



Faculty of Economics and Business

The Convergence of Banking Efficiency in ASEAN-5 Banking

Mohamad Hafiz Bin A. Aziz

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The Convergence of Banking Efficiency in ASEAN-5 Banking

Mohamad Hafiz Bin A. Aziz

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DECLARATION

I declare that the work of this thesis was carried out in accordance with the regulations of Universiti Malaysia Sarawak. It is original and is the result of my work, unless otherwise indicated or acknowledgement as reference work. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Name : Mohamad Hafiz Bin A. Aziz

Matric Number : 14020117

Thesis Title : The Convergence of Banking Efficiency in ASEAN-5 Banking

Signature :

Date :

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ABSTRACT

The convergence hypothesis, which is developed in the context of commercial banking in ASEAN-5 countries and has been applied in this study. Apart from that, Phillips and Sul convergence test is a nonlinear model which contains time varying components. Therefore, this nonlinear model is very crucial as it investigates the possible convergence or divergence over time of commercial banks in ASEAN-5 in terms of efficiency performance and observes the heterogeneous transition paths across countries commercial banks. From this study, results on the research indicate that commercial banks from Indonesia are converging among themselves. Indonesian government intervention to aid its banking sector leads to increment in efficiency. As a result, the banking sector in Indonesia becomes more resilience to another financial shock in 2008 and makes the commercial banks efficiency and performances sustainable. Another observation from this study implies that ASEAN-5 commercial banks tend to converge together. From the results, commercial banks from Malaysia and Singapore are converging towards the same efficiency path. Commercial banks from Philippines and Thailand are also converging under the same efficiency performance. All in all, it is crucial to see the efficiency performance of commercial banks in ASEAN-5 economies whether they are converging or diverging towards a common path. This is because it allows for these countries namely Malaysia, Singapore, Indonesia, Thailand and Philippines to take a similar action to any economic and financial shock to avoid the action of ones' country from jeopardizing stability of banking sector in other ASEAN countries.

Keywords: ASEAN-5, convergence, banking sector, Non-linear Factor Model

Penumpuan Kecekapan Perbankan dalam Perbankan ASEAN-5

ABSTRAK

Hipotesis konvergensi, yang dikembangkan dalam konteks perbankan komersial di negara-negara ASEAN-5 dan telah digunakan dalam kajian ini. Ujian penumpuan Phillips dan Sul merupakan model linear yang mengandungi tempoh masa yang berbeza komponen. Model ini penting bagi menyiasat penumpuan atau perbezaan yang mungkin dari masa ke masa mengikut bank perdagangan dalam ASEAN-5 dari segi prestasi kecekapan dan memerhati laluan peralihan heterogen bank perdagangan seluruh negara. Keputusan kajian menunjukkan bahawa bank-bank komersial dari Indonesia adalah tertumpu di antara mereka dan campur tangan dari kerajaan Indonesia untuk membantu sektor perbankan membawa kearah kenaikan dalam kecekapan. Hasilnya, sektor perbankan di Indonesia menjadi lebih berdaya tahan untuk satu lagi kejutan kewangan iaitu pada tahun 2008 dan mampu membuat kecekapan bank perdagangan serta prestasi yang mampan. Kajian ini menunjukkan bahawa bank perdagangan ASEAN-5 cenderung untuk berkumpul bersama-sama. Bank perdagangan dari Malaysia dan Singapura menumpu ke arah jalan kecekapan yang sama. Bank perdagangan dari Filipina dan Thailand juga tertumpu di bawah prestasi kecekapan yang sama. Sehubungan itu, ia adalah penting untuk melihat prestasi kecekapan bank perdagangan di negara-negara ASEAN-5 sama ada mereka menumpu atau mencapai ke arah jalan yang sama. Ini kerana ia membolehkan negara-negara iaitu Malaysia, Singapura, Indonesia, Thailand dan Filipina untuk mengambil tindakan yang sama dengan apa-apa kejutan ekonomi dan kewangan untuk mengelakkan tindakan negara dari menjejaskan kestabilan sektor perbankan di negara-negara ASEAN yang lain.

Kata kunci: ASEAN-5, penumpuan, sektor perbankan, Model Faktor tidak-linear

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CHAPTER 1

INTRODUCTION

1.1 Introduction

A bank is recognized as financial institution licensed to receive deposits and make loans. It also provides financial services, such as wealth management, currency exchange and safe deposit boxes. The importance of the banking sector is promised claiming banks are the main channel of savings and allocations of credit in an economy (Levine, (1997); Dell' Ariccia and Marquez, (2004)). The banking sector provides important financial intermediation function by converting deposits into productive investments, King and Levine (1993a, 1993b). According to Arun and Turner (2004) stated that in other developed nations, financial markets and banking sector works in unison to channel funds, meanwhile in developing countries, financial markets are undersized and sometimes completely absent.

1.2 Banking in Asia

According to Sufian (2010) explain in other developing economies, the banking system plays an important financial intermediary role as in the Malaysian economy. The banking sector controls most of the financial flows and accounts for more than 70 percent of the financial system's total assets. Therefore, it is reasonable to expect that an efficient and profitable banking sector may help ensure an effective financial system which is conducive to economic growth and development.

The financial systems of Indonesia, Singapore, Malaysia, Philippines and Thailand have long been dominated by commercial banks. In all countries, the commercial banking sector is dominated by a few large domestic commercial banks with extensive branch networks.

Foreign banks, which are often disadvantaged by many restrictions, account for a relatively small amount of bank assets and mostly provide trade finance to multinational firms. Other large groups of financial institutions are the finance companies in Malaysia and Thailand, and the merchant banks in Korea.

Finance companies and merchant banks faced more restrictions and engaged in different activities than commercial banks. Thai finance companies, for example, were not allowed to mobilize demand or time deposits, but were only permitted to issue fixed-term promissory notes and certificates of deposits to fund their businesses. In view of these restrictions, Thai finance companies could not effectively compete for most of the commercial bank mainstream business and were largely left to engage in riskier activities. Commercial banks had more freedom to choose their business mix and faced similar restrictions across countries. For the above reasons, we exclude finance companies and merchant banks from our analysis and focus only on commercial banks.

The local commercial banks in all five East Asian countries were originally set up by the State, a handful of families who controlled large enterprises (such as rice farms in the case of Thailand), or by trading houses. Despite attempts by the government to diversify the ownership of the local commercial banks, Indonesian and Thai commercial banks are still dominated by a handful of families. All the banks have powerful connections with the local and international business community and with the government.

In Korea, the largest banks are typically connected to a large conglomerate, the so-called *chaebol*, by acting as the main bank. The State is involved in the commercial banks through ownership of large savings banks that are important for channelling private savings to investment projects.

All five East Asian financial sectors had financial liberalization, a weak regulatory and supervisory framework, poor risk management and excessive lending in common. But there were differences in magnitudes and origins. In 1983, Indonesia started to liberalize its financial system after declining oil prices in 1982 and had led to a devaluation of the rupiah. The main financial sector reform was the dismantling of the credit ceiling system, which was imposed in the 1970s to control credit growth and money supply. The reform was directed to private banks only. For state banks, credit restrictions remained in place. In fact, Indonesian state banks had limits on their asset growth up to the crisis year 1997.

Montes *et al.* (1998) argued that the flexibility to extend credit led private banks to take on riskier projects, while state banks, hampered by cumbersome procedures in granting loans, were more successful in attracting deposits, as they owned large branch networks and were considered less risky by the public, who assumed an implied government guarantee. To foster competition, Indonesia introduced another financial reform package in 1988, which included the reduction of bank reserve requirements from 15 to 2 percent of assets and permitting public sector entities to place up to 50 percent of their deposits outside state banks.

Montes *et al.* (1998) reported that the introduction of these measures led to an explosive growth of new banks from 124 in 1988 to 244 in 1994. The increased competition, subsequently, led most of Indonesia's large conglomerates to set up or acquire at least one bank. As in the other countries, financial liberalization sparked a lending boom in Indonesia, with large exposures to the property development sector. Since the private banks showed the largest growth of loans during the 1990s and had significant cross-ownership links with other financial institutions and conglomerates, Montes *et al.* (1998) argues that they did not necessarily fare better in terms of their loan performance than did state-owned banks. In Thailand, financial liberalization in 1992 enabled commercial banks to borrow more freely

in foreign currencies from abroad, which subsequently led to substantial borrowing from abroad and a high level of investments. Lauridsen (1998) reported that during the 1990-96 periods, the investment ratio was over 40 percent and that by August 1997 the foreign debt was about US\$ 90 billion, of which US\$ 20 billion was due by the end of 1997. The massive inflow of money caused a misallocation of investment resources and a boom-bust cycle involving property and stock markets. Lauridsen (1998) reported that loans from financial institutions to property developers tripled during the period 1992-1996 causing inflated assets in the real estate sector. Not only had the Thai commercial banks contributed to the lending boom, but the 91 Thai finance companies as well.

In Malaysia, major companies borrowed heavily from abroad as well, at least until 1994 when restrictions on foreign borrowing were put into place. However, compared to Thailand and Indonesia, a lower share of foreign borrowing was of a short-term nature and a higher proportion was hedged. But as in the other countries, Malaysia also seems to have misallocated investments. According to Jomo (1998), in the period 1992-96 more than 70 percent of bank lending in Malaysia has not been for investments in manufacturing, agriculture or mining, but for other purposes, most notably real property and share purchases.

The story of the Philippines slightly differs, since the Philippines entered the 1990s with an economic recession, while the other four countries seemed to fare well under export-led growth. The Philippine financial system has been small compared to the other four East Asian countries, because high inflation has discouraged household savings. In 1992, the Philippines agreed to a debt restructuring program based on the Brady plan which converted loans into long-term bonds and started to liberalize its financial system by easing the entry of banks. Financial liberalization also allowed unchanged foreign borrowings, which, as Lim (1998) notes, was attractive because the central bank's policy of a stable currency made sure

that domestic interest rates were above foreign rates. Financial liberalization without sufficient prudential regulation and enforcement by the central bank also led in the Philippines to an over exposure to risky loans, especially real estate loans, foreign borrowings and consumer loans to high risk groups.

1.3 Banking Efficiency Performance

Berger and Mester (1997) discuss the investigation of bank efficiency is important from both microeconomic and macroeconomic. Banking sector serves as an important part in ASEAN economies. The efficiency of banking sector influences the cost of financial intermediation and the soundness of financial market. Thus, an improvement in the banking performance represents a better allocation of financial resources which results in higher private investments that favors economic growth. Various studies have been made by researchers in this respect. These dimensions are difficult to estimate. As previous test conducted by Wang (2012) tests income convergence within the ASEAN and APT region using the panel unit root approach and finds that the original ASEAN countries show income convergence within the period of 50 years while within the period of 22 years, only three-member countries of ASEAN (Malaysia, Myanmar, and the Philippines) are found to support the existence of convergence. Cristobal-Campoamor and Parcerro (2013) conduct through eastern Europe found out that first half of the period, liberalization leads to divergence of GDP per capita. However, the process reverses during the second half of the period. Therefore, an alternative approach is using data envelopment analysis (DEA) to fix this problem. DEA is a nonparametric method to measure the relative efficiency of a homogenous group of organizations (called decision making units, DMUs) that perform similar functions. Efficiency is an important attribute because all inputs are scarce. Thus, efficiency is one of the performance parameters that are theoretically underlies the whole performance of a

company. The ability to generate maximum output with existing input, a measure of expected performance. At the time of measurement of the efficiency, banks are faced with the challenges of how to get optimal output level with the level of the current input or use minimum input level with a given level of output (Hadad *et al.*, 2003).

1.4 Background of Study

International structure had undergone a vast change throughout end of World War II, whereby according D.P Calleo (1996) stated the international structure was dominated by superpowers with a system called bipolar. This development of international system had affected other countries, as well as countries in Southeast Asia. Southeast Asian (SEA) countries constantly conform to current demands to ensure national security due to influenced by superpowers stratagem and competition in international level. According Mohammed Ayoob (1995), in the 1950s and 1960s a good number of SEA countries were newly 'born' after achieving independence from colonization. Due to the SEA countries were very young, these countries faced tremendous internal political instability, ethnic conflict, unity problem and weak security and defense system. According K.R Singh (1987), the problem faced by SEA countries had alerted and motivated SEA to consider a formation of a state or regional organization that can be an alternative for regional peace foundation. In the end 1950s and 1960s, the Southeast Asia region comprises of very young countries in terms of national development or nation building. The study mainly focuses on ASEAN-5 member's country. The Association of Southeast Asian Nations or ASEAN was established on 8th August 1967 in Bangkok, Thailand. According to Ghazali Shafie (2002), the concept of establishment is open to create friendship with every country in the world regardless of political ideology so that peace and security in this region Is further guaranteed. ASEAN consist of 10th country, namely Indonesia, Malaysia, Philippines, Singapore, Thailand,

Brunei Darussalam, Vietnam, Laos PDR, Myanmar and Cambodia. These starts with the signing of the ASEAN Declaration, also known as the Bangkok Declaration by foreign ministers of Indonesia, Malaysia, Philippines, Singapore and Thailand. ASEAN members keep increasing which included Brunei (joined in 1984), Vietnam (joined in 1995), Laos and Myanmar (both joined in 1997) and Cambodia (joined in 1999).



Figure 1: Map of Southeast Asia (ASEAN)
Source : <https://i2.wp.com/von.gov.ng/wp-content/uploads/2017/06/ASEAN.jpg?resize=500%2C375&ssl=1>

Figure 1 shows the map of ASEAN which consists of ten-member countries. The initial objective of establishment of ASEAN is aimed to accelerate the economic growth, social progress and development in the region and joining together to strengthen the foundation for a prosperous and peaceful community of Southeast Asian Nations. Secondly, ASEAN aims to promote regional peace and stability through rule of law in the relationship among countries members. ASEAN also promote collaboration and mutual assistance between member's country on matters of common interest in economic, social, cultural, technical, scientific and administrative fields. Thus, their aim is to maintain close and beneficial

cooperation with existing international and regional organizations and to explore all avenues for closer cooperation among themselves.

Aslanyan *et al.* (2002) said that there are two key economic characteristics of ASEAN countries. First, most pursue policies of export-oriented growth directed toward markets outside the region. Second, the economies of ASEAN countries tend to be stratified between the relatively high-performing countries (Indonesia, Malaysia, Philippines, Singapore and Thailand) and the low-performing economies of a country (Brunei, Cambodia, Laos, Myanmar and Vietnam).

However, in these study, ASEAN-5 which include; Malaysia, Thailand, Singapore, Indonesia & Philippines were selected due to less study has been conducted within other ASEAN countries. Furthermore, the reason these countries had been chosen were due to their different economic status. The Asian Economic Community (AEC) known as “the realization of the end goal of economic integration” as envisaged in Vision 2020, declared in 1997. It is “a stable, prosperous and highly competitive ASEAN economic region in which there is a free flow of goods, services and investments, a freer flow of capital, equitable economic development and reduced poverty and socio-economic disparities.” Therefore, to establishing the AEC and make it realization, ASEAN has agreed to adopt “the principles of an open, outward-looking, inclusive, and market-driven economy consistent with multilateral rules as well as adherence to rules-based systems for effective compliance and implementation of economic commitments.”

1.4.1 ASEAN Banking Sector

ASEAN has taken a new step forward towards an integration which can be seen through banking market. ASEAN banking sector continues to be the high degree of government

evolvment in financial intermediation. Those interactions led to a specific outcome across the region which, collectively, may restrain market development. First interaction is based on reliance on rules-based approaches. These rules-based were focus on achieving compliance with these rules. Whereby excessive reliance on rules-based supervision often detracts from supervisors' using their own judgment. Secondly is on limited supervisory independence. It can be elaborated through the insufficient or ineffective corrective action frameworks due to supervisors are challenged in disciplining the state and its agents. The Malaysia FSAP points to the need to address existing legal provisions that can undermine the operational independence of supervisors.

These ASEAN 5 countries take a slow step to develop by opening their banking industry, cross-border banking and the cross-border penetration of ASEAN-based banks within ASEAN. Reference made to year 2010, non-ASEAN-based commercial bank had either a branch or a subsidiary in all ASEAN member country. However, three ASEAN banks known as Maybank, Bangkok Bank, and United Overseas Bank from ASEAN member comprising of Malaysia, Thailand and Singapore has an operation in seven ASEAN member countries.

In contrast, global commercial banks have a large presence in the region. For example, Standard Chartered Bank has subsidiaries in seven-member country and representative offices in three. Meanwhile Citibank and HSBC also have subsidiaries in seven-member country. Therefore, in-order to compete effectively, ASEAN banks must develop financial resources and managerial capacity which meet international standards and achieve similar levels of regional penetration. Liberalization alone will not achieve the intended result of banking integration since some ASEAN banks will still fall short of national regulatory standards compared with foreign banks. According to Dayang Affizah (2011) ASEAN continuous effort to foster closer political ties as well as to strengthen economic cooperation

are justified from its huge market opportunities, its democratic political belief (except Myanmar), and its closer proximity within the Southeast Asian region. In 1997, the ASEAN leaders adopted the “ASEAN Vision 2020” which envisaged a “concert of Southeast Asian nations, living in peace, stability and prosperity, bonded together in a partnership of dynamic development and in a community of caring societies” (ASEAN Secretariat, 2005; Economic Analytical Unit, 2006).

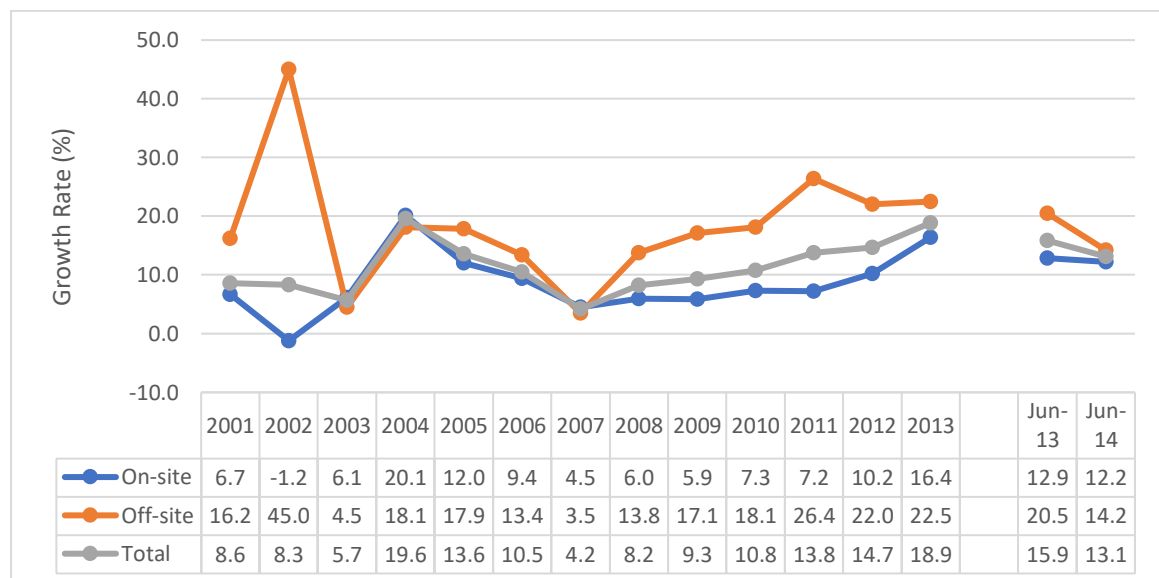


Figure 2: Banking System Comparative ATM Growth

The banking system continues to improve its performance by capitalizing on the use of various electronic banking (e-banking) channels to cater the needs of a diverse and increasingly sophisticated market. However automated teller machines (ATMs) remain a key e-banking platform.

According to Figure 2, system’s ATM network growth is slow and shrunk at the end-Jun 2014. Off-site ATMs, nonetheless, grew at a faster rate by 14.2 percent compared to on-site ATM’s growth of 12.2 percent year on year. Throughout the history of the Philippines financial system, it has shown the characteristics of a developing financial system, where the system has shown the periods of moderate to extreme financial repression, followed by the

cycles of reform and deregulation, periods of strong domestic credit growth, rise of moral hazard risks, and followed by severe crises and contraction in the supply of credit that usually leads to recessions. The Philippines has emerged as among the most resilient economies in the region, despite the generally difficult regional conditions due to the Asian financial crisis in 1997. In terms of wholesale funding for ASEAN-5 banking sector, referring to Figure 3, most of ASEAN-5 countries faces a slightly reduce in wholesale funding than recorded from previous years. However, Indonesia face increased reliance on wholesale funding.

Thus, the low global rates have benefited Asian bank profitability, potentially via the wholesale funding channel. This is also shown that some Asian banks appear to have tapped on cheaper wholesale funding to fund their loan growth.

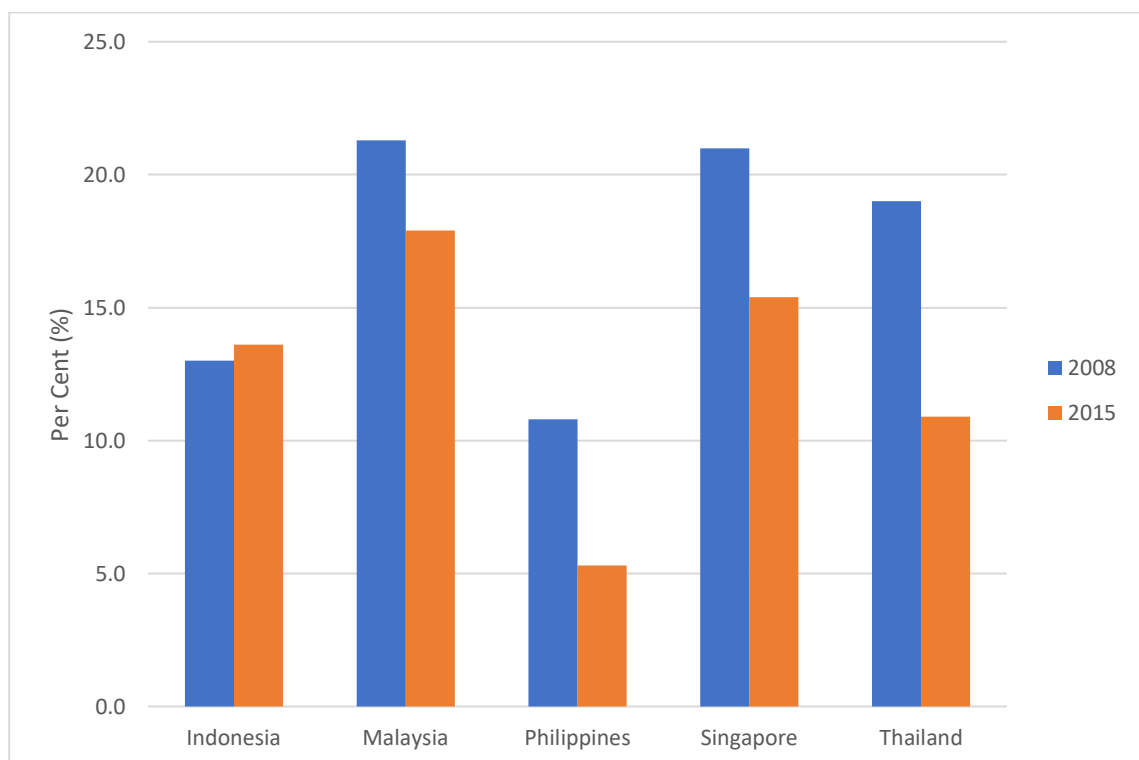


Figure 3: Share of Wholesale Funding Selected ASEAN-5 Economies

1.4.2 Malaysia

The Central Bank known as Bank Negara Malaysia is the main structure of the monetary and banking structure of the country. According to Central Bank of Malaysia Act 1958, their main objective is to issue currency and keep the reserves as to safeguarding the value of the currency. It also acts as a banker and financial adviser to the government. The bank is also responsible to promote monetary stability and a sound financial structure. Finally, it helps to promote reliability, efficiency and smooth operation of national payment and settlement systems. This is to ensure that the national policy and systems are directed to the advantage of Malaysia to influence the credit situation of the country. The Malaysian banking system can broadly be divided into the banking sector and non-banking financial intermediaries. These two groups differ from each other with respect to their activities.

Based on Table 1, the commercial banking sector dominates the Malaysian financial system's assets and liabilities, with total assets and liabilities amounting to RM1600.5 billion (\$462.6 billion). Out sizing non-banking intermediaries significantly, the banking sector accounts for approximately 70 percent of the banking system's total assets. In Malaysia, commercial banks are the main players in the banking sector and are the largest and most significant providers of funds.

A test has been attempted by Sufian and Habibullah (2012) on providing new empirical evidence on the efficiency of the Malaysian banking sector around the Asian financial crisis of 1997. The results indicated that the foreign banks have exhibited higher technical efficiency compared to the domestic bank counterparts. Legally, Malaysian commercial banks enjoy the widest scope of permissible activities and can engage in a full range of banking services. Despite controlling over 90 percent of the banking market in 1957, the

foreign commercial banks' market share declined markedly after the country's Independence in 1957 to only 15.3 percent of the banking system's assets in 1997.

Table 1: Assets of the Financial System: 1995 – 2008

Year	Commercial banks		Financial banks		Merchant banks	
	RM million	US\$ million	RM million	US\$ million	RM million	US\$ million
1995	295,460.0	116,322.8	91,892.0	36,177.9	27,062.0	10,654.3
1996	360,126.8	142,907.5	119,768.8	47,527.3	34,072.8	13,520.9
1997	480,248.1	126,381.1	152,386.8	40,101.8	44,300.0	11,657.9
1998	453,492.0	119,340.0	123,596.9	32,525.5	39,227.8	10,323.1
1999	482,738.3	127,036.4	116,438.0	30,641.6	39,184.0	10,311.6
2000	512,714.7	134,924.9	109,409.8	28,792.1	36,876.0	9,704.2
2001	529,735.5	139,924.9	121,811.1	32,055.6	41,025.2	10,796.1
2002	563,254.1	148,224.8	130,520.0	34,347.4	41,415.5	10,898.8
2003	629,975.3	165,782.9	141,911.0	37,345.0	44,103.6	11,606.2
2004	761,254.8	200,330.2	68,421.1	18,005.6	42,691.0	11,234.5
2005	745,357.7	197,184.6	-	-	128,371.5	33,960.7
2006	1,142,883.7	323,763.1	-	-	63,039.2	17,858.1
2007	1,447,540.5	437,323.4	-	-	85,586.6	25,857.0
2008	1,600,490.1	462,569.4	-	-	29,447.6	8,510.9

1.4.3 Thailand

The financial system of Thailand consists of the Bank of Thailand; 37 banks, including 32 commercial banks and six specialized banks owned by the government; 2,000 finance and securities companies; several governments owned or sponsored specialized institutions; and many small private and publicly owned institutions. Table 2 presents the structure of the financial system in terms of the number of financial institutions of Thailand as the end of 2015.

