emerging and small market tend to be affected by larger market after the crisis. Led by Singapore, regional variance is mostly explained by the changes in Singapore stock market. However, Malaysia appears to be alienated after the AFC. This situation could be explained by the capital control policies implemented by the Malaysian government. Most affected is Thailand, Indonesia and Philippines. However, due to the smaller size of stock market, these markets did not give any significant impact on the other stock market in the region. Moreover, Hashmi confirmed that linkage within the region is more significant in explaining the *SMD* in ASEAN rather than contagion effect from the US stock market. This finding also supported by Masih and Masih (1999) which found that, Asian stock markets are more affected by each other rather than developed markets using VAR estimation.

However, some other studies argued that ASEAN region are more affected by developed countries. For instance, Ghosh, Saidi, and Johnson (1999) found that the Philippines, Indonesia and Singapore are affected by Japan while Malaysia, India, Korea and Hong Kong are linked with the US. Meanwhile, Ng (2000) and Liu (2007) found significant impact of shock originated from Japan and the US to Asia – Pacific region which also include ASEAN – 5 countries. Yet, Chow, Huang, and Niu (2013) suggested that, inter – relationship of stock market in Asia with another countries are vary over time. Triggered by the recent financial crisis, it can cause to structural changes for the stock market in this region.

In related study, Royfaizal and Lee (2009) examined the linkages between ASEAN – 5 and another three countries namely China, Japan and Korea with the US stock markets. Using weekly stock indices data, they confirmed that, there is an interdependence during and post – crisis period. However, the impact of stock market of the US to these countries are only significant during pre – crisis period. Contrast with Arshanapalli, Doukas, and Lang (1995), common stochastic trend between the US and Asian stock markets during pre and post – October 1987 period are investigated using daily data. Analysis of cointegration and error – correction model suggested that Asia stock market are more affected by the US stock market during the post – crisis periods.

Similar study has been conducted by Sheng and Tu (2000) using cointegration and variance decomposition for S&P 500 and 11 major Asia – Pacific equity indices. They found that, Southeast Asia are more cointegrated than North – East Asia Countries with the US stock

market. Results also show that, no cointegration between these financial markets with the US during the pre – crisis period. Another method applied by Manning (2002) to consider the co – movement between stock markets in the US and Southeast Asia. Results from Johansen Maximum Likelihood and Haldane and Hall Kalman filter confirm that, there is a common trend present in the eight Asian Equities. Besides, model of Johansen VAR confirmed that there is effect of the US stock market changes to Southeast Asia stock markets. In addition, Granger causality and co – integration analysis was used by Jang and Sul (2002). They found that, there is no co – movement between seven Asian countries during pre – crisis period. However, since the AFC in 1997, uni – directional and bi – directional linkages between these countries were increased sharply. Moreover, a strong co – movement was still exhibited during 8 months of the post – crisis period and getting stronger in the following periods.

Moreover, study of Saini, Azali, Habibullah, & Matthews (2002) investigated financial integration among ASEAN – 5 stock markets. They used the Cointegration analysis, Seemingly Unrelated Regression (SUR) and Toda and Yamamoto Granger Non – causality test. Results reveal the evidences of co – integration among the stock markets in this region. Although there is no common stochastic trend was found, an increase in the correlation was found in the post – AFC period. In contrast, Daly (2003) found that there is no significant increase of integration between ASEAN stock markets in the post – AFC. Meanwhile, Goh, Wong and Kok (2005) employed daily closing prices over 1992 – 2002 and found that stock markets in ASEAN – 5 were cointegrated for pre – and post – AFC periods.

Studies on contagion effects were also conducted in the other region. For instance, Kamel (2006) covered on the Egyptian stock markets, study claim that the application of GARCH class models in developed and emerging markets could provide the evidence of contagion effects on stock market development. Based on the study, the aggregate market index will not reflect any significant differences of volatility pattern related to different stocks. Thus, the pooled – panel models are suggested. Beirne and Gieck (2012) provides the empirical evidence of interdependence and contagion for different asset classes comprise of bonds, stocks and currencies. Data for 60 economies over 1998 – 2011 were analysed using VAR. Results suggested that, within – market effects are significant for advanced economies. Meanwhile, for emerging economies, within market effects are notable for stock markets. Contagion effects within the stock market are most exhibited in Latin America and Emerging Asia while for global contagion effects were mostly notable for the bond markets in advanced economies. Also, the evidence suggests that shock emanated from the US play an important role for global transmission particularly in the stock markets. This shock led to risk aversion for the investors which then cause to the changes in the *SMD*.

Another study was conducted by Strohsal and Weber (2015). They examined the market interaction for major stock indices from the US, Canada, Argentina, Brazil, Mexico, Australia, Japan, Korea and Philippines. Results show that, international stock market interaction could cause to the financial volatility in domestic market. Also, volatility – dependence for cross – market contagion can be interpreted through the information flows and uncertainty. Based on the analysis using ARCH models, a strong contagion due to the

volatility was found. Common shocks was also seen as a reason for stock market co – movement by Babetskii *et al.* (2007). They used sample of EU members comprise of Czech Republic, Hungary, Slovakia and Poland, financial integration with euro area was investigated. Certainly, shock in a country can cause to the co – movement of the stock market in the neighbouring countries also triggered by the herd behaviour of the investors.

Recent investigation by Koulakiotis, Kiohos and Babalos (2015), Maddala and Wu (1999) and Rahman, Sidek, Zahirah and Sidek and Abdul-rahman (2011) claimed that, the interaction between the equity prices and exchange rate in the US, UK and Canada could be explained through flow oriented models. Given this, any macroeconomic events triggered by a movement in currency could be the mechanism for the changes in trade balance of a country and stock market values.

Based on the previous studies, there are evidences of contagion effects around the globe. Specifically, there are also empirical evidences which found that the US stock market play an important role in explaining the changes or movement in the global stock market particularly in emerging markets.

## **2.5 Literature Gap**

Several studies were conducted pertaining to the *SMD*, stock market liquidity and contagion effects. However, this study found that there is limited investigation on the differences of *SMD* especially in the emerging market as most of the studies are focusing on the theoretical explanation of the *SMD* stages and dimensions. Thus, the comparative

studies on the *SMD* during pre – and post – crisis are mostly using the trend analysis and dummy variable in the estimation model rather than any specific analysis. Moreover, there is limited studies on effects of stock market liquidity on *SMD* particularly in ASEAN – 5. As far as developed countries are concerned, limited studies were conducted in this region.

Based on the literature, there are numerous studies used numerous measurement of stock market liquidity. Such measurement include bid – ask spread, turnover ratio and volume traded. However, bid – ask spread has been widely applied as the main measurement of stock market liquidity. This is because, most of the studies are primarily concern on the developed stock market and there are few attentions have been paid on the emerging market due to data availability. Moreover, there are limited studies used the volume based measures as the indicator of stock market liquidity, although this measurement could capture the real stock market liquidity position of the stock market, as the cost of trading executions are concern, this measurement is relatively less being utilized in the literature.

Regarding the contagion effects to *SMD*, previous studies emphasize on the spill over effects rather than market interaction. Thus, the explanation of contagion effects is mostly focused on the direct transmission effects of the crisis rather than continuous interaction between the markets.

## **2.6 Conclusion**

This chapter provides a closer look on the concepts and measurements of *SMD*, stock market liquidity and contagion effects. Focusing the proposed measurements, previous

studies pertaining to the effects of stock market liquidity and contagion to *SMD* were discussed theoretically and empirically. Based on the literature, nearly all studies focus on the utilization of bid – ask spread in measuring stock market liquidity. Meanwhile, in examining the contagion effects, most of the studies focus on the spill over effect rather than market interaction. Moreover, the utilization of panel data approach is recommended, against the time-series approach, in examining the effects of stock market liquidity and contagion effects on *SMD*.



## CHAPTER 3

### METHODOLOGY

#### 3.0 Introduction

This chapter discusses the methodology applied in this study. The theoretical framework is explained in Section 3.1 which then followed by estimable models in Section 3.2. Then, the variables used in this study are explained in Section 3.3. The methods of analysis are discussed in the last section.

#### 3.1 Theoretical Channels of Liquidity and Contagion Effects on the Stock Market Development

The theoretical framework in this study has been constructed based on the behavioural models developed by Calderon – Rossell (1991). These models suggested that level of economic development measured by output growth and market liquidity could determines the *SMD* through following equations:

$$[3.1] \quad TMC = L \times P$$

$$[3.2] \quad TMC = L \times P = TMC(G, Q)$$

$$[3.3] \quad P = P(G, L)$$

$$[3.4] \quad L = L(Q, P)$$

where:

- $TMC$  = market capitalization (in local currency),
- $P$  = number of companies listed in a r stock market,
- $L$  = local currency average price of listed companies
- $V$  = price of listed companies in local currency,
- $Q$  = trading volume that measures the liquidity states in the market,
- $G$  = economic growth.

By applying the Equations [3.1] – Equation [3.4] proposed by Calderon – Rossell, the sophistication level of an economy and availability of liquidity sources determine development of stock markets. Specifically, an increase in  $L$  will result to an increase in  $TMC$  if  $P$  is constant. This is due to the high diversification potential in the market which result to a low corporate risk (industrial bankruptcy). Thus, the number of listed company would help in constructing a well – developed market. Another indicator which is  $P$  is related to the risk premium of an investment. It indicates the expected value of the stock relative to expected earnings. The risk premium in these equations is measured by the price – earnings ratio. High risk premium indicates that investors are willing to pay higher price for a higher return.

Meanwhile,  $Q$  which is the turnover ratio is the measurement of trading volume, liquidity and thinness of the market. Low liquidity represents the limitation to attract the international investors which slow – down the  $SMD$ . Meanwhile,  $G$  represents the overall

growth of the economy in a country. Therefore, higher  $G$  will attract more investors to invest into the stock market and support to accelerate the *SMD*.

Additionally, this study applied the definition of stock market liquidity proposed by previous studies such as Amihud and Mendelson (1986), Beaupain and Petitjean (2007), Brunnermeier and Pedersen (2009) and Fong *et al.* (2017), a liquid stock market allows the stock to be traded in large volume without substantially affect the stock price. Conversely, an illiquid stock market will give an extensive effect on stock price when it is traded in a large quantity. Hence, the effects of stock market liquidity on the *SMD* are explained through four channels. Such channels are marketability of the stock market (Amihud & Mendelson, 1986; Chipaumire & Ngirande, 2014; El-Wassal, 2013; Kyle, 1985), monetary policies (Chaisrisawatsuk, 2016; Devereux & Smith, 1994; Garcia & Liu, 1999; Levine & Zervos, 1998), investment cost (Acharya & Pedersen, 2005; Bencivenga, Smith, & Starr, 1996; Chipaumire & Ngirande, 2014; Dalsenius, 2007; Watanabe, 2004; Yartey & Komla, 2007) and protection of investors (Balogun, Dahalan, & Hassan, 2016; Fong *et al.*, 2017; Hagstrom, 2001; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 2000; Pagano, 1993; Tadesse, 2005).

The first channel is marketability of the stock market. It is related to the attractiveness of the stock market to be chosen as a long – term investment hub by investors. This channel specifically related to the firms listed in a stock market which have a high value, well – perform and good corporate governance. Also, it indicates a sustainable growth rate of the industry which then explains the stock return for investors. These criteria would make a

stock market become more attractive particularly for foreign investors. Given this, more trading activities will be performed in a stock market. Consequently, it will promote and attract more investors to trade their portfolio in a stock market of a country due to lower risk and higher return potential displayed by the firm listed.

Conversely, firms listed which are not well – perform and have a relatively weak corporate governance make the stock market less attractive or has a low marketability which then resulted to a lower trading volume and cause to an illiquid stock market. Besides, this channel also supports the theoretical explanation by Chipaumire and Ngirande (2014) and Majid, Meera and Omar (2009). They suggested that a liquid stock market signify an easy access to investors' wealth which can easily be sold without any effect on the price. This easy access and higher distribution of profits would encourage saving depositors to invest in a long – term investment. Simply, a liquid stock market would substitute the function of normal saving through a competitive rate of return and easy access of the stock.

Secondly, monetary policies of a country can also affect stock market liquidity. It is related to the policies implemented by government and central bank to control the supply of money in a country. In this regard, lower financing rate makes more investors interested to invest into a stock market in a country. Specifically, interest rate imposed and amount of credit provided to the firms which represent the capital accessibility for investment (Brogaard, Li, & Xia, 2016), supportive funding procedures (Vayanos & Wang, 2013; Werner, 2014) and well – developed financial system. These elements are important to influence foreign investors as it signify higher financial support for investors in gaining fund for their

investment and maintain a good performance of their firms. As *SMD* is also related to the investment capital availability, monetary policy can affect *SMD* through increment in trading volume.

In contrast, an illiquid stock market represented by least volume traded indicates a country has a tight monetary policy which then makes the stock market become less attractive to investors and reduces trading volume. Also, a tight monetary policy resulted to a financial support constraint for investors. Capital constraints resulted from a contractionary monetary policy can cause to a difficulty for trader to meet margin requirement and fail to provide liquidity to the market (Charoenwong, Ding, & Yang, 2012). Based on this criterion, it will be riskier for the foreign investors to invest into a stock market attributed by less capital availability and financial support from local financial banks especially for financial recovery due to any loss for their firm and investment.

The third channel is investment cost. It is associated with the information and transaction cost in stock trading activities. Information cost is the cost of gaining information regarding the agency cost during the investment strategy set – up. Meanwhile, transaction cost is associated with tax imposed in a trading activity. Thus, low investment costs for the investors in handling their investment in a stock market will result to a higher stock market liquidity. According to Butler, Grullon and Weston (2005), lower floatation cost associated with seasoned equity offering which is the cost faced by the investment banking group. A reasonable floatation cost must be in – line with the requirement or market marker such as

dealers, trading specialists or block traders who manage stock buyers and sellers and facilitate toward an immediate process of intermediation activities.

On the contrary, high information and trading cost in transacting their stock will cause to an illiquid stock market as it makes the stock market less attractive for investors which then affect the *SMD*. Also, it is associated with the cost of asymmetry information between the managers and stockholders during the investment strategy set-up processes (Acharya & Pedersen, 2005). As less stock traded, *SMD* will also plunge.

Lastly, protection of investors is another important consideration which also affect the stock market liquidity and *SMD*. Associated with the reliability of investment disclosure, investment regulatory framework and high enforcement of legal rules in a stock trading environment (Butsa, 2008; Chan, Hong, & Subrahmanyam, 2008; Vagias & Dijk, 2010). Thus, this channel signifies a safer market for investors which then contribute to a more liquid stock market. Given this, it will enhance the investors' confidence to invest and diversify their portfolios in a stock market and boost the trading volume and *SMD* of a country.

On the other hand, an illiquid stock market represents a riskier trading procedures and investment disclosure for the investors. As the uninformed traders would transact their stocks by only using publicly available information and their personal convictions, it led to portfolio adjustment through asymmetric information and herd behaviour which drop the confidence of investors and makes the stock market less attractive. Moreover, weak regulatory framework will increase the level of insider trading (Kyle, 1985). The prospect

of more insiders trading would drop the stock market liquidity due to greater adverse selection by the uninformed traders. It is supported by Fong *et al.* (2017) that the prosecution against insider trading would increase market quality and improving the stock market liquidity performance and help the *SMD*.

Meanwhile, in explaining the contagion effects on *SMD*, the contagion theory proposed by Henry Thornton (1802) which have been cited by Garcia, (1989), Moser (2003) and Werner (2014) are also applied in this study. This theory explained on the transmission of crisis particularly in a banking sector which then termed as contagion. In later definition, Forbes and Rigobon (2002) explained that the contagion is constituted if there is a significant increase in the cross – market interaction after the crisis period. Otherwise, if there is no significant different in the correlation during pre – and post crisis period, it may not constitute contagion but only termed as interdependence.

Through utilizing the definition of contagion and interdependence proposed by Forbes and Rigobon, the effects of contagion on *SMD* in this study are explained through several channels. Such channels include portfolio adjustment (Atiase, 2011; Beirne & Gieck, 2012; Billio, Lo Duca, & Pelizzon, 2005; Claessens & Forbes, 2004; Moser, 2003), monetary policies (Brunnermeier & Pedersen, 2009; Cheung, Tam, & Szeto, 2009; Danielsson, Shin, & Zigrand, 2011; Dungey & Vehbi, 2015; Werner, 2014), financial linkages (Claessens & Forbes, 2004; Marshall, 1998; Moser, 2003; Ndebbio, 2004; Poldauf, 2011) and information asymmetry (Barro, 2012; Bebczuk, 2003; Diamond & Verrecchia, 1981; El-Wassal, 2013; Poldauf, 2011).

First channel of contagion effects on *SMD* is portfolio adjustment by investors. If there is a contagion effect, it might constitute a risky market for the investors which could affect their future cash flow and the expectation towards the market. As the traders understand their roles, the available information regarding the contagion effects could be utilized in setting up their investment strategy to secure their position. Thus, traders will initiate an order to sell their stocks after the possibility of stock price depreciation. Contrary, if there is only interdependence disclosed, investors will maintain their position in a stock market and disregard of any shocks occurs particularly from the US stock market. Also, it indicates that there is a possibility of diversification opportunities in those markets as they are interdependence as long as there is an inverse relationship in terms of the stock movement and low correlation between the markets (Rezayat & Yavas, 2006). In this regard, the portfolio diversification could be implemented to reduce the total risk without sacrificing the expected returns.

