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論文内容の要旨

1. Purpose of the Dissertation

The economic cooperation in the East Asian countries is becoming important along with rapid economic growth and close economic interdependence in this region for more than two decades. The Asian financial crisis of 1997 has made the East Asian countries acutely aware of the need to develop regional monetary and financial cooperation to forestall new financial crisis and to attain stable economic growth.

The purpose of this dissertation is to examine the possibility of monetary and financial cooperation in East Asia¹. The regional monetary and financial cooperation has a wide range of scope from loose information exchange to the most formal monetary union (common currency area). We classify the monetary and financial cooperation into the four different levels: (i) policy dialogue, (ii) system of regional lender of last resort, (iii) exchange rate policy cooperation, (iv) common currency area. The

¹ East Asian countries in the paper refer to ASEAN+3; ASEAN (Association of Southeast Asian Nations) is represented by Indonesia, Malaysia, Philippines, Singapore and Thailand. The three is the big economies of Northeast Asia, i.e. China, Japan and Korea.

highest level of cooperation is to establish the common currency area.

The theory of optimal currency area (OCA) originated from Mundell (1961) and Mckinnon (1963) gives criteria to constitute a common currency area. The criteria include (i) openness of economies in the area, (ii) degree of trade integration among the countries in the region, (iii) similarity of trade patterns, (iv) business cycle synchronization, and (v) mobility of labors in the area. This paper examines whether the East Asian economies satisfy the above conditions (i) through (iv) to establish the common currency area. We do not discuss the condition (v) in this paper.

The paper is constructed as follows. Chapter 2 presents an overview of economic development in East Asia. This chapter gives background knowledge for the discussions on the monetary and financial cooperation in the following chapters. Chapter 3, first, briefly reviews how the East Asian countries recognized the necessity for monetary and financial cooperation after the crisis of 1997 and how they developed the cooperation after the crisis. After this, Chapter 3 classifies the four levels of cooperation: (i) policy dialogue, (ii) a system of regional lender of last resort, (iii) exchange rate policy cooperation, (iv) common currency area. Chapter 4 examines whether the East Asian countries satisfies the criteria on common currency area by analyzing the trade integration and trade patterns in the region. Chapter 5 investigates the business cycle synchronization among the East Asian countries by using the cointegration analysis in econometrics. The results indicate the existence of synchronization of business cycles in East Asia. This chapter constitutes a main contribution of the paper. Chapter 6 states some conclusions.

2. An Overview of Economic Development in East Asia

This chapter gives background knowledge for discussing monetary and financial cooperation in the following chapters.

Section 2.1 reviews economic performance in the East Asian countries during the past three decades in terms of (1) long term economic growth, (2) investment rate, and (3) poverty reduction. Although the East Asian countries are diversified in terms of territory size, economic development level, and political and social system, they have enjoyed a long period of macroeconomic stability and high economic growth, even when the Asian financial crisis hit the region in 1997. East Asia is regarded as the fastest growing region of the world during the past three decades. East Asian high economic growth has been driven by the high and rising investments to a considerable extent. East Asia has made substantial progress in reducing poverty while economic growth was very strong. The economic growth in East Asia provided a foundation for monetary and financial cooperation in this region.

Section 2.2 singles out the three main elements as determinants of economic growth which are common to all countries in the region: (1) agricultural reform, (2) open policy, and (3) high saving

rate and foreign direct investment (FDI). Although no uniform model of development was applied throughout East Asia, both economic growth strategy and economic growth pattern were broadly similar among the successful East Asian economies. There were a number of similar conditions favorable for economic growth in East Asia. Agricultural reform generated a lot of labor supplies and rural savings, which were transferred and used for industrialization at the early stage of economic development in East Asia. Open policy promoted both capital formation and the assimilation of new technologies, which were critical vehicles for the region's sustainable growth. The high domestic saving rate and FDI greatly contributed to economic growth in East Asia. Powerful education policy and family policy affected economic growth positively in East Asian countries.

3. Monetary and Financial Cooperation in East Asia

Chapter 3 provides a framework how we analyze the regional monetary and financial cooperation in East Asia in this paper.