1.4.4 Singapore

Singapore has five local banks whereby two of the banks are subsidiaries of the three major local banks. Export trade flows for Singapore were \$751 billion, meanwhile imports \$672 billion. The Monetary Authority of Singapore (MAS) known as an organization that conducts regular assessments of Singapore's financial system. According to MAS, its main mission is to promote sustained non-inflationary economic growth, and a sound and progressive financial center. The MAS has been given powers to act as a banker to and financial agent of the Government. It's also been entrusted to promote monetary stability, and credit and exchange policies conducive to the growth of the economy. Various aspects of monetary policy operations have been provided through monograph. This describes the objectives of the Monetary Authority of Singapore (MAS) exchange rate based monetary policy and illustrates the MAS intervention operation. The Singapore government implements liberalize the banking sector, which was relatively sheltered from international competition before the financial crisis of 1997-98. According to Sufian *et al.* (2007), the implementation has contributed to the country's growing role as a financial center for a region and a destination of choice for global investors.

These banking sector has grown rapidly and operated innovatively in recent years, becoming one of the main engines of growth and sources of employment. The illustration of banking system inflows and outflows of Singapore banking as Figure 4.

Table 2: Number and Asset Size of Financial Institutions Thailand end of 2015

	Number	% of Total Assets of Financial Institutions
Depository Corporations	2,037	70.4
Commercial Banks	31	47.8
Specialized Financial Institutions	6	15.6
Savings Cooperatives and Credit Unions	1,960	6.3
Money, Market Mutual Funds	40	0.7
Non-Depository Corporations	6,983	29.6
Mutual Funds	1,374	10.1
Insurance Companies	86	8.1
Leasing Companies	769	2.0
Credit Card and Personal Loan Companies (including Nano Finance)	42	2.6
Provident Funds	412	2.4
Government Pension Fund	1	1.9
Asset Management Companies	36	0.8
Securities Companies	52	0.8
Agricultural Cooperatives	3,613	0.6
Pawn Shops	598	0.2

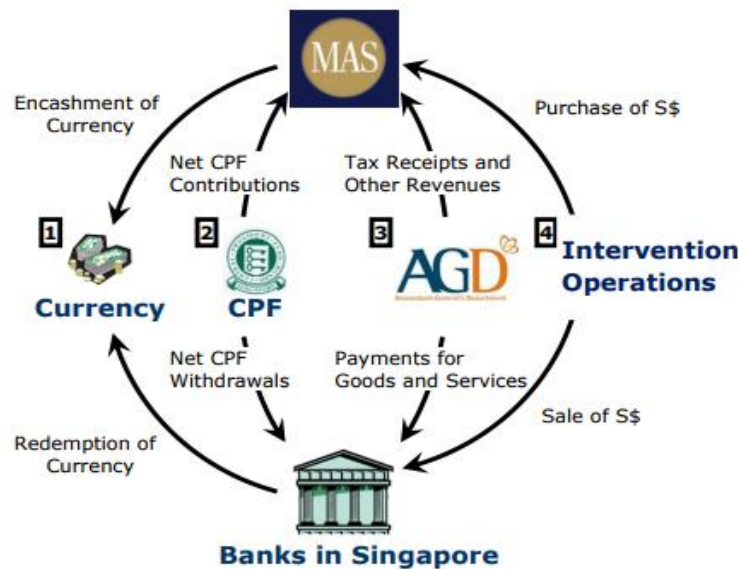


Figure 4: Schematic Illustration of Banking System Inflows and Outflows

It's been proven by previous study conduct by Lim and Chu (1998) and Chu and Lim (1998), throughout the same time, MAS behave as oligopolies by controlling activities of both domestic non-full-licensed banks such as restricted-licensed banks, finance companies and ACUs, and all foreign banks (fully-licensed and restricted-licensed) are restricted in their product and geographic activities. Historical performance of Singapore bank from 2007 to 2014 were seen in the Figure 5 which is APAC banks consist of 180 banks by assets of 13 (Australia, Hong Kong SAR, New Zealand, Singapore, South Korea, Taiwan, China, India, Indonesia, Malaysia, Philippines, Thailand, and Vietnam). APAC banks averaged 13% throughout Return on Equity (ROE). Prior to the crisis especially ASEAN Financial crisis, no APAC banks ranked in the top 10 banks globally. However, over year 2010 to 2014, Singapore gone through medium performance across markets. This could be seen through Figure 6.

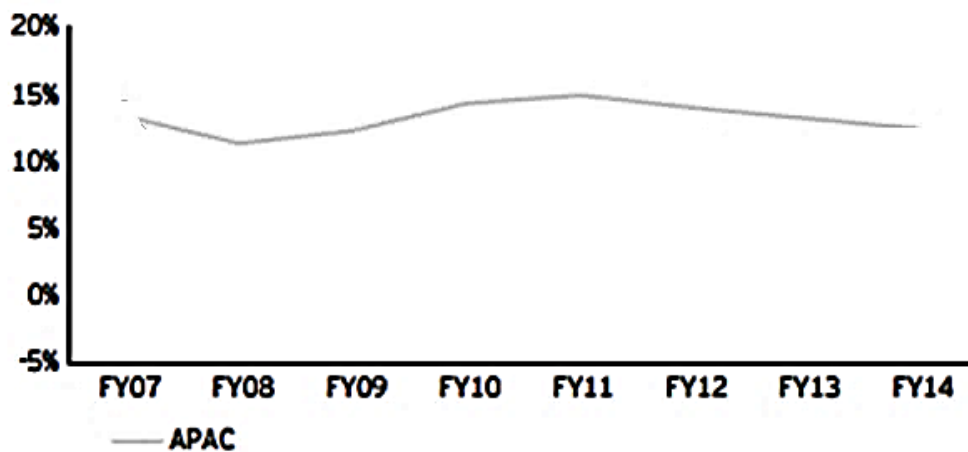


Figure 5: Average ROE

Figure 6 shows average five-year total shareholder returns from the year 2010 to 2014. Despite on many challenging economic performances throughout the year, Singapore maintain its total shareholder returns in a medium phase which around 40 percent of shareholder returns.

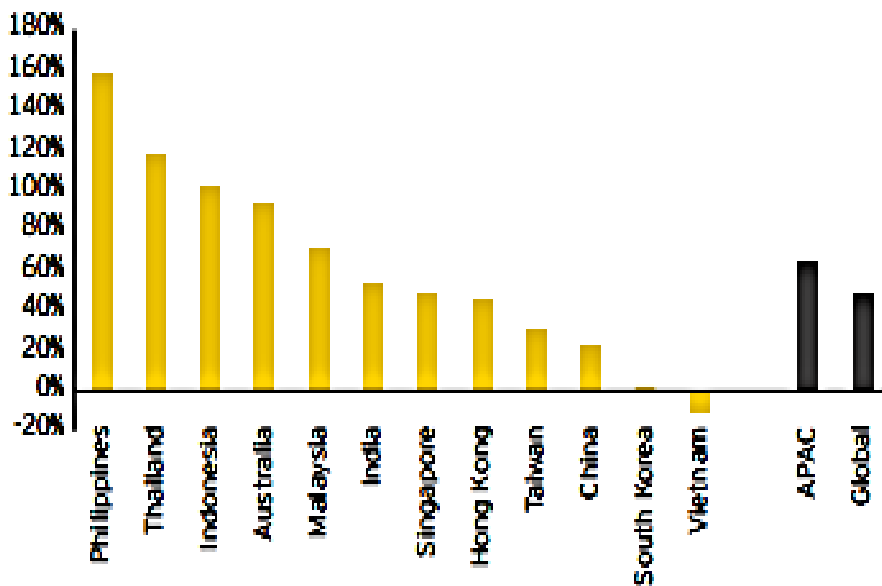


Figure 6: Average five-year Total Shareholder Returns 2010-14.

1.4.5 Philippines

The Philippines banking market consists of various types of banking institutions which include universal banks, commercial banks, thrift banks, rural banks and cooperative banks. The landscape remains streamlined on the back of continued industry mergers, consolidation and many small bank closures. As of end-June 2014 has shown that the number of financial institutions reached 27,999 (with additional 589 institutions from last year's 27,410). There is a total of 664 head offices of banking institutions with 9,456 branches or other offices operating in the Philippines. This is an ascending number as compared to the previous record, due to the option to consolidate or acquire other banks. All banking institutions in the Philippines are licensed under Bangko Sentral Ng Pilipinas (BSP), the central bank of the Philippines.

Table 3: Physical Composition of the Philippines Banking System

Period	All Banks	Universal and Commercial Banks	Thrift Banks	Rural and Cooperative Banks
End-June 2014				
Total	10,120	5,435	1,878	2,659
Head Office	664	36	70	558
Branches/Other Offices	9,456	5,547	1,808	2,101
End-June 2013				
Total	9,543	5,234	1,662	2,647
Head Office	683	36	70	577
Branches/Other Offices	8,860	5,198	1,592	2,070

Based on Table 3, the respective shares of banks categories in the Philippines have experienced a slight change as compared to the previous year. It is evident that the universal

and commercial banks accounted for the largest share (53.7 percent) of total network of the banking system. This shows that the universal and commercial banks have the widest customer outreach in the Philippines. However, rural and cooperative banks have the strongest foothold of the banking system where they accounted for 79.0 percent of total head office as of end-June 2014. In terms of average five-year total shareholder returns from year 2010 to 2014 in Figure 6. Despite on upside down of economy, Philippines achieve highest percentage around 160 percent of shareholder returns.

1.4.6 Indonesia

Indonesia has four state-owned banks dominate a banking sector. Export trade flows for Indonesia were \$294 billion meanwhile imports \$321 billion. Bank of Indonesia carries a three-fold responsibility as monetary authority and the regulatory and supervisory authority for the banking system and payment system. The Bank Indonesia responsibility to maintain financial system stability throughout five major roles. First, its responsible for safeguards monetary stability using interest rates in open market operations. It's also required establish a well-balanced monetary poly to prevent any disruption to monetary stability which could cause an immediate impact on all aspects of the economy. Therefore, to create monetary stability, Bank Indonesia has adopted a policy known as the inflation targeting framework.

Secondly, banking institutions in Indonesia need to be promoted through the supervisory and regulatory mechanism. This is due to any failure in the sector could lead to financial instability and disruption of the economy. To prevent the failure, it is essential to uphold an effective system for bank supervision and banking policy. Next, Bank Indonesia has taken step to mitigate the risk in the payment system by developing a specific regulatory framework and launched new mechanisms for payment system operation. One of these

mechanisms known as Real Time Gross Settlement. Fourth, Bank Indonesia role need to research and monitoring information on threats to financial stability. All the information generated by the monitoring system is used to produce recommendations to inform the decisions by relevant authorities on the most appropriate actions dealing with disturbances in the financial sector. Lastly, Bank Indonesia ensures all the financial system safety net under the central bank lender of last resort (LoLR). This support is extended only to banks faced with liquidity problems that could potentially trigger a systemic crisis. Referring to Figure 6 previously, terms of average shareholder returns year 2010 to 2014, Indonesia achieve at third place around 100 percent average shareholder returns.

1.5 Problem Statement

This study is concerned with an in-depth evaluation of relative efficiency and convergence of Asian Banking, which is further explored by the club convergence between member countries. The context of this study is ASEAN-5, which consist of Indonesia, Malaysia, Philippines, Thailand, and Singapore, whereby, according to previous study, there is less assessed within other Asian country thus limits our knowledge on efficiency and convergence impact between them. Furthermore, the reason these countries been chosen are due to the different economy status of those countries. As known, all these five countries (Singapore, Malaysia, Thailand, Indonesia and Philippines) are group into different income level. Singapore is a high-income country meanwhile Malaysia and Thailand group into upper-middle income country and finally Indonesia and Philippines were in lower-middle income country. The differences of income level could make the research much interesting to identify is it possible for these countries able to catch-up converging towards each other or vice versa thus the results gathered could be useful for government to implement a proper policy towards making AEC realization. In addition of that, there is less study conducted

toward these ASEAN-5 countries. Therefore, it is interesting to analyze performance financial institution of ASEAN especially ASEAN-5 due to ASEAN community is tied up with a different policy such as Asia-Pacific Economic Cooperation (APEC), ASEAN Free Trade Area (AFTA) and Association of Southeast Asian Nations (ASEAN). Consequently, cooperation of different country towards a uniform rules and regulation based on agreement of understanding bank performance affects firm growth, industrial expansions and economic development.

Therefore, research on the banking efficiency and effect of club convergence of ASEAN are important as it helps in policy implications in implementing suitable policies to achieve a unite growth of the economy. While there has been a rapidly growing research on the effects of banking efficiency in developed countries, less attention has been given so far to the effects of banking efficiency on convergence developing countries, such as in Indonesia, Malaysia, Philippines, Thailand and Singapore. Numerous research on efficiency and convergence have been done mostly on US, UK and the European countries. However, there is less research done on the efficiency and convergence performance of these ASEAN-5 countries.

Concerning these ASEAN-5 efficiencies and the different arguments from the previous literature, it will be very interesting to know whether the banks efficiency affects the convergence within member countries. As mentioned in previous paragraph study conducted by Wang (2012), Cristobal-Campoamor and Parcero (2013) one of the results of differences found out that first half of the period, liberalization leads to divergence of GDP per capita. However, the process reverses during the second half of the period. Therefore, the best method approach is using data envelopment analysis (DEA) to fix this problem. With the high degree of concentration in the ASEAN-5 banking sector, it is important to determine

the properties of efficiency that could lead towards converging between member countries. Therefore, this study will contribute to the literature of efficiency and convergence of ASEAN-5 banking which can be explained that banks can implement barriers to entry by increasing their customer ship, by switching costs for the customers. Thus, if obstacles remain, and no improvement of banking competition, it appears relevant to analyse the convergence of cost efficiency to assess the effective effect of banking integration on the behaviour of banks.

1.6 Objective of Study

1.6.1 The General Objective

The general objective of this study is to examine the efficiency and convergence in the ASEAN-5 banking. These ASEAN-5 countries are Singapore, Malaysia, Indonesia, Philippines, & Thailand. As the issue is concisely addressed, this study seeks to determine important attributes that affect the efficiency of ASEAN-5 banking thus capability of ASEAN-5 banking converge between each member. However, if these countries were unable to converge between each other's, there will be another action that could be made by identifying club convergence of ASEAN-5 to achieve the objectives, there will be two (2) methods being used which are Data Envelopment Analysis (DEA) and Nonlinear Time Varying Factor.

1.6.2 The Specific Objectives

The specific objectives are as follows:

- a) To measure the efficiency of ASEAN-5 bank
- b) To identify the efficiency properties of ASEAN-5 bank
- c) To identify convergence club of ASEAN-5 banking efficiency

1.7 Significance of Study

This study intends to determine whether the efficiency of ASEAN bank, especially ASEAN-5 country (Malaysia, Singapore, Thailand, Indonesia and Philippines) thus identify club convergence in ASEAN-5 banking. Thus, it could be explaining the properties of efficiency ASEAN-5 countries. In addition to that, this study significantly could determine convergence club of ASEAN-5 banking. The benefits obtained can be viewed from various perspectives. At the international and national level, concerns of achieving efficiency have become a major issue for banking institutions to maximize profits and minimize cost. With the efficiency of banking sector could lead to a rapid and sustainable development.

Given the juncture at which developing economies are currently poised, it is critical for policy makers, researchers and key stakeholders, in the fields of economic development, to delineate desirable growth trends to avert any potential threats (economic or environmental) and to plan for moving towards sustainable development.

The government benefits from this study as the government is committed to ensuring that society is adapting to the effects of efficiency of the banking sector. The government should play important role in determining the types of adaption strategies that can be adopted by individuals and businesses especially towards banking institutional. The government has also indicated that a review of the recent studies on what action need to be taken for ASEAN member countries convergence between each other and these will show that is it the ASEAN countries capable to cope with other ASEAN countries in terms of development progress towards banking sector. Therefore, this research can contribute to clear information the effect of efficiency of banking could influence the economic growth of ASEAN countries.

Thus, the understanding from this research can be used by the policy maker as further information or reference in their studies so that future research will have significant results.

In terms of benefit for Malaysian economies towards long term, the study could help the government implement a suitable policy and rules and regulation regarding banking system.

In addition of that, the new rules and policy might be able suite with other ASEAN-5 countries thus the effect of efficiency of banking influencing the economic growth of ASEAN countries.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

The purpose of this chapter is to provide a comprehensive overview regarding previous study related literature about quotation or statement that has a relationship to this study. Through the literature review helps researchers and give deeper understanding of the terms used in the study and the whole insights of the study. First part of the discussions will cover the theoretical review of this research. Next will be the discussions on the relevant literature that will be elaborated under empirical review. The last part will conclude this chapter.

2.2 Theoretical Review

These sections explain all structure that can hold or support a theory of a research study.

2.2.1 Theoretical Review on Efficiency

The world has gone through transformation in advanced technology and organizational progress since the period of slavery and feudalism. These transformations lead to increase in the efficiency of economic organizations. According to Stepien (2004), efficiency at the level of the bank or its organizational units, and for bank's activities are possible to investigate. Efficiency was defined by Rose (1997) as an indicator proves the ability of bank managers and its staff to keep the rate of increase in revenues and income at the level that exceeds the rate of increase in operational costs. Rogowski (1998a) elaborated that in order measuring bank efficiency, there were two alternative approaches need to be focused on which is analysis of technical efficiency and secondly analysis of scale and scope of efficiency. According to Forsound and Hjalmarsson (1974), efficiency is a statement about

the performance of processes transforming a set of inputs into a set of outputs. They pointed out that efficiency is a relative concept, where the performance of an economic unit must be compared with a standard unit. The identification of a standard should involve value judgment about the objective of the economic activities. The efficiency measurement discussion began with Farrell (1957) who's based on the work of Debreu (1951) and Koopmans (1951), defined a simple measure of firm efficiency that could account for multiple inputs. The efficiency of a firm consists of two components, namely, technical and price efficiency (or allocation efficiency) (Farrell, 1957).

The first component reflects the ability of a firm to obtain maximum output from a given set of inputs while the second reflects the ability of a firm to use the inputs at optimal proportions given their respective prices and the production technology (Omankhanlen, A., 2013). According to Adongo, Stork and Hasheela (2005) the concepts for measuring price (allocative) efficiency fall into three categories: revenue, cost and profit efficiency. These concepts according to them, established an economic foundation for analyzing bank efficiency because they are based on economic optimization in reaction to market price, competition and other business conditions rather than being based solely on the use of technology.

In this research, the frontier technique of Data Envelopment Analysis (DEA) to analyze the efficiency of the ASEAN-5 banking system. Originally, DEA was first introduced in the work of Farrell (1957) and then developed in the work of Charnes *et al.* (1978). DEA focuses primarily on the technological aspects of production requiring estimates of input and output prices. Banker *et al.* (1986) has used this approach extensively in regulating the sector. Meanwhile the non-profit sector being used by Lewin, Morey and Cook (1982). A Small portion of studies could be found which investigated the financial system of the countries in

transition; among the research mentioned conducted by Mertensa and Urga (2001) who evaluated the efficiency level of 79 Ukrainian banks in 1998 and the paper by Hassan and Marton (2003) for the Hungarian banking sector. But, the most significant paper among this literature is probably the IMF Working Paper by Grigorya and Manole (2002) which explored the efficiencies of 17 countries in transition (6 CIS countries).

Despite of the huge amount of literature which applied DEA into the banking sector, most of them assessed the performance of banks in the advanced economies. Most bank efficiency studies look at the US or other developed countries; while few studies conducted towards emerging markets. The paper by Bhattacharyya *et al.* (1997) probably was the first study using data of a developing country; the applied DEA to Indian banks. Gilbert and Wilson (1998) used linear programming techniques to investigate the effects of privatization and deregulation on the productivity of Korean banks over the years 1980-1994. The results show that Korean banks responded to privatization and deregulation by altering their mix of inputs and outputs, yielding large changes in productivity. Mahadzir Ismail (2004) by analyzing the performance of Malaysian banks during 1994 and 2000 in using 194 observations found that the main source of inefficiency of these banks was due to scale problem. They also further the study by exploring the characteristics of efficient banks according to the ownership structure and different bank specific indicators. As in, Quey-Jen Yeh (1996) an attempt made to incorporate DEA scores with the widely used bank financial ratios. By examining the performance of 6 large banks of Taiwan during 1980s, he also concluded that such integration of two methods is very useful for understanding the main inefficiency sources of banks.

2.2.2 Theoretical Review of Convergence

The world has gone through transformation in advanced technology and organizational progress since the period of slavery and feudalism. These transformations lead to increase in the efficiency of economic. Preferred methodology to identify efficiency in these studies is Data Envelopment Analysis, which is a non-parametric linear programming-based technique. Meanwhile preferred methodology to identify convergence hypothesis states that poor countries and with relatively low initial per capita income, grow faster than the rich ones where over time income levels converge across the country. An example is testing income convergence between Japan as the leader country compared with ASEAN-5 country. By using Philips and Sul (2007) long test clarify ASEAN-5 country converge to the leading country, Japan. There are three new convergence tests. Time series framework, economic growth literature and stationary matters for testing convergence Dayang Affizah (2011). An important issue to be added is the nonexistence of convergence would indicate the possibility of convergence clubs. The convergence hypothesis of ASEAN-5 banking is by identifying the efficiency and effect of club convergence using the method of nonlinear time varying factor model.

2.3 Bank Efficiency

So far limited research has been conducted to assess the performance of ASEAN-5 using Data Envelopment Analysis. For example, some yearly reports provided by investment companies such as Ansher Capital (2006) and East Orient Capital Management (2008) analyzed the overall performance of the system over each year. This study could be a comprehensive source which investigated the development of ASEAN-5 banking sector and

provide detailed analysis of individual banks using traditional methods of bank performance evaluation.

2.4 Convergence

The economic convergence refers to a process of national economies display increasing similarities in the patterns of their performances. According to Dayang Affizah (2011) said that the convergence hypothesis states that poor countries, which is relatively low initial per capita income, grow faster than rich countries so that over time income levels converge across countries. To make good policy coordination between Asian economies to be a net benefit, it is necessary that there be some degree of “convergence” between the participating countries. In order to have a successful cooperation and integration of the economies, it requires some degree of “convergence” between the participating countries and requires fulfilling certain criteria in terms of both the domestic policy and the structure of domestic institutions, or there has a supranational body that has sufficient authority to enforce compliance.

Countries in ASEAN mostly experienced a substantial economic growth. Recent empirical researchers have found an evidence of several convergence clubs which is convergence on per capita incomes for selected groupings of countries and regions. As an Asian country faces various stages of development, the path of transition in economic performance may be very different across nations. However, explaining why some countries differ whilst others converge towards each other requires a lengthy and thorough discussion subject to many technical and theoretical arguments in terms of methods, income, structure and indicators of competitiveness.

Adam *et al.* (2002) were the first researcher that adapted the concept of financial integration, which selected interbank rates, 10-year bond yields, mortgage and corporate loans rate to assess the degree of integration between countries within the euro area. During 1999 when interbank rates collapsed into a single market, there was evidence showing an increasing level of integration within the Euro area, though the long-term bond market had not reached full integration and the convergence speed of mortgage and corporate loan rates were rather slow. Rizavi *et al.* (2011) investigated Asian stock market and its integration with the world market between 1999 and 2009. The study explored the existence of convergence among the Asian markets with the world market, however the beta coefficient surpasses the maximum speed of -1 and was going on an upward trend. The study concludes there seem to be divergence than convergence, which was supported by the sigma convergence result. The dispersion seems to be decreasing in 1994-2004 indicating an increase in integration, followed by an increase in the dispersion from the benchmark, and was taken as a signal that the markets are moving away from convergence.

2.5 Conclusion

Based on the discussions of the relevant literature, a study regarding ASEAN-5 country important toward closure the gap of research towards ASEAN-5 country. According Zhang (2011), the ASEAN countries are still far away from satisfying convergence criteria. There are many authors that have contributed to the theories and literatures of structure-conduct-performance during the early times based on the literature explained previously. However, as far as this research is concerned, the studies on the ASEAN-5 banking are very scarce rather than the other perspective of study such as less attention has been given to the effects of banking efficiency on convergence developing countries, such as Indonesia, Malaysia, Philippines, Thailand and Singapore.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter explaining method being used to fulfill the objectives of the study thus seeks important attributes that affect efficiency of ASEAN-5 examine the efficiency and convergence in the ASEAN-5 banking.

3.2 Data Analysis

In this research, the main objective is to investigate the efficiency properties of ASEAN-5 bank and key factors influencing convergence and closure the gap of ASEAN-5 countries. From the objective, few tests will be used to test the efficiency properties of ASEAN-5 bank. Using DEA Excel Solver, weights to the inputs and outputs of a DMU are assigning to generate results of possible efficiency. Secondly, tests on identifying convergence between ASEAN-5 bank. Using the previous results of efficiency, the data will be interpreted and calculate using E-views to identify whether ASEAN-5 banking able to convergence between each other. Despite of that, efficiency properties of ASEAN-5 could be identified and could be measure using method explaining on data description section.

3.3 Data Description

The data used in this study relate to commercial banks in ASEAN-5 countries as data solely were obtained from Bank scope without adding other resources such as Data World bank etc. The data relate to 61 commercial banks over 2007 to 2010. This data was defined most accurate within 0.3 years. This has been stated by Phillips and Sul (2007), r should be set equal to 0.3 and the remaining two-thirds (latter part) of the sample should be able to identify

whether there are convergence or not are shown. Summary of the input/output variables used in the study were shown as Table 4.

