UNIVERSITI PUTRA MALAYSIA

CONVERGENCE OF INCOME IN ASIAN COUNTRIES

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This study examines convergence of per capita real income for seven Asian countries namely Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore and Thailand during the period 1970-1999. It has been argued that income convergence could be used as one of the criteria to form a single currency area.

Utilizing the concepts of deterministic and stochastic convergence, this study uses 3 types of time series techniques, namely the standard ADF test, the Zivot-Andrews endogenously determined break points and the Johansen-Juselius cointegration analysis to test the convergence hypotheses. These time series procedures are able to show whether the convergence hypotheses are supportive of the Solow growth model (deterministic convergence or long run convergence) or augmented Solow model (stochastic convergence) or endogenous growth model (divergence). In particular, the empirical findings are presented in two ways. First, convergence between individual country's log per capita real income and aggregate log per capita real income of the group (relative log per capita real

income). Second, convergence between two country's log per capita real income (bivariate differences log per capita real income).

The results show that per capita income of Indonesia, Japan, Korea and Malaysia is converging to the aggregate per capita income of the group. However, the findings in bivariate differences log per capita real income show that per capita income of Indonesia, Korea, Malaysia and Singapore are converging toward per capita income of Japan. In addition, the results of Zivot-Andrews endogenously determined break points revealed that the year 1978 which was between the first oil shock (1973-1975) and the second oil shock (1979-1980) was not the cause for concerned. This indicates that supply shock or external shock has minimal impact on Asian's countries growth processes.

Overall, this study has shown some initial insights on the possible single currency area among Asian countries based on income convergence hypothesis. This can be explained by the fact that Asian countries is undergoing a relatively high growth potential to converge toward a similar per capita income level either with leading country (Japan) or a group of Asian's countries per capita income. However, it should be noted that income convergence is a necessary condition but not a sufficient determinant to form a single currency area. Thus, a meaningful line of further study could be focused on the achievement of Asian regions against the five keys Maastricht Convergence Criteria namely inflation rate, long term interest rate, exchange rate, debt to GDP ratio and budget deficit to GDP ratio.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

PENDAPATAN PEMUSATAN DI ANTARA NEGARA ASIA

Oleh

LEE HOCK ANN

Januari 2002

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Tujuan utama kajian ini adalah untuk mengkaji pemusatan (convergence) Pendapatan Negara (KNK) per kapita benar di antara tujuh buah negara Asia iaitu Indonesia, Jepun, Korea, Malaysia, Singapura, Filipina dan Thailand di samping menggunakan pemusatan ini sebagai salah satu kriteria untuk mewujudkan kawasan matawang tunggal di rantau Asia ini.

Kajian ini menggunakan tiga kaedah siri masa iaitu ujian ADF, ADF Zivot-Andrews dan kointegrasi dengan berdasarkan kepada konsep pemusatan deterministik dan stokastik. Kaedah-kaedah ini dapat menunjukkan sokongan hipotesis pemusatan samada mirip kepada model pertumbuhan Solow atau model pertumbuhan berimbuhan Solow atau model pertumbuhan baru. Di samping itu, penemuan empirikal adalah dibahagikan kepada dua bahagian. Bahagian pertama menerangkan pemusatan di antara pendapatan per kapita benar di setiap negara Asia dan pendapatan per kapita benar keseluruhan Asia (pendapatan per kapita benar relatif). Kaedah kedua pula menerangkan pemusatan di antara dua buah pendapatan per kapita benar (perbezaan pendapatan per kapita benar).

Keputusan empirikal menunjukkan bahawa pendapatan per kapita bagi Indonesia, Jepun, Korea dan Malaysia adalah berpusat dengan pendapatan per kapita keseluruhan Asia. Manakala, penemuan dalam perbezaan pendapatan per kapita menunjukkan pendapatan per kapita di Indonesia, Korea, Malaysia dan Singapura adalah berpusat dengan pendapatan per kapita di Jepun. Tambahan pula, ujian ADF Zivot-Andrews mengesahkan bahawa gangguan atau ketidakstabilan luaran hanya mendatangkan kesan yang rendah terhadap proses pertumbuhan ekonomi di rantau Asia ini.