Secondly, contagion effects also trigger a monetary policy review by government and central bank. It is associated to the control of monetary supply to the economy. Due to any vulnerability of a country towards global shocks, if there is a contagion effect constituted, contractionary monetary policy will be implemented by government and central bank. Thus, additional reserve by the financial intermediaries to central bank will be required which then reduced the amount of financial facility to the economy. As a result, investors' investment funds will be reduced which then plunge the *SMD*. Contrary, if there

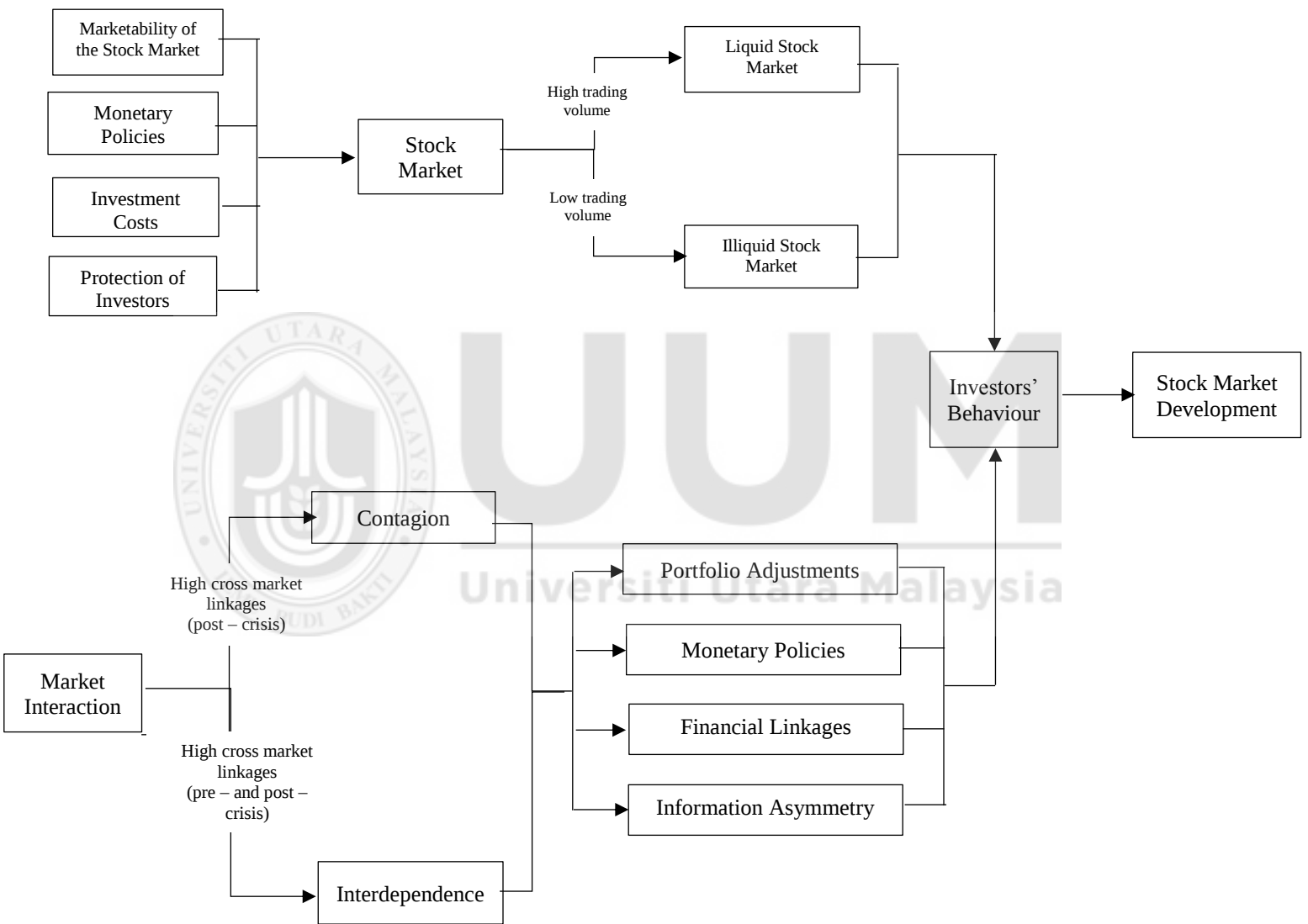
is interdependence is constituted, there is a possibility of expansionary or maintaining current monetary policy which increase the investment fund by the investors and boost the *SMD* of a country due to investment fund availability.

In addition, the third channel of contagion effects on *SMD* is trade and financial linkages among countries. Given by the interdependencies among countries, any individual firm, sector or market of a country can be affected by any adverse shock happen in another country. A firm which heavily rely on the import and export from the US would be affected by any adverse shock happen in the US. For instance, any shock in the US might affect the performance of the firm in the US due to policy adjustment made by government. Thus, the affected firm which mainly involve in international trading would reduce the quantity of import. This action will affect the revenues, cash flows and overall performance of the exported firms. It will also negatively affect their trading partner and subsidiaries due to a contagion effects. Given by a bad performance of the firm, investors will take an action to restructure their portfolio to other stable firms, sectors or markets. Consequently, it will finally affect the *SMD* of a country. Instead, if there is only interdependence found, any adverse shock happen in the US might not tremendously give a significant impact on the firms' performance. Thus, investors might not alter their portfolio as the firm can still manage their risk of loss. Consequently, it might attract or maintain the existing investors in the market which maintain the *SMD* of a country.

Lastly, the contagion or interdependence can affect the *SMD* through information asymmetry. It explains the information gained by the investors or fund managers prior to

the action of the big player in the market. Due to the high cost of gaining information, there will be a possibility of speculation made by the investors in adjusting their portfolios prior to the information obtained. If there is an information pertaining to contagion effects, investors would sell their share to avoid price depreciation. Meanwhile, in the case of interdependence information are obtained, they will maintain their investment in a stock market. Given by those action, it would affect the *SMD* in a country due to the herd behaviour of investors or fund managers.

Based on those circumstances, this study suggests that the contagion effects would reflects the behaviour of the investors to invest into a market through the stability of the market. If a shock could affect the performance of the stock in a market, it would indicate that those stock market are relatively less resilience toward external shocks. Thus, it would reduce the investors' confidence to invest into that stock market. Otherwise, relatively resilient stock market would attract more investors and boost the *SMD* in a country. As those explanation applied, the theoretical framework in this study was constructed which displayed in Figure 3.1.



*Figure 3.1*  
Channels of Liquidity and Contagion Effects on the SMD

### 3.2 Estimable Models

The theoretical framework used in this study has been built upon a behavioural model of *SMD*, which is introduced by Calderon-Rossell (1991) and is later developed by Yartey (2008). The main hypothesis of the model is that the level of economic development, which is captured by output growth, and stock market liquidity determines the *SMD*. The classical Calderon – Rossell model states that stock market capitalization is a function of the number of firms listed in the exchanges and the value of those companies. Based on this model, the prices of listed companies depend on number of listed companies and yearly output (generally measured by GDP). The number of listed companies is function of output and liquidity available for the financial transactions.

By using 24 years data of ASEAN – 5, the general function that describes the effects of stock market liquidity and contagion on *SMD* is shown by Equation [3.5].

$$[3.5] \quad SMD_{i,t} = f(LIQ_{i,t}, MRI_{i,t} * MRI_{US,t}), \quad i=1, 2, \dots, 5; \quad t=1,2,\dots,24$$

where, *SMD* is the stock market development, stock market liquidity is the stock market liquidity for *i* countries (Malaysia, Indonesia, Thailand, the Philippines and Singapore) in time *t*. Meanwhile,  $MRI_{i,t}$  is the stock price index of country *i* at time *t* of the ASEAN – 5 members at time *t* and  $MRI_{US,t}$  is the stock price index of the US. Thus,  $MRI_{i,t} * MRI_{US,t}$  is the interaction of the stock price index for a country in ASEAN – 5 with the US stock market. Based on the general function given in Equation [3.5], the basic model given by Equation [3.6] is used to investigate the effects of stock market liquidity on *SMD* which

stated in the second objective of this study. Given this, the Equation [3.6] is estimated by including the control variables.

$$[3.6] \quad SMD_{i,t} = \beta_0 + \beta_1 LIQ_{i,t} + \beta_2 GDP_{i,t} + \beta_3 INT_{i,t} + \beta_4 INF_{i,t} + \beta_5 SAV_{i,t} + \beta_6 CRT_{i,t} + \beta_7 DUM_{i,t} + \varepsilon_{i,t}$$

where:

|               |   |                                                               |
|---------------|---|---------------------------------------------------------------|
| <i>SMD</i>    | = | Market capitalization to GDP (percent)                        |
| <i>LIQ</i>    | = | Volume traded (million units)                                 |
| <i>GDP</i>    | = | Economic growth (USD billion)                                 |
| <i>INT</i>    | = | Interest rate (percent)                                       |
| <i>INF</i>    | = | Inflation rate (percent)                                      |
| <i>SAV</i>    | = | Total saving (USD million)                                    |
| <i>CRT</i>    | = | Credit to private sector by bank (USD million)                |
| <i>DUM</i>    | = | Dummy for pre – and post –crises                              |
| $\beta_j$     | = | Coefficient value for each variable, ( $i = 0, 2, \dots, 7$ ) |
| $\varepsilon$ | = | Error term.                                                   |

The error in this model is considered as white – noise where the mean is equal zero and variance is constant,  $\sigma_\varepsilon^2$  or  $\varepsilon \sim iid(0, \sigma_\varepsilon^2)$ .

Moreover, in analysing the effects of contagion on *SMD* which stated in the third objective, the estimable models are given by Equation [3.7] – Equation [3.11].

$$[3.7] \quad SMD_{M,t} = \phi_0 + \phi_1 LIQ_{M,t} + \phi_2 MRI_{M,t} + \phi_3 MRI_{US,t} + \phi_4 MRI_{M,t} * MRI_{US,t} + \\ \phi_5 CRT_{M,t} + \phi_6 SAV_{M,t} + \phi_7 DUM_{M,t} + \varepsilon_{M,t}$$

$$[3.8] \quad SMD_{I,t} = \theta_0 + \theta_1 LIQ_{I,t} + \theta_2 MR_{I,t} + \theta_3 MRI_{US,t} + \theta_4 MRI_{I,t} * MRI_{US,t} + \\ \theta_5 CRT_{I,t} + \theta_6 SAV_{I,t} + \theta_7 DUM_{I,t} + \varepsilon_{I,t}$$

$$[3.9] \quad SMD_{T,t} = \rho_0 + \rho_1 LIQ_{T,t} + \rho_2 MRI_{T,t} + \rho_3 MRI_{US,t} + \rho_4 MRI_{T,t} * MRI_{US,t} + \\ \rho_5 CRT_{T,t} + \rho_6 SAV_{T,t} + \rho_7 DUM_{T,t} + \varepsilon_{T,t}$$

$$[3.10] \quad SMD_{P,t} = \varsigma_0 + \varsigma_1 LIQ_{P,t} + \varsigma_2 MRI_{P,t} + \varsigma_3 MRI_{US,t} + \varsigma_4 MRI_{P,t} * MRI_{US,t} + \\ \varsigma_5 CRT_{P,t} + \varsigma_6 SAV_{P,t} + \varsigma_7 DUM_{P,t} + \varepsilon_{P,t}$$

$$[3.11] \quad SMD_{S,t} = \vartheta_0 + \vartheta_1 LIQ_{S,t} + \vartheta_2 MRI_{S,t} + \vartheta_3 MRI_{US,t} + \vartheta_4 MRI_{S,t} * MRI_{US,t} + \\ \vartheta_5 CRT_{S,t} + \vartheta_6 SAV_{S,t} + \vartheta_7 DUM_{S,t} + \varepsilon_{S,t}$$

where:

$MRI_i$  = Market index (point) of ASEAN – 5

$MRI_{US}$  = Dow Jones Index (point)

$MRI_{i,t} * MRI_{US,t}$  = Market interaction (thousand point)

M, I, T, P and S = Malaysia, Indonesia, Thailand, Philippines and Singapore, respectively

$\phi, \theta, \rho, \varsigma$  and  $\vartheta$  = Coefficient values

$\varepsilon$  = Error terms

### 3.3 Justification of Variables

This section explains the variables used in the estimable models. The explanation includes the definitions, measurements, previous study and hypothesis for each variable. The stock market development (*SMD*) is the dependent variable. The independent variables used in this study includes stock market liquidity (stock market liquidity), economic growth (*GDP*), saving (*SAV*), inflation (*INF*), interest rate (*INT*) and credit to private sector by bank (*CRT*). In accomplishing the third objective of this study, stock market index (*MRI*) and the market interaction term ( $MRI * MRI_{US}$ ) is employed in the SUR analysis. These variables are chosen based on availability of data and justification by previous studies.

#### 3.3.1 Stock Market Development

The *SMD* in this study is defined as the process of expanding the stock market which could satisfy the market participants, enhancing long – term investment, an efficient capital allocation at a relatively low cost, higher stock market liquidity position and highly contribute to the economic growth of a country. There are numerous indicators have been used in measuring *SMD*. Such indicators are the number of listed companies, volatility, market concentration and market capitalization. In this study, *SMD* is represented by market capitalization to *GDP* which computed using Equation [3.12]. The *SMD* measures the size of stock market in a financial system relative to the economic growth of a country. In this study, *SMD* is represented by market capitalization to *GDP* which is computed using Equation [3.12].

$$[3.12] \quad MCAP = \frac{\text{Value of listed share}}{GDP}$$

This indicator was applied by previous studies such as Bayraktar (2014), Balogun *et al.* (2016), Butsa (2008), Nowbutsing and Odit (2009) and Sukcharoensin and Sukcharoensin (2013). According to Bayraktar (2014), this measurement is worth to be applied for the countries which have a similar economic hinges and level of income. Thus, it is appropriate to be used in ASEAN – 5 which also considered as an emerging market which share the same economic characteristics. Nowbutsing and Odit (2009) also proposed that *MCAP* represent the overall market size with capital mobilization ability and risk diversification in a financial system while Butsa (2008) suggested that *MCAP* can capture the relative weight of the stock market to the economic growth. As those studies are referred, *MCAP* is used as the dependent variable in this study.

### 3.3.2 Stock Market Liquidity

In this study, the stock market liquidity (*LIQ*) measures the easiness of trading the assets without substantially affect the price. This definition was also proposed by Amihud, Mendelson, and Pedersen (1986), Balogun *et al.* (2016), Hegde and Paliwal (2011) and Sezgin and Atakan (2015). Moreover, according to Barro (2012), *LIQ* could represent the ability to mobilize the financial funds from one investment to the other at low cost and less impact on the stock prices.

Another study by Amihud and Mendelson (1991), Brogaard, Li, and Xia (2016), Fernando (2003), Holmstrom and Tirole (1993) and Yang and Hamori (2014) suggested that *LIQ* determines the incentives to the investors in acquiring information regarding the firms and corporate governance. These information are used by the investors to determine their trading strategies. Thus, stock market liquidity will drive the investors' expectation regarding the future stock price, returns and risk exposure which then affect the *SMD*.

Besides, *LIQ* would promote the *SMD* through disclosing the safetiness of the market which attract more investors particularly foreign investors in diversifying their portfolios into a particular stock market (Goyenko, 2006; Remorov, 2014). Moreover *LIQ* is used to represent the supply and demand intersection which aimed for the price equilibrium as stock market liquidity contains the information of the growth or decline in the stock price. Given this, if the stock price increases, but *LIQ* declines, it shows that the stock price growth is relatively unstable and affect the expectation of the investors.

In this study, trading volume which measured in units is utilized to measure *LIQ*. Although there are many measurements have been used in measuring stock market liquidity especially bid – ask price, this measurement still have some weaknesses. According to Pastor and Stambaugh (2003) argued that bid – ask spread not necessarily translate the actual transaction cost. This is because bid – ask spread is obtained during pre – trade which mean the agreed price of the transaction. Thus, it does not represent the actual cost of the trading execution. Also, although bid – ask spread is demonstrable for overall liquidity position, but the closing prices are often deviate from the quotes as the transaction is

concluded at different sources including outside sources. Moreover, quoted spread are not always available in all stock markets for all time periods (Lesmond, 2005).

Trading volume was also applied by Augusto *et al.* (2011), Chipaumire and Ngirande (2014), Demirgui-kunt and Levine (1996), Hegde and Paliwal (2011), Naceur *et al.* (2005) and Sezgin and Atakan (2015). In this study, the *LIQ* is hypothesized to have significant effect on *SMD* in ASEAN – 5.

### **3.3.3 Economic Growth**

Economic growth (*GDP*) measures the economic performance of a country for a particular year. In this study, economic performance is measured by nominal values of *GDP* for a particular year. The nominal *GDP* is used as it measures the quantities and prices in a given time period to track the total value produced in an economy over a certain time. Conversely, real *GDP* tracks the total value produced using constant prices, isolating the effect of price changes. As a result, real *GDP* is an accurate gauge of changes in the output level of an economy. There are some empirical evidences explained the effect of *GDP* on the *SMD* of a country. Such studies were done by Calderon – Rossell (1991), Masih and Masih (1999), Sukcharoensin and Sukcharoensin (2013) and Demirgüç-Kunt and Maksimovic (2016). They suggested that a progressive economic growth could attract more investors into the stock market and stimulate the *SMD*.

Furthermore, study by Naceur *et al.* (2005) suggested that *GDP* is the measure of the country's income. Therefore, as the income increases, it would provide a positive outlook on the *SMD* in a country. Also, they suggested that higher *GDP* signifies a better education, business environment and wealth of the citizens in a country. In addition, higher *GDP* would signifies a better living standards and encourage more saving which then give a positive impacts on the *SMD* (Garcia & Liu, 1999). Another study by Nair (2008) suggested that an increase in the real income represented by *GDP* would create a new demand for financial market particularly stock market in a country. Also, when income of a country increases, the stock market size and price index would be affected through demand – push factors. Thus, in this study, *GDP* is hypothesized to significantly affect the *SMD* in ASEAN – 5 countries.

### **3.3.4 Interest Rate**

Another determinant of *SMD* proposed by the literature is interest rate (*INT*). It is the measurement of the monetary policy which related to the cost of borrowing. From the borrowers' perspective, it signifies the real cost of funds while for lenders or investors, it indicates the real yield. In this study, the lending rate by financial institutions of a country is used as measurement of interest rate.

A high *INT* would decrease the demand for credit. As less money is available for investment, amount of money invested into the stock market will also decrease, vice – versa (Furuoka, Lim, Jikunan, & Chiun, 2012; Modigliani & Miller, 1958; Vagias & Dijk, 2010). Moreover, according to Stracca (2005), fall in *INT* leads to liquidity improvement. This is

due to increase willingness and ability of the investors to borrow from the financial institutions and utilized that fund for investment purposes.

Thus, *INT* would significantly adjust the trading volume and accelerates the *SMD* which also suggested by Kamel (2006), Kim and Nguyen (2009), Modigliani and Miller (1958) and Yang and Shimada (2011). As the theoretical implication implied, *INT* is hypothesized to be significantly affect the *SMD* of ASEAN – 5 countries.

### **3.3.5 Inflation Rate**

Inflation rate (*INF*) is a rate that signifies the general rising in price level of goods and services which cause falling in purchasing power of the consumers. *INF* is measured by the consumer price index (CPI) which reflects the percentage changes in costs and ability of consumer in acquiring goods and services.

This variable has been claims to have a significant relationship with *SMD*. According to El-Wassal (2013), high level of inflation is related to the credit availability provided by the financial intermediaries. Due to high *INF*, financial institution would tend to lend less to control the flow of money in the economy. This circumstance will then affect the capital flows into the stock markets. It is supported by Rahman and Salahuddin (2010) that inflation measures the stability of a country and reflect the confidence of the investors to invest into a particular country.

Further study was conducted by Demirgüç-Kunt and Maksimovic (2016). They suggested that the *INF* is associated with the default risk due to the decrease in the purchasing power. Thus, *INF* would affect the willingness of the financial institutions in providing the source of investment particularly for short – term financing to the firms. Therefore, this study hypothesizes that *INF* is significantly affect the *SMD* in the region of ASEAN –5.

### 3.3.6 Saving

Saving (*SAV*) is defined as the portion of unspent income which deposited into financial institution. In this study, *SAV* is calculated as the gross national income minus total consumption plus net transfer in USD currency. According to El-Wassal (2013) and Dalsenius (2007), stock market would be the mechanism to transform the saving into the investment in the real sectors.

Theoretically, stock markets could also accelerates the *GDP* through saving mobilization. If more *SAV* is channeled to finance the corporate projects, higher return could be gained as the the funds are utilized in financing the higher return projects. Thus, it can boost the financial performance of the firm especially those listed in the stock market. Consequently, it might attract more investors to buy that company' stocks. On the other hand, credit cretion by the bank is associated by the amount of *SAV* by the depositors which can be transformed into a credit facility for the firms which then utilized as a source of investment fund in the stock market (Werner, 2014). Therefore, *SAV* would represent the efficiency of the financial institutions in a country in term of saving mobilization, utilization of fund and availability of fund for investment (Barakat, Elgazzar, & Hanafy, 2016).