Sections 3.1 and 3.2 state how East Asia recognized necessity of the monetary and financial cooperation and how the cooperation progressed after the financial crisis in 1997. While trade and investment cooperation among East Asian countries had made considerable progress, monetary and financial cooperation were in blank before the 1997 financial crisis. During the fight against financial crises, some East Asian countries have come to a common understanding that regional economic cooperation is indispensable to the stable development in economy and finance system. The Asian financial crisis changed the governments' passive attitudes towards regional monetary and financial cooperation. East Asian countries have begun to actively discuss the form of East Asian monetary and financial cooperation and come to some common understanding and implemented some initiatives under the ASEAN+3 frameworks. Now, the process has been well developed since 1997.

Section 3.3 classifies the monetary and financial cooperation into the four different levels: (i) policy dialogue, (ii) system of regional lender of last resort, (iii) exchange rate policy cooperation, (iv) common currency area. The highest level of cooperation is to establish the common currency area.

The theory of optimal currency area (OCA) originated from Mundell (1961) and Mckinnon (1963) gives criteria to constitute a common currency area. The criteria include (i) openness of economies in the area, (ii) degree of trade integration among the countries in the region, (iii) similarity of trade patterns, (iv) business cycle synchronization, and (v) mobility of labors in the area.

In the following chapters, we examine whether the East Asian economies satisfy the above conditions (i) through (iv) to establish the common currency area.

4. Trade Integration in East Asia

Chapter 4 examines whether the East Asian countries satisfies the criteria on common currency

area by analyzing the trade integration and trade patterns in the region.

After brief review on literature in Section 4.1, Section 4.2 examines the degree of openness of economies in East Asia. The East Asian countries have experienced a remarkable expansion in trade and have high degree of economic openness in recent years.

Section 4.3 analyzes the degree of closeness among East Asian countries. The analysis indicates that it has reached a level similar to that of European Economic Community, the former EU, when they commenced the process for their integration. East Asian countries have closer trade relations and their import and export profiles become more complementary while intra-regional trade experiences rapid increase. Since the ongoing FTA establishment in East Asia will increase the share of intra-regional trade among the ASEAN+3, this area will be further eligible to higher level monetary and financial cooperation in the near future. A growing level of intra-industry trade suggests that East Asian countries business cycle should be more assimilated and strengthened.

Section 4.4 analyzes the similarity of trade pattern among East Asian countries. The trade structure in East Asian countries is broadly similar both in existing geographic and commodity structures, which means that East Asian countries is suitable to establish higher level monetary and financial cooperation.

5. Output Co-movements and Business Cycle Synchronization in East Asia

Chapter 5 investigates the business cycle synchronization among the East Asian countries by using the cointegration analysis in econometrics. The business cycle synchronization is the important precondition to constitute a common currency area as stated at the end of Chapter 3. Since this chapter constitutes a main contribution of the paper, we describe a relatively detailed summary.

5.1. Introduction

In order to find out to what extent business cycle is transmitted from one country to another, we employ three methods: (1) correlation analysis, (2) cointegration analysis in a bivariate model, and (3) cointegration and common cycle analysis in a multivariate model. First, the correlation analysis offers a rough and quick measure for co-movements of outputs between the two countries in the region. Second, the bilateral model is used to test common trend for each pair of countries as separate parts. Third, the multivariate model is used to find out common trends in the long run and common business cycle in the short run as whole countries in the region. On the whole, this study offers a more complete econometric analysis on the business cycle synchronization in East Asian countries.

This chapter is organized as follows. Section 5.2 reviews literature related to business cycle synchronization mainly involving East Asian countries. Section 5.3 introduces the main econometric methods in this paper. Section 5.4 presents the empirical results.

5.2. Literature Review

While most studies on East Asia currency area are descriptive, various studies have attempted to

approach the issue empirically. There are in general three different approaches in the literature that may be used to test business cycle synchronization among countries. One is correlation analysis that concentrates on contemporaneous movement by looking at correlations of pair economies. The other is a principal component analysis to measure the degree of synchrony and interdependence for a group of nations. The third is to use recent cointegration and common cycle theory to examine the business cycle synchronization both for pairs and groups of economies.