Table 4: Summary of Input and Output Variable Used in The Study

Variable	Description
Outputs:	Total Loans
	Total Securities
	Off-Balance sheet items
Inputs:	Interest expenses
	Deposits
	Non-interest expenses
	Personnel expenses
Input prices:	
Price of borrowed funds	Interest expenses/total deposits
Price of physical capital	Non-interest expense/fixed assets
Price of labour	Personnel expense/total assets

From Table 4, those inputs and outputs used towards identify efficiency is the most common use in other studies, outputs chosen to mean loans, other earning assets, and non-interest income. Meanwhile, inputs are interest expense for capital, deposits, personnel expenses and non-interest expenses. All the inputs and outputs were efficiency properties related to the ASEAN-5 banks. These inputs and outputs were examine using DEA Excel Solver in order the measure the efficiency of ASEAN-5 banks. Thus, from the results, we can fulfill two specific objectives of the study. To fulfil the third objectives of the study which is to identify convergence club of ASEAN-5 banking efficiency, results of the efficiency gather previously were tested with second method which using a non-parametric two-step approach created by Philips and Sul.

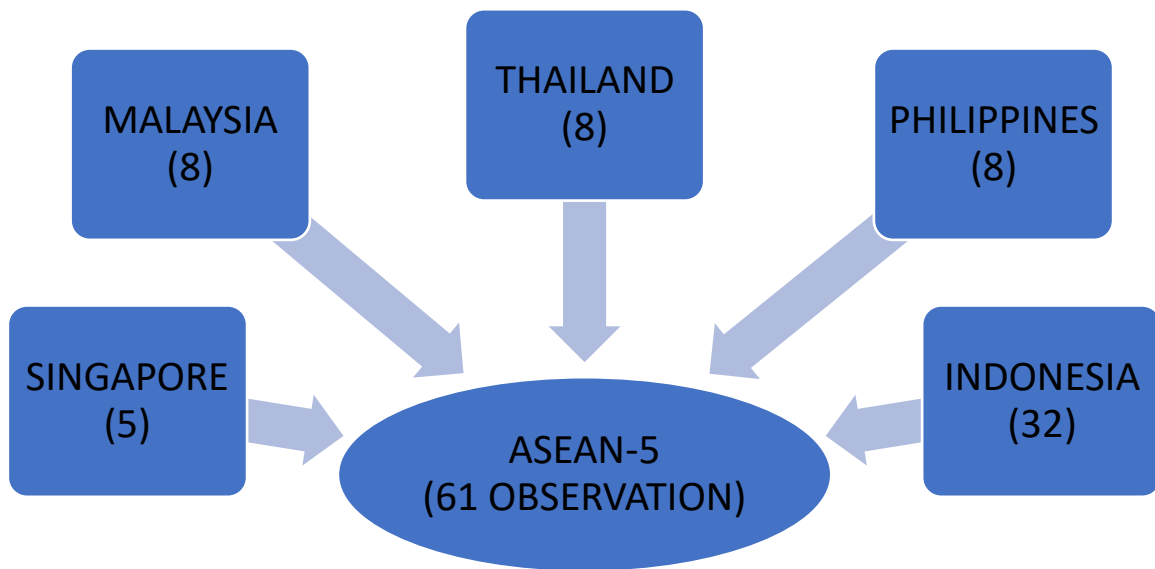


Figure 7: Illustration Total Number of Observation for the Data ASEAN-5 and Elaboration Number within each ASEAN-5 Countries Member.

As explain previously regarding the data observation for the study is consist of 61 observations from the ASEAN-5 countries, Figure 7 give an illustration on numbers of banks especially commercial banks that are used for the study. Figure 7 shows that Indonesia has a large number of observation regarding commercial banks which are 32 banks, meanwhile Malaysia, Thailand and Philippines have 8 banks for each country. Finally, Singapore has 5 banks of observation. According to Ariff (2011), there is still no universal agreement as to the explicit definitions and measurement of a bank's inputs and outputs.

3.3.1 Data Envelopment Analysis (DEA)

Data Envelopment Analysis (DEA) is a non-parametric technique used in the estimation of production functions. Thus, Rossazana (2015) stated that the method requires no assumption on the functional form of the efficient frontier, thereby making it a powerful tool in modelling complex and multi-faceted applications. In this study, technique of DEA for computing the measures of technical, pure technical, and scale efficiencies for individual

banks on each ASEAN-5 states being used. In general, DEA is referred as a linear programming technique that converts multiple incommensurable inputs and outputs of each decision-making unit (DMU) into a scalar measure of operational efficiency. According to Rossazana (2015), since its initial inception in 1978, DEA has evolved into more complex application. The highest level of satisfaction obtained from given resources lead to economic efficiency. According to Amos WEB (2017), Technical efficiency is a prerequisite for allocative or economic efficiency. According to studies by Kumar & Gulati (2008) towards Philippines bank, DEA involves solving a linear programming problem for each DMU. The solution to the linear programming problem consists of information about the peers of the DMU and the efficiency of the DMU relative to its peer group. Throughout the analysis, Kumar and Gulati (2008) found findings throughout process of DEA on technical efficiency.

Table 5: Findings of DEA on Technical Efficiency

Method of DEA	Findings
Technical Efficiency	1. Input oriented TE focuses on the possibility of reducing inputs to produce given output levels. 2. Output-oriented TE considers the possible expansion in outputs for a given set of input quantities.

Sources: Kumar & Gulati (2008)

Coelli and Perelman (1999) stated that the choice of orientation does not significantly alter efficiency estimation results. In order to measuring TE scores for DMU o , the assumptions are as follows:

$$i) \theta_o, \lambda_1, \lambda_2, \dots, \lambda_n, S_i^-, S_r^+ \min TE_o = \theta_o - \varepsilon [\sum_{i=1}^m S_i^- + \sum_{r=1}^s S_r^+]$$

Subject to

$$\text{ii)} = \sum_{j=1}^n \lambda_j x_{ij} + S_i^- = \theta_o x_{io}$$

$$\text{iii)} = \sum_{j=1}^n \lambda_j y_{rj} - S_r^+ = y_{ro}$$

$$\text{iv)} S_i^-, S_r^+ \geq 0 \quad (i=1, \dots, m; r=1, \dots, s)$$

$$\text{v)} \lambda_j \geq 0, \text{ if constant returns-to-scale}$$

$$\text{vi)} \sum_{j=1}^n \lambda_j = 1, \text{ If variable returns-to-scale}$$

Where x_{io} = amount of input I used by DMU o ,

y_{ro} = amount of output r produced by DMU o ,

m = the number of outputs,

s = the number of inputs,

n = the number of DMUs, and

ε = a small positive number.

The model involving steps i) – v) is known as envelopment form of CCR model and provides Farrell's input-oriented TE measure under the assumption of constant return-to-scale. The measurement from the model also is known as overall technical efficiency (OTE) and denoted as. Meanwhile steps involving i) – iv) and vi) is known as BCC model and provides Farrell's input-oriented TE measure under the assumption of variable returns-to-scale. The measure of efficiency provided by BCC model is known as pure technical efficiency (PTE) and denoted as θ_o^{BCC} .

Scale Efficiency (SE) can be obtained by the residual between efficiency under constant returns and efficiency under variable returns to scale. The measure of SE does not indicate whether the DMU in question is operating in increasing or decreasing returns-to-scale. The

nature of returns-to-scale can be determined from the magnitude of optimal $\sum_{j=1}^n \lambda_j^*$ in the CCR model by Banker (1984). Seiford and Zhu (1999) listed following three cases:

- i) if $\sum_{j=1}^n \lambda_j^* = 1$ in any alternate optima, then CRS prevails on DMU o;
- ii) if $\sum_{j=1}^n \lambda_j^* < 1$ in any alternate optima, then IRS prevail on DMU o; and
- iii) if $\sum_{j=1}^n \lambda_j^* > 1$ in any alternate optima, then DRS prevail on DMU o.

The CCR and BCC models need to be solved n times, once for each DMU to obtain the optimal values.

3.3.2 A Non-Parametric Two-Step Approach

Phillips and Sul (2007) have created a new econometric approach in order for testing the convergence hypotheses and the identification of convergence clubs. This method uses a nonlinear time varying factor model and provides the framework for modeling transitional dynamics as well as long run behavior.

They adopt the following time varying common factor representation for y_{it} of country i :

$$y_{it} = \delta_{it}\mu_{it} \quad (1)$$

Where μ is a single common component and δ_{it} is a time-varying element that captures the deviation of a country i from the common path defined by μ_t . Under this analysis, smoothing technique is required to estimate the trend component $\delta_{it}\mu_{it}$. Hodrick and Prescott (1997) smoothing filter is adopted due to its flexibility and the fact that it requires only the input of smoothing parameter and does not require prior specification of the nature of the common trend in y_{it} . Hodrick-Prescot (HP) filter using the smoothing parameter set equals to 100 for

(2)

annual data is to extract the long run component $\delta_{it}\mu_{it}$, so that the estimated transition coefficient unit can be calculated. Having computed the HP estimate;

$$\hat{x}_{it} = \hat{\delta}_{it}\hat{\mu}_{it}$$

Within the framework, all N economies will converge, at some point in the future, to the steady state, if $\lim_{k \rightarrow \infty} \delta_{it+k} = \delta$ for all $i=1,2,...,N$, irrespective of whether countries are near the steady state or in transition. It is important given that the paths to the steady state (or states) across countries can be differ significantly.

Since δ_{it} cannot be estimated directly from equation (1) due to over-parameterization, Phillips and Sul (2007) eliminate the common component μ_t through rescaling by the panel average:

$$h_{it} = \frac{\hat{x}_{it}}{\frac{1}{N} \sum_{i=1}^N \hat{x}_{it}} = \frac{\delta_{it}}{\frac{1}{N} \sum_{i=1}^N \delta_{it}} \quad (3)$$

The relative measure captures the transition path with respect to the panel average. Club convergence requires the following assumption for the semi-parametric form for the time varying coefficients δ_{it} :

$$\delta_{it} = \delta_i + \sigma_{it}\xi_{it} \quad (4)$$

Where $\sigma_{it} = \frac{\sigma_i}{L(t)t^\alpha}$, $\sigma_i > 0$, $t \geq 0$, and ξ_{it} is weakly dependent over t, but id(0,1) over i.

Thus, the hypothesis can be specified as:

$$H_0 : = \delta \text{ for all } i, \alpha \geq 0 \quad : \text{Convergence for all countries}$$

$$H_a : \neq \delta \text{ for some } i, \alpha < 0. \quad : \text{No convergence for some countries}$$

The null hypothesis indicates convergence for all countries meanwhile the alternative hypothesis indicates no converge for some countries. Phillips and Sul (2007) has shown that the null of convergence can be test using the framework of the following regression.

$$\log\left(\frac{H_1}{H_t}\right) - 2\log L(t) = \hat{c} + \hat{b}\log t + \hat{u}_t \quad (5)$$

In this regression, $t=[rT], [rT+1], \dots, T$, and $r > 0$. Meanwhile $H_t = \frac{1}{N} \sum_{i=1}^N (h_{it} - 1)^2$ and $\hat{b} = 2\hat{\alpha}$, where h_{it} is defined in (2) and $\hat{\alpha}$ is the least squares estimate of. Thus, the convergence hypothesis can be test whether it diverges; $\alpha > 0$, or $\alpha = 0$. Meanwhile it converges when $\alpha \geq 0$.

Phillips and Sul (2007) conditions stated that the test statistic $\hat{b}$ is asymptotically standard normally distributed, so that standard critical values can be employed. The standard error of the estimates is calculated using a HAC estimator for the long-run variance of the residuals. Thus, the null hypothesis of convergence is rejected if $t_b < -1.65$. Meanwhile, if the t-statistics t_b , suggests that $\hat{b}$ is either positive or equal to zero, we conclude that the panel converges. In addition, according to Phillips and Sul (2007), r should be set equal to 0.3 and the remaining two-thirds (latter part) of the sample should be able to identify whether there is convergence or not. In this study, the procedure can be summarized as follows, process number 3 until 5 being repeated in order to identify the convergence club of another cluster.

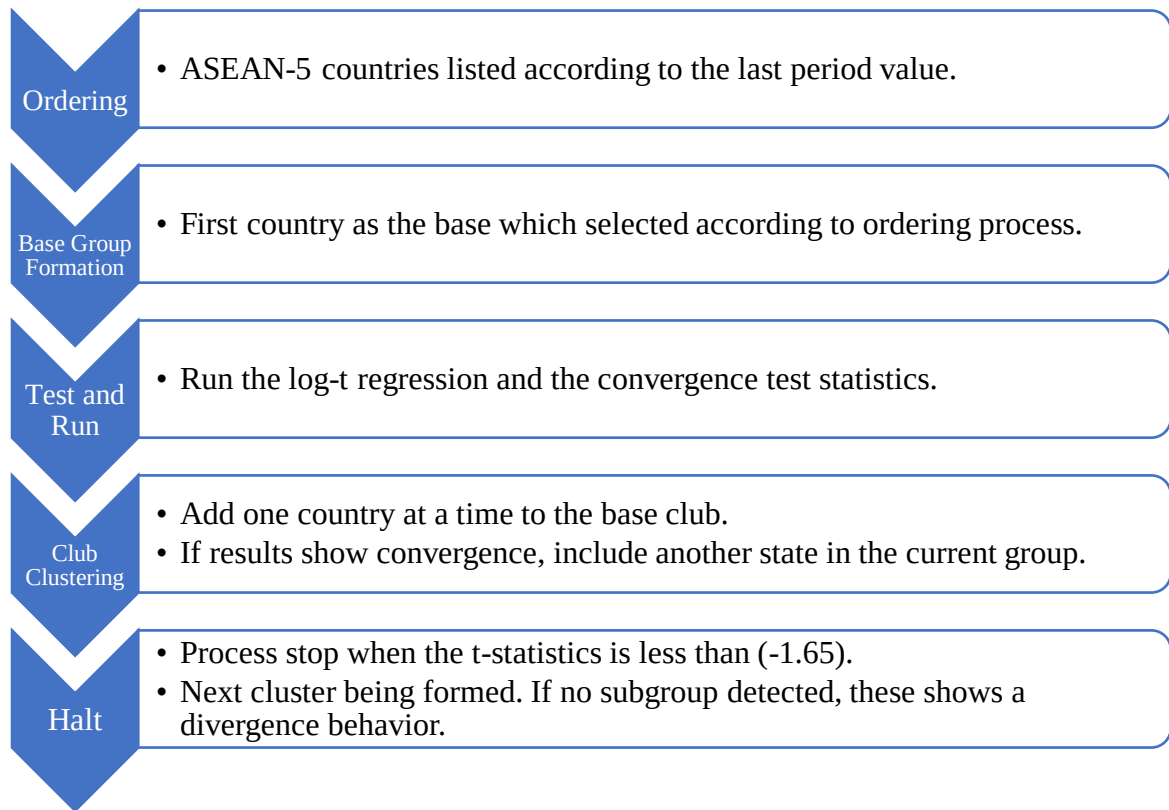


Figure 8: The Process of Algorithm Clustering

As per Figure 8, to identify the convergence club of other cluster, there will be five processes need to be through. Phillips and Sul (2007) conditions stated to gone through the process of algorithm clustering, all variables need to be listed according to the last period value. After the process of ordering has been done, the first country will be the base which selected according to the ordering process. The third step is a process of log-t regression been run whereby the results of convergence test statistics will be collected. Step four, results from the convergence test statistics will shows convergence or vice versa. If the results show convergence, another country need to be added into the current group. However, the process will be halt in step five the t-statistics is less than -1.65. therefore, next cluster being formed by repeating step three until five to identify number of club cluster in each country.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

In this section, the findings of this study and comparison with related previous research will be discussed. The test is analysing using data envelopment analysis (DEA) to test the efficiency of banking. The results of DEA show technical, pure and scale efficiency. A brief analysis on this efficiency within ASEAN states will be explained further in this chapter. Next, all results regarding technical efficiency been selected to analyse the convergence and he test conduct using EViews 9 with a formula. A brief analysis on convergence of ASEAN states towards technical efficiency will be explained further in this chapter. The clustering algorithm proposed by Phillips and Sul (2007) is applied to identify the relationship between the efficiency and economic growth from 2007 to 2010.

4.2 Efficiency

The mean efficiency scores of banks in each of the countries included in the sample were calculated with inputs and outputs indicated earlier and running a DEA program. Three types of scores; TE, PTE, and SE were generated using the BCC model described by Coelli (1996). The national frontier shows high efficiency scores. However, although it appears to be very efficient bank at the national frontier, it may not remain when cross-country frontiers are constructed. Table 5 is a summary of results on different components of efficiency measures which are technical efficiency (TE), pure technical efficiency (PTE), and scale efficiency (OE). These figures indicate the mean value of scale efficiency (SE) is higher than the technical efficiency (TE).

Table 6: Mean Efficiency Scores by Country under National Frontier				
Country	No. Of Banks	National Frontier		
		TE	PTE	SE
Malaysia	8	0.7670	0.8562	0.8965
Singapore	5	0.8228	0.9146	0.8980
Philippines	8	0.6269	0.6561	0.9507
Thailand	8	0.6349	0.8532	0.7497
Indonesia	32	0.5342	0.6709	0.8099

The results usually show an interpretation that ASEAN-5 banks experienced increasing returns to scale which is an ascend in productivity. This also explain that banks are using less input resources than is needed to produce the current output levels efficiently. ASEAN-5 bank management needs to increase input usage and change the scale of production to be able to improve their overall efficiency performances. Two countries which is Malaysia and Philippines show TE and PTE scores lower than the mean of the region while Thailand have SE lower than the regional score. The TE is highest among large banks in Singapore and Malaysia meanwhile Indonesia and Philippines were the least. The country in the top quartile of TE are Singapore and Malaysia. At national level, this means that there is scope for some large banks showing scale inefficiencies to achieve optimum size. Ferrier (1997) states “A DMU may be scale inefficient if it exceeds the most productive scale size (thus experiencing decreasing returns to scale) or if it is smaller than the most productive scale size (thus failing to take full advantage of increasing returns to scale).

4.3 Bank Convergence of Asean-5

In this section, the findings of this study and comparison with related previous research will be conduct. The first test will be gone through full panel convergence in order to identify the

convergence or divergence. Next, cross-sectional variation will be conducted in order to identify if there is convergence exist within each bank in each state.

4.3.1 Full Panel Convergence

The panel convergence analysis on aggregate level is employed on the 61 banks within 5 countries of technical efficiency by using the log t test. Table 5 reports the results of the panel convergence methodology for technical efficiency of 61 banks within 5 countries. After determining the ranking of the banks according to their last-period value of data, panel convergence is analyzed for acknowledging the level of convergence in aggregate level (Table 7).

As this method is based on non-linear time varying factor, the data does not need to run stationary data as this method able to cater the problem of stationarity of the sample data. The first row shows the result of testing full convergence. The results for all five ASEAN-5 countries show divergence with Malaysia -108.8330, Thailand -5.130571, Singapore -3.602386, Indonesia -6.520193 and Philippines -28.71462 which also indicates the rejection of the null hypothesis of convergence at the 5 percent significance level. The null hypothesis of full convergence is rejected for the period of 2007 to 2010 when data trimming focuses on the latter part of the sample data. According to Philips and Sul (2007), rejection of the null of convergence does not concluded there were no evidence of convergence in subgroups of the panel. Whereby the is high possibilities existing of convergence clusters around separate points of equilibria or steady state growth paths. Attempt to classify and identify convergence club were done by previous researcher such as Casanova (2004), Canova and Marcet (1995), Durlauf and Johson (1995), and Quah (1996, 1997).

Table 7: Results of Log T Convergence Test

Country / Sector	No of Banks		Remarks
Full Sample of Banks within each state			
Malaysia	8	-108.8330*	Divergence
Thailand	8	-5.130571*	Divergence
Singapore	5	-3.602386*	Divergence
Indonesia	32	-10.28352*	Divergence
Philippines	8	-28.71462*	Divergence
Full Sample of Banks within club			
ASEAN Club Aggregate	15	-39.44828*	Divergence

Notes: Asterisk (*) denotes rejection of the null hypothesis of convergence at the 5% level

According Phillip and Sul (2007) the empirical log t regression is based on time series data where the first $r\%$ (0.3) of the data is removed before analysis. Although cointegration and convergence are highly related, they have distinct features and cointegration tests do not serve as an adequate test for further convergence test. According to the analysis, the speed of convergence is not fast enough to ensure cointegrated behavior. Thus, this explains that overall banks within ASEAN-5 country are heterogeneous in terms of real GDP per capita. However, it does not mean that there is no convergence in the sub group within banks of countries, which brings a further analysis for the trimmed observation.

According to Phillip and Sul (2007), they stated that cross sectional variation is needed to examine the overall convergence of transition parameters, λ . The formula for this method is designed to measure the loading coefficient α_i in relation to the panel average at time t . This concept is applicable in the analysis of growth convergence and to measure transition effects.

The decreasing cross-sectional variation does not directly imply overall convergence as there might be local convergence within subgroups and overall divergence.

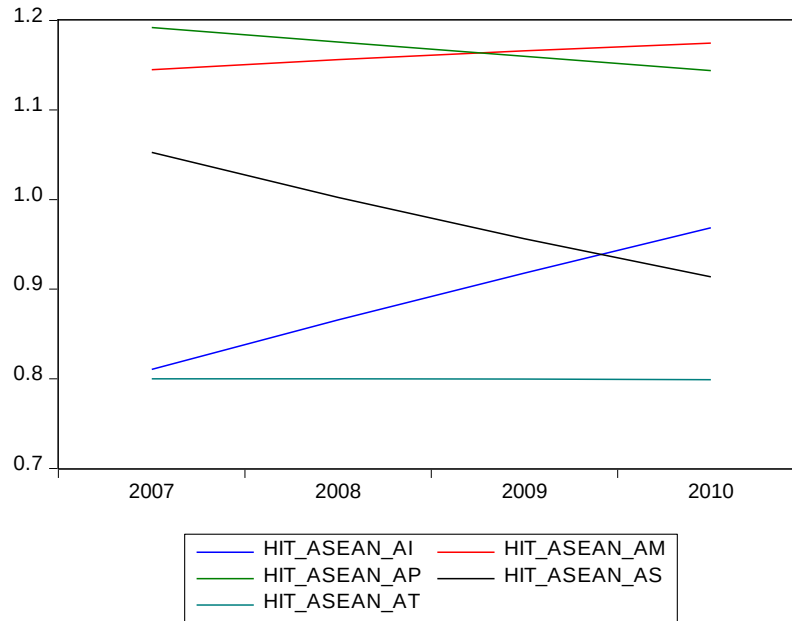


Figure 9: Cross Sectional Variation for ASEAN-5 Club Aggregate

Figure 9 displays the cross-sectional variation of 15 top bank within ASEAN-5 countries within the period of 2007 – 2010. In order to avoid the initial effect of the base year initialization, the first two yearly observations are discarded, and 5 filtered observations are used in the following analysis. The relative transition parameters for this period are smoothening by employing the Whittaker-Hodrick-Prescott (WHP) smoothing filter. This Technical mechanism is commonly used to separate the cyclical component of a time series from raw data. As we could see from the figure, there were two point shows and increasing trend of transition parameter path. In order words, we could see that Malaysia (HIT_ASEAN_AM) and Philippines (HIT_ASEAN_AP) tends to catch up and crossing over between each other. Meanwhile Indonesia (HIT_ASEAN_AI) and Singapore (HIT_ASEAN_AS) catch up and crossing over each other in a certain point. This could show that even though there are 15 different banks within ASEAN-5 countries, which those

ASEAN-5 has different type of income economies. In terms of income economies, Singapore is the only country stated in high-income economies, meanwhile Malaysia and Thailand share a same group in upper-middle income economies. Last but not least, Indonesia and Philippines share a same group in lower-middle income economies.

4.3.2 Singapore

Table 8: Results of Convergence on Aggregate of Variables in Singapore

Clubs	Country	t-statistics	Remarks
Full sample of all commercial banks	Singapore	-3.6024*	Divergence

Notes: Asterisk (*) denotes statistically significance at 5% level. The 5% critical value is -1.65.

Table 8 shows the results of panel convergence for banking efficiency of 5 commercial banks in Singapore. The log t-test result -3.6024 is lower than critical value of -1.65 at 5percent significant level. Therefore, the null hypothesis of convergence is rejected for the period 2007 until 2010. Overall, banking sector in Singapore specifically commercial banks are diverging in regards of efficiency performance. Again, Phillips and Sul (2007) postulated that the first $r(0.3)$ of the data should be eliminated. After that, apply the log t-regression on time series data. Based on this analysis, the overall efficiency of banking sector in Singapore is showing trend of divergence. However, there is possibilities of convergence might exist in the sub group that lead to the trimmed observations. In other words, commercial banks in Singapore have the possibilities of convergence in the sub group even though the bank is diverging. Rabobank (HIT_BB) and OCBC bank (HIT_BF) both have showed an increasing trend of transition parameter path. Whereas, Bank of Singapore (HIT_BA) and Citibank (HIT_BC) show a decreasing trend of transition parameter path throughout study period.

Lastly, DBS bank (HIT_BD) shows the lowest of parameter transition path in terms of banking efficiency even though it has subtle increasing trend. From the Figure, there is an evidence of convergence between Rabobank (HIT_BB) and Bank of Singapore (HIT_BA) in 2008, Bank of Singapore (HIT_BA) and OCBC (HIT_BF) in 2009 as well as OCBC bank (HIT_BF) and Citibank (HIT_BC). Additionally, we can observe the convergence between Bank of Singapore (HIT_BA) and Citibank (HIT_BC) in year 2010.

Table 9: Results of Convergence Club in Singapore

Last T order	Banks	Step 1	Step 2	Step 1	Clubs	Remarks
1	BC	Base			1	Divergence
2	BB	-4.2804	Base		2	Divergence
3	BF		-15.1648	Base	3	Convergence
4	BA			0.9765	3	Convergence
5	BD			1.0405	3	Convergence

Table 8 shows the last time series observation of commercial banks in Singapore. Citibank (BC) is the base commercial bank and it is the core group, Club 1. Following suit Rabobank (BB) is added to Citibank (BC) and run log-t regression to obtain compute t-statistics. The t-statistics for both banks are -4.2804 which is less than -1.65 therefore we do not add another bank. Thus, the result suggests that Rabobank (BB) is diverging and Club 2 is taken by the said bank. Now, Rabobank (BB) is a base bank and OCBC bank (BF) is added. The computed t-statistics indicate OCBC bank (BF) as diverging and we stop adding another bank because the t-statistics is lesser than -1.65. Therefore, Club 3 is taken by OCBC bank (BF) as a base and Bank of Singapore bank (BA) is added to get t-statistics. Computed t-statistics for OCBC bank (BF) and Bank of Singapore (BA) imply convergence since 0.9765

is greater than -1.65. Thus, the last bank which is DBS bank (BD) is added to Bank of Singapore (BA) and noted that Bank of Singapore (BA) becomes a base commercial bank when adding another bank into the club. The t-statistics insinuate that DBS bank (BD) is converging in regards of efficiency and belongs to Club 3.