On the other sides, if level of *SAV* remained unchanged, stock market could act as the substitute for the bank deposit due to its easy access features (Matsumura & Vicente, 2010). Moreover, Garcia and Liu (1999) suggested that *SAV* signifies the total capital flows into the stock market. The larger the *SAV*, higher would be the capital flow into the stock market (Naceur *et al.*, 2005). Thus, *SAV* is hypothesized to have a significant relationship with *SMD* for ASEAN-5 countries.

### **3.3.7 Credit to Private Sectors by Banks**

Credit to private sectors by banks (*CRT*) is used to represent the amount or availability of financial resources provided by the financial institutions and banks to the private sector in financing their projects or investments and require the repayment. In this study, *CRT* is measured by total loans, purchases or non-equity securities and trade credits to the private sector in USD.

The studies conducted by Balogun *et al.* (2016), Stracca (2005) suggested that *CRT* denote the amount of cash and other financial instruments granted by the bank to the private sectors which the utilized as a source of fund for the investment purposes. As the *CRT* increases, the availability of fund for investment will also increase and vice – versa.

Besides, *CRT* also represents the financial institutions' support on *SMD* in a particular country particularly through private sectors' development in term of stabilizing their cash flows, and encourage them to participate in the stock markets' trading activities (Garcia & Liu, 1999; Ksantini, 2014).

Furthermore, according to Barro (2012) and Naceur *et al.* (2005), *CRT* would demonstrates the economic position of a country because it represents the effectiveness of monetary policy implemented by government or central bank in a country. Therefore, *CRT* can be used as the indicators particularly for the foreign investors in considering their portfolio investment into the specific country. As the abovementioned circumstances are applied in this study, the *CRT* is hypothesized to provide a significant effect on the *SMD* in the ASEAN – 5 countries.

### **3.3.8 Stock Market Index**

Stock market index (*MRI*) is an aggregate value of the stocks which constructed by combining several stocks together. Also, *MRI* is used to represent the entire stock market performance over a certain time span. Additionally, *MRI* is used by the investors to track the changes of the stock market over a long period of time and utilize it as a benchmark to compare with their own portfolio returns. In this study, stock market indexes in ASEAN – 5 countries measured by Morgan Stanley Capital International (MSCI) are employed in the analysis. These indexes represent the performance 85 percent of the overall stock market in a particular country particularly for the emerging markets (Guidi & Gupta, 2012).

To analyse the contagion effects, this study utilized the market index of US ( $MRI_t^{US}$ ) which is measured by the Dow Jones Index. This index measures the performance of the overall performance of stock market in the US. The Dow Jones Index is used because it quoted the most highly capitalized and influential companies in the US market and it is the most referred market index to represent the general the US stock market position (Grimaldi, 2010).

Some previous studies also applied this measurement. Such studies include Hashmi (1997) and Wongswan (2006). These studies suggested that the *MRI* was used to measures the groups of stocks' values. Any increase in one level or one percent of *MRI* would correspondingly denotes the increment in the overall stock market performance of a stock market which attract more investors. *MRI* also indicates the healthiness of the financial market in a particular country (Dailami & Atkin, 1990). Therefore, investors would reassess their portfolios due to any drops of *MRI*. This is due to the speculation regarding a downturn or depression in the performance of any specific industry or market. Consequently, they will search for a better market which could provide a better returns for them (Demirgüç-Kunt & Maksimovic, 2016; Barro, 2012; Ehrmann *et al.*, 2011). Besides, Cheung *et al.* (2009) suggested that this measurement can be applied to those countries which do not have a trade linkages but they are affected by events or changes in financial market of another country. In this study, the *MRI* and  $MRI_{US}$  are hypothesized to have a significant relationship with *SMD* in ASEAN – 5.

### 3.3.9 Stock Market Index Interaction

Stock market index interaction is the measurement of tendency for a change in the market index in a market to influence a corresponding market index in another stock market. In this study, the interaction of the market is measured by estimating and obtaining the residual for each interaction term which explained through Equation [3.19] in Section 3.4.5 of this chapter.

As the cross – market interaction would allow for a cross – market listing or cross – portfolio diversification, a high market interaction would discourage less investment into a particular financial market as it does not allow for portfolio diversification (Capasso, 2011; El-Wassal, 2013). Conversely, a low cross – market interaction of the market would help the investors in diversifying their portfolios as their investments would be transferred into a better prospect market and higher return for their investment. In contrast, according to Williams (2015), the interaction term could be the measurement of co – movement and specify the total effects of a variable after considering the interaction with the other variables in a model. Therefore, the interaction term can be used as the indicator in implementing the investment strategy by referring to interacted variables or countries. It was supported by Dornbusch *et al.* (2000) which proposed that market index interaction can be used for measuring the economic integration in an individual country and the global market which involve both trade and financial links.

Thus, market interaction could be identified through the trading values, foreign direct investment, and capital flows into a country which affect the trading volume and market capitalization in the stock market. As these circumstances are considered, market index interaction is hypothesized to have a significant relationship with *SMD* in ASEAN – 5 countries in this study.

### **3.3.10 Dummy**

Dummy variable (*DUM*) is used to measure the effects of AFC and GFC crises period. It measures the pre – and post – crisis which represented by the value of 0 for non – crisis and 1 for post crisis which comprise of year 1997 – 1998 for AFC and 2008 for GFC. This measurement is also used to measure any significant different of *SMD* during pre – and post – AFC period.

Previous studies such as Amihud and Mendelson (1991) and Engkuchik and Kaya (2012) show that the financial crisis could provide a significant impact on *SMD*. Specifically, these studies illustrate that the crisis has a negative impact on the global stock market liquidity. This is due to the evidences which show that crisis could alter the asset prices and investors decisions in the stock market which then affect the *SMD*. Moreover, as claimed by Sok-Gee and Karim (2010), the performance of the stock market in ASEAN – 5 was volatile after the crises. According to United Nation Report (2010), the capital flows particularly private capital declined particularly after the AFC and GFC which then affect the *SMD* in this region. So, *DUM* is hypothesized to have a significant impact on *SMD* in ASEAN – 5.

### **3.4 Data Collection**

Data in this study was obtained from the secondary sources by utilizing the library research as the data collection method. Data of all variables used in this study were obtained from the Asia – Pacific Economic Cooperation (APEC) database. Meanwhile, data for stock market liquidity was collected from Thomson Reuter data stream. The Dow Jones Index data was collected from the US Federal Reserve Economic database. Based on the data sources, the choice of variables used in this study are subject to the data availability which covered on the period of 1990 – 2014.

### **3.5 Methods of Analysis**

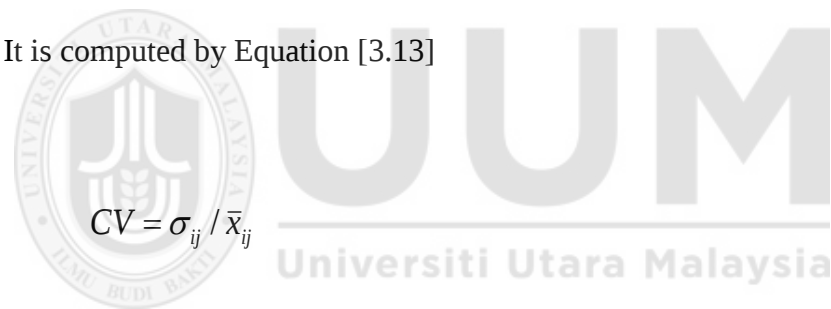
This section provides the explanation on the method of analysis in this study. In the first part, the descriptive statistics of all variables followed by the correlation analysis. In accomplishing the first objective of this study, the mean comparison analysis is applied. The traditional panel analyses comprise of Fixed Effects Model (FEM) and Random Effects Model (REM) are utilized in answering the second objective. Meanwhile, the third objective of this study is answered through the analysis of Seemingly Unrelated Regression (SUR).

#### **3.5.1 Descriptive Statistics**

The analysis in this study begins with the descriptive statistics which explain the distribution of the observations for each variable used in this study. For this purpose, the mean, minimum, maximum and standard deviation are utilized. Mean measures the arithmetic average of the observation for each variable while standard deviation is used to

measure the variability of the observations. Standard Deviation is the basic metric to measure volatility but it is an absolute measurement, not a relative measurement. To compare the volatility of two or more data sets, the coefficient of variation (CV) should be used. The CV is used to compare the relative variability of the observations of the variables used in a model. Also, CV is useful because the standard deviation of data must always be understood in the context of the mean of the data. In contrast, the actual value of the CV is independent of the unit in which the measurement has been taken, so it is a dimensionless number. For comparison between data sets with different units or widely different means, one should use the coefficient of variation instead of the standard deviation. This measurement is also suggested by Chordia *et al.* (2005), Lo and Wang (2001) and Sun (2003). It is computed by Equation [3.13]

[3.13]



$$CV = \sigma_{ij} / \bar{x}_{ij}$$

where  $\sigma$  is the standard deviation value and  $\bar{x}$  is the mean value for each variable in ASEAN – 5 countries. Lower value of CV indicates that the observations for the variables are clustered around the mean. In contrast, higher CV value shows that the observations are more spread out from the mean value which also indicate high volatility.

### 3.5.2 Correlation Analysis

After determining the properties of the observations, the next analysis is the examination of the correlation between the variables. Correlation analysis is conducted to obtain the information regarding the linear association between pairs of the variables used in the

estimable models. The importance of correlation analysis is that, the strength of relationship between the variables used in the models can be accessed. Larger the correlation coefficient indicates a stronger relationship between the variables in the models. Also, it ensures that the variables included in the model are linearly related which can be used for estimation purposes.

In this study, the correlation analysis is conducted according to the variables that used in the FEM, REM and SUR. Also, the correlation analysis describes the contagion effects of US stock market into ASEAN – 5 countries by comparing the correlation value for full period, pre –and post – AFC and GFC periods. The pre – crisis period is from 1990 – 1996, the post – AFC period is 1997 – 2014 and full period is total of pre– and post – crisis periods.

Based on the correlation coefficient values, if there are significant changes in the correlation coefficient values, it will signify a contagion effects otherwise it will only constitute an interdependence effects. As such, the correlation coefficient values are categorized into weak, moderate and strong based on suggestion by (Forbes & Rigobon, 2002). Thus, it is a weak correlation if the correlation coefficient are between 0 – 39 percent, moderate if between 40 – 69 percent and strongly correlated if 70 – 100 percent. Therefore, if the correlation significantly increase from weak to strongly correlated, it constitute contagion effect. Otherwise, if no significant changes between these periods; for instance, from weak to moderately correlated,

### 3.5.3 Stock Market Development Mean Comparison Analysis

For answering the first objective of this study, mean comparison analysis is applied. Basically, the purpose of comparative study is to detect and measure differences among ASEAN – 5. One of the comparative studies methods is mean comparison analysis. In the mean comparison analysis, the performance of *SMD* is evaluated and compared for pre – and post – crises period. Analysis is conducted based on pre – AFC (1990 – 1997) and post – AFC periods (1998 – 2014). Also, pre – GFC (1990 – 2013) and post – GFC (2008 – 2014).

Empirically, let say  $X_B$  and  $X_A$  are the measurement of *SMD* in ASEAN – 5 for pre – and post – crises periods. The means of *SMD* performance of each country for pre – and post-crisis periods are represented by  $\bar{X}_B$  and  $\bar{X}_A$ , respectively. A higher mean in the succeeding era suggests improvement in the performance of the country.

In examining the differences in the mean *SMD* for each country during pre – and post – crises periods, hypothesis  $H_0: \mu_A - \mu_B = 0$  against hypothesis alternative,  $H_1: \mu_A - \mu_B \neq 0$  are used. The  $t$  – test is used to test the hypotheses. The values of  $t$  – statistics or  $t^*$  is computed and compared with the  $t$  – critical values. The  $t^*$  is computed through Equation [3.14].

$$[3.14] \quad t^* = \frac{\bar{X}_A - \bar{X}_B}{S_m} \quad \text{and}$$

$$S_m = \frac{S_B^2}{n_B} + \frac{S_A^2}{n_A} ; \quad S_B^2 = \sum (X_B - \bar{X}_B)^2 \quad \text{and} \quad S_A^2 = \sum (X_A - \bar{X}_A)^2$$

where:

$\bar{X}_B$  = the mean of performance *SMD* pre – crises

$\bar{X}_A$  = the mean of performance *SMD* post – crises

$S_m$  = the standard deviation

$S_B^2$  = the variance for  $X_B$

$S_A^2$  = the variance of  $X_A$

$n_B$  = the sample size of  $X_B$

$n_A$  = the sample size of  $X_A$

#### 3.5.4 Traditional Panel Analysis

The second objective of this study is to determine the effects of stock market liquidity on *SMD*. To accomplish this objective, the traditional panel analyses comprise of Pooled Mean Group (PMG), FEM and REM are utilized.

The first model applied in the traditional panel analysis is the PMG. The PMG is also known as pooled OLS method. Under this estimation, the main assumption that there is no difference among the observation for cross – section dimension is applied. Simply, the model estimates a common constant for all countries.

For the analysis, Equation [3.6] is estimated. Data are pooled together with no provision for individual differences which lead to different coefficient value. The values of  $\beta$  do not have  $i$  or  $t$  subscripts since they are assumed to be constant for all individual for all period.

Thus, the PMG model does not allow for individual heterogeneity. The error assumptions required for PMG for  $t$  and  $F$  statistics when computed using OLS are given in Equation [3.15] – Equation [3.18].

$$[3.15] \quad E(\varepsilon_{it}) = 0$$

$$[3.16] \quad \text{var}(\varepsilon_{it}) = E(\varepsilon_{it}^2) = \sigma_\varepsilon^2$$

$$[3.17] \quad \text{cov}(\varepsilon_{it}, \varepsilon_{js}) = E(\varepsilon_{it}, \varepsilon_{js}) = 0, \quad i \neq j; t \neq s$$

$$[3.18] \quad \text{cov}(\varepsilon_{it}, X_{it}) = 0$$

Second model for traditional panel analysis is the FEM. According to Asterion and Hall (2007) and Baltagi (2008), the FEM is also called the least-square dummy variable (LSDV). The FEM allows the different constant for each group, that is, it includes a dummy variable for each group. In the FEM, the constant is treated as group specific that is the model allows for different constant for each group.

It is worth noting that FEM captures all effects which are specified to an individual and which do not vary overtime. In fact, if there is a panel of firms, households or countries, the FEM would take account of the basic factors which vary between them but not overtime. Also, in some cases, according to Asterion and Hall (2007), it may involve a very large number of dummy constants as some panel may have thousand individual numbers, in this case the FEM would use  $N$  degrees of freedom. In such a situation, the model is transformed by differencing all the variables or taking the deviation from the mean for each variable; this will have the effect of removing the dummy or constant and avoid the

problem of estimating so many parameters. Also, according to Baltagi (2008) and Asterion and Hall (2007), it is possible to extend the FEM by including a set of time dummies to make it two ways FEM. The two-way FEM has the advantage of capturing any effects which vary overtime but are not common across the whole panel. The FEM is linear regression models in which the terms of intercepts are vary over the individual units of analysis.

For estimation, Equation [3.6] in Section 3.3 once again utilized. Different with PMG model, the  $\beta$  represents the coefficient value for each variable in country  $i$  and year  $t$ . The error terms ( $\varepsilon_{it}$ ) are random unobserved component that reflects unobserved shocks.  $\varepsilon_{it}$  terms are assumed to be independent, with mean zero and constant variance ( $\sigma_\varepsilon^2$ ) for all firms and in all time periods. The term  $\alpha_i$  refers to the intercept parameter that varies across countries and not over time. It is treated as the fixed effect. All behavioural differences between individual firms and over time are captured by the intercept. Individual intercepts are included to control for these firms' specific differences.

The third model in traditional panel analysis is the REM. The difference between the FEM and REM is that, the REM methods handles the constants for each group not as fixed, but as random parameters. Thus, the variability of the constant for each entity comes to the fact that  $\alpha_i = \alpha + \nu_i$  where  $\nu_i$  has a zero mean,  $E(\nu_i) = 0$ ; constant variance,  $var(\nu_i) = \sigma_\nu^2$  and

uncorrelated across country,  $\text{cov}(\nu_i, \nu_j) = 0, i \neq j$ . The term  $\nu_i$  also known as unobservable or latent variable which treated as random effects.

The REM has the advantage of few parameters to be estimated compared to FEM. Also, REM allows for additional explanatory variables that have equal value for all observations within the group. Thus, Equation [3.6] is modified into Equation [3.15]

$$[3.15] \quad SMD_{i,t} = \beta_8 + \beta_9 LIQ_{i,t} + \beta_{10} GDP_{i,t} + \beta_{11} INF_{i,t} + \beta_{12} INT_{i,t} + \beta_{13} SAV_{i,t} + \beta_{14} CRT_{i,t} + \beta_{15} DUM_{i,t} + \mu_{i,t} + \omega_{i,t}$$

where the intercept parameter,  $\alpha_i$  is assumed to be constant and uncorrelated with each explanatory variable in all time periods. The term  $\nu_i$  is the cross –section error component while  $\varepsilon_{i,t}$  is the combined time series and cross – section error component which also called idiosyncratic term.

The combination of  $\nu_i$  and  $\varepsilon_{i,t}$  is known as composite error term or error component model which denoted as  $\mu_{i,t}$ . The assumptions under REM are given in Equation [3.16] – Equation [3.20].

$$[3.16] \quad \nu_i \sim N(0, \sigma_\nu^2)$$

$$[3.17] \quad \varepsilon_i \sim N(0, \sigma_\varepsilon^2)$$

$$[3.18] \quad E(\nu_i \varepsilon_{it}) = 0; E(\nu_i \nu_j) = 0, (i \neq j)$$

$$[3.19] \quad cov(\varepsilon_{it}, \varepsilon_{js}) = E(\varepsilon_{it}, \varepsilon_{js}) = E(\varepsilon_{it}, \varepsilon_{is}) = E(\varepsilon_{it}, \varepsilon_{ij}) = 0, (i \neq j; t \neq s)$$

$$[3.20] \quad cov(\varepsilon_i, X_{it}) = 0$$

So, the individual  $\mu_{i,t}$  are uncorrelated over cross – section and time – series unit. Also, it is not correlated with any explanatory variables included in the model. Thus, the abovementioned assumptions follow another assumption given in Equation [3.21] – Equation [3.24].

$$[3.21] \quad E(\mu_{it}) = E(v_i + \varepsilon_{it}) = E(v_i) + E(\varepsilon_{it}) = 0$$

$$[3.22] \quad var(\mu_{it}) = var(v_i + \varepsilon_{it}) = var(v_i) + var(\varepsilon_{it}) + 2cov(v_i, \varepsilon_{it}) = \sigma_v^2 + \sigma_\varepsilon^2$$

$$[3.23] \quad cov(\mu_{it}, \mu_{jt}) = E(\mu_{it}, \mu_{js}) = 0 \quad (i \neq j; t \neq s)$$

$$[3.24] \quad cov(\mu_{it}, \mu_{is}) = \sigma_\mu^2$$

Although the error term which shows by Equation [3.22] is homoscedastic, the error term at two different times  $\mu_{i,t}$  and  $\mu_{i,s}$  ( $t \neq s$ ) are correlated for a given cross –sectional unit.