Secara keseluruhan, kajian ini menunjukkan pertumbuhan ekonomi yang pesat di kalangan negara Asia telah memastikan mereka duduk sama rendah dan berdiri sama tinggi mahupun dari segi pendapatan per kapita keseluruhan atau pendapatan per kapita di Jepun. Ini telah memberikan idea yang memberangsangkan terhadap penubuhan kawasan matawang tunggal di rantau Asia dengan berdasarkan idealogi pemusatan pendapatan. Walaubagaimanapun, untuk mendapatkan gambaran yang lebih jelas, lima kriteria pemusatan iaitu kadar inflasi, kadar pertukaran, kadar faedah jangka panjang, nisbah hutang kepada KDNK dan nisbah defisit belanjawan kepada KDNK yang tercatat dalam “Maastricht Convergence Criteria” perlu diambilkira dalam kajian-kajian yang akan datang.

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LIST OF ABBREVIATIONS

LI: Log per capita real GNP of Indonesia

LJ: log per capita real GNP of Japan;

LK: log per capita real GNP Korea

LM: log per capita real GNP of Malaysia

LP: log per capita real GNP of the Philippines

LS: log per capita real GNP of Singapore

LTH: log per capita real GNP of Thailand

LGNP: log per capita real GNP of the group (consists of seven Asian countries).

CHAPTER I

INTRODUCTION

It has been argued that income convergence could be used as one of the criteria for forming a single currency area. The issue of single currency area is motivated by recent Asian financial crisis, which has increased the interests from policy makers to search for greater regional exchange rate stability through establishing currency board, replacing the domestic currency with another country's money and Asian currency arrangement. However, the Asian currency arrangement is one of the three options that are more attractive for Asian countries due to the successful launch of European Monetary Union (EMU) on the 1st January 1999.

As noted by Afxentiou and Serletis (1999), once the realized range of growth in per capita incomes across countries in European Union moved as narrow as possible, the political unification treaties could be signed and built on solid foundation by economically similar partners. In addition, Bayoumi and Mauro (1999) also point out that the process of currency union formation in Europe is associated with a significant degree of economic convergence in per capita output, which was partly a natural consequence of closer trade links and greater exchange rate stability.

Definition of Convergence

Convergence, according to Solow (1956) is the tendency for poor countries to grow faster than rich countries once the determinants of steady-state per capita income have been controlled. There are several key channels through which such regional disparities could be moved closely in the process of national economic growth. First, assuming that all regions posses similar technology and similar preferences, and there are no institutional barriers against the flow of both capital and labor across country borders, then the Solow neoclassical growth model predicts that countries would have similar levels of real per capita income in the long-run. Second, if across regions of a given country that shares a common long-run level of real per capita income, convergence of per capita incomes are driven by diminishing returns to capital. Other channels through which convergence can occur are interregional capital mobility, the transferring of technology from leader to follower economies, the redistribution of incomes from relatively rich regions to poor regions and the flows of labor from poor to rich regions.

Problem Statements

Most of the previous studies are based on OECD countries and US regions, meanwhile the study of income convergence on Asian economies has received less attention in the literature. Previous cross-section studies on East Asia (Young, 1995; Targetti and Foti, 1997), ASEAN (Park, 2000) and APEC (Engelbrecht and Kelsen, 1999) somehow did not attempt to show any possible different convergence club in Asian regions. In addition, serious shortcoming of researches focus on the combination of East Asian and South-East Asian countries and thus strongly support this study as a rightly time manner to fill the gaps of previous studies.

The use of cross-section results, which imposed by much of the previous studies, suffers from several problems. First, it is possible for a set of countries, which are diverging to exhibit the sort of negative correlation described by Baumol *et al* (1986) as the marginal product of capital is diminishing. However, according to Bernard and Durlauf (1996), a diminishing marginal product of capital means that a rejection of the null hypothesis of no convergence, which can be interpreted as a mixed up of short-run transitional dynamics and long-run steady state behavior in cross-section regressions. Second, cross-section test cannot identify which group of countries that are converging (Bernard and Durlauf, 1995), although the club convergence test is used recently by Chatterjji and Dewhurst (1996) to overcome this problem. Despite the weaknesses of cross-section approaches, the time series approaches on the other hand are able to overcome this drawback. These procedures can provide insight into the macroeconomic experience of individual countries. Therefore, this study will propose a set of convergence hypothesis test based on time-series rather than cross-sectional methods.

Choosing the appropriate method is one of the main concern in this study, since the empirical evidences from the industrialized countries are mixed, when employing on both cross-sectional and time series technique[1]. This study deals with the time series method, so, the possible structural discontinuities of data series during the long time period should weigh on considerations to avoid bias towards the acceptance of no convergence hypothesis. Moreover, recent studies also found that by imposing an appropriate time break, the results of convergence are well performed.