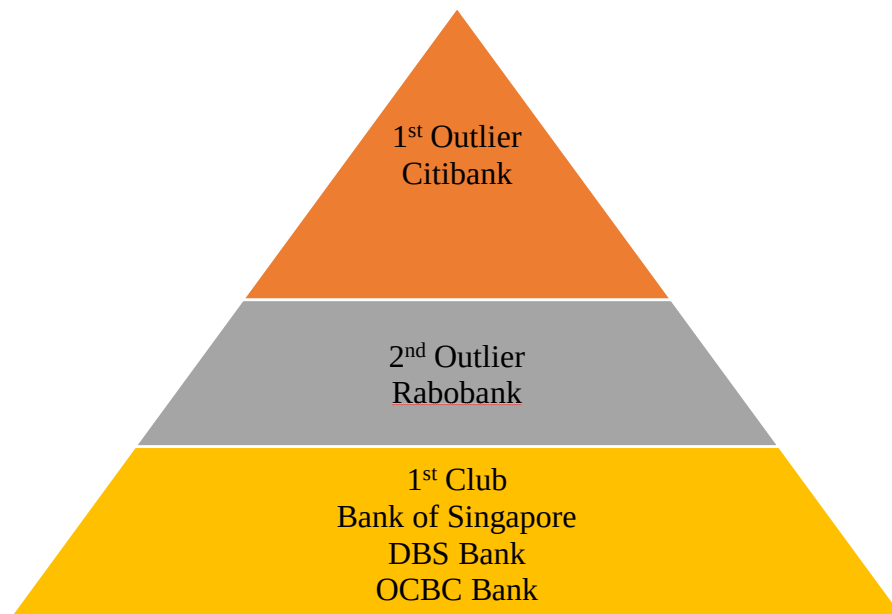


Figure 10: Illustration Group of Club Convergence in Singapore Banking Sector.

Figure 10 presented selected Singaporean commercial banks during study period from year 2007 until 2010. From the Figure, Club 1 comprises of Citibank and Club 2 consists of Rabobank. Both banks are posited to be diverging towards other commercial banks and are assumed as outlier. Citibank in Singapore is a subsidiary of Citigroup. Besides, it is also the leading commercial bank in the world as well as one of the world's largest financial organizations. This result implies that high efficiency performance of Citibank is attributed by the fact that it is a foreign bank in Singapore. In other words, foreign controlled bank such as Citibank is likely to have high efficiency level because it has better asset management and effective operation since it possesses financial transaction know-how,

banking experience, specific IT and has more advanced risk management system as compared to local banks (Wahid & Rehman, 2009 & Staikouras *et al.*, 2008).

On the other hand, Rabobank in Singapore serves as the Southeast Asia Hub for the Group serving customers from Malaysia, Philippines, Thailand, Vietnam and Singapore itself. Apart from that, the bank is recognized as global leading Food and Agribusiness bank. This is to say, Rabobank in Singapore is distinguished from others because of its efficiency and outstanding performances as Southeast Asia Hub for Rabobank as well as top bank for Food and Agribusiness. Overall, it can be assumed that Rabobank is diverging in terms of efficiency performance due to its large size in which affect the productivity and efficiency level of Rabobank as stated by Omar *et al.* (2006) and Sufian and Mohamad (2008).

Whereas, Club 3 consists of Bank of Singapore, DBS bank and OCBC bank and it can be concluded that the efficiency performance of these three banks is converging towards the same path. DBS bank and OCBC bank are both the largest banks in Singapore as well as ASEAN with total assets US\$ 322.8 billion and US\$ 275.1 billion respectively.

This is to say, they are both converge towards the same efficiency path due to stiff competition and high competitiveness to dominate Singapore banking sector and remain on top as stated by Andries and Caparu (2014). Additionally, Bank of Singapore is a subsidiary bank of OCBC bank. Thus, it is given for these two banks to converge under the same club and have the same efficiency performance. In brief, commercial banks in Singapore do not have diverse efficiency performance level since the bank will either diverge or converge under Club 3. Meaning to say, the catching-up effect for commercial banks in Singapore is rather fast. Thus, commercial banks in Singapore will take a shorter time to move towards same efficiency level.

4.3.3 Indonesia

Table 10: Results of Convergence on Aggregate of Variables in Indonesia

Clubs	Country	t-statistics	Remarks
Full sample of all commercial banks	Indonesia	-10.2835*	Divergence

Notes: Asterisk (*) denotes statistically significance at 5% level. The 5% critical value is -1.65.

Table 10 observed the results of the panel convergence methodology for banking efficiency of 32 commercial banks in Indonesia. From the table, null hypothesis of convergence for the year 2005 to 2010 is rejected since the log t-test result of -10.2835 which is smaller than critical value -1.65 at 5 percent significant level. It can be concluded that there is no panel convergence of banking efficiency in Indonesia.

Based on this analysis, the overall commercial banks in Indonesia are heterogeneous in terms of efficiency but as mentioned before there is possibilities of convergence existence in the sub group lead to the trimmed observation.

Based on the result, ICBC bank (HIT_FS) and Panin bank (HIT_FO) have an increasing trend and among the highest of transition parameter path in regards of efficiency. On the other hand, Mizuho bank (HIT_FAH) and BNP bank (HIT_FN) are showing a decreasing trend as well as among the lowest of efficiency in transition parameter path. From cross sectional variation, we can also observe they are quite numbers of commercial banks in Indonesia that show a strong evidence of convergence by looking at individuals transition parameter path that are crossing another banks transition parameter path.

Table 11 shows the last time series observation of commercial banks in Indonesia. As per mentioned previously, the panel convergence analysis on aggregate level is employed using

the log t test. Determining the ranking selection of banking in convergence club according to their last-period value of data, the first rank is chosen from the highest the last-period value of data from all the banks. As this method is based on non-linear time varying factor, the data does not need to run stationary data as this method able to cater the problem of stationarity of the sample data. The first row shows the result of testing full convergence. Based on this ranking, Panin bank (FO) is the base bank and it is also the core group, Club 1. Next, AG bank (FF) is added to Panin bank (FO) and the computed t-statistics is 2.5134 which imply that there is convergence since it is higher than -1.65.

Thus, another bank is added and by adding DBS bank (FAB), the base bank is taken by AG bank (FF). The t-statistics observe that DBS bank (FAB) is diverging with -18.3253 which is lower than -1.65 and we stop adding another bank. The Club 2 is taken by DBS bank (FAB) following by adding Rabobank (FAD) to get t-statistics. The result indicates Rabobank (FAD) is converging therefore another bank is added. The t-statistics for both Rabobank (FAD) and Mega bank (FX) is 2.2291 which is higher than -1.65 but the current t-statistics is lower than before.

Table 11: Results of Convergence Club in Indonesia

Last T order	Banks	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 2	Clubs	Remarks
1	FO	Base													1	Convergence
2	FF	2.5134													1	Divergence
3	FAB	- 18.3253	Base												2	Convergence
4	FAD		2.6740												2	Convergence
5	FX		2.2291	Base											3	Divergence
6	FC			-6.8417	Base										4	Convergence
7	FD				0.5210										4	Convergence
8	FQ				0.6001										4	Convergence
9	FY				-0.0789	Base									5	Divergence
10	FP					-3.3573	Base								6	Convergence
11	FL						5.2820								6	Convergence
12	FK						-0.5329	Base							7	Convergence
13	FAF							-0.62							7	Convergence
14	FAG							-0.9925	Base						8	Convergence
15	FH								-0.5843						8	Convergence
16	FI								0.7501						8	Convergence
17	FAC								0.7492	Base					9	Convergence
18	FA										2.1316				9	Convergence
19	FB										4.2806				9	Convergence

Table 11 continued

20	FM	2.2256	Base		10	Convergence
21	FS		0.5095		10	Convergence
22	FT		0.5400		10	Convergence
23	FR		2.2666		10	Convergence
24	FG		3.0072		10	Convergence
25	FAA		3.4366		10	Convergence
26	FZ	1.9782	Base		11	Convergence
27	FU		2.8376		11	Convergence
28	FJ		2.6261		11	Divergence
29	FAH		-7.2106	Base	12	Divergence
30	FV			- 9.4147	Base 13	Convergence
31	FW				3.970 8	Convergence
32	FN				1.811 7	Convergence

Later, Club 3 is created by adding BNI bank (FC) to the base bank Mega bank (FX). Since t-statistics -6.8417 for BNI bank (FC) and Mega bank (FX) is lesser than -1.65 which imply divergence and a new club is opened. Club 4 is taken by BNI bank (FC) and Agris bank (FD) is added and t-statistics imply Agris bank (FD) is converging thus QNB bank (FQ) is added. From observation, QNB bank (FQ) is also converging in terms of efficiency and we start adding another bank which is PPBI bank. However, t-statistics for PPBI bank (FY) and QNB bank (FQ) resulted in lower t-statistics despite the convergence. Now, Club 5 is PPBI bank (FY). We added Permata bank (FP) and get t-statistics of -3.3573 which insinuate Permata bank (FP) is diverging and a new club is created.

Then, Club 6 is identified by adding Maybank (FL) to the base bank which is Permata bank (FP) and the t-statistics for both bank is 5.2820 greater than -1.65. Therefore, Maybank (FL) is concluded to be converging and MNC bank (FK) is added to it. The t-statistics for Maybank (FL) and MNC bank (FK) shows that MNC bank (FK) is converging but Club 7 is created since t-statistics -0.5329 is lower than previous t-statistics. Now, MNC bank (FK) becomes the base and Sumitomo bank (FAF) is added to it and resulted in t-statistics of -0.6262 which is higher than -1.65 thus imply that Sumitomo bank (FAF) is converging. Since Sumitomo bank (FAF) shows convergence, now ANZ bank (FAG) is added and computed t-statistics indicates that ANZ bank (FAG) is converging. But, t-statistics for Sumitomo bank (FAF) and ANZ bank (FAG) resulted in lower result thus lead to a new club.

Club 8 is taken by ANZ bank (FAG) and BCA bank (FH) is added. The t-statistics result shows -0.5843 is higher than -1.64 which means BCA bank (FH) is converging. Following, Danamon bank (FI) is added to BCA bank (FH) and t-statistics imply evidence of convergence and another bank is added. By adding KEB bank (FAC), t-statistics shows that this bank is converging but Club 9 is opened because current t-statistics is lower than

previous result. Now, KEB bank (FAC) becomes the base and Mandiri bank (FA) is added and computed t-statistics 2.1316 is greater than -1.65. This means Mandiri bank (FA) is converging and another bank is added to it. The t-statistics of Mandiri bank (FA) and BRI bank (FB) postulate that there is convergence. Therefore, OCBC bank (FM) is now added to BRI bank (FB). However, the t-statistics for both banks is lower than before which lead to the creation of Club 10.

OCBC bank (FM) is the base bank for Club 10 and ICBC bank (FS) is added to it. Then, Mayapada bank (FT), Sinarmas bank (FR), BBA bank (FG) and Commonwealth bank (FAA) is added to Club 10 respectively. But, Club 11 is identified when t-statistics of Commonwealth bank (FAA) and CTBC bank (FZ) resulted in lower t-statistics even though it is converging. Club 11 is taken by CTBC bank (FZ) and t-statistics computed by adding BOI bank (FU) is 2.8376 which is higher than -1.65. Therefore, BOI bank (FU) is posited to be converging and Raharja bank (FJ) and Mizuho bank (FAH) is respectively added.

However, by adding Mizuho bank (FAH) to Raharja bank (FJ) a new club is created because the computed t-statistics is lesser than previous result even it is converging. Now, Mizuho bank (FAH) becomes the base for Club 12 and UOB bank (FV) is added to it. The t-statistics shows that UOB bank (FV) is diverging as -9.4147 is lower than -1.65. Therefore, we stop adding bank and open a new club. Lastly, Club 12 is taken by UOB bank (FV) and both CIMB bank (FW) and BNP bank is added respectively. The results indicate that both banks are converging in terms of efficiency.

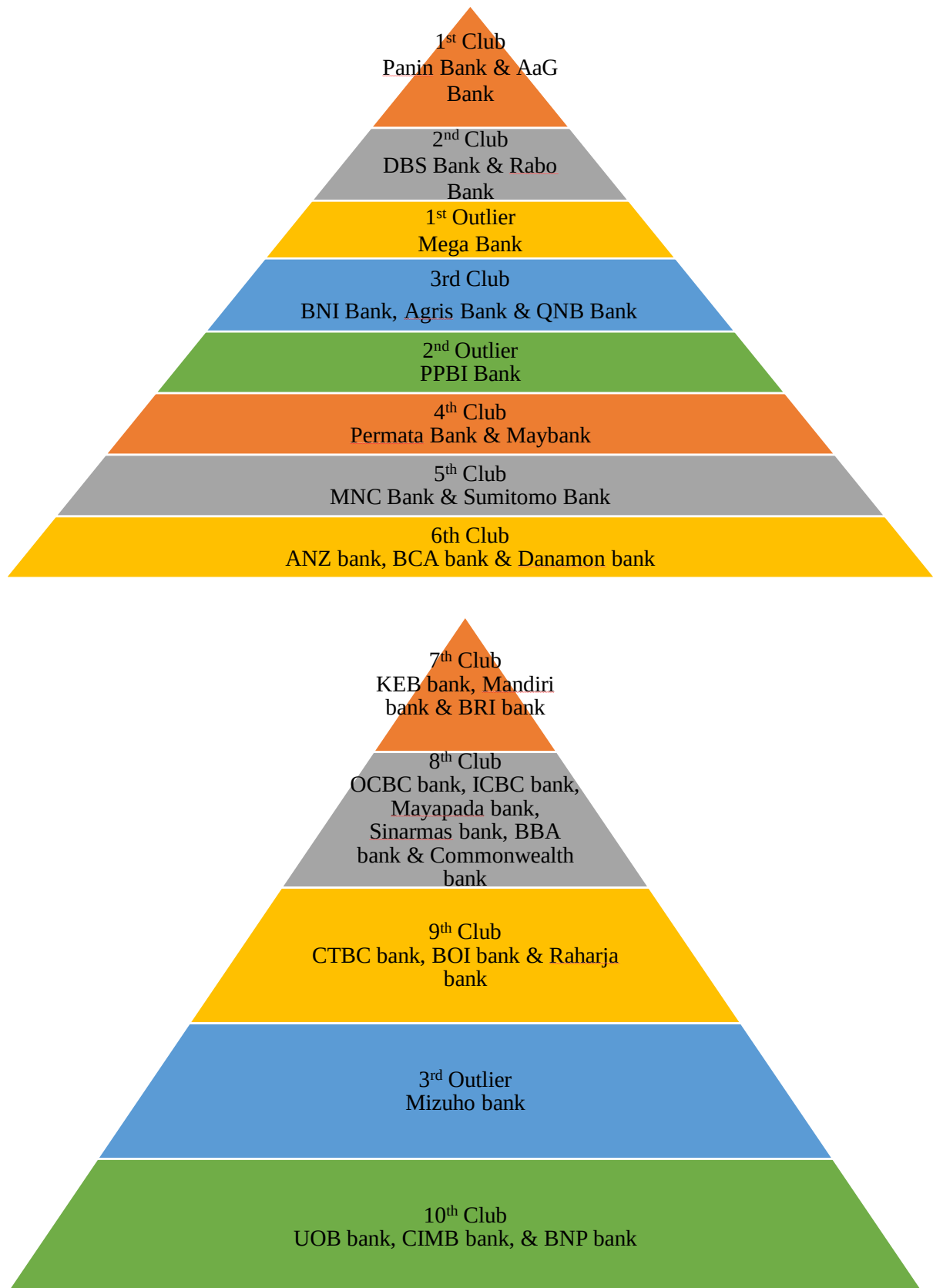


Figure 11: Illustration Group of Club Convergence in Indonesia Banking Sector

Moving on to Club 8, ANZ bank, BCA bank and Danamon bank are concluded to be converging towards the same path of efficiency performance. Club 9 comprises of KEB bank, Mandiri bank as well as BRI bank in which they are all converging towards other banks in Indonesia. Onto Club 10, there are 6 commercial banks that are converging with each other namely OCBC bank, ICBC bank, Mayapada bank, Sinarmas bank, BBA bank and Commonwealth bank. In Club 11, CTBC bank, BOI bank as well as Raharja bank are postulated to be converging together. However, Mizuho bank implies to be diverging from other banks under Club 12. Lastly, UOB bank, CIMB bank and BNP bank share the same Club 13 which means they are converging towards the same path in regards of efficiency.

Club 1 which comprise of Panin bank and AG bank indicate that both banks are converging towards the same equilibrium state in terms efficiency performance. Panin bank and AG bank are both local and national commercial banks in Indonesia. Before the privatization program, Indonesian banking sector focuses on its local and national banks. Hence, this contributes to Panin bank and AG bank highest efficiency performance in Indonesian banking sector since there is a restriction that hinder foreign-owned banks from expanding their banking operation. Foreign banks in Indonesia before the privatization program do not have the freedom to compete freely with domestic banks thus attributes to high efficiency performance of local and national banks in the country (Lensik *et al.*, 2008). In other words, government protection on commercial banks in Indonesia affects foreign and local banks to converge towards the same efficiency path. In addition, the least efficient banks are under Club 13 namely UOB bank, CIMB bank and BNP bank in which these banks are foreign-owned banks.

Also, based on observation, most of the convergence club consists of one to three banks except in Club 10 in which comprise of six Indonesian commercial banks. Therefore, it

implies that catching-up effect of commercial banks in Indonesian banking sector is vast due to many club convergences. Besides, it also indicates that efficiency level of each convergence club is very diverse from each other. On the other hand, Club 3, Club 5 and Club 12 are respectively made up of Mega bank, PPBI bank and Mizuho bank. Thus, these banks are considered as diverge and outlier. Mega bank is the top 10 anchor banks in Indonesia (Sarifuddin *et al.*, 2015) and it is also one of national banks in Indonesia. Apart from that, Mega bank is also one out of three banks that are not affected by economic crisis in 2008 and it continues to grow without government help (PT Bank Mega Tbk, 2013).

4.3.4 Thailand

Table 12: Results of Convergence on Aggregate of Variables in Thailand			
Clubs	Country	t-statistics	Remarks
Full sample of all commercial banks	Thailand	-5.1306*	Divergence

Notes: Asterisk (*) denotes statistically significance at 5% level. The 5% critical value is -1.65.

Table 12 shows the results of the panel convergence methodology for commercial banks efficiency of Thailand. The log t-test result of -5.1306 is lesser than critical value -1.65 at 5 percent significant level. Therefore, based on Phillip and Sul (2007) convergence methodology the null hypothesis is rejected for the year 2005-2010. In short, there is no panel convergence. However, there is a still possibility of convergence in the sub group of commercial banks. Thus, the data is further run individually for more trimmed observations.

Kasikornbank (HIT_DD) has an increasing trend of transition path and is the highest as compared to the other banks. Additionally, SCB bank (HIT_DH) and Communications bank (HIT_DC) also demonstrate an increasing in trend of transition parameter path. On the other hand, Ayudhya bank (HIT_DF) and Krungthai bank (HIT_DB) are among the lowest of

transition parameter path in terms of banking efficiency. TMB bank (HIT_DI) and Thanachart bank (HIT_DG) have a decreasing trend. However, there are strong evidence of convergence throughout the year of study between Kasikornbank (HIT_DD) and Bangkok bank (HIT_DA), Bangkok bank (HIT_DA) and SCB bank (HIT_DH), Bangkok (HIT_DA) and Communications bank (HIT_DC), Ayudhya bank (HIT_DF) and Thanachart bank (HIT_DG), Krungthai bank (HIT_DB) and Thanachart bank (HIT_DG) as well as between Communications bank (HIT_DC), SCB bank (HIT_DH) and Thanachart bank (HIT_DG).

Table 13 is the result of convergence club in Thailand that focuses on 8 selected commercial banks. Kasikornbank (DD) is the base bank and it is the core group, Club 1. SCB bank (DH) is added to Kasikornbank (DD) and the accumulation of t-statistics -86.4258 is lower than -1.65 insinuate that SCB bank (DH) is diverging. Thus, do not add another club and Club 2 is now taken by SCB bank (DH). Next, after adding Communications bank (DC) to SCB bank (DH) it can be concluded that the latter bank is diverging since t-statistics of -7.5379 is lesser than -1.65. A new group, Club 3 is opened and Communications bank (DC) is a base following by adding Bangkok bank (DA) and Ayudhya bank (DF) respectively.

From the results, Bangkok bank (DA) and Ayudhya bank (DF) are both converging. However, since the resulted t-statistics between Bangkok bank (DA) and Ayudhya bank (DF) is smaller than the previous result then Club 4 is identified. Now, Ayudhya bank (DF) becomes the base and TMB bank (DI) is added to it. The t-statistics result indicates that TMB bank (DI) is converging because t-statistics -0.7956 is lower than -1.65. Therefore, since the bank is converging we add another bank to compute new t-statistics. TMB bank (DI) and Thanachart bank (DG) have t-statistics of -0.8093. The result implies Thanachart bank (DG) is converging but Club 5 is created because the current t-statistics shows decreasing manner. Lastly, Thanachart bank (DG) becomes the base and Krungthai bank

(DB) is added to it. The t-statistics result is 4.36561 which postulate Krungthai bank (DB) is converging.

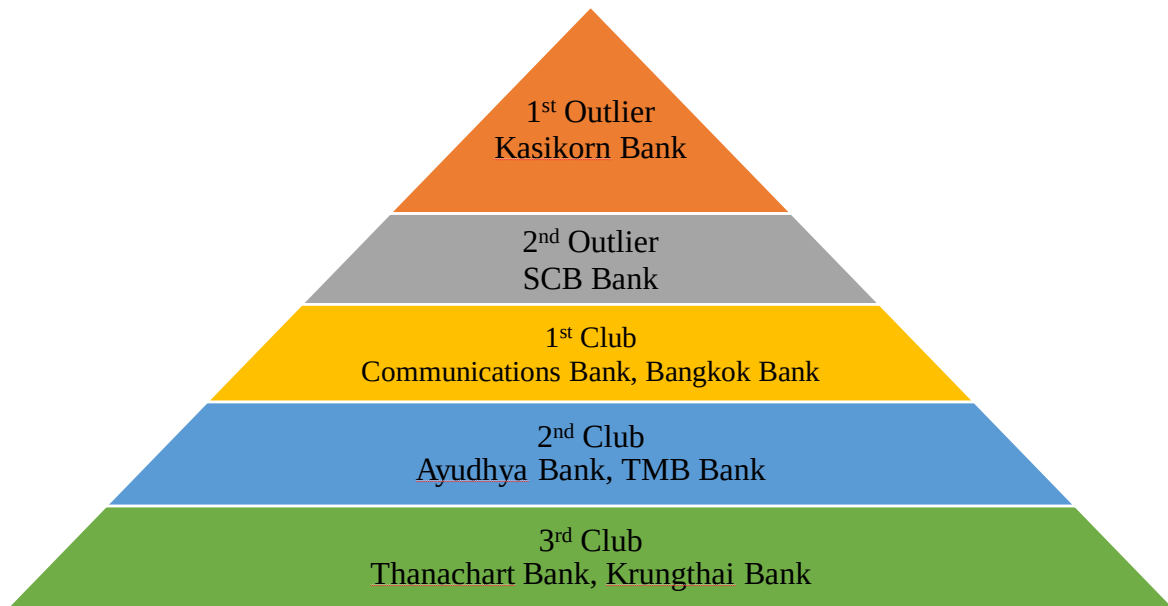


Figure 12: Illustration Group of Club Convergence in Thailand Banking Sector

Figure 12 shows the result of club convergence in regards of efficiency in Thailand. Club 1 which is Kasikornbank and Club 2 that is SCB bank are observed to be outlier and are diverging towards other commercial banks. Both Kasikornbank and SCB bank are among the top four of big banks in Thailand for a long time due to their abundant assets and market share in banking sector (Chansarn, 2008). As stated by Mohama Ismail *et al.* (2013) bank size has positive impact on bank efficiency. In addition, Thailand commercial banks current size reflects their production technology in which display increasing return to scale manner (Mahathanaseth & Tauer, 2014). Therefore, it can be assumed that Kasikornbank and SCB bank are diverging towards other commercial banks due to their large total assets size specifically in technology used in banking operation.

Table 13: Results of Convergence Club in Thailand

Last T order	Banks	Step 1	Step 2	Step 1	Step 2	Step 1	Clubs	Remarks
1	DD	Base					1	Divergence
2	DH	-86.4258	Base				2	Divergence
3	DC		-7.5379	Base			3	Convergence
4	DA			0.7356			3	Divergence
5	DF			-7.0077	Base		4	Convergence
7	DI				-0.7956		4	Convergence
6	DG				-0.8093	Base	5	Convergence
8	DB					4.3561	5	Convergence

Consequently, this technology contributes to high efficiency performance of Kasikornbank and SCB bank and set apart these two banks from other commercial banks in Thailand banking sector. Apart from that, there is a positive relationship between market capitalization and efficiency of a bank (Sufian & Mohamad, 2008). Therefore, high efficiency performance of Kasikornbank and SCB bank might be attributed by their large market capitalization size in Thailand banking sector and in Southeast Asia that amounted to US\$11.1 billion and US\$12.7 billion respectively (Schaefer, 2016).

Meanwhile, Club 3 consists of Communications bank and Bangkok bank. Follow by Club 4 with Ayudhya bank and TMB bank. Lastly, Thanachart bank and Krungthai bank are under Club 5. Based on Club 3, Club 4 and Club 5 it can be concluded that efficiency level of each bank in these three clubs are diverse. In other words, commercial banks in Thailand have slower catching-up effect. Meaning to say, each bank will take a longer period to reach steady-state equilibrium of efficiency performance.