This study, which uses cointegration and common cycles theory by a vector error correction model (VECM) for quarterly real output per capita of eight East Asian countries from 1994Q1 to 2005Q3, leads to two conclusions about East Asian output fluctuation. There is strong evidence of common stochastic trend in long-run economic fluctuations across the countries among East Asian countries. In addition, significant evidence of the presence of cofeature vector exists, i.e. the eight East Asian countries share common short-term business cycle. Then, significant common business cycles are shared by all East Asian countries considered, which are suitable for establishing higher level monetary and financial cooperation such as forming a currency area.

5.3. Methodology

The econometric methods, cointegration and common cycles analysis, are explained in the section.

5.3.1. Methodology for Unit Root Test

We assume the individual output series satisfying the autoregressive model AR(p):

$$y_t = \alpha_0 + \sum_{i=1}^p \alpha_i y_{t-i} + \varepsilon_t \quad (5.1)$$

where y_t denotes the logarithm of output level of each country at time t for China, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore and Thailand, and ε_t is a mean zero white noise process.

Before testing for business cycle synchronization, unit root is checked by the augmented Dickey-Fuller (ADF) test for individual output series as a preliminary analysis. The ADF test is based on the regression equation,

$$\Delta y_t = \alpha_0 + \delta y_{t-1} + \sum_{i=1}^{p-1} \gamma_i \Delta y_{t-i} + \varepsilon_t \quad (5.2)$$

where $\gamma_i = \sum_{j=i+1}^p \alpha_j$, and $\delta = \sum_{i=1}^p \alpha_i - 1$. The null and alternative hypotheses are written as:

$$H_0 : \delta = 0 \quad \text{vs.} \quad H_1 : \delta < 0 \quad (5.3)$$

The length of lags (p) is determined by the Akaike information criterion (AIC). Simulated critical values of the ADF test statistic are taken from Mackinnon (1996).

5.3.2 Methodology for Cointegration Test

The next empirical work is to test the existence and order of cointegrations among $I(1)$ variables. The likelihood-based cointegration test of Johansen (1991, 1995) and Johansen and Juselius (1990) are

used to test whether these output series move together in the long run, i.e. whether they have common stochastic trends.

An $n \times 1$ vector of the logarithm of output levels is assumed to have an autoregressive representation in error correction form as:

$$\Delta Y_t = \mu + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \Phi D_t + \varepsilon_t \quad (5.4)$$

where $\Gamma_i = -\sum_{j=i+1}^p A_j$, $\Pi = \sum_{i=1}^p A_i - I$ and D_t denotes a set of dummy variables controlling the abnormal effects of the Asian crisis on the output levels between 1997 Q4 to 1998 Q4. The coefficient Π represents the long-run relationship among the individual output series, while Γ_i traces the short-run impact of the past variables. If the rank of Π ($= r$) is less than n , the matrix Π can be written as:

$$\Pi = \alpha \beta', \quad (5.5)$$

where β is $n \times r$ matrix. The linear combination $\beta' Y_t$ is stationary and is called a cointegration vector. This is a long-run relationship in the sense that while each element of Y_t is $I(1)$ the linear combination of Y_t is reduced to $I(0)$. The trace statistic and the maximum eigenvalue statistic, which are proposed by Johansen test the rank of the matrix Π . The critical values for the asymptotic distributions of both statistics are tabulated in Mackinnon, Haug and Michelis (1999).

5.3.3 Methodology for Common Cycles Test

Vahid and Engle (1993) introduced a concept of “common cycle”. If some linear combination of a vector of the autocorrelated series is not serially correlated, the vector is called to have a common cycle.