To check the most appropriate model, the redundant fixed effect and Hausman test are conducted. To test either PMG or FEM is more appropriate, the redundant fixed effect is used. The null hypothesis of homogeneity across countries, the  $F$  – statistic is computed using Equation [3.25].

$$[3.25] \quad \frac{(R_{FE}^2 - R_{PMG}^2)/(N - 1)}{(1 - R_{FE}^2)/(NT - N - K)}$$

where,  $R^2$  is the coefficient of determination,  $N$  is number of observation,  $T$  is time-period and  $K$  is number of independent variables in the model. If the null hypothesis is rejected, it indicates that FEM is more appropriate than PMG. Otherwise, if null hypothesis is failed to be rejected, PMG is sufficient for estimation.

Finally, the Hausman Test is performed to select the most appropriate model between FEM and REM. Study by Han and Lee (2012) pointed that FEM is always outperform due to the consistent result but it is not the most efficient model to run since REM could give a better  $\rho$  value. However, if there is no correlation between the regressors and effect, FEM is inefficient. In contrast, if there is correlation, REM will be inefficient. The statistic of estimator that tested using the Hausman Test is shown by Equation [3.26].

$$[3.26] \quad H = (\hat{\eta}^{FE} - \hat{\eta}^{RE})' [\text{var}(\hat{\eta}^{FE}) - \text{var}(\hat{\eta}^{RE})]^{-1} (\hat{\eta}^{FE} - \hat{\eta}^{RE}) \sim \chi^2(k)$$

Where,  $\hat{\eta}$  is the estimated parameter,  $RE$  and  $FE$  is random effects and fixed effects, respectively. The null hypothesis for this test would be REM is consistent and efficient than FEM while the alternate hypothesis states that REM is inconsistent (as the FEM will be always consistent). If the null hypothesis is rejected, the results indicates that the random effects are probably correlated with one or more regressors. Thus, FEM is preferred.

### 3.5.5 Seemingly Unrelated Regression

In determining the inter – relationship between  $MRI_{i,t}$  and  $MRI_{i,t} * MRI_{US}$  on  $SMD$  across the ASEAN – 5 countries, SUR is employed. The SUR which is also known as contemporaneous correlation<sup>1</sup> was initially proposed by Zellner (1962). This method can capture the efficiency due to the correlation of the disturbances across equations. Also, SUR is an appropriate approach as each of the countries are sharing the similar economic hinges.

There are three stages included in applying the SUR in this study. The first stage is to test the contemporaneous correlation between the models using the residual covariance and Langrange Multiplier ( $LM$ ) Test. This test provides the evidences that the error terms between the models are correlated by using the assumption of  $COV(\varepsilon_i, \varepsilon_j) = \sigma_{ij}$  if  $t = s$  and  $COV(\varepsilon_{i,t}, \varepsilon_{j,t}) = 0$  if  $t \neq s$ . The covariance of the error terms is calculated by using Equation [3.27].

$$[3.27] \quad \hat{\sigma}_{i,j} = \frac{1}{\sqrt{T-K_i}\sqrt{T-K_j}} \sum_{t=1}^T \hat{\varepsilon}_{i,t} \hat{\varepsilon}_{j,t}, i=1,2,3,...5, t=1,2,3, ....24$$

where  $T$  is the period for the parameters in the models and  $K$  represent the number of parameters in the equation for each country  $i$ . Then the squared correlations are computed by using Equation [3.32]. It measures the degree of relationship between two variables. It can go between -1 and 1. The value of 1 indicates that the two variables are moving in

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<sup>1</sup> Correlation between the error terms between the models.

unison. They rise and fall together and have perfect correlation. Meanwhile, value of -1 means that the two variables are in perfect opposites.

$$[3.28] \quad r^2_{i,j} = \frac{\hat{\sigma}^2_{i,j}}{\hat{\sigma}^2_i \hat{\sigma}^2_j}$$

Then, the null hypothesis of  $COV(\varepsilon_{1,t}, \varepsilon_{2,t}) = 0$  is tested using the *LM* test is computed in Equation [3.29].

$$[3.29] \quad LM = T(r^2_{i,j}, r^2_{i,k})$$

Through Equation [3.29], the values obtained are compared with chi – square ( $\chi^2$ ) critical value which utilize the number of equation as the degree of freedom. If the null hypothesis is failed to be rejected, then it suggested that SUR would be more accurate than separate least square estimation as there is contemporaneous correlation between the error terms.

Then, the second stage which is to estimate the equations using SUR are proceeds through estimable models given in Equation [3.7] – Equation [3.11] in Section 3.3. Before Equation [3.7] – Equation [3.11] are estimated, the interaction variables should be estimated to get the value of those variables. The first step in the estimation process is to estimate Equation [3.30].

$$[3.30] \quad MRI_{i,t} * MRI_{US,t} = \gamma_0 + \gamma_1 MRI_{i,t} + \gamma_2 MRI_{US,t} + \varepsilon_{i,t}$$

where  $MRI_{i,t}$  is the stock market index of country  $i$  of the ASEAN – 5 members at time  $t$  and  $MRI_{US,t}$  is the stock market index of the US at time  $t$ . The term  $\gamma$  is the coefficient value for each variable and  $\varepsilon$  represents the error term. After the interaction terms have been estimated, the residual series is created and substituted into the Equation [3.7] – Equation [3.11]. By using partial derivative, the measurement of total effect of  $MRI$ s and interaction variables is shown in Table 3.1.

Table 3.1  
*Total Effect of MRIs and Interaction Variables*

| Country     | Total Effect of $MRI_{it}$                                                         | Total Effect of $MRI_{US,t}$                                                       |
|-------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Malaysia    | $\frac{\delta SMD_{M,t}}{\delta MRI_{M,t}} = \psi_2 + \psi_4 MRI_{US,t}$           | $\frac{\delta SMD_{M,t}}{\delta MRI_{US,t}} = \phi_3 + \phi_4 MRI_{M,t}$           |
| Indonesia   | $\frac{\delta SMD_{I,t}}{\delta MRI_{I,t}} = \theta_2 + \theta_4 MRI_{US,t}$       | $\frac{\delta SMD_{I,t}}{\delta MRI_{US,t}} = \theta_3 + \theta_4 MRI_{I,t}$       |
| Thailand    | $\frac{\delta SMD_{T,t}}{\delta MRI_{T,t}} = \rho_2 + \rho_4 MRI_{US,t}$           | $\frac{\delta SMD_{T,t}}{\delta MRI_{US,t}} = \rho_3 + \rho_4 MRI_{T,t}$           |
| Philippines | $\frac{\delta SMD_{P,t}}{\delta MRI_{P,t}} = \varsigma_2 + \varsigma_4 MRI_{US,t}$ | $\frac{\delta SMD_{P,t}}{\delta MRI_{US,t}} = \varsigma_3 + \varsigma_4 MRI_{P,t}$ |
| Singapore   | $\frac{\delta SMD_{S,t}}{\delta MRI_{S,t}} = \vartheta_2 + \vartheta_4 MRI_{US,t}$ | $\frac{\delta SMD_{S,t}}{\delta MRI_{US,t}} = \vartheta_3 + \vartheta_4 MRI_{S,t}$ |

Based on SUR analysis, the equation for each country is inter – related to one another in considering that the error terms in different equations are linked to each other,  $Cov(\varepsilon_{i,t}, \varepsilon_{j,t}) \neq 0$ . Also, SUR is the application of least-square estimation which generalized into group of SUR. The last stage in the SUR analysis is to determine equality of the

coefficients in the models by using Wald Test. While using this test, the hypothesis of equal coefficient for each variable are describe as Table 3.2.

Table 3.2  
*Wald Test Hypotheses*

| Variable         | Hypothesis                                                 |
|------------------|------------------------------------------------------------|
| $LIQ$            | $\phi_0 = \theta_0 = \rho_0 = \varsigma_0 = \mathcal{I}_0$ |
| $MRI$            | $\phi_1 = \theta_1 = \rho_1 = \varsigma_1 = \mathcal{I}_1$ |
| $MRI_{US}$       | $\phi_3 = \theta_3 = \rho_3 = \varsigma_3 = \mathcal{I}_3$ |
| $MRI * MRI_{US}$ | $\phi_4 = \theta_4 = \rho_4 = \varsigma_4 = \mathcal{I}_4$ |

Based on the  $F$  – statistic and Chi – square values, if the null hypothesis is rejected, it signifies that the coefficients for each variable across countries are not equal and SUR is more appropriate to be applied rather than OLS.

### 3.6 Conclusion

This study proposed the investigation on the effects of stock market liquidity and stock market interaction on the  $SMD$  in ASEAN – 5. As the objectives of this study implied. The first objective in this study would be accomplished mean comparison. The second objective which is to determine the effect of stock market liquidity on the  $SMD$  is established by conducting the traditional panel analyses comprises of FEM and REM. Meanwhile, the last objective which is to identify the effects of US stock market on the ASEAN – 5's stock markets are recognize through the SUR analyses. As those methods are applied, the next chapter reports the empirical results for this study.

## CHAPTER 4

### DISCUSSION OF RESULTS

#### 4.0 Introduction

This chapter reports the empirical results of the study. In the first part, descriptive statistics and correlation analysis are reported. Then, traditional panel approach comprise of PMG, FEM and REM are undertaken followed by SUR which then closed by conclusion.

#### 4.1 Descriptive Statistics

This section presents the descriptive statistics for all variables used in the analyses. The values of mean, maximum, minimum and standard deviation of each country are described for each variable. The variability of observations characterized by the coefficient of variation (CV) is also reported.

For the explanation of descriptive statistic, the interest variables which are *SMD*, *LIQ*, *MRI* and  $MRI * MRI_{US}$  are concerned while the other variables are considered as controlled variables. Altogether, the total observations are 125. The discussion of each interest variable is mainly based on the values of CV. Results are displayed in Table 4.1.

Table 4.1  
Descriptive Statistics by Variable

| Variable   | Country     | Mean   | Max    | Min   | Std. Dev. | CV   |
|------------|-------------|--------|--------|-------|-----------|------|
| <i>SMD</i> | Malaysia    | 158.01 | 320.99 | 81.99 | 59.27     | 0.38 |
|            | Indonesia   | 32.48  | 48.98  | 13.46 | 11.38     | 0.35 |
|            | Thailand    | 60.11  | 106.32 | 15.24 | 26.44     | 0.44 |
|            | Philippines | 53.27  | 97.35  | 22.75 | 22.59     | 0.42 |
|            | Singapore   | 183.79 | 299.57 | 93.82 | 63.56     | 0.35 |

*Table 4.1 continue*

|                             |             |           |           |          |           |      |
|-----------------------------|-------------|-----------|-----------|----------|-----------|------|
| <b>LIQ</b>                  | Malaysia    | 323.23    | 697.89    | 32.44    | 214.36    | 0.66 |
|                             | Indonesia   | 199.23    | 439.56    | 79.39    | 90.95     | 0.46 |
|                             | Thailand    | 517.46    | 1240.70   | 43.62    | 331.08    | 0.64 |
|                             | Philippines | 46.74     | 104.83    | 15.11    | 22.45     | 0.48 |
|                             | Singapore   | 951.98    | 2784.60   | 131.08   | 741.71    | 0.78 |
| <b>GDP</b>                  | Malaysia    | 148.74    | 338.06    | 44.02    | 93.48     | 0.63 |
|                             | Indonesia   | 363.22    | 91.787    | 95.44    | 286.36    | 0.79 |
|                             | Thailand    | 207.81    | 419.88    | 85.34    | 106.23    | 0.51 |
|                             | Philippines | 120.69    | 284.83    | 44.31    | 73.47     | 0.61 |
|                             | Singapore   | 138.41    | 306.34    | 36.15    | 84.15     | 0.61 |
| <b>SAV</b>                  | Malaysia    | 0.21      | 0.45      | 0.05     | 0.11      | 0.51 |
|                             | Indonesia   | 0.71      | 2.31      | 0.04     | 0.78      | 1.10 |
|                             | Thailand    | 0.30      | 0.52      | 0.11     | 0.12      | 0.41 |
|                             | Philippines | 0.39      | 0.99      | 0.04     | 0.32      | 0.81 |
|                             | Singapore   | 0.49      | 1.10      | 0.11     | 0.33      | 0.67 |
| <b>INF</b>                  | Malaysia    | 2.81      | 5.44      | 0.58     | 1.30      | 0.46 |
|                             | Indonesia   | 10.30     | 58.39     | 3.72     | 10.62     | 1.03 |
|                             | Thailand    | 3.53      | 7.99      | -0.85    | 2.13      | 0.60 |
|                             | Philippines | 6.30      | 19.26     | 2.29     | 3.70      | 0.59 |
|                             | Singapore   | 2.01      | 6.52      | -0.39    | 1.70      | 0.85 |
| <b>INT</b>                  | Malaysia    | 3.56      | 10.63     | -5.29    | 3.87      | 1.09 |
|                             | Indonesia   | 5.24      | 17.59     | -24.60   | 8.30      | 1.59 |
|                             | Thailand    | 5.42      | 11.86     | 0.67     | 2.72      | 0.50 |
|                             | Philippines | 4.96      | 10.70     | -4.58    | 3.03      | 0.61 |
|                             | Singapore   | 4.48      | 10.09     | -0.50    | 2.59      | 0.58 |
| <b>CRT</b>                  | Malaysia    | 114.90    | 154.89    | 69.41    | 19.97     | 0.17 |
|                             | Indonesia   | 34.85     | 60.82     | 18.16    | 14.37     | 0.41 |
|                             | Thailand    | 107.77    | 166.50    | 83.37    | 22.86     | 0.21 |
|                             | Philippines | 33.08     | 56.46     | 17.76    | 8.62      | 0.26 |
|                             | Singapore   | 97.63     | 132.10    | 79.14    | 14.37     | 0.15 |
| <b>MRI</b>                  | Malaysia    | 361.51    | 646.50    | 131.45   | 147.11    | 0.41 |
|                             | Indonesia   | 1,917.16  | 5925.75   | 340.67   | 1,877.04  | 0.98 |
|                             | Thailand    | 308.28    | 605.64    | 101.73   | 149.81    | 0.49 |
|                             | Philippines | 551.51    | 1,191.22  | 136.70   | 275.15    | 0.50 |
|                             | Singapore   | 1,205.38  | 2,138.55  | 623.53   | 387.97    | 0.32 |
|                             | US          | 9,011.74  | 16,862.44 | 2,662.23 | 3,898.83  | 0.43 |
| <b>MRI*MRI<sub>US</sub></b> | Malaysia    | 3,614.01  | 10,581.82 | 465.10   | 2,774.08  | 0.77 |
|                             | Indonesia   | 22,411.52 | 99,922.55 | 1,009.88 | 28,128.33 | 1.26 |
|                             | Thailand    | 2,820.65  | 8,894.75  | 563.81   | 2,204.64  | 0.78 |
|                             | Philippines | 5,474.74  | 20,086.95 | 363.93   | 4,800.91  | 0.88 |
|                             | Singapore   | 11,844.37 | 28,224.47 | 1,659.98 | 7,891.21  | 0.67 |
| <b>DUM</b>                  | Malaysia    | 0.16      | 1         | 0        | 0.37      | 2.31 |
|                             | Indonesia   | 0.16      | 1         | 0        | 0.37      | 2.31 |
|                             | Thailand    | 0.16      | 1         | 0        | 0.37      | 2.31 |
|                             | Philippines | 0.16      | 1         | 0        | 0.37      | 2.31 |
|                             | Singapore   | 0.16      | 1         | 0        | 0.37      | 2.31 |

For the *SMD* series, the value of CV indicates that the data for Thailand has the highest dispersion followed by the Philippines and Malaysia. Both, Indonesia and Singapore have the lowest dispersion since their values of CV are smaller than the other counterparts. Specifically, values of CV signify that the variability in *SMD* series for Thailand and the Philippines are over 40 percent. These values signify that the observation of *SMD* for these countries are more spread out from each mean value compared to other countries. In contrast, the variability in *SMD* series for Indonesia, Singapore and Malaysia, which are more than 30 percent signifies that the observations are relatively clustered around their mean values.

Meanwhile, for the *LIQ* series, Singapore is empirically found to have the highest value of CV which is 78 percent from its mean value and it seems to be farther than the rest of member countries. Correspondingly, most of the observation of *LIQ* for Malaysia and Thailand are also located above the mean values represented by the CV of 66 and 64 percent, respectively. Meanwhile, less dispersion was illustrated for the observation of *LIQ* for Philippines and Indonesia.

For *MRI* series, the highest dispersion of this series from its mean can be observed for the case of Indonesia since it has the value of CV. Meanwhile, for the other countries; the Philippines, Thailand, Malaysia and Singapore as well as the US are disclosed to have considerably moderate dispersion in *MRI* series as their estimated CV values are ranging from 30 percent to 50 percent, accordingly. Hence, it shows that the *MRI* series for these

four countries including the US to be closely dispersed from their mean values compared to that of for Indonesia.

Furthermore, the CV values of  $MRI * MRI_{US}$  for all countries in ASEAN – 5 are considerably high as their CV values are spanning from 65 percent to 130 percent of dispersion from their mean values. Indonesia has the highest dispersion in the series with CV value of 126 percent. It is orderly followed by the Philippines, Thailand, Malaysia and Singapore. Therefore, the CV values indicate that observations of  $MRI * MRI_{US}$  for all countries in ASEAN – 5 are located be farther their mean values. Which also indicates higher volatility.

## **4.2 Correlation Analysis**

This section reports the correlation analysis between all variables used in the estimable models. It signifies the strength of the relationship between the variables. The first part reports the correlation between the variables used in the FEM and REM models followed by the correlation of variables used in the SUR models. Then, the last part reports the identification of the contagion effect from the US country.

### **4.2.1 Correlation Analysis for Traditional Panel Analyses**

This section provides the correlation analysis results for the variable used in the analyses of FEM and REM. Values reported are correlation coefficient while  $p$  – values are considered in the parentheses. In the both models,  $SMD$  is the dependent variable. Results are displayed in Table 4.2.

Table 4.2

*Correlation Matrix of Variables for PMG, FEM and REM*

| <i>Variable</i> | <i>SMD</i>        | <i>LIQ</i>       | <i>GDP</i>       | <i>INT</i>       | <i>INF</i>       | <i>SAV</i>       | <i>CRT</i>     | <i>DUM</i> |
|-----------------|-------------------|------------------|------------------|------------------|------------------|------------------|----------------|------------|
| <i>SMD</i>      | 1.00              |                  |                  |                  |                  |                  |                |            |
|                 | -                 |                  |                  |                  |                  |                  |                |            |
| <i>LIQ</i>      | 0.53<br>[0.00]*   | 1.00             |                  |                  |                  |                  |                |            |
|                 |                   | -                |                  |                  |                  |                  |                |            |
| <i>GDP</i>      | -0.14<br>[0.04]*  | 0.16<br>[0.09]** | 1.00             |                  |                  |                  |                |            |
|                 |                   |                  | -                |                  |                  |                  |                |            |
| <i>INT</i>      | -0.10<br>[0.08]** | -0.11<br>[0.23]  | -0.08<br>[0.37]  | 1.00             |                  |                  |                |            |
|                 |                   |                  | -                |                  |                  |                  |                |            |
| <i>INF</i>      | -0.35<br>[0.00]*  | -0.21<br>[0.02]* | -0.02<br>[0.84]  | -0.38<br>[0.00]* | 1.00             |                  |                |            |
|                 |                   |                  |                  | -                |                  |                  |                |            |
| <i>SAV</i>      | 0.03<br>[0.07]**  | 0.21<br>[0.02]*  | 0.88<br>[0.00]*  | -0.05<br>[0.58]  | -0.08<br>[0.36]  | 1.00             |                |            |
|                 |                   |                  |                  |                  | -                |                  |                |            |
| <i>CRT</i>      | 0.54<br>[0.00]*   | 0.40<br>[0.00]*  | -0.21<br>[0.02]* | 0.01<br>[0.90]   | -0.37<br>[0.00]* | -0.24<br>[0.01]* | 1.00           |            |
|                 |                   |                  |                  |                  |                  | -                |                |            |
| <i>DUM</i>      | -0.11<br>[0.04]*  | 0.12<br>[0.20]   | -0.04<br>[0.69]  | -0.24<br>[0.01]* | 0.20<br>[0.03]*  | -0.05<br>[0.59]  | 0.09<br>[0.33] | 1.00       |
|                 |                   |                  |                  |                  |                  |                  | -              |            |

Note: Figures in parenthesis represent p – value.