4.3.5 Philippines

Table 14: Results of Convergence on aggregate of Variables in Philippines			
Clubs	Country	t-statistics	Remarks
Full sample of all commercial banks	Philippines	-28.7146*	Divergence

Notes: Asterisk (*) denotes statistically significance at 5% level. The 5% critical value is -1.65.

Table 14 reports the results of the panel convergence methodology for banking efficiency of 8 commercial banks in Philippines banking sector. The log t-result is -28.7146 which is lower than -1.65 at 5 percent level of significant. Therefore, the null hypothesis of convergence is rejected for the period 2007 to 2010. The data trimming focuses on the latter part of the

sample data. From the results, it can be postulated that there is no panel convergence. However, noted that Phillip and Sul (2007) stated that there is possibility of convergence in the sub group. The later part of the results will show the trimmed observation of efficiency in Philippines banking sector specifically commercial banks.

PBCOM bank (HIT_CD) and BPI bank (HIT_CC) are among the highest of transition parameter path in terms of efficiency. Meanwhile, BDO bank (HIT_CF) and CBC bank (HIT_CH) are among the lowest of transition parameter path. On the other hand, BDO bank (HIT_CG) shows an increasing trend throughout study period.

Whereas, PNB bank (HIT_CA), Philtrust bank (HIT_CI) and AUB bank (HIT_CB) show a decreasing manner of transition parameter path that focuses on efficiency. Apart from that, there is also occurrence of convergence in 2008 between BDO bank (HIT_CG) and Philtrust bank (HIT_CI) as well as between BDO bank (HIT_CG) and AUB bank (HIT_CB). As for 2010, there is evidence of convergence between BDO bank (HIT_CG) and PNB bank (HIT_CA).

Table 15 shows the last time series observation of 8 commercial banks in Philippines. Based on this ranking, PBCOM bank (CD) is the base bank and it is the core group Club 1. Next, BPI bank (CC) is added to PBCOM bank (CD) and the t-statistics for both banks indicate divergence. This is because t-statistics of -5.4297 is lower than -1.65 therefore we stop adding another bank and a new club is identified. Club 2 is taken by BPI bank (CC) following by adding BDO bank (CG) to it. The t-statistics result is -3.4679 which is lower than -1.65. Therefore, it can be said that BDO bank (CG) is diverging and stop adding another bank to it. Club 3 is created and now BDO bank (CG) becomes the base bank. PNB bank (CA) is added to BDO bank (CG) to compute the t-statistics.

The result implies PNB bank (CA) is converging since t-statistics 4.5748 is higher than -1.65. Therefore, Philtrust bank (CI) is added to PNB bank (CA) and the accumulated t-statistics is 1.7138. This means Philtrust bank (CI) is converging but Club 4 is identified. This is because the current t-statistics is lower than previous result despite the convergence. Now, Philtrust bank (CI) is the base bank for Club 4. BDO unibank (CF) is added to the base bank and the t-statistics of 0.5900 which is greater than -.165 postulates that BDO unibank (CF) is converging. Therefore, AUB bank (CB) is added and the t-statistics shows that the bank is converging however the current t-statistics is lesser than before. Lastly, Club 5 is opened and CBC bank (CH) is added to the base bank AUB bank (CB). The computed t-statistics is -2.3257 which imply divergence.

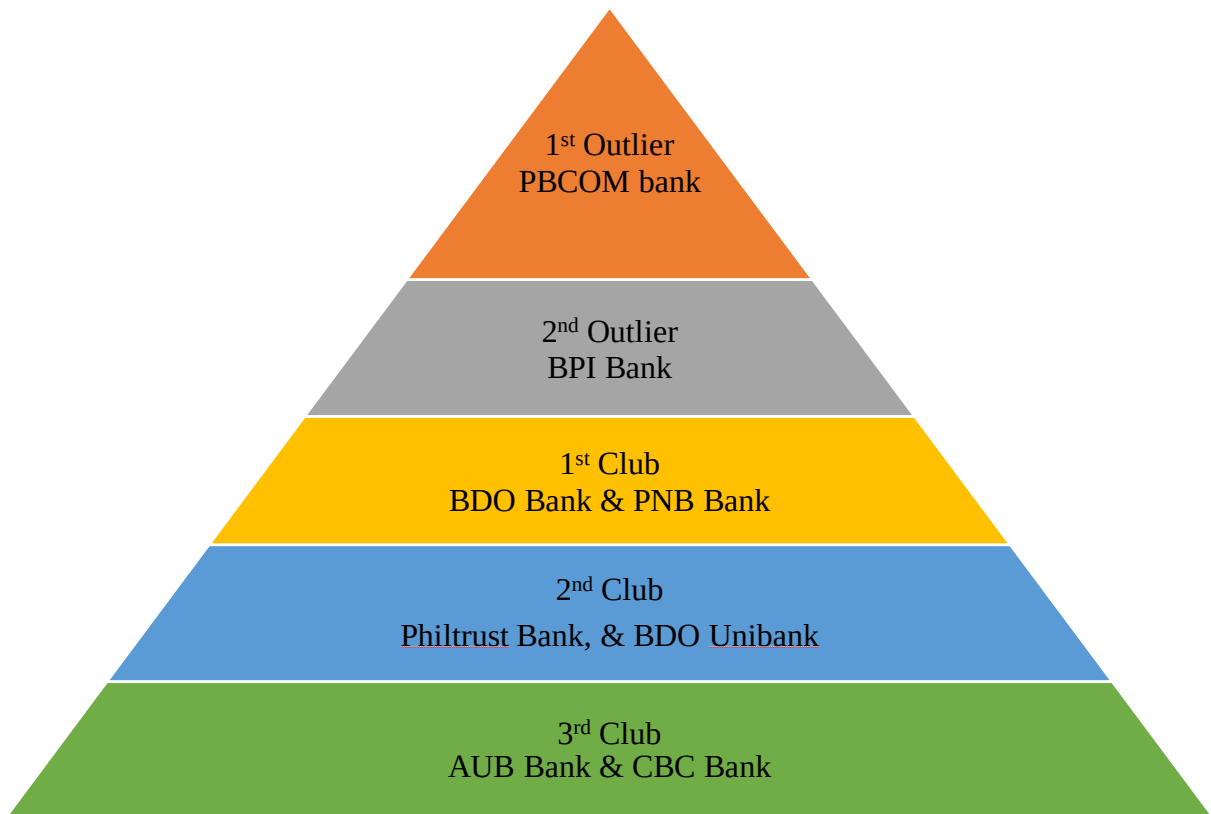


Figure 13: Illustration Group of Club Convergence in Philippines Banking Sector

Table 15: Results of Convergence Club in Philippines

Last order	T	Banks	Step 1	Step 2	Step 1	Step 2	Step1	Clubs	Remarks
1		CD	Base					1	Divergence
2		CC	-5.4197	Base				2	Divergence
3		CG		-3.4679	Base			3	Convergence
4		CA			4.5784			3	Convergence
5		CI			1.7138	Base		4	Convergence
7		CF				0.5900		4	Convergence
6		CB				-0.395	Base	5	Divergence
8		CH					-2.3257	5	Divergence

Figure 13 is the illustration group of club convergence for Philippines commercial banks. From the observation, Club 1 and Club 2 is both individually consist of PBCOM bank and BPI bank. BPI bank is the first bank in Philippines that ever been established which make this bank enjoy the first-mover advantage. This can be referred to Berger and Dick (2004) whom postulate bank that comes first has larger market share and higher control over its own bank. Thus, it makes BPI bank enjoys larger market share that resulted in higher efficiency performance even though it does not have larger asset size as compared to other commercial banks in Philippines banking sector. Besides, large banks tend to overuse their economies of scale in which cause them to experience diminish returns to scale and in turns make the large banks inefficient (Wahidudin, 2010). From observation, there are four top commercial banks in this study namely BPI bank, PNB bank. BDO unibank and CBC bank but neither of them are converging together in terms of efficiency performance. This might be due to the differences in bank managers' skills as well as corporate governance system (Staikouras *et al.*, 2008).

Moving on, Club 3 consists of BDO bank and PNB bank. As for Club 4 it comprises of Philtrust bank and BDO unibank. Meanwhile, AUB bank and CBC bank belong to Club 5. Form the results, efficiency performance of commercial banks in Philippines are considered diverse from each other since there is only two banks for each convergence club except for Club 1 and Club 2. Thus, many convergence clubs imply that catching-up effect for commercial banks in Philippines banking sector are slower. Hence, banks will take a longer time to move towards same efficiency path.

4.3.6 Malaysia

Table 16: Results of Convergence on aggregate of Variables in Malaysia

Clubs	Country	t-statistics	Remarks
Full sample of all commercial banks	Malaysia	-108.8330*	Divergence

Notes: Asterisk (*) denotes statistically significance at 5% level. The 5% critical value is -1.65.

Table 16 reports the results of the panel convergence methodology for banking efficiency of 8 commercial banks in Malaysia banking sector. The log t-result is -108.8330 which is lower than -1.65 at 5 percent level of significance. Therefore, the null hypothesis of convergence is rejected for the period 2007 to 2010. The data trimming focuses on the latter part of the sample data. From the results, it can be postulated that there is no panel convergence. However, noted that Phillip and Sul (2007) stated that there is possibility of convergence in the sub group. The later part of the results will show the trimmed observation of efficiency in Philippines banking sector specifically commercial banks.

Ambank (HIT_AC), Public bank (HIT_AH) and Affin bank (HIT_AA) have showed an increasing trend of transition parameter path. Whereas, RHB bank (HIT_AI) and Alliance bank (HIT_AB) both shows increasing manner of transition parameter path but not as obvious as the other three banks and there is a strong evidence of convergence between RHB bank (HIT_AI) and Ambank bank (HIT_AC). In addition, Alliance bank (HIT_AB) is the lowest of transition parameter path in regards of banking efficiency within the study period. We can also observe that banks such as Hong Leong bank (HIT_AF), Maybank (HIT_AG) and CIMB bank (HIT_AD) shows a decreasing trend of transition parameter path.

Table 17: Results of Convergence Club in Malaysia

Last order	T	Banks	Step 1	Step 2	Step 1	Step 2	Clubs	Remarks
1		AC	Base				1	Divergence
2		AH	-8.9977	Base			2	Divergence
3		AI		-23.8187	Base		3	Convergence
4		AA			2.9147		3	Convergence
5		AF			-0.0613	Base	4	Convergence
7		AG				0.1527	4	Convergence
6		AB				0.9413	4	Convergence
8		AD				-9.7389	4	Convergence

Firstly, Table 17 shows the last time series observation of Malaysia. Based on this ranking, Am bank (AC) is the base bank and it is the core group, Club 1. Next, by adding one more bank to existing bank and run the log-t regression to obtain compute t-statistics. Do not add another bank when the t-statistics is less than -1.65 as it indicates divergence. As can be seen, the t-statistics for Am bank (AC) and Public bank (AH) is -8.9977 which is less than -1.65. Therefore, Public bank (AH) is diverging and stops adding another bank to Club 1. In order to identify the Club 2, take Public bank (AH) as a base bank and add RHB bank (AI). The computed t-statistics for Public bank (AH) and RHB bank (AI) is -23.8187 which is less than -1.65.

The result indicates RHB bank (AI) banking efficiency is diverging and stops adding another bank. Thus, Club 3 is taken by the RHB bank (AI) and following by adding Affin bank (AA). The t-statistics result obtained is 2.9147 which greater than -1.65. This implies that Affin

bank (AA) is converging and it had taken Club 3. Then, take Affin bank (AA) as a base and add Hong Leong bank (AF). The result shows that Hong Leong bank (AF) is converging since t-statistics -0.061 is greater than -1.65. However, we stop adding another bank even though t-statistics indicates convergence because the current t-statistics shows reduction from 2.9147 to -0.0613 and therefore Club 4 is created. Hong Leong bank (AF) is a base for Club 4 and Maybank (AG) is added. The t-statistics result is greater than -1.65 with 0.1527 which also means Maybank (AG) is converging. Then, add Alliance bank (AB) to Maybank (AG) that is now become a base. Once again, t-statistic of 0.9413 is greater than -1.65 and it signals Alliance bank (AB) is converging. Lastly since adding Maybank (AG) and Alliance bank (AB) in Club 4 resulted in convergence and higher t-statistics then another bank will be added in this club. Now, Alliance bank (AB) becomes base by adding CIMB bank (AD). The result suggests that t-statistic is -9.7389 which is less than -1.65 and supposedly to be diverging but since there is no more bank to add we assume CIMB bank (AD) efficiency is converging same as other banks in Club 4.

Figure 14 demonstrates selected Malaysian commercial banks in this study from year 2007 until 2010. From the illustration, Ambank in Club 1 and Public bank in Club 2 are considered as outlier and both banks are diverging towards other banks in terms of efficiency performance. Ambank and Public bank are both anchor banks in Malaysia and based on the observation they have highest efficiency performance as compared to others commercial banks in Club 3 and Club 4.

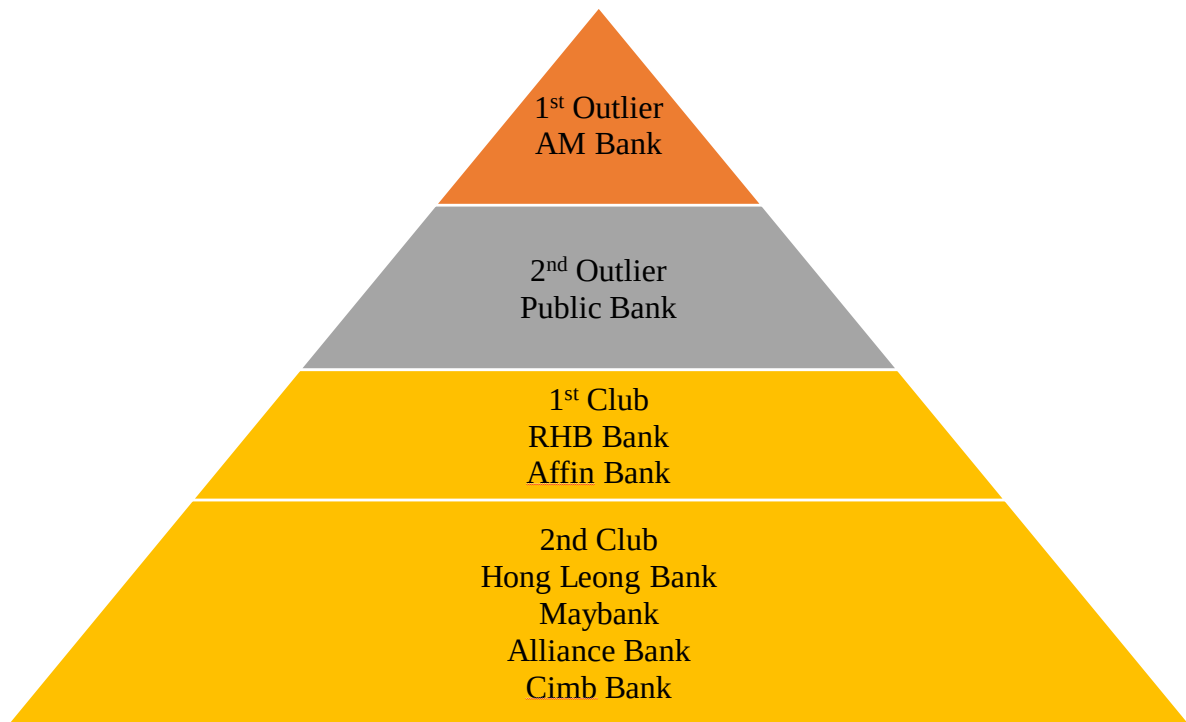


Figure 14: Illustration Group of Club Convergence in Malaysia Banking Sector

This result suggests that they manage risk better especially during financial crisis and customers must have trust in these banks (Sarifuddin *et al.*, 2015) Apart from that, private equity fund that has been launched in 2006 also contributed to Ambank divergence manner as it increases equity of the bank. In other words, increase in equity improves efficiency level because it increases equity ratio and reduces bankruptcy possibility and explicit costs due to financial distress (Casu & Molyneux, 2003).

In addition, Public bank is the largest bank by shareholders and come in third as the largest bank by market capitalization in Malaysian banking sector. Moreover, Public bank is also among the leading banks in the country and Asia region with asset amounted more than US\$90 billion as in 2015 (Relbanks, n.d.). As stated by Sufian and Mohamad (2008), bank size and its market capitalization have positive relationship with bank efficiency. Thus, the size of Public bank in terms of shareholders and market capitalization might contribute to its

efficiency performance and set apart the bank from other banks in Malaysia. Meanwhile, Club 3 consists of two banks namely RHB bank and Affin bank. It can be postulated that RHB bank is converging with Affin bank during study period. Lastly, Club 4 comprises of Hong Leong bank, Maybank, Alliance bank and CIMB bank. All these banks in Club 4 have existed before Asian Financial Crisis in 1997 and among the 10 anchor banks that have been approved by Bank Negara for merger and acquisition in year 2000 (Bank Negara, 2001). From the results, it can be assumed that commercial banks in Malaysia have faster catching-up effect since there is less convergence club as bank that is converging is either under Club 3 or Club 4. Besides, it also means that level of efficiency performance for commercial banks in Malaysia is not that diverse from each other. Additionally, commercial banks will take a shorter period to reach steady-state of efficiency level in Malaysian banking sector.

4.4 ASEAN-5

Table 18: Results of Convergence on Aggregate of Variables in ASEAN-5

Clubs	Country	t-statistics	Remarks
Full sample of all commercial banks	Malaysia, Singapore, Indonesia, Thailand and Philippines	-6.5048*	Divergence

Notes: Asterisk (*) denotes statistically significance at 5% level. The 5% critical value is -1.65

Table 18 shows the results of panel convergence methodology in terms of banking efficiency in ASEAN 5 economies. Phillip and Sul (2007) convergence methodology stated that the null hypothesis of convergence is rejected if the log t-test result is smaller than critical value -1.65. From the analysis, the t-statistics is -6.5048 which is smaller than -1.65 at 5 percent significant level. Thus, null hypothesis is rejected for the period 2005-2010 and there is no panel convergence. Additionally, Phillip and Sul (2007) mentioned that the first $r(0.3)$ of

the data should be eliminated before applying the log t-regression on time series data. Even though the results of convergence on aggregate variables in ASEAN 5 indicate divergence but there is possibility of convergence to exist in the sub group. Therefore, this leads to further trimmed observation. Figure 15 demonstrates cross sectional variation for banking efficiency in ASEAN 5 countries within the period 2007 to 2010. From the Figure, it can be seen that Panin bank (HIT_FF), OCBC bank (HIT_BF), AG bank (HIT_FO), Affin bank (HIT_AA) and BDO bank (HIT CG) show an increasing trend throughout the study period.

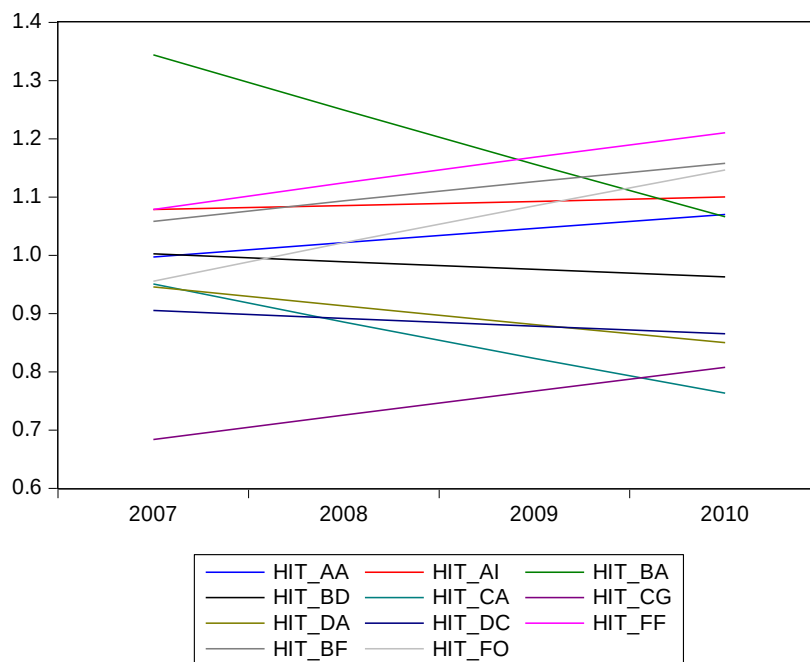


Figure 15: Cross Sectional Variation for Banking Efficiency in ASEAN-5

Table 19: Symbol Represents Bank and Country

Symbol	Name of Bank	Country
HIT_AA	Affin bank	Malaysia
HIT_AI	RHB bank	Malaysia
HIT_BA	Bank of Singapore	Singapore
HIT_BD	DBS bank	Singapore
HIT_BF	OCBC bank	Singapore
HIT_CA	PNB bank	Philippines
HIT_CG	BDO bank	Philippines
HIT_DA	Bangkok bank	Thailand
HIT_DC	Communications bank	Thailand
HIT_FF	AG bank	Indonesia
HIT_FO	Panin bank	Indonesia

However, Bank of Singapore (HIT_BA), DBS bank (HIT_BD), Bangkok bank (HIT_DA), Communications bank (HIT_DC) as well as PNB bank (HIT_CA) are observed to have a decreasing manner from year 2007 to 2010. On the other hand, there is a few evidences of convergence among commercial banks. In 2007, there are convergence between Affin bank (HIT_AA) and DBS bank (HIT_BD) and PNB bank (HIT_CA) and Bangkok bank (HIT_DA).

As in 2008, there are four occurrences of convergence which is between RHB bank (HIT_AI) and OCBC bank (HIT_BF), DBS bank (HIT_BD) and Panin bank (HIT_FO), PNB bank (HIT_CA) and Communications bank (HIT_DC) as well as convergence between Affin bank (HIT_AA) and Panin bank (HIT_FO). Moving on to year 2009, there are 5 convergences that can be observed from the transition parameter path.

The convergence is between Bank of Singapore (HIT_BA) and AG bank (HIT_FF), Bank of Singapore (HIT_BA) and OCBC bank (HIT_BF), Bank of Singapore (HIT_BA) and Panin bank (HIT_FO), RHB bank (HIT_AI) and Panin bank (HIT_FO) and lastly, it is between Bangkok bank (HIT_DA) and Communications bank (HIT_DC).

Table 20 represents results of convergence club of commercial banks in ASEAN 5 based on their efficiency. From this ranking, Panin bank (FO) is the base bank and it is the core group, Club 1. AG bank (FF) is added to the base bank to compute t-statistics. From the result, it can be implied that AG bank (FF) is converging on the same path as Panin bank (FO) since t-statistics 2.5138 is higher than -1.65. Next, we add another bank to get a new t-statistics. Now, AG bank (FF) becomes the base and RHB bank (AI) is added to it. The t-statistics is -0.5012 which is lower than -1.65.

However, Club 2 is identified due to resulted t-statistics is lower than previous result despite RHB bank (AI) convergence. Thus, Club 2 is taken by RHB bank (AI) following by adding OCBC bank (BF). From the result, it implies that OCBC bank (BF) is diverging because the t-statistics -1.6708 is lower than -1.65. Therefore, we stop adding another bank and open a new club. OCBC bank (BF) now is the base bank for Club 3 and Affin bank (AA) is added. The result insinuates that Affin bank (AA) is diverging with t-statistics -23.7782 is lesser than -1.65. With that, CIMB bank (AA) becomes the base for Club 4. Following, Bank of Singapore (BA) is added to the base bank and the accumulated t-statistics of 1.9533 postulates that the bank is converging since it is higher than -1.65. Next, we add another bank to Bank of Singapore (BA).

The t-statistics for Bank of Singapore (BA) and DBS bank (BD) is 4.3034 that is higher than -1.65. Thus, it means the latter bank is converging. Since DBS bank (BD) is converging now it acts as the base bank and BDO bank (CG) is added to it. However, Club 5 is identified even though t-statistics implies that BDO bank (CG) is converging. This is because the current t-statistics for DBS bank (BD) and BDO bank (CG) have resulted in smaller value than previous result. Club 5 is taken by BDO bank (CG) as the base bank and Communications bank (DC) is added to it. The computed t-statistics is 2.8966 which is higher than -1.65. Therefore, Communications bank (DC) is concluded to be converging and PNB bank (CA) is added to it. From the result, it indicates that PNB bank (CA) is converging with t-statistics of 3.9887 is greater than -1.65. Lastly, Bangkok bank (DA) is added to PNB bank (CA). The t-statistics result for both banks is 5.3564 that is higher than -1.65. This means that Bangkok bank (DA) is converging and it belongs to Club 5.