If the cointegration relation is taken account, equation (5.4) is written as

$$\begin{aligned} \Delta Y_t &= \mu + \alpha Z_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \Phi D_t + \varepsilon_t \\ &= B W_t + \mu + \Phi D_t + \varepsilon_t \end{aligned} \quad (5.6)$$

where $B = (\Gamma_1, K, \Gamma_{p-1}, \alpha)$, $W_t = (\Delta Y_{t-1}, K, \Delta Y_{t-(p-1)}, Z_{t-1})$, and $Z_{t-1} = \beta' Y_{t-1}$. We examine whether ΔY_t in (5.6) has common cycles. In other words, we test whether some linear combination of ΔY_t exhibits uncorrelated time series. Moreover, if such linear combinations exist we find the number of common cycles. The cointegration represents a long run relation among the level vector of Y_t . On the other hand, the common cycle in ΔY_t indicates short-run business cycle synchronization implying reduced rank in the short-run dynamics. The existence of common cycle in ΔY_t is equivalent to the reduced rank of B . The rank of B ($= n-s$) represents the number of common cycles.

Vahid and Engle (1993) proposed a test statistic for testing the hypothesis

$$H_0 : \text{rank}(B) = n-s \quad \text{vs.} \quad H_1 : \text{rank}(B) > n-s. \quad (5.7)$$

The procedure utilizes the canonical correlations between ΔY_t and W_t after removing the effects of

dummy variables D_t . The test statistic is written as:

$$C(p,s) = -(T - (p-1) - 1) \sum_{i=1}^s \ln(1 - \lambda_i^2), \quad (5.8)$$

where $\lambda_i^2 (i=1, K, s)$ are the s smallest squared canonical correlations between ΔY_t and W_t . Under the null hypothesis, this statistic has a χ^2 distribution with $s^2 + sn(p-1) + sr - sn$ degrees of freedom.

5.3.4 Common Trend and Common Cycles

If the time series of Y_t has r cointegration relations and s common cycles, then Y_t can be decomposed to a random walk part which is called the “trend” and a stationary part which is called the “cycle”. They are referred as the common trend and the common cycle. The time series of Y_t has the following representation:

$$Y_t = \gamma \tau_t + F \tilde{c}_t, \quad (5.9)$$

where $\gamma : n \times (n-r)$, $F : n \times (n-s)$ matrices, $\tau_t : (n-r) \times 1$ vector of random walk process, and $\tilde{c}_t : (n-r) \times 1$ vector of stationary process. If there exist a $r \times 1$ cointegration vector and an $s \times 1$ cofeature vector in the elements of a set of $I(1)$ variables, then those variables must share $n-r$ common trends and $n-s$ common cycles. When the GDP series of the East Asian countries have a $r \times 1$ cointegration vector and an $s \times 1$ cofeature vector, then trends in those countries move together in the long-run and also the business cycles move together.

5.4. Empirical Study and Results

In this section, we apply the methodologies summarized in Section 5.3 for the quarterly data of per capita real GDP in the East Asian countries from 1994Q1 to 2005Q3. The East Asian countries consist of the core ASEAN (Indonesia, Malaysia, Philippines, Singapore and Thailand), China, Japan and Korea. As preliminary findings, we show the two facts: (i) Business cycle synchronization among East Asian countries except Indonesia are visually observed from the graphs of GDP growth rates. (ii) The sample correlation coefficients among the East Asian countries exhibit highly strong coefficient, which indicates that East Asian countries are closely linked with each other.

The empirical study reveals the two important facts: (i) the per capita real GDP in the region are cointegrated. In other words, the GDP series have common stochastic trends in the long run. (ii) The difference of per capita real GDP series have three cofeature vectors or five common cycles in the short run.

It can be concluded that the core ASEAN+3 countries do share both common trend in the long run and also synchronous business cycles in the short run. The result of this section indicates that the East Asian countries satisfy the important precondition for creating the common currency area in this region.

6. Conclusions

This dissertation studied monetary and financial cooperation in East Asia. We classified the monetary and financial cooperation into the four different levels: (i) policy dialogue, (ii) system of regional lender of last resort, (iii) exchange rate policy cooperation, (iv) common currency area. Since the highest level of cooperation is to establish the common currency area, the paper mainly focused on investigating the fourth level.