Recent Asian currency crisis has drawn increasing interests in policy-making to achieve greater regional exchange rate stability and correspondingly growing interests in currency boards, as well as in replacing the domestic currency with another country's money and Asian currency arrangement. However, the Asian currency arrangement is one of the three options that are more interesting and a more look forward issue for Asian countries due to the successful launch of European Monetary Union (EMU) on 1st January 1999. There are five keys economic criteria, namely inflation rate, long term interest rate, exchange rate, debt to GDP ratio and budget deficit to GDP ratio which are used to fulfill the convergence criteria in final stage of formation of the EMU. Only Luxembourg succeeded fully of the five criterias and pass the Maastricht tests in 1997 (Engler *et al*, 1997). Despite the difficulties in the past experience of EMU in achieving five convergence criteria towards a common currency arrangement, ASEAN as pointed by Bayoumi and Mauro (1999) also appears to be less suited for a regional currency arrangement than Europe before the Maastricht Treaty by looking on the

[1] The cross-sectional tests generally find evidence for convergence across countries, for example Barro, (1991), Barro and Sala-i-Martin (1991, 1992) and Mankiw *et al.* (1992). However, time series tests find little evidence of convergence across countries (Campell and Mankiw, 1989, Bernard and Durlauf, 1995, 1996).

economic criteria. However, this arguments remained not an absolute conclusion. Thus, this study uses the per capita income convergence as a measurement of pre-condition for a possible common currency area in Asian. As reported by World Bank (1993), the high-performing Asian economies such as Japan, the Four Asian Tigers (Hong Kong, South Korea, Singapore and Taiwan) and the three South-East Asian newly industrializing economies, for example Indonesia, Malaysia and Thailand have actually grown at a rate more than twice as fast as the rest of East Asian countries since 1960. Consequently, the study based on the well-performing of East Asian Economies and ASEAN countries should be an ideal study to conduct test on the convergence and catching up hypothesis. Most importantly, the income convergence is believed to be one of the important criteria in forming a single currency area.

Objectives of the Study

The general objective of this study is to examine convergence of per capita real GNP for seven Asian countries namely Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore and Thailand during the period 1970-1999. It has been argued that income convergence can be used as one of the criteria in forming a single currency area. The specific objective of this study that contributes to the evidence of convergence can be demonstrated into three ways.

1. To provide a pre-condition of a possible unification of Asian single currency arrangement based on the convergence hypothesis,

2. To answer the problem of a different club convergence hypothesis existed, and
3. To investigate a possible structural change that may led to the rejection of convergence hypothesis.

Significance of the Study

While there were significant number of studies focused on stock market integration, interest rate linkages, purchasing power parity and yen bloc, one of the important features in this study is the implication of convergence hypothesis for Asian regions, which can provide a supplementary information and an important insights into Asian Economies Integration.

Under this study, the structural discontinuities of time series data is considered by employing two recent methods, which are Zivot and Andrews (1992) and Perron and Vogelsang (1992) sequential unit root tests. The major advantages of these techniques are such as to avoid the problem of accepting the null hypothesis of no convergence that is often caused by structural discontinuities problem. Hence, the significance of the study helps to overcome some weaknesses in the past studies.

Finally, since the study enable us to provide insight view of the intra-regional trade performances, it will also help the participants in the region's organization such as ASEAN, AFTA and APEC to formulate a more effective co-operation to reduce the gap between the leader and the follower countries. In conclusion, the approaches and methodologies impose in this study will be useful for policy makers and international organizations

Organization of the Thesis

The organization of this study is divided into 5 chapters. Chapter II evaluates the economic performance of seven Asian countries based on real GDP growth rates. Besides, this chapter also provides regional's income overviews during period 1970-1999. Chapter III reviews the theoretical development and current empirical studies on convergence. In addition, this chapter also provides some of the major criticisms related to this area of study. Chapter IV presents the model, methodology and data to be used in this study. This chapter starts with the basic model employed in previous studies. Then, followed by methodology of the study and lastly discusses the data collection for each country and data sources. Chapter V presents the empirical results. The summary and concluding remarks of this study are summarized in Chapter VI.

CHAPTER II

ASIAN ECONOMIES: AN OVERVIEW

In this chapter, the overviews consider both the individual countries and the cross-country to give the economic performance scenario among the selected Asian countries during 1970-2001.