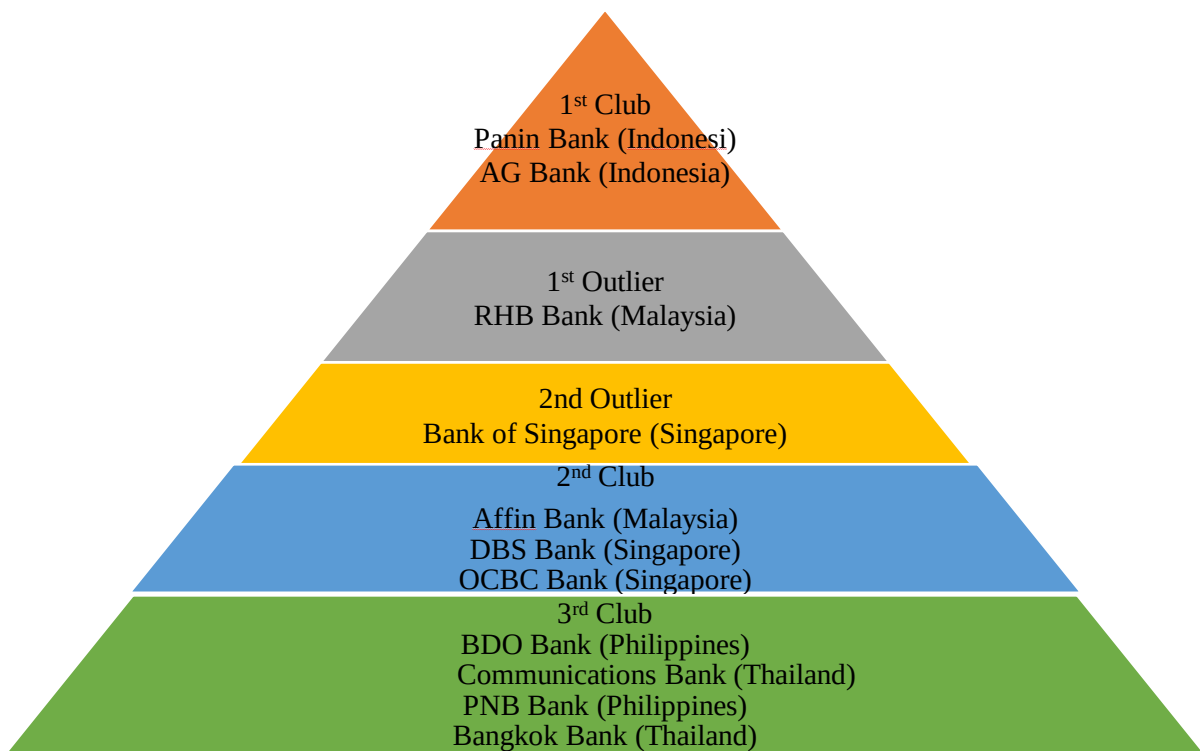


Figure 16: Illustration Group of Club Convergence in ASEAN-5 Banking Sector

Table 20: Results of Convergence Club in ASEAN-5

Last T order	Banks	Step 1	Step 2	Step 1	Step 2	Step 1	Clubs	Remarks
1.	FO	Base					1	Convergence
2.	FF	2.5138					1	Convergence
3.	AI	-0.5012	Base				2	Divergence
4.	BF		-1.6708	Base			3	Divergence
5.	AA			-23.7782	Base		4	Convergence
6.	BA				1.9533		4	Convergence
7.	BD				4.3034		4	Convergence
8.	CG				2.3910	Base	5	Convergence
9.	DC					2.8966	5	Convergence
10.	CA					3.9887	5	Convergence
11.	DA					5.3564	5	Convergence

Figure 16 is the illustration of group club convergence of commercial banks in ASEAN-5 banking sector. Club 1 consists of Panin bank and AG bank which are both a commercial bank in Indonesia. Meanwhile, banks in Club 2 and Club 3 which is RHB bank from Malaysia and Bank of Singapore is an outlier. Thus, both banks are considered diverging towards other commercial banks in ASEAN countries. As for Club 4, it comprises of Affin bank from Malaysia and two other commercial banks from Singapore namely DBS bank and OCBC bank. From the result, it can be postulated that these three banks are converging towards the same efficiency path. Lastly, BDO bank, Communications bank, PNB bank and Kasikornbank are all included under Club 5. Club 5 belongs to commercial banks from Philippines and Thailand. Thus, these four commercial banks are posited to be converging on the same path among them in regards of efficiency performance.

From the findings, the most efficient banks are from Indonesia which is Panin bank and AG bank. It can be concluded that these two banks are converging towards the same state of equilibrium in terms of efficiency performance. This outcome might be due to banking structural reformation program by Indonesia government after Asian Financial Crisis in 1997 (Zhang & Matthews, 2011). Additionally, government had re-privatised its formerly nationalized banks by selling government shares to local and foreign investors in which increase the present foreign subsidiary banks. As a result, banking sector in Indonesia became more competitive, stronger and had a better capitalized banking system as the competitiveness in Indonesian banking sector rise. (McCawley, 2009). Besides, Ataullah *et al.* (2004) mentioned that liberalization reduce efficiency gap of different size of groups. In this case, Panin bank is the 7th largest bank in Indonesia banking sector and have huge total assets as compared to AG bank. However, they share the same efficiency performance despite bank size and are converging together.

On the other hand, in Club 4 there are two banks from Singapore and one commercial bank from Malaysia. The result indicates that these three banks namely Affin bank, DBS bank as well as OCBC bank are converging on the same efficiency path. Since Singapore and Malaysia is a neighboring country thus the prosperity of Singaporean and Malaysian banking sectors somehow depends on each other. In other words, Malaysia and Singapore are countries that are closely interlinked and economically interdependent with each other as they have a common strategic outlook (Thayer, 2008). Malaysia and Singapore leaders both committed to work closely to further strengthen and deepen regional economic integration according to what has been outlined in AEC Blueprint 2025 (Channel NewsAsia, 2016). It is noteworthy to mention that under AEC Blueprint 2025 it includes three strategic objectives in which to achieve financial integration, financial inclusion and financial stability and both leaders; Malaysian Prime Minister and Singaporean President are committed to make this happen beyond 2015 (Asia One, 2015). Overall, this economic relation between Singapore and Malaysia somehow has contributed to the same efficiency performance for both countries' commercial banks namely Affin bank from Malaysia and DBS bank as well as OCBC bank from Singapore. From the result, it also implies that asset size does not affect bank efficiency in ASEAN banking sector. This is to say, DBS bank and OCBC bank have lower efficiency performance as compared to Panin bank and AG bank from Club 1 despite being the top 2 largest commercial banks in Southeast Asia in terms of total assets and market capitalization sizes (Schaefer, 2016). This implies that DBS bank and OCBC bank tend to overuse their economies of scale which in return diminish their returns to scale and causes the banks to be inefficient (Wahidudin, 2010). Lastly, Club 5 consists of commercial banks from Philippines and Thailand. Commercial banks from Philippines and Thailand are converging with each other towards the same equilibrium state of efficiency performance.

This outcome might be due to their political instability in these past few years. Among other commercial banks in ASEAN, banks from Philippines and Thailand have the lowest efficiency level. This might be attributed by political instability that happens to these two countries in which Philippines has on going corruption issue in the government whereas Thailand experienced military coup in 2014 by Royal Thai Army (Celestial, 2015). Political instability due to corruption and unstable government is known as a country-specific risk in which affects economies, bank outputs as well as bank performance (Tamadonnejad *et al.*, 2013). Since efficiency is closely related with bank outputs and performance then this conflict in turns will affect banking efficiency as country-specific risk is beyond the control of banks. Hence, it is concluded that both commercial banks in Philippines and Thailand are converging with each other because of their internal conflict that is political instability that later affect banking efficiency performance in both countries. Figure 17 shows the result of cross sectional variation of every commercial bank in ASEAN-5 countries within the period of 2007 until 2010.

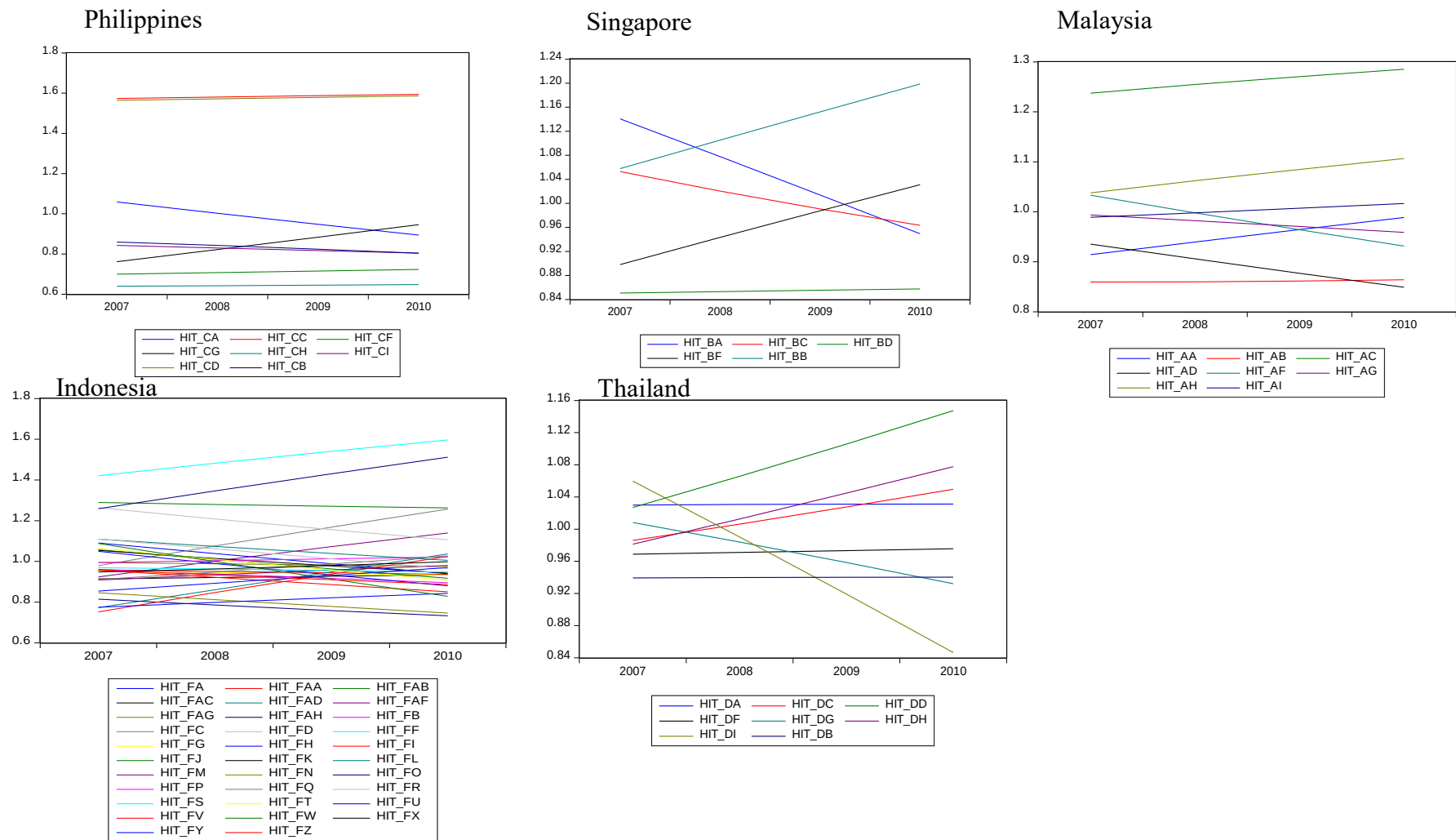


Figure 17: Cross-Sectional Transition Path for ASEAN-5

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter will briefly be concluded about the conclusion and findings throughout the study and policy recommendations could be proposed or suggest towards policy maker especially government of Malaysia towards policy consequence in short term and long term. Thus, the policy might be able to implement toward others ASEAN-5 countries namely Singapore, Indonesia, Thailand and Philippines.

5.2 Conclusion

In summary, the application of DEA, developed by Phillips and Sul (2007) to exploring the convergence of efficiency within ASEAN states revealed that efficiency does have an effect of convergence between this Asean-5, and not a great extent.

From this study, several conclusions have emerged. Firstly, results on the research indicate that commercial banks from Indonesia are converging among themselves. Indonesian government intervention to aid its banking sector leads to increment in efficiency. As a result, the banking sector in Indonesia becomes more resilience to another financial shock in 2008 and makes the commercial banks efficiency and performances sustainable. Secondly, observation from this study implies that neighbouring commercial banks tend to converge together. From the results, commercial banks from Malaysia and Singapore are converging towards the same efficiency path. Thus, diplomatic relation between these two countries is very important to each other in terms of economic performance especially in banking sector in order to attain high efficiency performance. Thirdly, commercial banks

from Philippines and Thailand are also converging under the same efficiency performance. Political instability is assumed to affect banking efficiency performance in these two countries.

All in all, it is crucial to see the efficiency performance of commercial banks in ASEAN economies whether they are converging or diverging towards a common path. This is because it allows for these countries namely Malaysia, Singapore, Indonesia, Thailand and Philippines to take a similar action to any economic and financial shock to avoid the action of ones' country from jeopardizing stability of banking sector in other ASEAN countries.

Government intervention and attention for implication of the right policies would be needed as the potential opportunities that exist for the less-developed economies is smudge and hidden.

5.3 Policy Recommendation

In this study, it can be concluded that ASEAN countries are correlated and most of the banks were convergence between each other's although there is a different of club of convergence. In terms of efficiency, the results show that aggregate, the ASEAN countries are competitive between each other. This is shows that the policy implications that apply by all of the ASEAN countries are merely the same and due to that, the results show that efficiency of ASEAN in terms of club are converging between each other's. In terms of future works, there are many opportunities for analysis of this rich data set. In the research, 3 specific objectives were successfully achieved.

This study can act as an evaluation of policy implementation within ASEAN countries generally as a whole. The evaluations of this study are able to gain an overview regarding ASEAN countries able to catch-up between other states in terms of banking sector thus it could lead to a successful to achieved ASEAN objectives creating a single currency within ASEAN countries. Efficient banking sector is crucial to ensure the stability of financial system in a country. Berger *et al.* (1993) defined a stable financial institution when there is profitability improvement, large amount of funds, high services quality with best prices for consumers as well as greater safety in which improvement in capital buffer ability to absorb risk. Apart from that, efficiency reflects performances of the banks in which imply banks with better performances manage their efficiency level for more competition so that they remain competitive in banking sector. Moreover, a well-functioning and stable banking sector is favorable for economic development and growth of a country (Ferreira, 2012).

In this study, it can be concluded that Indonesian commercial banks are converging with each other. It means that Indonesian government and central bank of Indonesia are monitoring and regulating their banking system tightly. Generally, a strict and tight regulation of banking system would hinder commercial banks in ASEAN countries to converge towards the same efficiency path. This is because heavily regulated banking system prevents commercial banks to become more competitive. Hence, efficiency level might decrease over time. Therefore, to promote financial integration, each of ASEAN countries needs to cooperate so that they can execute similar actions in the presence of economic and financial shocks.

Meanwhile, for Singaporean and Malaysian commercial banks they are neighboring countries that converge together. This means that efficiency of commercial banks in both countries is depending with each other economic structures, foreign policy as well as

diplomatic relations. This is to say, governments, central banks and commercial banks of neighboring countries should cooperate to strengthen their banking sector as well as to remain competitive in the region and global scenes as the banking performance of Malaysia and Singapore is dynamic.

As for Thailand and Philippines, their commercial banks have lower efficiency level as compared to others ASEAN countries. It indicates that political instability due to corruption and unstable government has affected their banking efficiency performance as political instability is beyond the control of banks. Therefore, government needs to ensure country's political stability in order to have a sound and stable banking sector.

In brief, the findings suggest that ASEAN countries should engage in regional cooperation to increase its financial integration in order to have a high integrated banking sector with high efficiency performance. As stated by Tamadonnejad (2013), integrated banks in a region can benefit the bank itself by providing diversification and easy accessibility to technology as well as other resources for inputs and outputs. In addition, highly integrated banking sector in ASEAN ensure banks in the region to temporary diversify when their domestic markets are volatile. By doing this, banks are likely to survive better during economic shock, financial crisis as well as during the occurrence political instability as integrated banking sector does strengthen and improve resiliency of the banks. This highly integrated banking sector can be achieved through many existed agreements that are already or yet to be signed such as ASEAN Economic Community (AEC) and Regional Comprehensive Economic Partnership (RCEP) where both agreements include the objective to intensify financial integration in ASEAN region which in turn will fuel banking integration as well.

Governors of each central bank in ASEAN have introduced ASEAN Banking Integration Framework (ABIF) in 2014 as it is a part of ASEAN Financial Integration Framework under AEC. ABIF allows banks from other ASEAN economies to get the same treatment as local banks in that particular ASEAN countries where banks are established as foreign or subsidiary banks. This arrangement will benefit smaller and medium banks in ASEAN as they get the opportunity to expand their business to other countries in the region and get to have the same benefit as local banks in the host country. Eventually, this leads to more competition in banking sector around the region and it will boost competitiveness in which raise banks efficiency performance and strengthen integration among banks. Unfortunately, ABIF arrangement to increase banking integration in order to promote high level of banking efficiency is futile as bilateral banking integration in ASEAN is suggested still at a low level (Duval *et al.*, 2014). However, despite this agreement, financial markets in ASEAN specifically its banking sector is still far from being an open market and liberalize which also indicate that banking sector in this region is not integrated.

On the other hand, Optimum Currency Area (OCA) is another framework that can assist development of banking efficiency. Basically, OCA eliminates the needs to exchange from one currency to another among members because the members will adopt this common currency and it will be used as medium of exchange in the region. As a result, financial transaction costs are reduced and banking efficiency is increased. Lastly, ASEAN countries that are involved in RCEP should place their best terms so it would benefit the region more. Through RCEP, economies in the ASEAN should put some terms that could attract investment to the region. Investment is pivotal so that the new and low-cost ways of banking sector could be provided to the customers in markets that has limited infrastructure as well as for banks to get a better accessibility on credit risks (Ernst & Young Global Limited,

2014). Consequently, this will improve the efficiency and effectiveness of banks internal operations. Apart from that, through RCEP a partnership between banks and other financial institutions as well as other sectors can be performed to help in filling skills gaps in the banks and to boost banking efficiency as what have been done by a bank in India and a major Chinese bank (Ernst & Young Global Limited, 2014 & 2015).

In short, all leaders in ASEAN economies need to come to terms to drive financial integration especially integrated banking sector through AEC and RCEP. In conclusion, commercial banks in ASEAN are the most crucial financial institution with overall assets more than 80percent. In other words, banking sector in ASEAN region have the potential to penetrate international financial market and compete with international banks (Asian Development Bank, 2013). Besides, banks are the main key of financial intermediation in ASEAN. This is to say, banking sector in ASEAN is the major contributor in escalating financial integration in the region (Almekinders *et al.*, 2015). Therefore, ASEAN commercial banks' growth, efficiency and effectiveness need to be developed and improved through integration of banking sector.

5.4 Future Research

For future researches, it is encouraged that in the future, researches are to be conducted using more determinant and deeper scope to attain more holistic understanding of convergence of efficiency. Upon this, an important matter could be added is that even though the non-existence of convergence would indicate the possibilities of convergence clubs.

In order for ASEAN to continue sustain and compete with EU country, ASEAN community members need to implement a same fiscal policy management and it should be made more

transparent thus could give benefits within members. Thus, these ASEAN countries could catch up between each other accordingly.

5.5 Limitation of Study

This study is limited by several numbers of setbacks that affect the outcome of the findings. One of it is limitation of the data collection method for the research survey which is only by accessing online database known as “Bankscope; by bureau van Dijk” whereby the data need to be purchased in order to collect data.

Next limitation is the study only applied three methods in determining the efficiency and one method determine convergence and its relationship towards efficiency. In future, more theoretical framework could be added to give a better result on the research study.

Lastly, only a few studies were conducted previously on convergence of banking efficiency on ASEAN countries. Thus, it makes the process of making literature review and better explanation to analyse the variable consumes a lot of time.

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APPENDICES

Appendix A: Panel Analysis Results (Eviews)

Appendix A1: Descriptive Analysis All Countries (Malaysia, Singapore, Philippines, Thailand and Indonesia.

Dependent Variable: DV_ASEAN_ALL

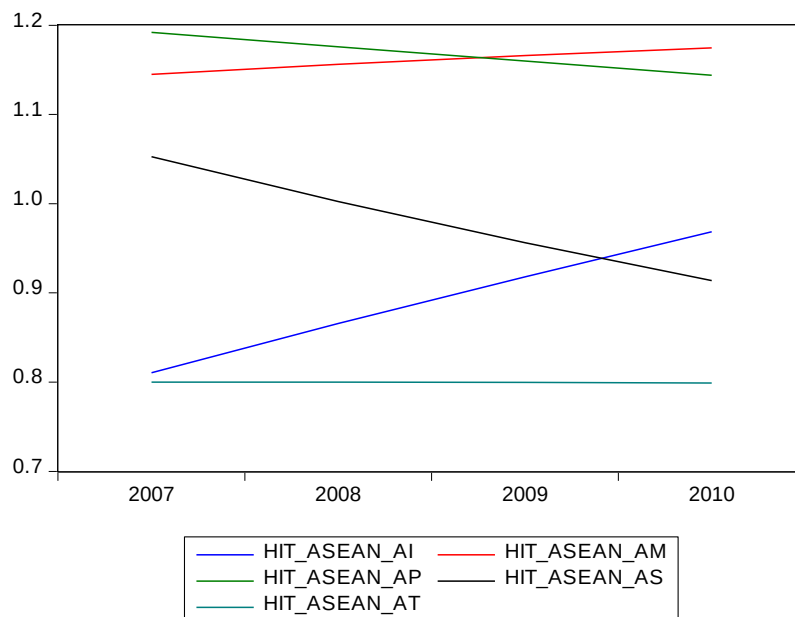
Method: Least Squares

Date: 02/20/17 Time: 15:07

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.386617	0.036090	38.42078	0.0007
LOG(TIME)	-0.952875	0.024155	-39.44828	0.0006
R-squared	0.998716	Mean dependent var	-0.015564	
Adjusted R-squared	0.998075	S.D. dependent var	0.284931	
S.E. of regression	0.012502	Akaike info criterion	-5.618942	
Sum squared resid	0.000313	Schwarz criterion	-5.925795	
Log likelihood	13.23788	Hannan-Quinn criter.	-6.292308	
F-statistic	1556.167	Durbin-Watson stat	3.085671	
Prob(F-statistic)	0.000642			



Without Log

Dependent Variable: DV_M_ALL

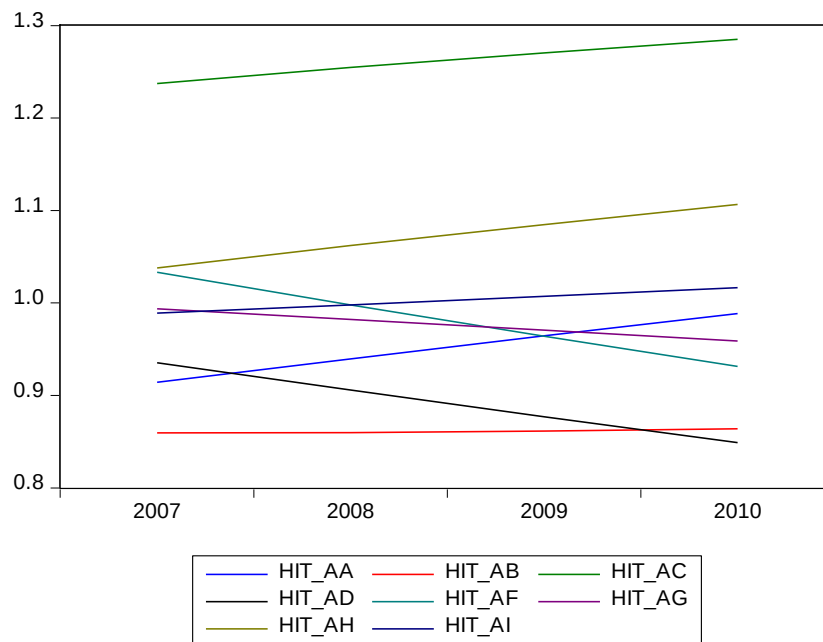
Method: Least Squares

Date: 01/12/17 Time: 02:02

Sample: 2007 2010

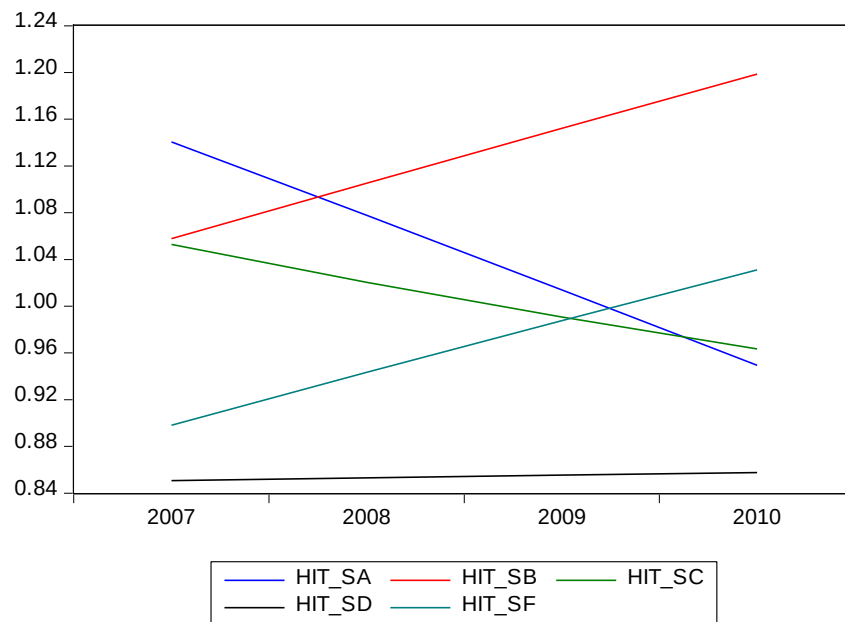
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.244205	0.028114	-8.686166	0.0130
LOG(TIME)	-2.047878	0.018817	-108.8330	0.0001
R-squared	0.999831	Mean dependent var	-3.257710	
Adjusted R-squared	0.999747	S.D. dependent var	0.612019	
S.E. of regression	0.009739	Akaike info criterion	-6.118440	
Sum squared resid	0.000190	Schwarz criterion	-6.425292	
Log likelihood	14.23688	Hannan-Quinn criter.	-6.791805	
F-statistic	11844.63	Durbin-Watson stat	2.082749	
Prob(F-statistic)	0.000084			