The theory of optimal currency area (OCA) originated from Mundell (1961) and Mckinnon (1963) gives criteria to constitute a common currency area. The criteria include (i) openness of economies in the area, (ii) degree of trade integration among the countries in the region, (iii) similarity of trade patterns, (iv) business cycle synchronization, and (v) mobility of labors in the area. The paper examined whether the East Asian economies satisfy the above conditions (i) through (iv) to establish the common currency area.

The finding of the paper are as follows:(i) The East Asian countries have experienced a remarkable expansion in trade and have high degree of economic openness in recent years. (ii) The degree of trade integration among the countries in the region has greatly increased in terms of both the index of intra-regional trade and the index of intra-industry trade. (iii) The trade structure in the East Asian countries is broadly similar in terms of the geographic and commodity patterns.

As for (iv) business cycle synchronization, we applied the methodology of econometrics for the quarterly data of per capita real GDP in the East Asian countries from 1994Q1 to 2005Q3. The empirical study revealed the two important facts: (1) the per capita real GDPs in the region are cointegrated. In other words, the GDP series have common stochastic trends in the long run. (2) The difference of per capita real GDP series have three cofeature vectors or five common cycles in the short run. It can be concluded that the core ASEAN+3 countries do share both common trend in the long run and also synchronous business cycles in the short run. The result of this section indicates that the East Asian countries satisfy the important precondition for creating the common currency area in this region.

The study in this paper suggests that the East Asian countries are now well qualified as a candidate to establish higher level monetary and financial cooperation such as a fixed exchange rate regime or even a common currency area in the future.

Although this paper showed that the conditions (i) to (iv) for the common currency area are satisfied, the paper did not investigate the fifth condition of labor mobility. This study is left for future research. Although one might believe that the degree of business cycle co-movement should increase with trade integration in East Asia, it remains to be verified by empirical studies. It is unrealistic to assume that the path to economic integration of East Asia is without impediments. And further work will certainly be needed in the future to discuss the theory and process of economic integration.

論文審査結果の要旨

本論は、東アジア諸国の経済発展状況や1997年に起こったアジアの通貨危機を問題意識として、東アジアにおける通貨・金融問題に関する各国の協力関係を形成する前提条件について、実証分析により、厳密に考察した論文である。

第2章では、アジア諸国の経済発展に共通な要因として、高い経済成長率、農業改革、国際取引に関する開放政策、高い貯蓄率、多額の先進国からの直接投資、が挙げられている。経済構造の類似性が貨幣・金融協力の前提条件であり、本章はこの検定に充てられている。

第3章は、1997年に起こったアジア通貨危機を教訓として、東アジア諸国が貨幣・金融力関係を築くことの必要性を論じ、チェンマイ・イニシャティブ等の通貨危機後の協調体制の説明が行われ、貨幣・金融協力の具体的な方策として、①外交的会話、②危機に陥った国に対する資金供給、③外国為替レート管理の協力体制、④共通通貨圏の構築、が挙げられている。

第4章では、最適通貨圏の理論が最適な通貨圏を構成する要素として、①それに属す国の経済の開放性、②圏内の国における経済の相互依存性、③貿易パターンの類似性、④景気循環の類似性を挙げ、①～③について、データを用いながら、東アジアでは、これらの条件が満足されていることを示している。

第5章は、本論文の中心をなす章で、東アジア諸国の景気循環が協調性を有するかを厳密な実証分析により検証している。対象となっている国東アジア8カ国の1994年から2005年までのデータを用い、VARによる統計分析により、これらの国の景気変動には、長期的には共通のトレンドがあり、短期的な景気変動パターンを共有していることを検証している。これらの分析により、東アジアの共通通貨圏構築の前提条件は整っていると結論されている。

共通通貨圏構想の本来の目的である域内経済の効率性の向上、実現された場合の経済状況の変化等、今後に残された課題はあるが、先行研究を丹念に検討し、厳密な計量分析により、一定の結論を得たことは高く評価できる。博士（経済学）論文として合格と判定する。