Individual Countries Overviews

This section provides an insight view of current issues, highlighting on success stories as well as prospective weaknesses. Generally, the issues discussed include (i) economic growth over time; (ii) the impacts of currency crisis; and (iii) how will the global slowdown affect Asia?

Table 2.1: Real GDP Growth rates for 7 Asian Countries

	Country						
Period	Japan	Korea	Singapore	Malaysia	Thailand	Indonesia	Philippines
1970*	11.3	11.0	12.9	4.2	9.4	8.2	4.9
1975*	4.4	8.6	9.6	10.5	5.7	8.2	6.2
1980*	4.8	7.4	8.6	15.8	7.9	7.9	6.1
1985*	3.8	8.4	6.8	5.1	5.5	5.5	-1.2
1990*	4.5	10.3	7.5	6.2	10.3	6.3	4.8
1995*	1.5	8.9	8.6	8.4	8.0	7.8	2.2
1996	5.0	6.7	8.4	8.6	5.5	7.8	5.8
1997	1.5	4.9	8.3	7.8	-0.4	4.8	5.2
1998	-2.5	-6.7	-2.1	-4.1	-10.2	-13.2	-0.6
1999	0.2	10.9	5.9	5.8	4.2	0.8	3.3
2000	1.4	8.8	9.9	8.5	4.3	4.8	3.9
2001	1.8	3.5	5.0	4.5	3.0	3.5	3.3

Note:
* denotes percentage change from previous 5 years.
Growth rates from 1996 to 2001 are percentage change from previous year.
Data in year 2001 is estimated.
Data source: International Financial Statistics and World Economic Outlook, various issues.

Japan

Table 2.1 shows that Japan has the highest economic growth since 1970 relative to other Asian countries. However, the first oil shock occurred during 1973-1975 has caused an incredible decrease in output growth from 11.3% to 4.4%. Once again, the second oil shock (1979-1980) has further reduced the real GDP growth rate to 3.8% in 1985. Although the output performance has shown a significance improvement during period 1986-1990, the burst of "bubble economy" in early 1990s has reflected a lower growth rate if compared to the previous period. The slowdown in Japan's output growth may be caused by the fall in capital productivity and reduction in working population growth since 1988 (International Monetary Fund, 1999). Japanese economy has undergone a significant recovery from the long-lasting 1990s recession with a high output growth in 1996 before the Asian financial crisis. Responsive to a falling import demand from financial crisis countries, once again Japan's economy was stroked back by another lower growth of –2.5% and 0.2% in 1998 and 1999 respectively. However, after the crisis, Japanese economy has improved by 1.4% in term of real GDP growth rate. The increases are mainly boosted by one-time factors, such as a delay in wage bonuses from December to January and a shift in imports associated with Y2K concerns. Since the economy's vulnerability towards the global electronics cycle has caused concerns over unemployment, that are likely to restrain the household spending and slowing down of world demand for electronic equipment. Therefore, the forecast for output growth in 2001 has been marked at a low rate of 1.8%.

Korea

Korea is one of the most densely populated countries in Asia. It has an estimated population of 46.43 million in 1998. The rapid economic expansion that began in 1963, has transformed Korea from an underdeveloped and an agricultural-based economy into a newly industrialized economy in less than two decades (see Islam and Chowdhury, 1997). Islam and Chowdhury noted that the substantial inflow of foreign aid, following the Korea War, has helped Korea to achieve a moderate rate of economic growth during 1953-1958. However, the expansion of Korea's economy slowed down during 1959-1962 and income per capita growth rate declined to almost zero in the early 1960s. They also noted that the two five-year plans that spanned from the period 1962 to 1971 and policy reforms had remarkable influences on Korea's economic performance. Table 2.1 shows that Korea achieved an average annual growth rate of 11% during 1966-1970. The well spot of Korea economic performance was also displayed in both 1980s and 1990s periods when the real GDP grew by 8.75% per annum. Unfortunately, the effects of economic crisis in 1997 have caused economic stagnation in Korea. Korea's real economic growth rate declined from 6.7% in 1996 to 4.9% in 1997, and fell to –6.7% in 1998. This is the second negative growth since the study period in 1965. However, by implementing the IMF's reform agreement, the Korea's economic performance started to perform well, where the real GDP growth rate achieved at 10.9% in 1999 and slightly lower rate at 8.8% in 2000. These positive sign growth rate are unsustainable. The economic growth rate of Korea is expected to decline to 3.5% due to the economic slowdown in United States. Besides, as reported by International Monetary Fund (2001) this slowdown has also been exacerbated by