\* and \*\* indicate significant at 5 percent and 10 percent significance level, respectively.

Generally, the correlation coefficient values indicate that all variables included in the model of FEM and REM are statistically significant at five percent confidence level except for *CRT* which found to be statistically correlated with *SMD* at 10 percent confidence level.

Specifically, the variables of *LIQ* and *DUM* are found to have correlation coefficients values of 59 and 58 percent, respectively. These values are indicated that *LIQ* and *DUM* variables have a moderate significant correlation with *SMD* in ASEAN – 5 countries. Moreover, variables of *GDP*, *SAV*, *INF*, *INT* and *CRT* are found to be weakly correlated with *SMD* in ASEAN – 5 since their correlation coefficient values are less than 50 percent. The variables of *GDP*, *INF* and *INT* have weak negative correlation with *SMD*.

Thus, the correlation results indicate that all variables included in the models are relevant to be included into the traditional panel analyses in this study. Although some of the variables have weak correlation, it does not mean that they do not have relationship with each other.

#### **4.2.2 Contagion or Interdependence Effects**

Table 4.3 discloses the identification of contagion or interdependence effects through the correlation analysis between the *MRI* of ASEAN – 5 countries and  $MRI_{US}$  in the pre – and post – AFC periods. Values reported are correlation coefficient while *p* – values are considered in the parentheses. Adopting the definition of contagion or interdependence definition proposed by Beirne and Gieck (2012) and Forbes and Rigobon (2002), if there is a strong correlation between the countries in the pre and post – crisis or no significant different, it would indicate the interdependence. Otherwise, if there is only strong correlation exist in the post – crisis period, it constitutes a contagion effect.

As Table 4.3 is referred, results show that there is evidence of contagion effects of the US stock market into Indonesia, Thailand and Singapore; the other the ASEAN – 5 countries are only signified an interdependence. during AFC period. Meanwhile, during GFC period, Malaysia, the Philippines and Singapore constitute contagion effects while Indonesia and Thailand only evidenced an interdependence with the US.

Table 4.3  
*Contagion and Interdependence Effects Test*

| <b>Asian Financial Crisis</b>  |                    |                     |                      |                                  |
|--------------------------------|--------------------|---------------------|----------------------|----------------------------------|
| <b>Countries' Market Index</b> | <b>Full period</b> | <b>Pre – crisis</b> | <b>Post – crisis</b> | <b>Contagion/interdependence</b> |
| Malaysia                       | 0.61<br>[0.00]*    | -0.52<br>[0.05]*    | 0.86<br>[0.01]*      | Contagion                        |
| Indonesia                      | 0.69<br>[0.00]*    | 0.62<br>[0.07]**    | 0.63<br>[0.01]*      | Interdependence                  |
| Thailand                       | 0.49<br>[0.06]**   | -0.38<br>[0.01]*    | 0.82<br>[0.00]*      | Contagion                        |
| Philippines                    | 0.52<br>[0.01]*    | 0.67<br>[0.04]*     | 0.71<br>[0.00]*      | Interdependence                  |
| Singapore                      | 0.66<br>[0.00]*    | -0.44<br>[0.03]*    | 0.81<br>[0.01]*      | Contagion                        |
| <b>Global Financial Crisis</b> |                    |                     |                      |                                  |
| <b>Countries' Market Index</b> | <b>Full period</b> | <b>Pre – crisis</b> | <b>Post – crisis</b> | <b>Contagion/interdependence</b> |
| Malaysia                       | 0.61<br>[0.00]*    | 0.11<br>[0.07]**    | 0.66<br>[0.06]**     | Contagion                        |
| Indonesia                      | 0.69<br>[0.00]*    | 0.46<br>[0.07]**    | 0.64<br>[0.09]**     | Interdependence                  |
| Thailand                       | 0.49<br>[0.06]**   | -0.55<br>[0.02]*    | 0.75<br>[0.03]*      | Interdependence                  |
| Philippines                    | 0.52<br>[0.01]*    | -0.20<br>[0.08]**   | 0.86<br>[0.01]*      | Contagion                        |
| Singapore                      | 0.66<br>[0.00]*    | 0.42<br>[0.09]**    | 0.71<br>[0.05]**     | Contagion                        |

Note: Figures in parenthesis represent  $p$  – value.

\* and \*\* indicate significant at five percent and 10 percent significance level, respectively.

Specifically, correlation coefficient between Malaysia, Thailand and Singapore with the US were significantly increased in the post – AFC period. Meanwhile, correlation coefficient values for Malaysia, the Philippines and Singapore were significantly increased in the post – GFC period. Based on these results, it signifies a contagion effects of the US stock market into these countries. For instance, policies revision in the US such as the adjustment of reserve requirement has affected the financial institutions and firms in the US. Higher reserve requirement by the central bank reduces the amount of financing to the

economy. Therefore, the firms in the ASEAN – 5 countries which rely on the import by the US will be affected (Burton, 2007; Dornbusch, Park, & Claessens, 2000).

This contagion effects were supported by Kim and Kim (1997) who claimed that the trade openness policy implemented by Thailand to perceive the suggestion from IMF in the post – crisis period makes this country more vulnerable to the external shocks. Meanwhile, although Singapore leads the in term of performance of stock market in pre – crisis period, the performance was weakened in the post – crisis period as it was constantly affected by the bad news and the rippled to the other countries in the region (Chen, Leng, & Lian, 2005).

The economic condition in Singapore is further accentuated by the huge loss in wealth from the rapidly declining in the Singapore stock market through the GFC. The Singapore Stock Index was above 3500 points in December 2007 and as of November 2008 it is hovering at around 1700 points. The large negative wealth effect to trickled – down to domestic demand by reducing consumption and investment in assets in the next few quarters, thereby deepening the economic recession in the City-State. As the economy experiences liquidity-crunch or credit tightening from the financial crisis, the immediate concern is to maintain the confidence of the banks and to provide sufficient liquidity in the system for firms to sustain their credit line with the banks. To assist companies to get access to credit facilities, the Singapore government announce SGD2.3 billion loan facilitation to local companies (including SMEs) through its business financing scheme on 21 November 2008.

The contagion effects in Thailand are due to high exposure to the external shocks deficits in current account, high external debt and low foreign reserves (Burton, 2007; Khor, 2017). This high exposure also led by rapid accumulation of external loans over 100 billion USD, the financial liberalization implemented Thailand allow the local private companies to borrow from abroad freely particularly in USD. This liberalization has led these countries to be more vulnerable with external shocks due to high external debts.

In Malaysia, FDI inflows have moderated compared to the pre – crisis period with averaged of USD5.2 billion but declined to an average of USD4.3 billion in the post – AFC period. Moreover, according to United Nations Conference on Trade and Development (UNCTAD), Malaysia accounted for only 2.6 percent of the total FDI inflows to Asia in 2007, compared to eight percent in the mid – 1990s and 10 percent in the 1980s. Also, there were less mega – projects in the post – crisis period as the government scaled down, postponed several mega projects to reduce its budget deficit.

Additionally, Malaysia learnt a good lesson from the Asian financial crisis and had kept external borrowings low. The regulatory framework and instruments have kept non – performing loans (NPLs) low. Despite such fundamentals, large attacks can still bring down small economies, no matter how well their macroeconomic conditions are managed. Besides that, the lack of a run in the stock market reminiscent of the 1997 – 1998 financial crisis consequently lead to lack of major global players providing the leadership for such attacks that were mounted by hedge funds, such as the Quantum Fund and Tiger Fund (Khoo & Lim, 2010). The paralysis faced by the developed countries narrowed the space

for such attacks in 2008 – 2009. Hence, whereas massive capital flight took place in the 1997-98 financial crisis, such flight has been limited this time.

Result also signify that there is a contagion effect in the Philippines during the post – GFC period. This result support the finding by (Guinigundo, 2009) which found that due to the GFC, the benchmark Philippine Stock Exchange Index dropped. Specifically, on 16 September 2008, by 9.3 percent or 224.3 index points to 2,421.7 from the 12 September level of 2,646.1. The index had been on a downtrend since early September 2008. The downtrend continued, on 28 October, the composite index fell to a record low of 1,704.41 index points, the lowest level since January 2007. By end of December 2008, the index had declined by 48.3 percent, year – on – year, to close at 1,872.85 index points. This reflected the movement of equity prices worldwide as risk aversion and uncertainty over the earnings of listed firms intensified.

As these results are concerned, it is worth to consider the contagion effects by using SUR. Next section discusses on the variables used in the SUR estimation.

#### **4.2.3 Correlation Analysis for Seemingly Unrelated Regression Models**

This section discusses on the correlation analysis based on the variables used in the SUR models. Values reported are correlation coefficient while  $p$  – values are considered in the parentheses. Results are reported in Table 4.4. Based on the results, the observations for *MRI* of all countries in ASEAN – 5 are statistically correlated with *SMD* at five percent confidence level. Moderate correlation was illustrated between *MRI* and *SMD* of Malaysia

and Indonesia with correlation coefficient values are 67 and 68 percent, respectively. Meanwhile, *MRI* of the Philippines, Thailand and Singapore are strongly correlated with *SMD*.

Table 4.4  
*Correlation Matrix of Variables for Seemingly Unrelated Regression Models*

| Country   | Variable                    | <i>SMD</i> | <i>LIQ</i> | <i>MRI</i> | <i>MRI<sub>US</sub></i> | <i>MRI*MRI<sub>US</sub></i> | <i>SAV</i> | <i>CRT</i> | <i>DUM</i> |
|-----------|-----------------------------|------------|------------|------------|-------------------------|-----------------------------|------------|------------|------------|
| Malaysia  | <i>SMD</i>                  | 1.00       |            |            |                         |                             |            |            |            |
|           |                             | –          |            |            |                         |                             |            |            |            |
|           | <i>LIQ</i>                  | 0.49       | 1.00       |            |                         |                             |            |            |            |
|           |                             | [0.01]*    | –          |            |                         |                             |            |            |            |
|           | <i>MRI</i>                  | 0.67       | 0.71       | 1.00       |                         |                             |            |            |            |
|           |                             | [0.01]*    | [0.00]*    | –          |                         |                             |            |            |            |
|           | <i>MRI<sub>US</sub></i>     | 0.29       | 0.34       | 0.61       | 1.00                    |                             |            |            |            |
|           |                             | [0.06]**   | [0.10]     | [0.00]*    | –                       |                             |            |            |            |
|           | <i>MRI*MRI<sub>US</sub></i> | -0.11      | 0.61       | 0.89       | 0.86                    | 1.00                        |            |            |            |
|           |                             | [0.06]**   | [0.00]*    | [0.00]*    | [0.00]*                 | –                           |            |            |            |
| Indonesia | <i>SMD</i>                  | 1.00       |            |            |                         |                             |            |            |            |
|           |                             | –          |            |            |                         |                             |            |            |            |
|           | <i>LIQ</i>                  | 0.45       | 1.00       |            |                         |                             |            |            |            |
|           |                             | [0.03]*    | –          |            |                         |                             |            |            |            |
|           | <i>MRI</i>                  | 0.68       | 0.73       | 1.00       |                         |                             |            |            |            |
|           |                             | [0.00]*    | [0.00]*    | –          |                         |                             |            |            |            |
|           | <i>MRI<sub>US</sub></i>     | 0.34       | 0.65       | 0.69       | 1.00                    |                             |            |            |            |
|           |                             | [0.01]*    | [0.00]*    | [0.00]*    | –                       |                             |            |            |            |
|           | <i>MRI*MRI<sub>US</sub></i> | 0.62       | 0.62       | 0.96       | 0.77                    | 1.00                        |            |            |            |
|           |                             | [0.00]*    | [0.00]*    | [0.00]*    | [0.00]*                 | –                           |            |            |            |
| Thailand  | <i>SMD</i>                  | 1.00       |            |            |                         |                             |            |            |            |
|           |                             | –          |            |            |                         |                             |            |            |            |
|           | <i>LIQ</i>                  | 0.45       | 1.00       |            |                         |                             |            |            |            |
|           |                             | [0.02]*    | –          |            |                         |                             |            |            |            |
|           | <i>MRI</i>                  | 0.83       | 0.23       | 1.00       |                         |                             |            |            |            |
|           |                             | [0.00]*    | [0.26]     | –          |                         |                             |            |            |            |
|           | <i>MRI<sub>US</sub></i>     | -0.30      | 0.76       | 0.49       | 1.00                    |                             |            |            |            |
|           |                             | [0.04]*    | [0.00]*    | [0.06]**   | –                       |                             |            |            |            |
|           | <i>MRI*MRI<sub>US</sub></i> | -0.70      | 0.74       | 0.68       | 0.75                    | 1.00                        |            |            |            |
|           |                             | [0.00]*    | [0.00]*    | [0.00]*    | [0.00]*                 | –                           |            |            |            |

Table 4.4 ‘continued’

| Country     | Variable                    | <i>SMD</i>        | <i>LIQ</i>      | <i>MRI</i>      | <i>MRI<sub>US</sub></i> | <i>MRI*MRI<sub>US</sub></i> | <i>SAV</i>       | <i>CRT</i>      | <i>DUM</i> |
|-------------|-----------------------------|-------------------|-----------------|-----------------|-------------------------|-----------------------------|------------------|-----------------|------------|
| Philippines | <i>SMD</i>                  | 1.00              |                 |                 |                         |                             |                  |                 |            |
|             |                             | –                 |                 |                 |                         |                             |                  |                 |            |
|             | <i>LIQ</i>                  | 0.82<br>[0.02]*   | 1.00            |                 |                         |                             |                  |                 |            |
|             | <i>MRI</i>                  | 0.79<br>[0.00]*   | 0.33<br>[0.11]  | 1.00            |                         |                             |                  |                 |            |
|             | <i>MRI<sub>US</sub></i>     | -0.36<br>[0.07]** | 0.19<br>[0.35]  | 0.52<br>[0.01]* | 1.00                    |                             |                  |                 |            |
|             | <i>MRI*MRI<sub>US</sub></i> | 0.69<br>[0.00]*   | 0.27<br>[0.19]  | 0.86<br>[0.00]* | 0.82<br>[0.00]*         | 1.00                        |                  |                 |            |
|             | <i>SAV</i>                  | 0.46<br>[0.42]    | 0.12<br>[0.57]  | 0.61<br>[0.00]* | 0.75<br>[0.00]*         | 0.77<br>[0.00]*             | 1.00             |                 |            |
|             | <i>CRT</i>                  | 0.11<br>[0.06]**  | 0.57<br>[0.00]* | 0.25<br>[0.22]  | 0.36<br>[0.08]**        | 0.24<br>[0.25]              | -0.01<br>[0.98]  | 1.00            |            |
|             | <i>DUM</i>                  | -0.23<br>[0.70]   | -0.24<br>[0.47] | 0.56<br>[0.05]* | 0.15<br>[0.00]*         | 0.76<br>[0.07]**            | 0.54<br>[0.10]** | -0.21<br>[0.45] | 1.00       |
|             |                             |                   |                 |                 |                         |                             |                  |                 | –          |
| Singapore   | <i>SMD</i>                  | 1.00              |                 |                 |                         |                             |                  |                 |            |
|             |                             | –                 |                 |                 |                         |                             |                  |                 |            |
|             | <i>LIQ</i>                  | 0.75<br>[0.00]*   | 1.00            |                 |                         |                             |                  |                 |            |
|             | <i>MRI</i>                  | 0.84<br>[0.00]*   | 0.80<br>[0.00]* | 1.00            |                         |                             |                  |                 |            |
|             | <i>MRI<sub>US</sub></i>     | 0.64<br>[0.03]*   | 0.75<br>[0.00]* | 0.66<br>[0.00]* | 1.00                    |                             |                  |                 |            |
|             | <i>MRI*MRI<sub>US</sub></i> | -0.82<br>[0.00]*  | 0.87<br>[0.00]* | 0.88<br>[0.00]* | 0.91<br>[0.00]*         | 1.00                        |                  |                 |            |
|             | <i>SAV</i>                  | 0.69<br>[0.00]*   | 0.77<br>[0.00]* | 0.78<br>[0.00]* | 0.71<br>[0.00]*         | 0.83<br>[0.00]*             | 1.00             |                 |            |
|             | <i>CRT</i>                  | 0.24<br>[0.05]*   | 0.58<br>[0.00]* | 0.29<br>[0.16]  | 0.77<br>[0.00]*         | 0.59<br>[0.00]*             | 0.63<br>[0.00]*  | 1.00            |            |
|             | <i>DUM</i>                  | 0.25<br>[0.03]*   | 0.42<br>[0.00]* | 0.65<br>[0.00]* | 0.24<br>[0.00]*         | 0.75<br>[0.00]*             | 0.32<br>[0.04]*  | 0.34<br>[0.02]* | 1.00       |
|             |                             |                   |                 |                 |                         |                             |                  |                 | –          |

Notes: Figures in parenthesis represent *p* – values.

\* and \*\* indicate significant at five percent and 10 percent significance levels, respectively.

In addition, as this study focus on the contagion effects from the US, the observation for *MRI<sub>US</sub>* is also considered in the model. The correlation values signify that *MRI<sub>US</sub>* is statistically correlated with *SMD* of all ASEAN – 5 countries. Interestingly, there is a negative correlation was displayed between *MRI<sub>US</sub>* and *SMD* of Thailand and the Philippines.

Furthermore, correlation between *MRI\*MRI<sub>US</sub>* and *SMD* of all countries in ASEAN – 5 are statistically significant at five percent level of confidence. Negative correlation was

displayed between these variables for Malaysia, Thailand and Singapore. Moreover, the variable of *LIQ* of all countries in ASEAN – 5 appears to have a positive significant correlation with *SMD*. There is a moderate correlation between *LIQ* and *SMD* of Malaysia, Indonesia and Thailand. Meanwhile, *LIQ* of the Philippines and Singapore appear to have a strong correlation with *SMD*.

Based on the correlation analysis for *SUR*, there is an evidence or linear relationship between the variables used in the estimable models with *SMD* of all countries in the ASEAN – 5. Thus, it indicates that those variables included in the models are relevant *SUR* estimation in this study.