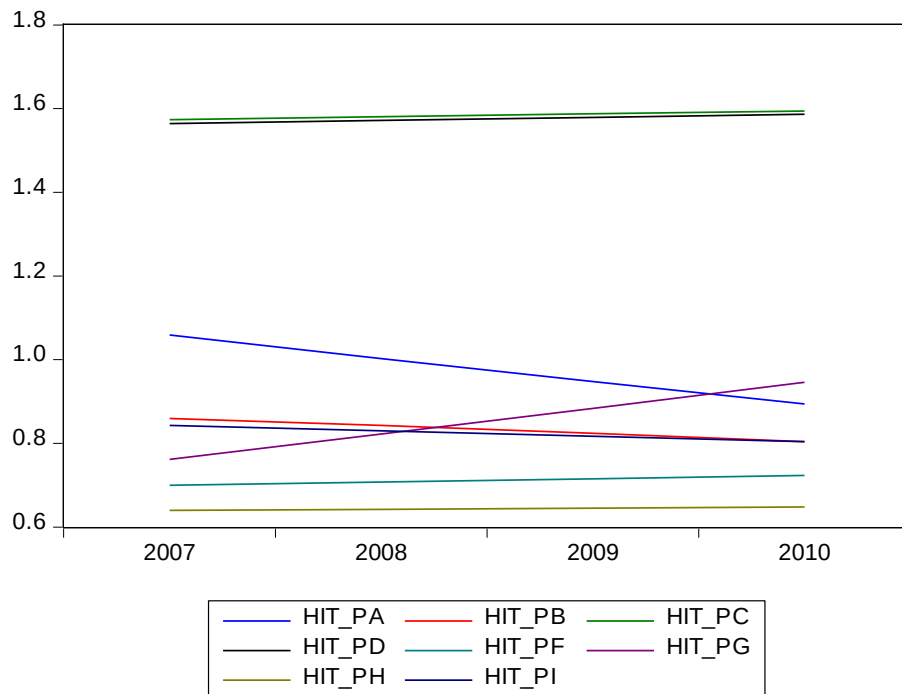
Dependent Variable: DV_S_ALL
Method: Least Squares
Date: 01/12/17 Time: 02:02
Sample: 2007 2010
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.493658	0.619092	4.027925	0.0565
LOG(TIME)	-1.492668	0.414355	-3.602386	0.0692
R-squared	0.866464	Mean dependent var	0.297158	
Adjusted R-squared	0.799695	S.D. dependent var	0.479195	
S.E. of regression	0.214466	Akaike info criterion	0.065520	
Sum squared resid	0.091991	Schwarz criterion	-0.241333	
Log likelihood	1.868961	Hannan-Quinn criter.	-0.607846	
F-statistic	12.97718	Durbin-Watson stat	1.985419	
Prob(F-statistic)	0.069160			



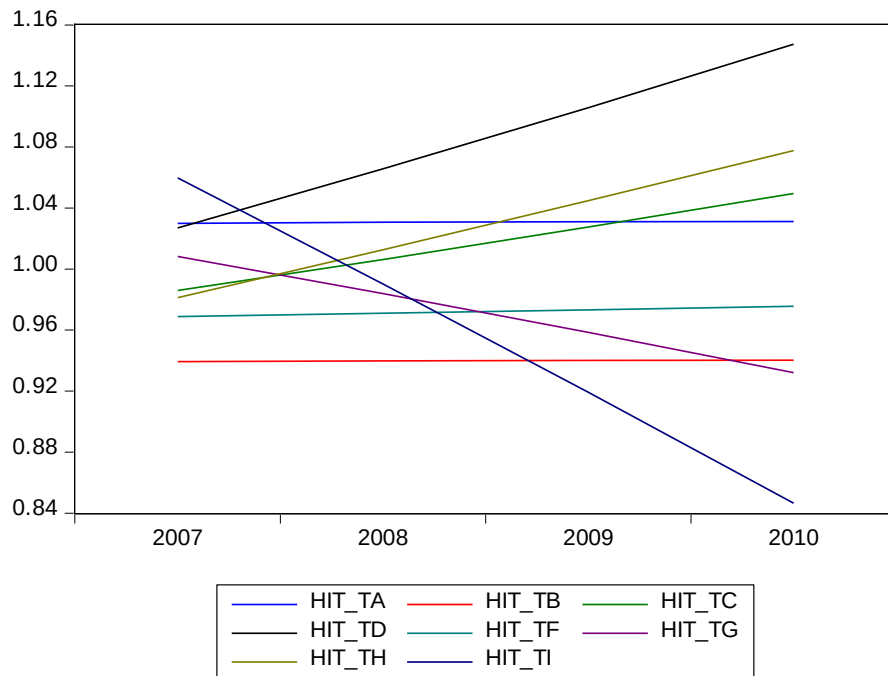
Dependent Variable: DV_P_ALL
Method: Least Squares
Date: 01/12/17 Time: 02:04
Sample: 2007 2010
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.427054	0.074676	19.11003	0.0027
LOG(TIME)	-1.435157	0.049980	-28.71462	0.0012
R-squared	0.997580	Mean dependent var	-0.684817	
Adjusted R-squared	0.996370	S.D. dependent var	0.429388	
S.E. of regression	0.025869	Akaike info criterion	-4.164682	
Sum squared resid	0.001338	Schwarz criterion	-4.471535	
Log likelihood	10.32936	Hannan-Quinn criter.	-4.838048	
F-statistic	824.5295	Durbin-Watson stat	2.101363	
Prob(F-statistic)	0.001211			



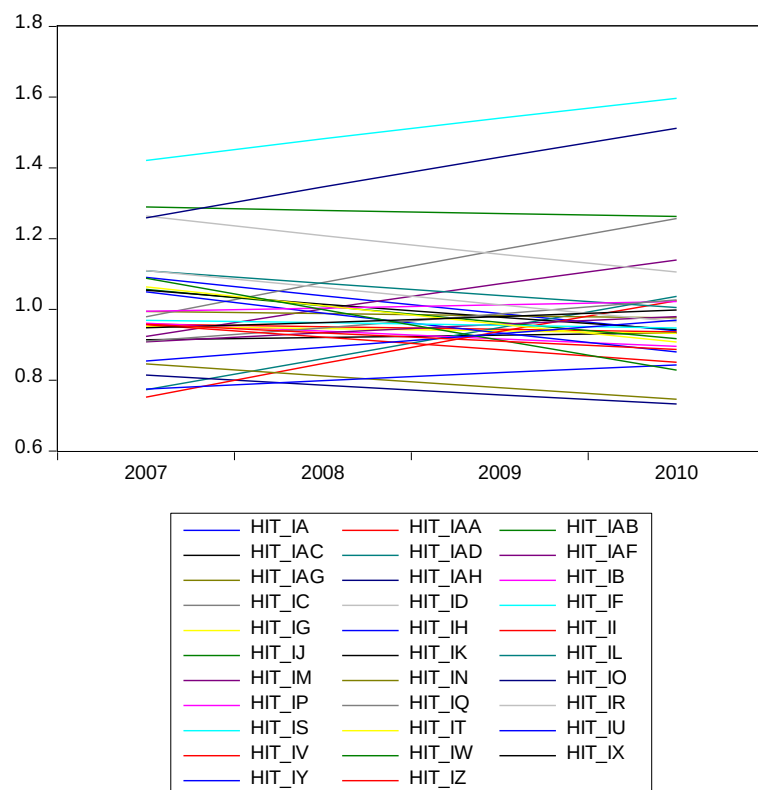
Dependent Variable: DV_T_ALL
Method: Least Squares
Date: 01/12/17 Time: 02:04
Sample: 2007 2010
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.266719	1.185720	5.285158	0.0340
LOG(TIME)	-4.071604	0.793597	-5.130571	0.0360
R-squared	0.929385	Mean dependent var	0.275248	
Adjusted R-squared	0.894078	S.D. dependent var	1.262095	
S.E. of regression	0.410757	Akaike info criterion	1.365222	
Sum squared resid	0.337442	Schwarz criterion	1.058369	
Log likelihood	-0.730444	Hannan-Quinn criter.	0.691856	
F-statistic	26.32276	Durbin-Watson stat	2.248252	
Prob(F-statistic)	0.035954			



Dependent Variable: DV_I_ALL
Method: Least Squares
Date: 01/12/17 Time: 23:11
Sample: 2007 2010
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.589986	0.282002	9.184269	0.0116
LOG(TIME)	-1.940939	0.188743	-10.28352	0.0093
R-squared	0.981439	Mean dependent var	-0.266157	
Adjusted R-squared	0.972158	S.D. dependent var	0.585470	
S.E. of regression	0.097691	Akaike info criterion	-1.507159	
Sum squared resid	0.019087	Schwarz criterion	-1.814012	
Log likelihood	5.014318	Hannan-Quinn criter.	-2.180525	
F-statistic	105.7507	Durbin-Watson stat	1.991156	
Prob(F-statistic)	0.009324			



Appendix B: Descriptive Analysis on Malaysia

C + H

Dependent Variable: DV_M1_ALL

Method: Least Squares

Date: 01/13/17 Time: 13:23

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.047656	0.158824	6.596331	0.0222
LOG(TIME)	-0.956457	0.106300	-8.997705	0.0121
R-squared	0.975892	Mean dependent var	-0.359796	
Adjusted R-squared	0.963837	S.D. dependent var	0.289327	
S.E. of regression	0.055020	Akaike info criterion	-2.655395	
Sum squared resid	0.006054	Schwarz criterion	-2.962248	
Log likelihood	7.310791	Hannan-Quinn criter.	-3.328761	
F-statistic	80.95870	Durbin-Watson stat	2.017835	
Prob(F-statistic)	0.012128			

H + I

Dependent Variable: DV_M2_ALL

Method: Least Squares

Date: 02/20/17 Time: 14:00

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.418694	0.191069	2.191331	0.1598
LOG(TIME)	-3.045962	0.127881	-23.81868	0.0018
R-squared	0.996487	Mean dependent var	-4.063518	
Adjusted R-squared	0.994731	S.D. dependent var	0.911828	
S.E. of regression	0.066190	Akaike info criterion	-2.285725	
Sum squared resid	0.008762	Schwarz criterion	-2.592578	
Log likelihood	6.571450	Hannan-Quinn criter.	-2.959091	
F-statistic	567.3296	Durbin-Watson stat	2.053936	
Prob(F-statistic)	0.001758			

I + A

Dependent Variable: DV_M3_ALL

Method: Least Squares

Date: 01/13/17 Time: 13:30

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.190055	0.773603	-1.538327	0.2638
LOG(TIME)	1.509161	0.517769	2.914738	0.1003
R-squared	0.809446	Mean dependent var	1.030714	
Adjusted R-squared	0.714169	S.D. dependent var	0.501263	
S.E. of regression	0.267991	Akaike info criterion	0.511129	
Sum squared resid	0.143639	Schwarz criterion	0.204276	
Log likelihood	0.977742	Hannan-Quinn criter.	-0.162237	
F-statistic	8.495699	Durbin-Watson stat	1.985160	
Prob(F-statistic)	0.100308			

I + A + F

Dependent Variable: DV_M4_ALL

Method: Least Squares

Date: 02/20/17 Time: 13:58

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.694027	2.171713	0.780042	0.5170
LOG(TIME)	-0.089090	1.453517	-0.061293	0.9567
R-squared	0.001875	Mean dependent var	1.562928	
Adjusted R-squared	-0.497188	S.D. dependent var	0.614847	
S.E. of regression	0.752324	Akaike info criterion	2.575554	
Sum squared resid	1.131983	Schwarz criterion	2.268701	
Log likelihood	-3.151108	Hannan-Quinn criter.	1.902188	
F-statistic	0.003757	Durbin-Watson stat	2.098824	
Prob(F-statistic)	0.956700			

I + A + F + G

Dependent Variable: DV_M5_ALL

Method: Least Squares

Date: 02/20/17 Time: 14:03

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.822657	2.231740	0.816698	0.4999
LOG(TIME)	-0.191754	1.493693	-0.128376	0.9096
R-squared	0.008173	Mean dependent var	1.540486	
Adjusted R-squared	-0.487741	S.D. dependent var	0.633844	
S.E. of regression	0.773119	Akaike info criterion	2.630084	
Sum squared resid	1.195425	Schwarz criterion	2.323232	
Log likelihood	-3.260169	Hannan-Quinn criter.	1.956719	
F-statistic	0.016480	Durbin-Watson stat	2.085103	
Prob(F-statistic)	0.909596			

I + A + F + G + B

Dependent Variable: DV_M6_ALL

Method: Least Squares

Date: 02/20/17 Time: 14:08

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.624594	0.355833	4.565613	0.0448
LOG(TIME)	-0.868393	0.238157	-3.646304	0.0677
R-squared	0.869243	Mean dependent var	0.346731	
Adjusted R-squared	0.803864	S.D. dependent var	0.278336	
S.E. of regression	0.123267	Akaike info criterion	-1.042069	
Sum squared resid	0.030390	Schwarz criterion	-1.348922	
Log likelihood	4.084138	Hannan-Quinn criter.	-1.715435	
F-statistic	13.29553	Durbin-Watson stat	2.045011	
Prob(F-statistic)	0.067668			

B + D

Dependent Variable: DV_M7_ALL

Method: Least Squares

Date: 02/20/17 Time: 14:14

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.227989	1.611605	-2.002965	0.1831
LOG(TIME)	3.669863	1.078639	3.402308	0.0766
R-squared	0.852678	Mean dependent var	2.172310	
Adjusted R-squared	0.779017	S.D. dependent var	1.187631	
S.E. of regression	0.558292	Akaike info criterion	1.978982	
Sum squared resid	0.623379	Schwarz criterion	1.672130	
Log likelihood	-1.957965	Hannan-Quinn criter.	1.305617	
F-statistic	11.57570	Durbin-Watson stat	3.355696	
Prob(F-statistic)	0.076594			

Table B1: Convergence Club Malaysia

Last T order	Bank s	Step 1	Step 2	Step 1	Step 2	Club s	Remarks
1	C	Base				1	Divergence
2	H	-8.9977	Base			2	Divergence
3	I		- 23.81868	Base		3	Divergence
4	A			2.9147		3	Convergence
5	F			-0.0613		3	Convergence
6	G			-0.1284		3	Convergence
7	B			-3.6463	Base	4	Divergence
8	D				3.4023	4	Convergence

Appendix C: Descriptive Analysis on Singapore

C + B

Dependent Variable: DV_S1_ALL

Method: Least Squares

Date: 01/13/17 Time: 13:53

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	19.28807	4.308485	4.476764	0.0464
LOG(TIME)	-12.34319	2.883647	-4.280410	0.0505
R-squared	0.901584	Mean dependent var	1.124741	
Adjusted R-squared	0.852376	S.D. dependent var	3.884621	
S.E. of regression	1.492544	Akaike info criterion	3.945694	
Sum squared resid	4.455373	Schwarz criterion	3.638841	
Log likelihood	-5.891387	Hannan-Quinn criter.	3.272328	
F-statistic	18.32191	Durbin-Watson stat	2.179785	
Prob(F-statistic)	0.050482			

B + F

Dependent Variable: DV_S2_ALL

Method: Least Squares

Date: 01/13/17 Time: 13:57

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.245280	0.115901	10.74437	0.0086
LOG(TIME)	-1.176362	0.077572	-15.16483	0.0043
R-squared	0.991378	Mean dependent var	-0.485768	
Adjusted R-squared	0.987067	S.D. dependent var	0.353058	
S.E. of regression	0.040150	Akaike info criterion	-3.285523	
Sum squared resid	0.003224	Schwarz criterion	-3.592376	
Log likelihood	8.571045	Hannan-Quinn criter.	-3.958888	
F-statistic	229.9721	Durbin-Watson stat	2.035276	
Prob(F-statistic)	0.004320			

F + A

Dependent Variable: DV_S3_ALL
Method: Least Squares
Date: 01/13/17 Time: 14:07
Sample: 2007 2010
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.021846	4.611813	-0.438406	0.7039
LOG(TIME)	3.014245	3.086663	0.976538	0.4318
R-squared	0.322866	Mean dependent var	2.413694	
Adjusted R-squared	-0.015700	S.D. dependent var	1.585227	
S.E. of regression	1.597622	Akaike info criterion	4.081763	
Sum squared resid	5.104795	Schwarz criterion	3.774910	
Log likelihood	-6.163526	Hannan-Quinn criter.	3.408397	
F-statistic	0.953627	Durbin-Watson stat	2.840459	
Prob(F-statistic)	0.431787			

F + A + D

Dependent Variable: DV_S4_ALL
Method: Least Squares
Date: 01/13/17 Time: 14:10
Sample: 2007 2010
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.433568	0.501586	0.864395	0.4785
LOG(TIME)	0.349305	0.335709	1.040499	0.4074
R-squared	0.351205	Mean dependent var	0.947579	
Adjusted R-squared	0.026807	S.D. dependent var	0.176136	
S.E. of regression	0.173759	Akaike info criterion	-0.355440	
Sum squared resid	0.060385	Schwarz criterion	-0.662293	
Log likelihood	2.710880	Hannan-Quinn criter.	-1.028806	
F-statistic	1.082637	Durbin-Watson stat	2.493321	
Prob(F-statistic)	0.407375			

Appendix D: Descriptive Analysis on Philippines

D + C

Dependent Variable: DV_P1_ALL

Method: Least Squares

Date: 01/13/17 Time: 14:17

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.341978	0.276850	1.235246	0.3422
LOG(TIME)	-1.004241	0.185294	-5.419708	0.0324
R-squared	0.936251	Mean dependent var	-1.135789	
Adjusted R-squared	0.904377	S.D. dependent var	0.310146	
S.E. of regression	0.095906	Akaike info criterion	-1.544039	
Sum squared resid	0.018396	Schwarz criterion	-1.850892	
Log likelihood	5.088078	Hannan-Quinn criter.	-2.217405	
F-statistic	29.37324	Durbin-Watson stat	2.037883	
Prob(F-statistic)	0.032399			

C + G

Dependent Variable: DV_P2_ALL

Method: Least Squares

Date: 01/13/17 Time: 14:24

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.699927	0.229060	3.055647	0.0925
LOG(TIME)	-0.531655	0.153309	-3.467871	0.0740
R-squared	0.857409	Mean dependent var	-0.082418	
Adjusted R-squared	0.786114	S.D. dependent var	0.171577	
S.E. of regression	0.079351	Akaike info criterion	-1.923021	
Sum squared resid	0.012593	Schwarz criterion	-2.229874	
Log likelihood	5.846043	Hannan-Quinn criter.	-2.596387	
F-statistic	12.02613	Durbin-Watson stat	2.006734	
Prob(F-statistic)	0.074036			

G + A

Dependent Variable: DV_P3_ALL

Method: Least Squares

Date: 01/13/17 Time: 14:27

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.641925	1.323034	-2.752708	0.1105
LOG(TIME)	4.054147	0.885500	4.578372	0.0445
R-squared	0.912898	Mean dependent var	2.323858	
Adjusted R-squared	0.869346	S.D. dependent var	1.267981	
S.E. of regression	0.458325	Akaike info criterion	1.584376	
Sum squared resid	0.420123	Schwarz criterion	1.277523	
Log likelihood	-1.168751	Hannan-Quinn criter.	0.911010	
F-statistic	20.96149	Durbin-Watson stat	3.379575	
Prob(F-statistic)	0.044543			

G + A + I

Dependent Variable: DV_P4_ALL

Method: Least Squares

Date: 01/13/17 Time: 14:33

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.126393	0.875788	-0.144319	0.8985
LOG(TIME)	1.004544	0.586160	1.713769	0.2287
R-squared	0.594896	Mean dependent var	1.351819	
Adjusted R-squared	0.392344	S.D. dependent var	0.389200	
S.E. of regression	0.303390	Akaike info criterion	0.759258	
Sum squared resid	0.184091	Schwarz criterion	0.452405	
Log likelihood	0.481484	Hannan-Quinn criter.	0.085892	
F-statistic	2.937004	Durbin-Watson stat	2.612991	
Prob(F-statistic)	0.228705			

G + A + I + F

Dependent Variable: DV_P5_ALL

Method: Least Squares

Date: 01/13/17 Time: 14:37

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.692186	0.293269	2.360240	0.1422
LOG(TIME)	0.010744	0.196284	0.054738	0.9613
R-squared	0.001496	Mean dependent var	0.707997	
Adjusted R-squared	-0.497756	S.D. dependent var	0.083014	
S.E. of regression	0.101594	Akaike info criterion	-1.428806	
Sum squared resid	0.020643	Schwarz criterion	-1.735658	
Log likelihood	4.857611	Hannan-Quinn criter.	-2.102171	
F-statistic	0.002996	Durbin-Watson stat	2.482631	
Prob(F-statistic)	0.961323			

G + A + I + F + B

Dependent Variable: DV_P6_ALL

Method: Least Squares

Date: 01/13/17 Time: 14:42

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.785293	0.334331	2.348848	0.1433
LOG(TIME)	-0.071815	0.223766	-0.320938	0.7787
R-squared	0.048978	Mean dependent var	0.679616	
Adjusted R-squared	-0.426533	S.D. dependent var	0.096970	
S.E. of regression	0.115819	Akaike info criterion	-1.166726	
Sum squared resid	0.026828	Schwarz criterion	-1.473578	
Log likelihood	4.333451	Hannan-Quinn criter.	-1.840091	
F-statistic	0.103001	Durbin-Watson stat	2.390276	
Prob(F-statistic)	0.778690			

G + A + I + F + B + H

Dependent Variable: DV_P7_ALL

Method: Least Squares

Date: 01/13/17 Time: 14:46

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.058782	0.148252	7.141771	0.0190
LOG(TIME)	-0.514892	0.099224	-5.189167	0.0352
R-squared	0.930862	Mean dependent var	0.301106	
Adjusted R-squared	0.896292	S.D. dependent var	0.159477	
S.E. of regression	0.051357	Akaike info criterion	-2.793162	
Sum squared resid	0.005275	Schwarz criterion	-3.100015	
Log likelihood	7.586324	Hannan-Quinn criter.	-3.466528	
F-statistic	26.92745	Durbin-Watson stat	2.482623	
Prob(F-statistic)	0.035188			

Appendix E: Descriptive Analysis on Thailand

D + H

Dependent Variable: DV_T1_ALL

Method: Least Squares

Date: 01/13/17 Time: 14:53

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.712781	0.040378	42.41897	0.0006
LOG(TIME)	-2.335622	0.027025	-86.42579	0.0001
R-squared	0.999732	Mean dependent var	-1.724148	
Adjusted R-squared	0.999598	S.D. dependent var	0.698048	
S.E. of regression	0.013988	Akaike info criterion	-5.394434	
Sum squared resid	0.000391	Schwarz criterion	-5.701287	
Log likelihood	12.78887	Hannan-Quinn criter.	-6.067800	
F-statistic	7469.417	Durbin-Watson stat	2.135930	
Prob(F-statistic)	0.000134			

H + C

Dependent Variable: DV_T2_ALL

Method: Least Squares

Date: 01/13/17 Time: 15:00

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.95175	1.322317	8.282243	0.0143
LOG(TIME)	-6.671214	0.885020	-7.537924	0.0171
R-squared	0.965998	Mean dependent var	1.134884	
Adjusted R-squared	0.948997	S.D. dependent var	2.028341	
S.E. of regression	0.458076	Akaike info criterion	1.583292	
Sum squared resid	0.419668	Schwarz criterion	1.276439	
Log likelihood	-1.166583	Hannan-Quinn criter.	0.909926	
F-statistic	56.82030	Durbin-Watson stat	2.883029	
Prob(F-statistic)	0.017148			

C + A

Dependent Variable: DV_T3_ALL

Method: Least Squares

Date: 01/13/17 Time: 15:03

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.885968	6.127678	-0.307779	0.7873
LOG(TIME)	3.017035	4.101224	0.735643	0.5385
R-squared	0.212961	Mean dependent var	2.553678	
Adjusted R-squared	-0.180558	S.D. dependent var	1.953685	
S.E. of regression	2.122748	Akaike info criterion	4.650153	
Sum squared resid	9.012117	Schwarz criterion	4.343300	
Log likelihood	-7.300305	Hannan-Quinn criter.	3.976787	
F-statistic	0.541170	Durbin-Watson stat	2.805978	
Prob(F-statistic)	0.538523			

C + A + F

Dependent Variable: DV_T4_ALL

Method: Least Squares

Date: 01/13/17 Time: 15:06

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.605117	0.402632	6.470211	0.0231
LOG(TIME)	-1.888428	0.269480	-7.007677	0.0198
R-squared	0.960867	Mean dependent var	-0.173754	
Adjusted R-squared	0.941300	S.D. dependent var	0.575696	
S.E. of regression	0.139480	Akaike info criterion	-0.794941	
Sum squared resid	0.038909	Schwarz criterion	-1.101794	
Log likelihood	3.589883	Hannan-Quinn criter.	-1.468307	
F-statistic	49.10754	Durbin-Watson stat	1.986180	
Prob(F-statistic)	0.019762			

F + I

Dependent Variable: DV_T5_ALL

Method: Least Squares

Date: 01/13/17 Time: 15:09

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.184132	5.662306	1.092158	0.3888
LOG(TIME)	-3.015020	3.789753	-0.795572	0.5097
R-squared	0.240391	Mean dependent var	1.747452	
Adjusted R-squared	-0.139413	S.D. dependent var	1.837618	
S.E. of regression	1.961534	Akaike info criterion	4.492183	
Sum squared resid	7.695229	Schwarz criterion	4.185330	
Log likelihood	-6.984367	Hannan-Quinn criter.	3.818818	
F-statistic	0.632934	Durbin-Watson stat	2.248117	
Prob(F-statistic)	0.509703			

F + I + G

Dependent Variable: DV_T6_ALL

Method: Least Squares

Date: 01/13/17 Time: 15:13

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.224055	5.617945	1.107888	0.3833
LOG(TIME)	-3.043052	3.760062	-0.809309	0.5033
R-squared	0.246699	Mean dependent var	1.746125	
Adjusted R-squared	-0.129952	S.D. dependent var	1.830839	
S.E. of regression	1.946166	Akaike info criterion	4.476453	
Sum squared resid	7.575127	Schwarz criterion	4.169600	
Log likelihood	-6.952906	Hannan-Quinn criter.	3.803087	
F-statistic	0.654981	Durbin-Watson stat	2.258392	
Prob(F-statistic)	0.503312			

F + I + G + B

Dependent Variable: DV_T7_ALL

Method: Least Squares

Date: 01/13/17 Time: 15:16

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.615098	3.383426	1.068472	0.3972
LOG(TIME)	-1.450553	2.264510	-0.640559	0.5874
R-squared	0.170233	Mean dependent var	1.480572	
Adjusted R-squared	-0.244650	S.D. dependent var	1.050596	
S.E. of regression	1.172085	Akaike info criterion	3.462299	
Sum squared resid	2.747568	Schwarz criterion	3.155446	
Log likelihood	-4.924598	Hannan-Quinn criter.	2.788933	
F-statistic	0.410316	Durbin-Watson stat	1.985166	
Prob(F-statistic)	0.587407			

Appendix F: Descriptive Analysis on Indonesia

O + F + AB + AD + X + C +D +Q +Y + P +L +K + AF + AG + H + I + AC + A + B + M
 + S + T + R + G + AA + Z + U + J + AH + V + W + N