#### **4.3 Stock Market Development Mean Comparison Analysis**

The *SMD* mean comparison analysis results are reported in Table 4.5. Based on the results, for the AFC period, the calculated *t* – values for Malaysia, Thailand and Singapore are greater than the critical *t* – value. Therefore, the null hypothesis of no differences between the *SMD* in pre – and post – AFC for these countries are rejected at 10 percent confidence level. These results indicate that the mean of *SMD* between pre – and post – crisis period for Malaysia, Thailand and Singapore are significantly different. Specifically, mean of the *SMD* for Malaysia is relatively decline indicated by lower mean value in the post – crisis period. Meanwhile, *SMD* of Thailand and Singapore were significantly improved in the post – crisis period. On the other hand, the mean of *SMD* between pre – and post – GFC for Malaysia and Singapore signify significant different at ten percent significance level. Both countries imply a reduction in the *SMD* after the GFC in 2008.

Table 4.5  
*Stock Market Development Mean Comparison Analysis Results*

| <b>Asian Financial Crisis</b>  |              |               |                 |                  |
|--------------------------------|--------------|---------------|-----------------|------------------|
| <b>Country</b>                 | <b>Mean</b>  |               | <b>Std. dev</b> | <b>t – value</b> |
|                                | pre – crisis | post – crisis |                 |                  |
| Malaysia                       | 235.34       | 110.65        | 68.56           | -1.82**          |
| Indonesia                      | 43.37        | 32.14         | 22.74           | -0.49            |
| Thailand                       | 33.27        | 88.27         | 30.7            | 1.79**           |
| Philippines                    | 56.04        | 52.2          | 101.61          | -0.04            |
| Singapore                      | 135.4        | 228.72        | 52.11           | 1.78**           |
| <b>Global Financial Crisis</b> |              |               |                 |                  |
| <b>Country</b>                 | <b>Mean</b>  |               | <b>Std. dev</b> | <b>t – value</b> |
|                                | pre – crisis | post – crisis |                 |                  |
| Malaysia                       | 176.87       | 150.56        | 13.64           | -1.93**          |
| Indonesia                      | 29.40        | 40.41         | 8.82            | 1.25             |
| Thailand                       | 53.43        | 77.27         | 49.07           | 0.49             |
| Philippine                     | 46.37        | 71.03         | 36.42           | 0.68             |
| Singapore                      | 293.67       | 114.98        | 98.45           | -1.82**          |

Notes: *t* – values are compared with the *t* – critical value of 2.07 and 1.73 for 10 and five percent significance level, respectively.

\* and \*\* indicate significant at five and 10 percent significance levels, respectively.

Athukorala (2010) claimed that the speculative attack on the Thai Baht during the AFC caused to a heavy ceiling pressure on Malaysia Ringgit. During this time, ringgit was depreciated against USD by almost 50 percent. Due to this circumstance, for the first time after 1991, total portfolio inflows were turned into negative and the Composite Index of Kuala Lumpur Stock Exchange (KLSE) had fallen more than 50 percent from the pre – crisis position. These massive reversal of portfolio capital flows wiped off almost USD225 billion of share values (Athukorala, 2010).

Moreover, due to the downturn in the foreign exposure on the domestic stock market and financial institutions during end of 1998, the economy of Malaysia was turned into recession which caused to increase in unemployment rate from 2.6 percent in 1996 to 3.9 percent in 1998. The inflation rate also peaked at 6.2 percent in 1998. Due to this position, there is a strong possibility of the contraction in the economy of Malaysia. Furthermore,

there is also a constraint on the short – term capital inflows, foreign share holds by the local brokerage firms and financial facilities to the non – residents in the stock market of Malaysia. All of these reasons are among the possibility which affect the attractiveness of the institutional investors and fund managers to trade into the Malaysia's stock market particularly after the crisis period which then plunge the *SMD* of this country (Filardo *et al.*, 2010).

On the other hand, results provide the evidences of significant improvement in the *SMD* for Thailand and Singapore in the post – crisis period as the values of mean were relatively higher than pre – crisis period. According to Ibrahim (2011), significant improvement in *SMD* of Thailand is mainly due to several initiatives specially to sought foreign investors into the Thailand stock market. Such initiatives include stabilizing the float in Baht and restructuring the financial institutions. As the value of Baht approach the pre – crisis level, Thailand authorities reduced the lending rate to encourage more investment activities mainly into the stock market. Also, stronger financial institutions of Thailand improved the ability to provide the financial supports especially for the corporate investors and encourage them to invest into stock market. These initiatives increased the investment fund demanded by the investors through financial institution which then boost the *SMD*.

Meanwhile, there is a significant improvement illustrated in the *SMD* of Singapore in the post – crisis period. According to Lee and Takagi (2013), the AFC was not really affect the Singapore's economy compared to the other regional counterparts. Although the AFC impaired the economic growth but it was not led to the collapse of the Singapore's currency

and financial sectors. The initiatives such as reliability on the foreign direct investment rather than external loan, good stock market governance and high supervision of the financial sectors are among the factors which retain the confidence of investors to invest into Singapore's stock market. Also, in the local market, tax and other transaction costs cutting after the AFC retained the attractiveness of the stock market in Singapore which also boost the *SMD* of this country.

As the GFC effects concerned, up to the first half of 2008 Malaysia was relatively unaffected by the GFC. The financial and economic environment worsened in the second half of 2008 and first quarter of 2009. According to Khoon and Lim (2010), real GDP of Malaysia only grew 0.1 percent year – on – year in the fourth quarter of 2008 compared to 4.7 percent in the third quarter of the same year. The depressing performance in the first quarter of 2009 confirmed the expectation that Malaysia faces a full – blown recession. This decline was mainly due to the drastic contraction in export value which then affect the economic growth particularly in the manufacturing and financial sectors. Specifically, Malaysia suffered capital flight since the second quarter of 2008. Banks and financial institutions in the US and the West reduced their international business and focused on their home markets. As a result, there was a big drop in funds flowing into the other region including Malaysia.

Furthermore, portfolio investment are the most volatile and recorded the largest net outflow of RM84.4 billion in 2008, compared to a positive net inflow of RM18.4 billion in 2007 (Khoon & Lim, 2010). Malaysia was one of the countries which affected by the portfolio

investment outflows in 2008 (Khor, 2017) as there is a high level of foreign investors. Trading volume attributable to non – resident investors has been more than 30 percent since year 2004. The reversal of the portfolio investment then affects the KLCI.

Given by the effects of GFC, several measures to directly support the economy were introduced by government of Malaysia. Such measures include the reduction of employees' provident fund (EPF) contribution from 11 percent to 8 percent and higher vehicle loan eligibility for civil servants. This effort is made for the aim of increasing the private consumption and flow of money in the economy which then stimulate the economic growth. Besides, RM7 billion stimulus package which accounted for approximately one percent of Malaysia's GDP was criticised as too small. As the GFC deteriorated into fourth quarter of 2008 and early 2009, Malaysia economy faced the prospect of a deep recession which is worse than expected global trade slowdown. This condition prompted the government of Malaysia to introduce a second stimulus package which is bigger and more comprehensive totalling RM60 billion in March 2009. This makes Malaysia the second aggressive country which induce the recovery policy among other ASEAN countries after Singapore.

For decades, Singapore had a highly developed and successful free-market economy. It enjoyed a remarkably open and corruption-free environment with stable prices and a per capita GDP higher than that of most developed countries. The economy depends heavily on exports, particularly in consumer electronics, information technology products, pharmaceuticals, and financial services. Because of all this, Singapore's real GDP growth

averaged 7.1 percent between 2004 and 2007. When the 2008 GFC hit, Singapore was the first East Asian country to fall into recession (Ehrmann & Fratzscher, 2009). This clearly showed the vulnerability of the trade – dependent Singaporean economy. The manufacturing sector was hit particularly hard due to falling demand induced by the overall deterioration of economic conditions in the US and Europe (Ehrmann & Fratzscher, 2009).

Fortunately, due to its well – regulated market, the exposure of Singapore’s banks to subprime mortgage was limited (Beeson & Rosser, 1998). Even though damage to the banking sector was limited, Singapore still suffered a huge loss of wealth as the stock market plummeted from a high of 3500 points in December 2007 to 1700 points in the last quarter of 2008. This situation then depressed domestic demand and investment in assets.

Singapore’s policy makers responded with a series of measures aimed at insulating the population at large from the negative effects of the financial crisis. The Monetary Authority of Singapore (MAS) guaranteed bank deposits and flushed the money market with enough liquidity to restore market confidence. It established a USD30 billion swap line with the US Federal Reserve to abate any strain in USD funding in the Asian dollar market (Furuoka, Lim, Jikunan, & Chiun, 2012). To assist local, small – and medium – sized companies in obtaining access to credit, the Singaporean government established a USD1.56 billion (SGD2.3 billion) loan facility and launched a risk – sharing initiative which took on significant shares of bank-lending risks in November 2008.

Moreover, the Singapore central bank shifted its currency policy to a zero percent appreciation stance and devalued the Singapore dollar to help electronics exports (Beeson & Rosser, 1998). The Singaporean government also set training and development of workers to improve its human capital. This had a strong impact on future reemployment and retention of productive workers in the labour market.

Furthermore, the government delivered a USD13.8 billion resilience package for the 2009 financial year for temporary measures to combat the effects of the financial crisis (Dailami & Atkin, 1990). The key objective was to help Singaporeans keep their jobs and thus increase overall confidence. In addition, Singapore's government spent heavily on big investment projects in the construction sector such as the construction of two integrated resorts, the Marina Bay financial sector and the new MRT. Given these, it attracts more investors and capital inflow into Singapore.

#### **4.4 Traditional Panel Analyses**

This section provides the estimation results of traditional panel analysis using PMG, FEM and REM. Section 4.4.1 discussed on the model selection between PMG, FEM and REM followed by coefficient estimation for selected model in Section 4.4.2.

##### **4.4.1 Model Selection**

This section devotes to choose the most accurate model between PMG, FEM and REM. To choose between PMG and FEM, the redundant fixed effects test is used. Results are reported in Table 4.6.

Table 4.6  
*Redundant Fixed Effects Test Results*

| Effects Test             | Statistic | d.f.      | <i>p</i> – value |
|--------------------------|-----------|-----------|------------------|
| Cross-section F          | 22.59     | -4,113.00 | 0.00*            |
| Cross-section Chi-square | 73.45     | 4.00      | 0.00*            |

Note: \* indicates significant at five percent significance levels.

As above results are referred, the null hypothesis of PMG is more appropriate than FEM is rejected. Thus, it is viewed that is inappropriate to assume the variables in the model to be homogenous for each member country and for every year due to the exclusion of entity – specific (heterogeneity) effects. Alternatively, the inclusion of fixed effects into the model is necessary so that the ASEAN – 5 individually will be granted to have their corresponding intercepts that do not vary over time or time invariant.

Moving on, there is necessary to consider the inclusion of random effects into the model. Subsequently, Hausman test is undertaken to choose between FEM and REM. Results are reported in Table 4.7. Based on the associated *p*-value, the null hypothesis is failed to be rejected. Therefore, the estimation using REM is more appropriate to be employed than the FEM.

Table 4.7  
*Hausman Test Results*

| Variable             | Cross-section random effects test comparisons |                     |              | Prob. |
|----------------------|-----------------------------------------------|---------------------|--------------|-------|
|                      | Fixed                                         | Random              | Var(Diff.)   |       |
| <i>LIQ</i>           | 0.34                                          | 0.27                | 0.25         | 0.63  |
| <i>GDP</i>           | -0.01                                         | -0.01               | 0.00         | 0.71  |
| <i>INT</i>           | -0.26                                         | -0.52               | 0.11         | 0.44  |
| <i>INF</i>           | 0.27                                          | 0.04                | 0.09         | 0.43  |
| <i>SAV</i>           | 57.57                                         | 58.53               | 64.42        | 0.90  |
| <i>CRT</i>           | 0.22                                          | 0.31                | 0.01         | 0.40  |
| <i>DUM</i>           | -31.28                                        | -32.37              | 9.17         | 0.72  |
| <b>Test Summary</b>  | <b>Chi-Sq. Statistic</b>                      | <b>Chi-Sq. d.f.</b> | <b>Prob.</b> |       |
| Cross-section random | 1.15                                          | 7.00                | 0.99         |       |

#### 4.4.2 Coefficient Estimation

This section discusses on the coefficient estimation for selected model after Redundant Fixed Effects Test and Hausman Test. Based on the previous section, Table 4.8 shows the estimation results for REM.

Table 4.8

##### *Random Effects Estimation Results*

| <b>Variable</b>               | <b>Coefficient</b> | <b>Std. Error</b> | <b>t-Statistic</b> | <b>Prob.</b> |
|-------------------------------|--------------------|-------------------|--------------------|--------------|
| <i>C</i>                      | 65.14              | 28.98             | 2.25               | 0.03*        |
| <i>LIQ</i>                    | 0.27               | 0.06              | 4.23               | 0.00*        |
| <i>GDP</i>                    | 0.01               | 0.01              | 2.03               | 0.04*        |
| <i>INT</i>                    | -0.52              | 0.91              | -0.57              | 0.57         |
| <i>INF</i>                    | 0.04               | 0.81              | 0.05               | 0.96         |
| <i>SAV</i>                    | 58.53              | 22.35             | 2.62               | 0.01*        |
| <i>CRT</i>                    | 0.31               | 0.21              | 1.49               | 0.14         |
| <i>DUM</i>                    | -32.37             | 9.55              | -3.39              | 0.00*        |
| <b>Random Effects (Cross)</b> |                    |                   |                    |              |
| Malaysia                      |                    |                   |                    | 56.94        |
| Indonesia                     |                    |                   |                    | -38.06       |
| Thailand                      |                    |                   |                    | -40.96       |
| Philippines                   |                    |                   |                    | -23.49       |
| Singapore                     |                    |                   |                    | 45.57        |
| <b>Effects Specification</b>  |                    |                   |                    |              |
|                               |                    | <b>S.D.</b>       |                    | <b>Rho</b>   |
| Cross-section random          |                    | 50.96             |                    | 0.67         |
| Idiosyncratic random          |                    | 36.17             |                    | 0.34         |
| <b>Weighted Statistics</b>    |                    |                   |                    |              |
| R-squared                     | 0.75               |                   |                    |              |
| Adjusted R-squared            | 0.71               |                   |                    |              |
| S.E. of regression            | 37.69              |                   |                    |              |
| F-statistic                   | 5.67               |                   |                    |              |
| Prob(F-statistic)             | 0.00*              |                   |                    |              |

Note: \* and \*\* indicate significant variables at the 5 and 10 percent significance levels, respectively.

Based on the results, the coefficient value of *LIQ* is found to be statistically significant at five percent confidence level and positively affect the *SMD* in ASEAN – 5. So, any increase in 1.0 million units of *LIQ* will stimulate 0.27 percent of *SMD* in ASEAN – 5.

As the REM suggested that constant for each country has a random parameter, the common constant is given as 65.14. The term  $V_i$  which is the composite error terms or individual specific error term is given as given by 50.96 percent. The composite error term indicates the unmeasured random individual effects which are correlated for individual over time. The composite error term also signifies that the estimation using PMG is no longer efficient and unreliable. This is because the PMG tend to understate the actual variation of observation in an estimation as this error term is ignored. Meanwhile, the idiosyncratic term ( $\varepsilon_{it}$ ) which signify the idiosyncratic error term signifies the error which change over time and cross – country is 36.17.

The positive effect of *LIQ* on the *SMD* from the REM support the theoretical framework applied in this study also proposed by Calderon – Rossell (1991) and El – Wassal (2013). They suggested that the number of listed company in a stock market is determined by the *LIQ* position which then increase the *SMD*. Higher *LIQ* will convince an investor to consider to invest into a stock market as any withdrawal of the stocks would not give a substantial effects on the stock prices (Chipaumire & Ngirande, 2014).

Furthermore, Bencivenga *et al.* (1996) and Yartey and Komla (2007) claimed that higher *LIQ* can reduce the downside risk and investment cost in a projects. As the liquid market could secure the saving access of and investor during the project implementation which they can easily, quickly and sell their stake in a company with a low cost, higher *LIQ* will encourage longer – term investment and profitable projects which then improve the capital allocation and long-term growth of a stock market.

In addition, higher *LIQ* reduces the information and transaction costs in the financial market. As a liquid stock market could reduce the cost of asymmetry information between the managers and stockholders during the investment strategy set-up processes. Also, the minimum agency cost occurs when there is only one or minimum long – term investment manager will be used in controlling their investment (Chipaumire & Ngirande, 2014; Dalsenius, 2007). Also, increase in agency costs onto real equilibrium interest matters the impact on the excess rather than gross and demand for each financial instrument (Stracca, 2005). Thus, depending on the nature of financial contracts and the incentives faced by borrowers and lenders, an increase an agency costs may result in reduced liquidity for both asset holders in terms of higher screening and monitoring costs and for liability holders in terms of signalling. The net effect of these factors onto equilibrium asset returns are also considered.

Furthermore, the positive effect of *LIQ* on *SMD* in – line with the theory proposed by Pagano (1993) related to protection for the investors. The compulsory disclosure regarding the reliable information and financial data on the market could increase the participation by the investors and enhance the investors' confidence to invest in a stock market. This is also related to the risk of investing in a country. Higher *LIQ* discloses that a country has a good regulatory framework and legal enforcement. This low risk promises will attract more investors to invest into a stock market. In addition, Dalsenius (2007) suggested that if the control mechanisms of the financial markets are poor and lots of illiquid securities, it may be very difficult to distinguish from solid liquid ones beforehand, are listed on it the efficiency of stock markets will be impaired. Thus, risk adverse investors will tolerate for

a safer stock market. La Porta *et al.* (2000) suggested that higher *LIQ* discloses the efficiency in the legal enforcement of a country. Higher prosecution enforces the firms to conduct a good governance, provide a good guideline and trading procedures to the traders. Consequently, it accelerates the confidence of investors to invest into a stock market to low risk in term of security of their investment.

Furthermore, Vagias and Dijk (2010) suggested that monetary policies implemented by ASEAN – 5 during the crises makes this region remained stable. Such monetary policies include lowering interest rate and increase support on local firms and banks. These policies were implemented to ensure the sustainability of the market player which then increase the confidence of foreign investors. Besides, financial supports obtained by IMF also retained the performances of stock markets in ASEAN – 5 economies. According to Briguglio and Cordina (2006), economic stabilization manifests a sustainable fiscal policy, external balance of a country which comprise of international current account position and external debt level. Therefore, it can be used by investors as an indicator to put their investment into a country.

Moreover, numerous initiatives undertook by ASEAN – 5 countries. Specifically, in Malaysia, several initiatives such as the establishment of Capital Market Masterplan in 2008 and introduction of Capital Market Development Fund Bursa Research Scheme in January 2005 have been initiated. Based on these initiatives, Malaysia concerns on improving their investment quality to attract more investors, deal with a huge trading volume and sustaining stock market.

Meanwhile, Thailand has introduced the Alternative Investment (MAI) in the Stock Exchange of Thailand (SET). This alternative investment market was formed to ensure the marketability and the liquidity of the stocks traded. Also, the marketing issuer unit was established for inspiring the potential issuers to raise capital through MAI besides provide an ongoing advisory service to the potential companies. MAI has cooperated with many international organizations to build – up network and identify a broad base companies which potentially listed on MAI. Through these initiatives, it can stimulate the *SMD* in Thailand by considering the liquidity, marketability and the effects of international portfolio investment.

However, high taxes for the trading activities in the Philippines' stock market certainly restricts the stock market liquidity. It is associated with high transaction costs which can plunge the *SMD* in the Philippines. According to Amihud and Mendelson (1986), Balogun *et al.* (2016) and Vayanos and Wang (2013), when interest rates are relatively low, high transaction cost can discourage the investors from unloading their securities to enjoy the realize capital gains.

Instead, Government of Indonesia has offers a tax holiday scheme which allow for tax exemption for certain businesses from paying the corporate income tax up to 10 years. This initiative has been initiated to encourage more investment by the corporate sectors especially pioneer sectors into the financial market. Moreover, Indonesia has continuously reforms their regulatory system especially in trading execution related to the international

investment to ensure a good trading environment for investors. As a result, it will accelerate the confidence of the foreign investors to invest more into Indonesia's stock market.

Meanwhile, in Singapore, there are numerous measures have been implemented to ensure the short – term stability especially in financial markets and currency particularly after the AFC. Such measures include tax cutting upon the stock execution of stock and improvising trading infrastructures to stimulate more trading activity in its stock market. Besides, Singapore's government also concern on the competitiveness of the enterprises. Therefore, the costs including rental costs, wage costs and other business costs was reduced which aimed to improve the competitiveness of the firms in the long – term. As a result, a better business environment and cash flows would encourage more corporate firms to get involve into the stock market investment.

The REM results also signify that the variable of *GDP*, *SAV* and *DUM* are statistically significant at five percent confidence level. Therefore, any increase of USD1.0 billion in *GDP* and *SAV* would stimulate 0.01 and 58.53 percent of *SMD*, respectively. This finding was supported by Sukcharoensin and Sukcharoensin (2013), Masih and Masih (1999), Naceur *et al.* (2005) and Demirgüç-Kunt and Maksimovic (2016). They suggested that *GDP* would signify a steady and good country prospect which then attract more investors into the stock market and boost the *SMD*. This is because, *GDP* could represent the growth and the stability of the countries which related to the macroeconomic risk bear by the traders.

Besides, the variable of *DUM* denotes that the *SMD* in ASEAN – 5 are generally affected by the AFC and GFC as the *SMD* 32.37 percent plunged during these crises.

On the overall model, the adjusted  $R^2$  illustrates that 71 percent of the variation in the *SMD* in ASEAN – 5 for the 1990 – 2014 period can be explained by explanatory variables in REM. In addition, the value of  $F$  – statistic, which determines the joint statistical influence between explanatory variables and *SMD* in ASEAN – 5 are proven to be statistically significant at the five percent significance level for FEM.

#### **4.5 Seemingly Unrelated Regression**

This section provides the discussion pertaining to the SUR estimation results which mainly focus on the explanation pertaining to the contagion effects on *SMD* in ASEAN – 5. Through the SUR, the contemporaneous correlation proposed by Zellner (1962) is considered to capture the correlation of the disturbances across the equations.

The discussions for this section are divided into three sub – sections which are preliminary test in Section 4.5.1, coefficient estimation in Section 4.5.2 and diagnostic test in Section 4.5.3.

##### **4.5.1 Preliminary Test**

The analysis of SUR begun with the preliminary test to identify the correlation between the error terms across the models. For this purpose, the residual covariance and correlation test is utilized. Results are reported in Table 4.9.

Table 4.9  
Residual Covariance and Correlation Matrix

| Residual Covariance Matrix  |          |           |          |             |           |
|-----------------------------|----------|-----------|----------|-------------|-----------|
| Country                     | Malaysia | Indonesia | Thailand | Philippines | Singapore |
| Malaysia                    | 703.07   |           |          |             |           |
| Indonesia                   | 92.90    | 35.95     |          |             |           |
| Thailand                    | 88.15    | 21.27     | 123.60   |             |           |
| Philippines                 | 209.34   | 54.77     | 42.99    | 185.38      |           |
| Singapore                   | 202.77   | 48.08     | 149.55   | 85.82       | 457.78    |
| Residual Correlation Matrix |          |           |          |             |           |
| Country                     | Malaysia | Indonesia | Thailand | Philippines | Singapore |
| Malaysia                    | 1.00     |           |          |             |           |
|                             | –        |           |          |             |           |
| Indonesia                   | 0.58     | 1.00      |          |             |           |
|                             | [14.61]* | –         |          |             |           |
| Thailand                    | 0.30     | 0.32      | 1.00     |             |           |
|                             | [7.48]*  | [7.98] *  | –        |             |           |
| Philippines                 | 0.58     | 0.67      | 0.28     | 1.00        |           |
|                             | [14.50]* | [16.77] * | [7.10] * | –           |           |
| Singapore                   | 0.36     | 0.37      | 0.63     | 0.29        | 1.00      |
|                             | [8.94]*  | [9.37] *  | [15.72]* | [7.37] *    | –         |

Note: Chi – square critical values at five and 10 percent confidence level are 1.15 and 1.61, respectively.  
\* and \*\* indicate significant variables at the 5 and 10 percent significance levels, respectively.  
Figures in parenthesis are the *LM* values

Based on the *LM* test values, *LM* between the countries illustrate value greater than *LM* critical value. Thus, the null hypothesis of no correlation between the error terms across the models are rejected at 95 percent confidence level. Therefore, SUR models are more efficient than OLS.

#### 4.5.2 Coefficient Estimation

This section reports the results of SUR coefficient estimation. Based on the results given in Table 4.10, For all ASEAN – 5 countries, the coefficients of interaction terms;  $MRI_{it} * MRI_{US}$  are found to be statistically significant at 10 percent significance levels for all countries. Therefore, the effects of market interaction to the ASEAN-5's *SMD* can be possibly explained through both total effects of  $MRI_{it}$  and  $MRI_{US}$ .

Table 4.10  
SUR Estimation Results

| Country     | Variable                      | Coefficient | Total Effect                   | Std. Err | t – Stat | Prob.  |
|-------------|-------------------------------|-------------|--------------------------------|----------|----------|--------|
| Malaysia    | C                             | 128.97      |                                | 40.03    | 3.22     | 0.00*  |
|             | <i>MRI</i>                    | 0.50        | $MRI_M = 0.50 + 0.67MRI_{US}$  | 0.09     | 5.54     | 0.00*  |
|             | <i>MRI<sub>US</sub></i>       | 0.32        | $MRI_{US} = 0.32 + 0.67MRI_M$  | 0.10     | 3.2      | 0.00*  |
|             | <i>MRI * MRI<sub>US</sub></i> | 0.67        |                                | 0.38     | 1.76     | 0.08** |
|             | <i>LIQ</i>                    | 0.23        |                                | 0.08     | 2.85     | 0.01*  |
|             | <i>CRT</i>                    | -0.10       |                                | 0.38     | -0.25    | 0.80   |
|             | <i>SAV</i>                    | -185.60     |                                | 158.78   | -1.17    | 0.25   |
|             | <i>DUM</i>                    | -26.45      |                                | 20.71    | -1.28    | 0.20   |
| Indonesia   | C                             | 14.25       |                                | 10.70    | 1.33     | 0.19   |
|             | <i>MRI</i>                    | 0.02        | $MRI_M = 0.02 + 0.13MRI_{US}$  | 0.00     | 6.93     | 0.00*  |
|             | <i>MRI<sub>US</sub></i>       | -0.03       | $MRI_{US} = -0.03 + 0.13MRI_M$ | 0.03     | -0.92    | 0.36   |
|             | <i>MRI * MRI<sub>US</sub></i> | 0.13        |                                | 0.08     | 1.67     | 0.10** |
|             | <i>LIQ</i>                    | 0.20        |                                | 2.22     | 0.09     | 0.93   |
|             | <i>CRT</i>                    | 0.33        |                                | 0.17     | 1.91     | 0.06*  |
|             | <i>SAV</i>                    | -24.98      |                                | 5.11     | -4.89    | 0.00*  |
|             | <i>DUM</i>                    | -13.46      |                                | 4.74     | -2.84    | 0.01*  |
| Thailand    | C                             | 30.68       |                                | 12.70    | 2.42     | 0.02*  |
|             | <i>MRI</i>                    | 0.17        | $MRI_T = 0.17 + 0.3MRI_M$      | 0.03     | 6.36     | 0.00*  |
|             | <i>MRI<sub>US</sub></i>       | 0.56        | $MRI_{US} = 0.56 + 0.3MRI_T$   | 0.33     | 1.71     | 0.09** |
|             | <i>MRI * MRI<sub>US</sub></i> | 0.30        |                                | 0.17     | 1.76     | 0.08** |
|             | <i>LIQ</i>                    | 0.02        |                                | 0.01     | 1.69     | 0.09** |
|             | <i>CRT</i>                    | -0.18       |                                | 0.11     | -1.64    | 0.11   |
|             | <i>SAV</i>                    | -66.94      |                                | 34.63    | -1.93    | 0.06** |
|             | <i>DUM</i>                    | -5.14       |                                | 6.97     | -0.74    | 0.46   |
| Philippines | C                             | 22.94       |                                | 11.17    | 2.05     | 0.04*  |
|             | <i>MRI</i>                    | 0.05        | $MRI_P = 0.05 + 0.34MRI_{US}$  | 0.02     | 3.02     | 0.00*  |
|             | <i>MRI<sub>US</sub></i>       | -0.46       | $MRI_{US} = -0.46 + 0.34MRI_P$ | 0.38     | -1.20    | 0.23   |
|             | <i>MRI * MRI<sub>US</sub></i> | 0.34        |                                | 0.18     | 1.89     | 0.06** |
|             | <i>LIQ</i>                    | 0.20        |                                | 0.20     | 1.02     | 0.31   |
|             | <i>CRT</i>                    | 0.09        |                                | 0.46     | 0.19     | 0.85   |
|             | <i>SAV</i>                    | 24.47       |                                | 17.95    | 1.36     | 0.18   |
|             | <i>DUM</i>                    | -9.54       |                                | 8.74     | -1.09    | 0.28   |
| Singapore   | C                             | 41.67       |                                | 48.67    | 0.86     | 0.39   |
|             | <i>MRI</i>                    | 0.14        | $MRI_S = 0.14 + 0.6MRI_{US}$   | 0.02     | 7.27     | 0.00*  |
|             | <i>MRI<sub>US</sub></i>       | 0.23        | $MRI_{US} = 0.23 + 0.6MRI_S$   | 0.08     | 2.77     | 0.01*  |
|             | <i>MRI * MRI<sub>US</sub></i> | 0.60        |                                | 0.34     | 1.76     | 0.08** |
|             | <i>LIQ</i>                    | 0.11        |                                | 0.20     | 0.56     | 0.57   |
|             | <i>CRT</i>                    | -0.44       |                                | 0.52     | -0.83    | 0.41   |
|             | <i>SAV</i>                    | -9.07       |                                | 33.75    | -0.27    | 0.79   |
|             | <i>DUM</i>                    | -32.24      |                                | 11.14    | -2.89    | 0.00*  |

Note: \* and \*\* indicate significant variables at 5 and 10 percent significance levels, respectively.

Among others, it is also revealed that the coefficients of  $MRI_{it}$  are significantly different from zero at the five and 10 percent significance levels for the ASEAN – 5 countries, respectively. Given the positive coefficient values of  $MRI$ s, any increase of one point in  $MRI_{US}$  would further stimulate the  $SMD$ .

Moreover, statistically significant at five percent confidence level the effects of  $MRI_{US}$  to  $SMD$  can be empirically observed in Malaysia and Singapore but statistically significant at five percent in Thailand. Based on the positive coefficients of interaction terms, that any increase in one point of  $MRI$  would stimulate the effect of  $MRI_{US}$  to  $SMD$  of these countries.

These empirical findings supported by the studies conducted by Chow *et al.* (2013) and Liu (2007) which found a strong statistical evidence of the contagion effects of US market particularly due to the volatility of the market index to the ASEAN – 5 countries. Also, Trivedi and Birău (1999) found a highly reliance of the emerging markets on the index movement in the developed countries particularly the US which then provide a significant implications for the investment process and management of risk toward a financial liberalization. Bagliano and Morana (2012) suggested that the key transmission of the effects of US stock market to the other region is through the currency which then transmitted through trade channel besides the excess liquidity creation and stock price dynamic. These transmission channel support the Contagion Theory which related to the crises transmission.

Also, the empirical results obtained support the theoretical effects of contagion to *SMD* applied in this study. Generally, the contagion effects from the US can reflect the behaviour of the investors towards their investment strategy in ASEAN – 5. Specifically, the contagion could affect the *SMD* through several channels such as portfolio adjustment by the investors, changes in monetary policies, financial linkages and information asymmetry.

Through portfolio adjustment, any changes in the international correlation patterns will call for an adjustment of portfolio as the policy makers concern on the implications towards stability of the financial system (Billio *et al.*, 2005). Particularly for institutional investors such as banks, hedge funds, mutual fund and pension funds, they will diversify their portfolio over financial assets in numerous countries to ensure they are able to pay the return to their shareholders. Moreover, a risk adverse investor would rebalance their portfolio in response of a crisis from a country. This situation thereby troubled the emerging economies as most of the investors would sell their stock and search for a safer stock market (Beirne & Gieck, 2012). Investor will rearrange their portfolio due to optimal response regarding realized loss which also associated with the asset return's distribution. Thus, deleverage and reduce the position in a risky asset would be a worth consideration by the risk adverse investors.

Meanwhile, changes in monetary policies are associated with the funding constraint based due to the changes in the financial intermediaries' position during the crisis (Brunnermeier & Pedersen, 2009). The funding constraint contributes to a large impact on the prices of a volatile stock as more collateral is needed for the fund required by the investors during the

crisis period. In addition, the contraction monetary policy implemented by the government as a result from the contagion effects, financing facilities will be reduced which then limit the capital availability for investment. According to Vayanos and Wang (2013) fund availability constraint would trigger the investors to short their position which consequently affect the stock prices. Consequently, short position will cause to deviation of the stock price and affect the portfolio diversification strategy of investors (Long *et al.* 1990).

In addition, contagion can affect the *SMD* through financial and trade linkages. As suggested by Claessens and Forbes (2004), any firm which mainly involve in international trading activities will reduce their quantity of import due to the policy adjustment made by the government and firm itself regarding international trade. This action will affect the revenues, cash flows and overall performance of the trading partner and subsidiaries. Also, given by the bad performance of the firm, investors will take an action to restructure their portfolio to other stable firms, sectors or markets. Consequently, it will finally affect the *SMD* of a country. Also, according to Bagliano and Morana (2012), the effects of the US stock market to the other region is mainly through the currency depreciation which then transmitted through trade channel, excess liquidity creation and stock price dynamic.

Furthermore, Diamond and Verrecchia (1981) explained that, any asymmetric information especially related to the crisis and contagion might cause to short sell activities by investors. This is because, contagion will give a negative signal to the investors to recompose their portfolio. Particularly for the uninformed traders, they will just follow the

big player in the stock market. Subsequently, the short sale activities will cause to underpricing of stocks as it creates the uncertainty about the negative private information. Besides, any uncertainty regarding the real position of a countries' fundamental will lead to misjudge on the assessment of the investment opportunities by investors (El-Wassal, 2013; Moser, 2003).

As the US market plays an important role in stimulating of *SMD* for ASEAN – 5, several initiatives were undertaking by governments to ensure the sustainability of the stock market in this region. For instance, Malaysia and Singapore joined the Trans – Pacific Partnership (TPP). This agreement was an initiative to seek for a market expansion and fostering market integration among the members particularly the developed market likes the US. Besides, Singapore has participated in the TPP negotiations, the regional trade agreement is also considered. Moreover, the US is the largest foreign investors in Singapore reaching USD288 billion in 2015. Also, according to Tan (2012), local investors will look to Singapore as the signals whether the crises from Europe or US will affect the ASEAN stock market. This is because, Singapore is the only developed country particularly among the ASEAN – 5 which considered to have a strong and stable economic position. Therefore, if crises can affect Singapore, the other countries in ASEAN – 5 will also be affected.

Moreover, Malaysia has introduced a series of initiatives including Economic Transformation Program (ETP) which focuses on the measurements to enhance their investment particularly in the stock market. Another initiative is the Government Transformation Program (GTP) which focus on the governance of the country which

include the aims to reduce corruption and improving trading infrastructures for investors. Through these initiative, it would attract more foreign investors to trade into Malaysia's stock market. Moreover, the Bursa Malaysia Central Depository System (CDS) for stocks and bonds introduced since 1991 makes the physical possession of the certificates became unnecessary. As all shares traded should be deposited into CDS, short selling of the stocks is prohibited. As the short selling is prohibited, the risk for uninformed traders will be reduced which then boost the confidence of new investors to trade into stock market in Malaysia.

Meanwhile, the efforts of strengthening the relationship with US implemented by Government of Indonesia was worth. The comprehensive Partnership Agreement (CPA) which signed by both countries would be a signal of a new era bilateral cooperation. This initiative includes a range of issues which would tightened the US – Indonesia cooperation including the economic interaction, trading and investment. Also, the Trade – Related investment Measures (TRIMS) introduced by Government of Indonesia in 1998 states that the government should provide an equal treatment for both domestic and foreign investors in a trading activity. This rule would encourage more foreign investors particularly from US to trade into the Indonesia stock market.

While in Thailand, foreign investments are welcomed and they try to avoid the dependency on any specific country as a source of investment. The Foreign Business Act (FBA) of 1999 continues to be used in governing most of the investment activities particularly by foreign investors. Meanwhile, the US – Thailand Treaty of Amity and Economic Relations

(AER) governed in 1833 allows the US citizens, business which collaborate with US and majority – owned by US companies which operated in Thailand to engage into business likes any other local companies which also exempts them from the restriction stated in FBA. Moreover, in term of stock market, a regulatory framework was maintained to encourage more foreign investment and avoids market – distorting for specific sectors. Thai government also encouraged portfolio investment and ensuring a sufficient liquidity. Besides, foreign investors are also allowed to borrow from the local financial institutions, but through some regulations, in order to balance the proportion of local and foreign investors in the stock market.

In the Philippines, foreign ownership restrictions, high transaction cost, poor infrastructure and corruption are among the significant concerns for foreign investors. Due to these reasons, the Philippines is lagging behind her counterparts in attracting foreign investment. Thus, the Philippines has liberalized their banking laws in stimulating investment. As a result, more investors become more attractive to invest into stock market as the availability of investment funds increased.

Besides the contagion effects, another interesting result found from this analysis is regarding the *LIQ*. As the REM shows that *LIQ* was generally significant in defining *SMD* for Malaysia and Thailand. Also,

### 4.5.3 Diagnostic Test

This section reports on the overall goodness of the model. In the first part, the coefficient of determination ( $R^2$ ), adjusted  $R^2$  and probability of  $F$  – statistic are explained. Subsequently, the Wald test is used to confirm that SUR is more efficient than separate model for estimation. Results are reported in Table 4.11.

Table 4.11  
*Diagnostic Test for Seemingly Unrelated Regression Estimation*

| Diagnostic Test    | Value |
|--------------------|-------|
| $R^2$              | 0.96  |
| Adjusted $R^2$     | 0.94  |
| S.E. of regression | 1.19  |
| F-statistic        | 47.26 |
| Prob(F-statistic)  | 0.00* |

On the overall goodness of the model, 94 percent of the variation in the *SMD* of the ASEAN-5's for the 1990 – 2014 period can be explained by explanatory variables within the SUR models. Also, the  $F$ -statistic value of 47.26 percent indicates that, at the five percent significance level, there is a strong evidence of the joint statistical influence between the variables in the model.