O + F

Dependent Variable: DV_I1_ALL

Method: Least Squares

Date: 01/13/17 Time: 19:31

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.306927	0.515552	-0.595336	0.6120
LOG(TIME)	0.867405	0.345057	2.513805	0.1285
R-squared	0.759593	Mean dependent var	0.969482	
Adjusted R-squared	0.639389	S.D. dependent var	0.297410	
S.E. of regression	0.178597	Akaike info criterion	-0.300512	
Sum squared resid	0.063794	Schwarz criterion	-0.607365	
Log likelihood	2.601024	Hannan-Quinn criter.	-0.973878	
F-statistic	6.319217	Durbin-Watson stat	1.985822	
Prob(F-statistic)	0.128454			

O + F + AB

Dependent Variable: DV_I2_ALL
Method: Least Squares
Date: 01/13/17 Time: 19:38
Sample: 2007 2010
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.444120	0.257606	17.25159	0.0033
LOG(TIME)	-3.159524	0.172415	-18.32515	0.0030
R-squared	0.994080	Mean dependent var	-0.205202	
Adjusted R-squared	0.991119	S.D. dependent var	0.946968	
S.E. of regression	0.089240	Akaike info criterion	-1.688124	
Sum squared resid	0.015928	Schwarz criterion	-1.994977	
Log likelihood	5.376249	Hannan-Quinn criter.	-2.361490	
F-statistic	335.8112	Durbin-Watson stat	2.223524	
Prob(F-statistic)	0.002965			

AB + AD

Dependent Variable: DV_I3_ALL
Method: Least Squares
Date: 01/13/17 Time: 19:43
Sample: 2007 2010
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.889606	0.685578	-1.297599	0.3239
LOG(TIME)	1.226977	0.458854	2.674002	0.1160
R-squared	0.781428	Mean dependent var	0.915923	
Adjusted R-squared	0.672142	S.D. dependent var	0.414779	
S.E. of regression	0.237498	Akaike info criterion	0.269536	
Sum squared resid	0.112810	Schwarz criterion	-0.037317	
Log likelihood	1.460928	Hannan-Quinn criter.	-0.403830	
F-statistic	7.150289	Durbin-Watson stat	1.985411	
Prob(F-statistic)	0.116016			

AB + AD + X

Dependent Variable: DV_I4_ALL
Method: Least Squares
Date: 01/13/17 Time: 19:48
Sample: 2007 2010
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.189625	0.393151	-0.482320	0.6772
LOG(TIME)	0.586542	0.263134	2.229059	0.1556
R-squared	0.713003	Mean dependent var	0.673487	
Adjusted R-squared	0.569504	S.D. dependent var	0.207576	
S.E. of regression	0.136195	Akaike info criterion	-0.842600	
Sum squared resid	0.037098	Schwarz criterion	-1.149453	
Log likelihood	3.685200	Hannan-Quinn criter.	-1.515966	
F-statistic	4.968704	Durbin-Watson stat	2.008627	
Prob(F-statistic)	0.155605			

AB + AD + X + C

Dependent Variable: DV_I5_ALL
Method: Least Squares
Date: 01/13/17 Time: 19:53
Sample: 2007 2010
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.446595	0.115744	3.858479	0.0611
LOG(TIME)	0.204038	0.077467	2.633878	0.1190
R-squared	0.776219	Mean dependent var	0.746843	
Adjusted R-squared	0.664329	S.D. dependent var	0.069206	
S.E. of regression	0.040096	Akaike info criterion	-3.288229	
Sum squared resid	0.003215	Schwarz criterion	-3.595082	
Log likelihood	8.576458	Hannan-Quinn criter.	-3.961595	
F-statistic	6.937314	Durbin-Watson stat	2.661689	
Prob(F-statistic)	0.118967			

AB + AD + X + C + D

Dependent Variable: DV_I6_ALL

Method: Least Squares

Date: 01/13/17 Time: 19:58

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.157173	0.147601	1.064851	0.3985
LOG(TIME)	0.539124	0.098789	5.457338	0.0320
R-squared	0.937072	Mean dependent var	0.950508	
Adjusted R-squared	0.905609	S.D. dependent var	0.166428	
S.E. of regression	0.051132	Akaike info criterion	-2.801961	
Sum squared resid	0.005229	Schwarz criterion	-3.108814	
Log likelihood	7.603921	Hannan-Quinn criter.	-3.475326	
F-statistic	29.78254	Durbin-Watson stat	3.386408	
Prob(F-statistic)	0.031975			

AB + AD + X + C + D + Q

Dependent Variable: DV_I7_ALL

Method: Least Squares

Date: 01/13/17 Time: 20:04

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.204229	0.137576	1.484481	0.2760
LOG(TIME)	0.464304	0.092079	5.042462	0.0372
R-squared	0.927078	Mean dependent var	0.887463	
Adjusted R-squared	0.890616	S.D. dependent var	0.144101	
S.E. of regression	0.047659	Akaike info criterion	-2.942640	
Sum squared resid	0.004543	Schwarz criterion	-3.249493	
Log likelihood	7.885280	Hannan-Quinn criter.	-3.616006	
F-statistic	25.42642	Durbin-Watson stat	3.278898	
Prob(F-statistic)	0.037151			

AB + AD + X + C + D + Q + Y

Dependent Variable: DV_I8_ALL

Method: Least Squares

Date: 01/14/17 Time: 21:35

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.345293	0.119348	2.893167	0.1016
LOG(TIME)	0.306801	0.079879	3.840823	0.0616
R-squared	0.880611	Mean dependent var	0.796758	
Adjusted R-squared	0.820916	S.D. dependent var	0.097699	
S.E. of regression	0.041344	Akaike info criterion	-3.226906	
Sum squared resid	0.003419	Schwarz criterion	-3.533759	
Log likelihood	8.453813	Hannan-Quinn criter.	-3.900272	
F-statistic	14.75192	Durbin-Watson stat	3.159891	
Prob(F-statistic)	0.061591			

AB + AD + X + C + D + Q + Y + P

Dependent Variable: DV_I9_ALL

Method: Least Squares

Date: 01/14/17 Time: 21:49

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.441257	0.110125	4.006871	0.0570
LOG(TIME)	0.217831	0.073706	2.955401	0.0980
R-squared	0.813683	Mean dependent var	0.761802	
Adjusted R-squared	0.720525	S.D. dependent var	0.072163	
S.E. of regression	0.038150	Akaike info criterion	-3.387754	
Sum squared resid	0.002911	Schwarz criterion	-3.694607	
Log likelihood	8.775508	Hannan-Quinn criter.	-4.061120	
F-statistic	8.734398	Durbin-Watson stat	3.372243	
Prob(F-statistic)	0.097956			

AB + AD + X + C + D + Q + Y + P + L

Dependent Variable: DV_I10_ALL

Method: Least Squares

Date: 01/14/17 Time: 21:59

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.550317	0.152656	3.604959	0.0691
LOG(TIME)	0.151035	0.102172	1.478245	0.2774
R-squared	0.522127	Mean dependent var	0.772568	
Adjusted R-squared	0.283190	S.D. dependent var	0.062462	
S.E. of regression	0.052883	Akaike info criterion	-2.734622	
Sum squared resid	0.005593	Schwarz criterion	-3.041474	
Log likelihood	7.469243	Hannan-Quinn criter.	-3.407987	
F-statistic	2.185208	Durbin-Watson stat	2.998666	
Prob(F-statistic)	0.277417			

AB + AD + X + C + D + Q + Y + P + L + K

Dependent Variable: DV_I11_ALL

Method: Least Squares

Date: 01/15/17 Time: 01:29

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.859311	0.253698	3.387142	0.0772
LOG(TIME)	-0.093606	0.169799	-0.551276	0.6368
R-squared	0.131909	Mean dependent var	0.721567	
Adjusted R-squared	-0.302137	S.D. dependent var	0.077018	
S.E. of regression	0.087886	Akaike info criterion	-1.718702	
Sum squared resid	0.015448	Schwarz criterion	-2.025555	
Log likelihood	5.437404	Hannan-Quinn criter.	-2.392068	
F-statistic	0.303906	Durbin-Watson stat	2.369256	
Prob(F-statistic)	0.636807			

AB + AD + X + C + D + Q + Y + P + L + K + AF

Dependent Variable: DV_I12_ALL

Method: Least Squares

Date: 01/15/17 Time: 01:33

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.924725	0.317538	2.912174	0.1005
LOG(TIME)	-0.062145	0.212526	-0.292409	0.7975
R-squared	0.040999	Mean dependent var	0.833278	
Adjusted R-squared	-0.438502	S.D. dependent var	0.091716	
S.E. of regression	0.110001	Akaike info criterion	-1.269795	
Sum squared resid	0.024201	Schwarz criterion	-1.576648	
Log likelihood	4.539591	Hannan-Quinn criter.	-1.943161	
F-statistic	0.085503	Durbin-Watson stat	2.260916	
Prob(F-statistic)	0.797519			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG

Dependent Variable: DV_I13_ALL

Method: Least Squares

Date: 01/15/17 Time: 01:35

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.046118	0.345043	3.031850	0.0937
LOG(TIME)	-0.172427	0.230935	-0.746648	0.5331
R-squared	0.217981	Mean dependent var	0.792387	
Adjusted R-squared	-0.173028	S.D. dependent var	0.110362	
S.E. of regression	0.119530	Akaike info criterion	-1.103652	
Sum squared resid	0.028575	Schwarz criterion	-1.410505	
Log likelihood	4.207304	Hannan-Quinn criter.	-1.777018	
F-statistic	0.557483	Durbin-Watson stat	2.195997	
Prob(F-statistic)	0.533116			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG + H

Dependent Variable: DV_I14_ALL

Method: Least Squares

Date: 01/15/17 Time: 01:38

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.485786	0.493551	3.010402	0.0949
LOG(TIME)	-0.512747	0.330331	-1.552220	0.2608
R-squared	0.546422	Mean dependent var	0.731266	
Adjusted R-squared	0.319633	S.D. dependent var	0.207283	
S.E. of regression	0.170976	Akaike info criterion	-0.387738	
Sum squared resid	0.058465	Schwarz criterion	-0.694591	
Log likelihood	2.775476	Hannan-Quinn criter.	-1.061104	
F-statistic	2.409388	Durbin-Watson stat	2.060077	
Prob(F-statistic)	0.260796			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG + H + I

Dependent Variable: DV_I15_ALL

Method: Least Squares

Date: 01/15/17 Time: 01:43

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.110142	0.457910	2.424366	0.1362
LOG(TIME)	-0.149266	0.306477	-0.487040	0.6744
R-squared	0.106028	Mean dependent var	0.890493	
Adjusted R-squared	-0.340957	S.D. dependent var	0.136986	
S.E. of regression	0.158629	Akaike info criterion	-0.537643	
Sum squared resid	0.050326	Schwarz criterion	-0.844496	
Log likelihood	3.075286	Hannan-Quinn criter.	-1.211009	
F-statistic	0.237208	Durbin-Watson stat	2.144152	
Prob(F-statistic)	0.674380			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG + H + I + AC

Dependent Variable: DV_I16_ALL

Method: Least Squares

Date: 01/15/17 Time: 01:45

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.191785	0.447322	2.664264	0.1167
LOG(TIME)	-0.238945	0.299391	-0.798105	0.5085
R-squared	0.241554	Mean dependent var	0.840171	
Adjusted R-squared	-0.137669	S.D. dependent var	0.145283	
S.E. of regression	0.154961	Akaike info criterion	-0.584431	
Sum squared resid	0.048026	Schwarz criterion	-0.891284	
Log likelihood	3.168861	Hannan-Quinn criter.	-1.257796	
F-statistic	0.636972	Durbin-Watson stat	2.121696	
Prob(F-statistic)	0.508518			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG + H + I + AC + A

Dependent Variable: DV_I17_ALL

Method: Least Squares

Date: 01/15/17 Time: 01:47

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.286347	0.524014	2.454796	0.1335
LOG(TIME)	-0.298389	0.350720	-0.850790	0.4845
R-squared	0.265743	Mean dependent var	0.847260	
Adjusted R-squared	-0.101385	S.D. dependent var	0.172972	
S.E. of regression	0.181529	Akaike info criterion	-0.267954	
Sum squared resid	0.065905	Schwarz criterion	-0.574806	
Log likelihood	2.535907	Hannan-Quinn criter.	-0.941319	
F-statistic	0.723843	Durbin-Watson stat	2.097829	
Prob(F-statistic)	0.484497			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG + H + I + AC + A +B

Dependent Variable: DV_I18_ALL

Method: Least Squares

Date: 01/15/17 Time: 01:49

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.450050	0.545428	2.658554	0.1171
LOG(TIME)	-0.449570	0.365052	-1.231521	0.3433
R-squared	0.431276	Mean dependent var	0.788496	
Adjusted R-squared	0.146914	S.D. dependent var	0.204571	
S.E. of regression	0.188947	Akaike info criterion	-0.187848	
Sum squared resid	0.071402	Schwarz criterion	-0.494701	
Log likelihood	2.375696	Hannan-Quinn criter.	-0.861214	
F-statistic	1.516645	Durbin-Watson stat	2.064663	
Prob(F-statistic)	0.343284			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG + H + I + AC + A +B + M

Dependent Variable: DV_I19_ALL

Method: Least Squares

Date: 01/15/17 Time: 01:51

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.425529	0.533256	2.673253	0.1161
LOG(TIME)	-0.430109	0.356906	-1.205106	0.3514
R-squared	0.420673	Mean dependent var	0.792612	
Adjusted R-squared	0.131009	S.D. dependent var	0.198167	
S.E. of regression	0.184730	Akaike info criterion	-0.232985	
Sum squared resid	0.068251	Schwarz criterion	-0.539838	
Log likelihood	2.465970	Hannan-Quinn criter.	-0.906351	
F-statistic	1.452280	Durbin-Watson stat	2.068088	
Prob(F-statistic)	0.351407			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG + H + I + AC + A + B + M + S

Dependent Variable: DV_I20_ALL

Method: Least Squares

Date: 01/15/17 Time: 01:56

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.473639	0.540332	2.727283	0.1123
LOG(TIME)	-0.475625	0.361642	-1.315183	0.3190
R-squared	0.463765	Mean dependent var	0.773745	
Adjusted R-squared	0.195647	S.D. dependent var	0.208708	
S.E. of regression	0.187182	Akaike info criterion	-0.206621	
Sum squared resid	0.070074	Schwarz criterion	-0.513474	
Log likelihood	2.413243	Hannan-Quinn criter.	-0.879987	
F-statistic	1.729706	Durbin-Watson stat	2.059815	
Prob(F-statistic)	0.318997			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG + H + I + AC + A + B + M + S +

T

Dependent Variable: DV_I21_ALL

Method: Least Squares

Date: 01/15/17 Time: 01:59

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.585327	0.604872	2.620929	0.1199
LOG(TIME)	-0.552543	0.404838	-1.364849	0.3056
R-squared	0.482243	Mean dependent var	0.772246	
Adjusted R-squared	0.223364	S.D. dependent var	0.237770	
S.E. of regression	0.209540	Akaike info criterion	0.019045	
Sum squared resid	0.087814	Schwarz criterion	-0.287808	
Log likelihood	1.961911	Hannan-Quinn criter.	-0.654321	
F-statistic	1.862813	Durbin-Watson stat	2.044668	
Prob(F-statistic)	0.305563			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG + H + I + AC + A + B + M + S +
T + R

Dependent Variable: DV_I22_ALL
Method: Least Squares
Date: 01/15/17 Time: 02:01
Sample: 2007 2010
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.564439	0.633819	2.468274	0.1323
LOG(TIME)	-0.528548	0.424212	-1.245953	0.3389
R-squared	0.437000	Mean dependent var	0.786666	
Adjusted R-squared	0.155500	S.D. dependent var	0.238929	
S.E. of regression	0.219567	Akaike info criterion	0.112537	
Sum squared resid	0.096420	Schwarz criterion	-0.194316	
Log likelihood	1.774925	Hannan-Quinn criter.	-0.560828	
F-statistic	1.552400	Durbin-Watson stat	2.051053	
Prob(F-statistic)	0.338940			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG + H + I + AC + A + B + M + S + T + R +
G

Dependent Variable: DV_I23_ALL
Method: Least Squares
Date: 01/15/17 Time: 02:03
Sample: 2007 2010
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.598884	0.629778	2.538806	0.1264
LOG(TIME)	-0.565806	0.421507	-1.342341	0.3116
R-squared	0.473944	Mean dependent var	0.766285	
Adjusted R-squared	0.210916	S.D. dependent var	0.245600	
S.E. of regression	0.218167	Akaike info criterion	0.099744	
Sum squared resid	0.095194	Schwarz criterion	-0.207109	
Log likelihood	1.800512	Hannan-Quinn criter.	-0.573622	
F-statistic	1.801878	Durbin-Watson stat	2.045856	
Prob(F-statistic)	0.311564			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG + H + I + AC + A + B + M + S + T + R + G + AA

Dependent Variable: DV_I24_ALL

Method: Least Squares

Date: 01/15/17 Time: 02:06

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.627820	0.627530	2.594011	0.1220
LOG(TIME)	-0.596948	0.420003	-1.421296	0.2911
R-squared	0.502498	Mean dependent var	0.749395	
Adjusted R-squared	0.253747	S.D. dependent var	0.251648	
S.E. of regression	0.217389	Akaike info criterion	0.092594	
Sum squared resid	0.094516	Schwarz criterion	-0.214259	
Log likelihood	1.814813	Hannan-Quinn criter.	-0.580772	
F-statistic	2.020082	Durbin-Watson stat	2.041867	
Prob(F-statistic)	0.291129			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG + H + I + AC + A + B + M + S + T + R + G + AA +

Z

Dependent Variable: DV_I25_ALL

Method: Least Squares

Date: 01/15/17 Time: 02:14

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.720726	0.633264	2.717234	0.1130
LOG(TIME)	-0.685539	0.423840	-1.617446	0.2472
R-squared	0.566737	Mean dependent var	0.711938	
Adjusted R-squared	0.350105	S.D. dependent var	0.272123	
S.E. of regression	0.219375	Akaike info criterion	0.110784	
Sum squared resid	0.096251	Schwarz criterion	-0.196069	
Log likelihood	1.778432	Hannan-Quinn criter.	-0.562582	
F-statistic	2.616132	Durbin-Watson stat	2.030116	
Prob(F-statistic)	0.247181			

AB + AD + X + C + D + Q + Y + P + L + K + AF + AG + H + I + AC + A + B + M + S + T + R + G + AA +
Z + U

Dependent Variable: DV_I26_ALL

Method: Least Squares

Date: 01/15/17 Time: 02:24

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.621744	0.535200	3.030162	0.0938
LOG(TIME)	-0.656916	0.358207	-1.833901	0.2081
R-squared	0.627088	Mean dependent var		0.655075
Adjusted R-squared	0.440632	S.D. dependent var		0.247896
S.E. of regression	0.185404	Akaike info criterion		-0.225707
Sum squared resid	0.068749	Schwarz criterion		-0.532560
Log likelihood	2.451414	Hannan-Quinn criter.		-0.899073
F-statistic	3.363192	Durbin-Watson stat		2.039980
Prob(F-statistic)	0.208111			

U + J

Dependent Variable: DV_I27_ALL

Method: Least Squares

Date: 01/15/17 Time: 02:29

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.046244	1.233229	-1.659258	0.2389
LOG(TIME)	2.187233	0.825394	2.649927	0.1178
R-squared	0.778322	Mean dependent var		1.172326
Adjusted R-squared	0.667484	S.D. dependent var		0.740866
S.E. of regression	0.427215	Akaike info criterion		1.443792
Sum squared resid	0.365025	Schwarz criterion		1.136939
Log likelihood	-0.887584	Hannan-Quinn criter.		0.770426
F-statistic	7.022115	Durbin-Watson stat		1.992797
Prob(F-statistic)	0.117774			

U + J + AH

Dependent Variable: DV_I28_ALL

Method: Least Squares

Date: 01/15/17 Time: 02:33

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.556660	0.128543	4.330536	0.0494
LOG(TIME)	-0.132083	0.086033	-1.535253	0.2645
R-squared	0.540969	Mean dependent var	0.362297	
Adjusted R-squared	0.311453	S.D. dependent var	0.053664	
S.E. of regression	0.044530	Akaike info criterion	-3.078464	
Sum squared resid	0.003966	Schwarz criterion	-3.385316	
Log likelihood	8.156927	Hannan-Quinn criter.	-3.751829	
F-statistic	2.357001	Durbin-Watson stat	2.506941	
Prob(F-statistic)	0.264494			

U + J + AH + V

Dependent Variable: DV_I29_ALL

Method: Least Squares

Date: 01/15/17 Time: 02:37

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.478790	0.149631	3.199805	0.0853
LOG(TIME)	-0.076398	0.100147	-0.762856	0.5252
R-squared	0.225392	Mean dependent var	0.366368	
Adjusted R-squared	-0.161912	S.D. dependent var	0.048088	
S.E. of regression	0.051835	Akaike info criterion	-2.774646	
Sum squared resid	0.005374	Schwarz criterion	-3.081498	
Log likelihood	7.549291	Hannan-Quinn criter.	-3.448011	
F-statistic	0.581950	Durbin-Watson stat	2.394390	
Prob(F-statistic)	0.525246			

U + J + AH + V + W

Dependent Variable: DV_I30_ALL

Method: Least Squares

Date: 01/15/17 Time: 02:42

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002220	0.197091	0.011261	0.9920
LOG(TIME)	0.454661	0.131912	3.446689	0.0748
R-squared	0.855904	Mean dependent var	0.671265	
Adjusted R-squared	0.783856	S.D. dependent var	0.146859	
S.E. of regression	0.068276	Akaike info criterion	-2.223654	
Sum squared resid	0.009323	Schwarz criterion	-2.530507	
Log likelihood	6.447308	Hannan-Quinn criter.	-2.897020	
F-statistic	11.87967	Durbin-Watson stat	2.768757	
Prob(F-statistic)	0.074849			

U + J + AH + V + W + N

Dependent Variable: DV_I31_ALL

Method: Least Squares

Date: 01/15/17 Time: 02:48

Sample: 2007 2010

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.337675	0.139220	2.425480	0.1361
LOG(TIME)	0.120399	0.093179	1.292125	0.3255
R-squared	0.454980	Mean dependent var	0.514845	
Adjusted R-squared	0.182470	S.D. dependent var	0.053340	
S.E. of regression	0.048228	Akaike info criterion	-2.918884	
Sum squared resid	0.004652	Schwarz criterion	-3.225736	
Log likelihood	7.837767	Hannan-Quinn criter.	-3.592249	
F-statistic	1.669588	Durbin-Watson stat	3.064486	
Prob(F-statistic)	0.325478			

Appendix G: Convergence Club Results

Table G1: Malaysia Results

Last T order	Banks	Step 1	Step 2	Step 1	Step 2	Clubs	Remarks
1	C	Base				1	Divergence
2	H	-8.9977	Base			2	Divergence
3	I		-15.2894	Base		3	Convergence
4	A			2.9147		3	Convergence
5	G			0.1820		3	Convergence
6	B			-19.7879	Base	4	Divergence
7	F				2.1319	4	Convergence
8	D				1.5868	4	Convergence

Table G2: Singapore Results

Last T order	Banks	Step 1	Step 2	Step 1	Clubs	Remarks
1	C	Base			1	Divergence
2	B	-4.2804	Base		2	Divergence
3	F		-15.1648	Base	3	Convergence
4	A			0.9765	3	Convergence
5	D			1.0405	3	Convergence

Table G3: Philippines Results

Last T order	Banks	Step 1	Step 2	Step 1	Clubs	Remarks
1	D	Base			1	Divergence
2	C	-5.4197	Base		2	Divergence
3	G		-3.4679	Base	3	Convergence
4	A			4.5784	3	Convergence
5	I			1.7138	3	Convergence
6	F			0.0547	3	Convergence
7	B			-0.3209	3	Convergence
8	H			-5.1892	4	Divergence

Table G4: Thailand Results

Last T order	Banks	Step 1	Step 2	Step 1	Step 2	Clubs	Remarks
1	D	Base	Outlier			1	Divergence
2	H	-86.4258	Base	Outlier		2	Divergence
3	C		-7.5379	Base		3	Convergence
4	A			0.7356		3	Convergence
5	F			-7.0077	Base	4	Divergence
6	I				-0.7956	4	Convergence
7	G				-0.8093	4	Convergence
8	B				-0.6405	4	Convergence

Table G5: Indonesia Results

Last T order	Banks	Step 1	Step 2	Step 1	Clubs	Remarks
1	O	Base			1	Divergence
2	F	2.5138			2	Divergence
3	AB	-18.3251	Base		3	Divergence
4	AD		2.6740		4	Divergence
5	X		2.2290		4	Convergence
6	C		2.6339		4	Convergence
7	D		5.4573		5	Divergence
8	Q		5.0425		5	Convergence
9	Y		3.8408		5	Convergence
10	P		2.9554		6	Divergence
11	L		1.4782		6	Convergence
12	K		0.5513		6	Convergence
13	AF		-0.2924		6	Convergence
14	AG		-0.7466		6	Convergence
15	H		-1.5522		6	Convergence
16	I		-0.4870		6	Convergence
17	AC		-0.7981		6	Convergence

18	A		-0.8508		6	Convergence
19	B		-1.2315		6	Convergence
20	M		-1.2051		6	Convergence
21	S		-1.3152		6	Convergence
22	T		-1.3648		6	Convergence
23	R		-1.2459		6	Convergence
24	G		-1.3423			
25	AA		-1.4213			
26	Z		-1.6174			
27	U		-1.8339	Base		
28	J			2.6499		
29	AH			-1.5352		
30	V			-0.7628		
31	W			3.4467		
32	N			1.2921		

Table G6: ASEAN Results

Last T order	Banks	Step 1	Step 2	Step 1	Step 2	Clubs	Remarks
1	D	Base	Outlier			1	Divergence
2	H	-86.4258	Base	Outlier		2	Divergence
3	C		-7.5379	Base		3	Convergence
4	A			0.7356		3	Convergence
5	F			-7.0077	Base	4	Divergence
6	I				-0.7956	4	Convergence
7	G				-0.8093	4	Convergence
8	B				-0.6405	4	Convergence