The last stage for SUR analysis is Wald test is reported in Table 4.12 This test is used to confirm that SUR is more efficient than separate model. Based on the results, the  $F$  – statistic and Chi – square values signify that at five percent confidence level, null hypotheses of equal coefficient for  $LIQ$ ,  $MRI$ ,  $MRI_{US}$  and  $MRI * MRI_{US}$  are rejected. Therefore, *SUR* model is more efficient than separate models.

Table 4.12

*Wald Test for Seemingly Unrelated Regression Models*

| Test Statistic | Value  | df       | p - value |
|----------------|--------|----------|-----------|
| F-statistic    | 8.94   | (20, 85) | 0.00*     |
| $\chi^2$       | 178.79 | 20       | 0.03*     |

Based on the F – statistic and  $\chi^2$  values, the null hypothesis is rejected at five percent confidence level. Thus, the coefficients for each variable are not equal across countries and SUR is more appropriate to be applied than OLS.

#### 4.6 Conclusion

This chapter discusses on the results of the estimation models. First, the descriptive statistics of the dataset was described which includes the mean, minimum, maximum, standard deviation and coefficient of variation. In the second part, the correlation analysis was conducted. Results from correlation analyses also convinced that there is a contagion effects from US stock market to ASEAN – 5 stock markets. Subsequently, by using the traditional panel analysis, results indicate that the estimation using REM is more appropriate. Also, results demonstrate that  $LIQ$  are significantly affect the  $SMD$  in ASEAN – 5. In the last part of the analyses, the SUR models were applied. Results suggested that  $MRI$  for all countries are statistically significant in determining the changes of  $SMD$  in the ASEAN – 5 which were affected by the  $MRI_{US}$  through interaction terms. Meanwhile,  $MRI_{US}$  are have significantly contribute to the changes in  $SMD$  of Malaysia, Thailand and Singapore directly.

## CHAPTER 5

### CONCLUSION AND POLICY RECOMMENDATION

#### 5.0 Introduction

This chapter summarize and conclude the overall study. Specifically, this chapter is divided into six main sections. In Section 5.1, the summary of finding is provided followed by policy implication in Section 5.2. Then, Section 5.3 describes the limitations of the study. Whereas, the recommendations for future research are provided in Section 5.4. Subsequently, this chapter is closed by conclusion in section 5.5.

#### 5.1 Summary of Findings

This section provides summary of overall findings for this study. The first objective of this study is to identify the difference of *SMD* before and after the AFC for ASEAN – 5 countries. By using mean comparison analysis, results show that the *SMD* are vary across the ASEAN – 5 countries. Specifically, these results indicate that the mean of *SMD* between pre – and post – crisis period for Malaysia, Thailand and Singapore are significantly different. On the other hand, the mean of *SMD* between pre – and post – GFC for Malaysia and Singapore signify significant different at ten percent significance level. Both countries imply a reduction in the *SMD* after the GFC in 2008

The second objective of this study is to determine the effects of stock market liquidity on *SMD* of the ASEAN – 5. Traditional panel analyses comprise of PMG, FEM and REM were employed. Other determinants such as economic growth, saving, credit to private sectors, inflation rate, interest rate and dummy for pre – and post AFC period were included

in the models as the control variables. Using redundant fixed effects test and Hausman Test, results prove that REM is most efficient model to be used. Based on the REM estimation results, the coefficient value for stock market liquidity was found to be statistically significant at five percent confidence level. On the overall goodness of the model, adjusted R – squared indicates that 71 percent of the variation in the *SMD* of ASEAN – 5 can be explained by explanatory variables within the REM. Additionally, the probability of *F*-statistic indicates that, at the five percent significance level, there is a strong evidence of the joint statistical influence between the variables in the model.

The last objective of this study is to identify the contagion effects from the US stock market to ASEAN – 5 stock markets. The correlation analysis for pre – and post AFC period signify that there is a contagion effects constituted for Malaysia, Thailand and Singapore. Meanwhile, Indonesia and the Philippine only constitute an interdependence with the US stock market. Meanwhile for the GFC effect, Malaysia, the Philippines and Singapore constituted contagion while Indonesia and Thailand constituted an interdependence.

Further analysis was conducted by using SUR estimation models. positive coefficient values of *MRI*s signify that any increase of one point in  $MRI_{US}$  would further stimulate the *SMD*. Also, the effects of  $MRI_{US}$  to *SMD* can be empirically observed in Malaysia and Singapore and Thailand. Although there are insignificant effects of  $MRI_{US}$  to Indonesia and the Philippines, the contagion can also affect the *SMD* through considering the interaction term.

## 5.2 Policy Implication

There are some policy implications raised through the findings in this study. It could be used as the reinforcement grounded through the empirical explanation pertaining to the impacts of liquidity and contagion on the *SMD* in the ASEAN – 5.

Concerning on the first objective of this study, the financial crises could affect the *SMD* across the countries in ASEAN – 5. Therefore, this study proposes some initiatives such as financial institutions reformation, bilateral banking integration, financial support mechanism and revision on crisis management frameworks.

In term of financial institutions reformations, financial institutions in ASEAN – 5 are suggested to fulfil its core function in the economic system which also stimulate the performance of stock market. Specifically, financial institutions should utilize the customers' liquid deposit and transform it into a reasonable long – term financing for firms as banking sector for these countries as amount of deposit by the nations are relatively higher than the other counterparts. Based on this initiative, more fund will be available for the firms to invest into the capital market particularly stock market. Also, financial institutions will indirectly act as intermediaries and market makers in the stock market. Besides, financial institutions can become the policy tools for governments in implementing any economic policies. For instance, they can expand the lending into favoured sectors based on the government plans. Within this transformation, financial institutions should form a well – regulatory framework, insured deposits and access to central bank fund to provide a greater low -cost fund for investors. Subsequently, easy

access to investment fund by investors will attract more investors into a stock market. As a result, more investor will be attracted to acquire investment fund which encourage them to invest into stock market.

Furthermore, to ensure the sustainability and resiliency of the financial institutions against financial crises. A bilateral banking integration framework can be formed. A new era specialization particularly for corporate customers can be connected through a network of integration as part of financial reshaping. Through banking integration, all financial institutions in the ASEAN – 5 countries can provide banking and financial services to the other ASEAN – 5 members by removing the limitation or restriction of market access. Given this, firms will have better access to financing as lending capacity of banks are improved, better scope of activities and stronger capital. Moreover, banking integration can contribute to both economic and financial inclusion as quality of services can be improved which in turn will spur more trade and investment in this region. Besides, modern technologies can be used by the regional banks to reach out wider segment of population.

Moreover, a financial support mechanism should be constructed in helping the affected ASEAN – 5 members due to any external shocks. For instance, significant financial aids from richer or unaffected countries could enhance the economies for the affected countries and boosting their economic up. In this regard, greater economic among ASEAN – 5 countries like Singapore and Malaysia can provide the Financial aid through a short – term financing to any members which experience a balance of payment difficulty. This is because, source of fund through depositors in the financial institution for Singapore and

Malaysia are relatively high compared to the other ASEAN – 5 members. This initiative was also implemented by the European Union (EU) in the form of structural fund for the new members from the former Eastern Union. Another example of structural fund in the EU include the European Regional Development Fund (ERDF), The European Social Fund, (ESF) and Cohesion Fund. Consequently, the cooperation between the countries in the region could be enhance as they are moving towards an integrated economy and this supportive mechanism could ensure an intimacy development among the ASEAN members.

Additionally, crisis management framework also play an important role for a country in handling external crisis. Particularly Indonesia, Thailand and Singapore, crisis management is needed as development coherent strategies for a country as these countries are more vulnerable to the contagion effects. The roles of legislative bodies, non – bank regulators such as securities commission and insurance companies should be strengthening to ensure the financial system stability.

Generally, ASEAN – 5 can take the action like EU through the formation of Economic and Financial Affairs Council (ECOFIN) in 2010. The ECOFIN played as policy maker which enhance the regulatory framework, improving the systematic risk mechanism to bear with the net cost of financial crisis and constructing better coordination framework in handling crisis. Specifically, the framework must address the clear power in prohibiting dividend payment, additional reporting requirement and replacement of the management bodies for insolvent institution. Also, political leader of a country must send unambiguous warning

which any dishonesty will no longer tolerated. These steps could be taken before the institution face a severe problem with the aim of returning the normal state of health for the institution or banks in the post – crisis period which then restore the investors' confidence.

As the second objective of this study is concerned, stock market liquidity is a worth factor to be considered in promoting the development of the stock market in ASEAN – 5. Thus, this study suggested several approaches towards this aim. Such initiatives include the encourage long – term investment, lowering the investment costs and corporate governance reformation.

To attract more foreign investors, listed firms in ASEAN – 5 stock markets should endeavour to make their stock attractive to investors. A good prospect firm will be considered by investors as a hedge for long – term investment. In this regard, firms listed in ASEAN – 5 stock market must invest into a project which provide a long – term return for the firm and investors. Once this superior prospect is realized by investors, it will attract more investors which aim to diversify their portfolio and hedge against risk of inflation which then affect their real rate of return.

Another initiative is related to investment costs mainly tax and financing costs. As for the tax costs, specifically the Philippines, government should consider a tax exemption especially for corporate investors as the tax cost are relatively higher than the other ASEAN – 5 members. This upfront exemption could bring more local retail investors into the stock

market. Another cost is related to the financing costs. Government and central banks of Indonesia, Malaysia and Thailand should provide more financial support and lowering the borrowing costs particularly for institutional investors. As a result, increase in investment fund availability will entice for more investors' consideration to make stock market as one of their source of capital gain.

The third initiative proposed pertaining to the impact of stock market liquidity to *SMD* is the stock market corporate governance. It is related to the managerial and prosecution of legal case regarding trading activities in a stock market. Specifically, the operational framework which include regular disclosure of the stock traded, transparency and enforcement form and supervision of the operation in the ASEAN – 5 stock market should be frequently revised. In term of disclosure, relevant information regarding transaction, financial record and identity of stocks ownership must be simple and support the legal and accounting system of a stock market. Particularly for Singapore, the enforcement of a legal prosecution should be quick, simple and supportive to the traders. Meanwhile, in term of trading procedure, the regulation related to the listing requirement should be simplified. The elements such as the time required for issuance approval process should be shortened.

The third findings in this study suggested that ASEAN – 5 stock market are not isolated from the effects of contagion particularly from the US market. Therefore, any changes in the US economy and stock market such as monetary policy, international regulatory framework and volatility of the stock prices can provide a signal of contagion effect to ASEAN – 5 specifically for Indonesia, Thailand, and Singapore. Under these

circumstances, this study proposes that the policymakers in these countries should focus on preparing prudential initiatives to protect the domestic and regional stock market against contagion effects. Such initiatives include macroeconomic policies responses, trade openness and the inspiration towards an integrated stock market.

During a stable period, policy makers should create a macroeconomic policy which could adapt any crisis or adverse shock. Explicitly, Thailand, Indonesia and Malaysia should have lower public debt and have more room for aggressive countercyclical fiscal policy which can respond to the global financial crisis. A pre – emptive macroeconomic policy can considerably reduce the effect of major shock. Consequently, a well – countercyclical tool will ensure a sustainable economic and stock market development of a country besides enhancing investors' confidence.

In addition, the Philippines and Singapore can derive a significant benefit from openness for foreign capital but the dependencies on certain form of capital particularly short -term external debt should be avoided. The dependencies upon external debt especially from foreign banks can create additional source of exposure to a country from financial crisis. Instead, central bank and government of these countries should increase saving rate which then accelerate deposit into bank like Indonesia. Thus, the dependencies on foreign debt can be reduce as the utilization of domestic source of fund is concerned.

Finally, in strengthening the resiliency, this study supports the inspiration toward an integrated stock market among ASEAN countries. Individually, ASEAN – 5 stock market are relatively small which have limited range of financial products and services. Therefore, the collaboration of all ASEAN countries would promote a bigger market and could promote ASEAN – 5 stock market as market of choice. Also, an integrated stock market would promote for a greater cross –border access which allow a broader range of products for investors. Thereby, the domestic stock market could be strengthened and promote better liquidity position. As a result, it would ultimately stimulate ASEAN – 5’s stock markets as competitive stock market relative to the developed capital markets.

### **5.3 Limitations of the Study**

Like the other studies, this study also bears several limitations. Firstly, limited time span covered due to the data availability. In achieving the stated objectives, this study only covered the yearly observations from 1990 – 2014. Higher frequency data is expected to provide more reliable results especially for the measurement of stock market liquidity. The time series properties are also overlooked due to this limitation.

Secondly, as the other ASEAN countries are emerging, the accessibility of the stock market data for all countries in ASEAN are very limited. This limitation results to the ignorance of the overall ASEAN stock market outlook. Also, as ASEAN stock market are proposed to be integrated, this limitation would restrict the assessment on the overall ASEAN countries over a long – time span which might be useful for the prospect international investors.

Finally, limitation identified in this study is the measurement of stock market liquidity. As previous study suggested that there are four dimensions of stock market liquidity measurement which are tightness, immediacy, depth and breadth. However, due data availability constraint, this study can only access the breadth and depth dimensions by using the trading volume to represent the stock market liquidity in the ASEAN – 5. Therefore, the other dimensions of stock market liquidity are overlooked for this study. Thus, the overall dimension of stock market liquidity in the ASEAN – 5 became limited be discussed.

#### **5.4 Recommendations for Future Research**

Studies regarding the effects of stock market liquidity and contagion on *SMD* are scant particularly in the emerging market. Generally, this study propose that further research could cover on the time series data, all ASEAN countries and other emerging markets. Also, the other measurements used particularly to measure stock market liquidity should be concerned which enable to elaborate the overall position of stock market liquidity. The subsequent paragraph would explain specific recommendation for future studies.

As the impact of the stock market liquidity on *SMD* is among the main concern for this study, higher frequency data are recommended. By utilizing the longer period data, time series analysis on the determinants of the *SMD* in the ASEAN – 5 could be accessed. Also, as this study also focus on the different between pre – and post – crisis period, a wider data spectrum would allow for more accurate and reliable outcomes.

Secondly, this study encourages further study on the *SMD* for all ASEAN countries which allow for the assessment of the overall ASEAN region. Concurrently, it would be an opportunity for the policy makers in determining the superlative policies which meet the expectation as a preferred hub of investment among the emerging markets for the prospect investors. Moreover, a comparative study with the other emerging market will be worth to provide a significance evidence regarding the position of ASEAN stock market relative to the other emerging market around the world.

Finally, this study suggests that the future study can utilize the data which can explain the other dimension of stock market liquidity and its impacts on the *SMD*. The evaluation on different indicators could provide relatively different outcomes in explaining the effect of stock market liquidity of *SMD* particularly for the ASEAN – 5.

## **5.5 Conclusion**

In conclusion, this study provides the empirical evidences regarding the effects of stock market liquidity and contagion on the *SMD* in ASEAN – 5. Also, the differences of the *SMD* in ASEAN – 5 between pre – and post – crises periods are evaluated. Moreover, this study suggested that stock market liquidity can affects the variation of the *SMD* in the ASEAN – 5. Also, there is a contagion effects from the US were constituted in some of the ASEAN – 5 members. Based on the finding and analysis of this study, some policy implications, limitation of the study and recommendations for future research were disclosed.

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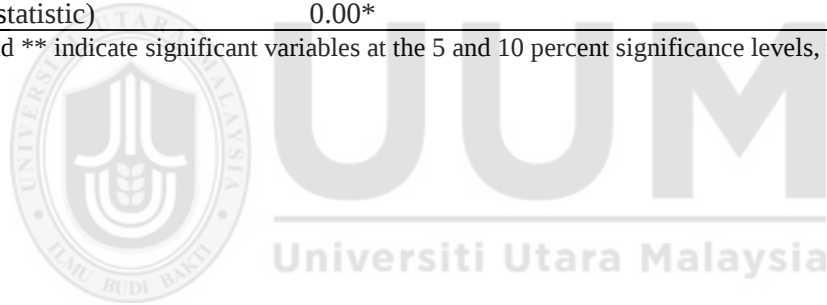
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## APPENDIX A

### *Pooled Mean Group Estimation Results*

| <b>Variable</b>        | <b>Coefficient</b> | <b>Std. Error</b> | <b>t-Statistic</b> | <b>Prob.</b> |
|------------------------|--------------------|-------------------|--------------------|--------------|
| <i>C</i>               | 63.96              | 17.66             | 3.62               | 0.00*        |
| <i>LIQ</i>             | 0.05               | 0.01              | 4.51               | 0.00*        |
| <i>GDP</i>             | -0.03              | 0.01              | -5.23              | 0.00*        |
| <i>INT</i>             | -2.98              | 1.09              | -2.73              | 0.01*        |
| <i>INF</i>             | -1.72              | 0.93              | -1.85              | 0.07**       |
| <i>SAV</i>             | 101.72             | 22.48             | 4.53               | 0.00*        |
| <i>CRT</i>             | 0.72               | 0.14              | 5.01               | 0.00*        |
| <i>DUM</i>             | -39.21             | 12.82             | -3.06              | 0.00*        |
| <b>Diagnostic Test</b> |                    |                   |                    |              |
| R-squared              | 0.57               |                   |                    |              |
| Adjusted R-squared     | 0.55               |                   |                    |              |
| S.E. of regression     | 49.81              |                   |                    |              |
| F-statistic            | 22.48              |                   |                    |              |
| Prob(F-statistic)      | 0.00*              |                   |                    |              |

Note: \* and \*\* indicate significant variables at the 5 and 10 percent significance levels, respectively.



## APPENDIX B

### *Fixed Effects Estimation Results*

| <b>Variable</b> | <b>Coefficient</b> | <b>Std. Error</b> | <b>t-Statistic</b> | <b>Prob.</b> |
|-----------------|--------------------|-------------------|--------------------|--------------|
| <i>C</i>        | 68.34              | 19.25             | 3.55               | 0.00*        |
| <i>LIQ</i>      | 0.34               | 0.09              | 3.85               | 0.00*        |
| <i>GDP</i>      | -0.01              | 0.01              | -1.78              | 0.08**       |
| <i>INT</i>      | -0.26              | 0.97              | -0.27              | 0.79         |
| <i>INF</i>      | 0.27               | 0.86              | 0.32               | 0.75         |
| <i>SAV</i>      | 57.57              | 23.75             | 2.42               | 0.02*        |
| <i>CRT</i>      | 0.22               | 0.23              | 0.98               | 0.33         |
| <i>DUM</i>      | -31.28             | 10.02             | -3.12              | 0.00*        |

### **Fixed Effects (Cross)**

|              |        |
|--------------|--------|
| <i>_M--C</i> | 62.05  |
| <i>_I--C</i> | -45.24 |
| <i>_T--C</i> | -39.18 |
| <i>_P--C</i> | -27.94 |
| <i>_S--C</i> | 50.31  |

### **Effects Specification**

|                    |       |
|--------------------|-------|
| R-squared          | 0.76  |
| Adjusted R-squared | 0.74  |
| F-statistic        | 33.08 |
| Prob(F-statistic)  | 0.00  |

Note: \* and \*\* indicate significant variables at the 5 and 10 percent significance levels, respectively.