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Wang Zhiqian

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In the aftermath of the 1997 Asian currency crises, some policymakers and academics proposed surveillance over the intra-regional exchange rates of East Asian currencies, to preclude future crises. In accordance with these proposals, the Chiang Mai Initiative (CMI) was established in 2000 by the members of the Association of Southeast Asian Nations (ASEAN), Japan, China, and Korea (ASEAN+3), to enhance regional monetary cooperation within East Asia.\footnote{ASEAN consists of Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam.} Under the CMI, the monetary authorities developed and strengthened cooperation in the fields of bilateral and multilateral currency swap arrangements. Concurrently, the finance deputy ministers of the ASEAN+3 countries executed the Economic Review and Policy Dialogue (ERPD) to oversee the macroeconomic performance of each member country.

The objective of entering into a currency swap arrangement is to manage crises; therefore, the CMI exerts its effect only in cases of an actual currency crisis. On the other hand, the ERPD is simply a surveillance system that focuses on the performance of each country’s macroeconomic variables (e.g., gross domestic product [GDP] and inflation rate), as well as the soundness of its financial sector. Therefore, it is necessary to incorporate intra-regional exchange rates into the surveillance process, not only to preclude future currency crises but also to enhance foreign exchange surveillance of the ASEAN+3 countries. The monetary authorities are expected to establish a surveillance system to monitor fluctuations and misalignments of each ASEAN+3 currency, versus not only the US dollar but also other member currencies.

In line with the need to establish a system for monitoring fluctuations in intra-regional exchange rates, Williamson (2000), Kuroda and Kawai (2003), and Ogawa (2004) have suggested the introduction in the East Asian area of a common basket system. Among the various approaches used to simulate a common currency basket, Ogawa and Shimizu (2005) propose a new surveillance measurement called the Asian Monetary Unit (AMU). The AMU is calculated using the same method applied to calculate the European Currency Unit (ECU). The deviation indicators of the AMU’s component currencies are also calculated, to monitor the East Asian currencies’ deviations from the benchmark rate. There are two types of AMU
deviation indicators—namely, nominal AMU deviation indicator and real AMU deviation indicator—and which is best depends on the purpose at hand.

According to the findings of previous studies, the benchmark rate of the AMU deviation indicators was fixed as of 2000 and 2001. Since this rate has not been revised for over 10 years, the rate itself could be overvalued or undervalued. Here we point out that the benchmark rate should not be constant, but rather should vary over time—especially among East Asian countries with relatively higher productivity growth rates. Therefore, the first purpose of this paper is to improve the AMU deviation indicator by changing the benchmark rate from a constant rate to a time-varying one. To keep the benchmark rate at an appropriate level, we suggest that it be measured based on an equilibrium exchange rate. We improve upon the AMU deviation indicators by changing the benchmark rate from a constant rate to a time-variant one, based on the purchasing power parity (PPP); this is the most general and easiest way to measure an equilibrium exchange rate, in view of the data constraints often seen among developing countries.

The consumer price index (CPI) is used to calculate PPP values as a time-variant benchmark for AMU deviation indicators; it is often used in view of data unavailability in some countries regarding price index statistics. Because CPI values include the prices of non-tradable goods, the PPP values based on them are problematic in terms of Balassa–Samuelson effect. Therefore, when CPI values are used as price data, PPP values adjusted by Balassa–Samuelson effect should be used to calculate AMU deviation indicators. We calculate Balassa–Samuelson effect on each currency, to eliminate this effect from any benchmark rate that is based on the PPP.

Our simulation results show that there is a tendency for the Japanese yen, the Chinese yuan, and the Malaysian ringgit to be undervalued, while there is a tendency for the Korean won, the Indonesian rupiah, the Thai baht, the Vietnamese dong, and the Philippine peso to be overvalued. The Singapore dollar tends to be balanced over the entire sample period. The divergence spread between the maximum and the minimum was near to 80% after the bankruptcy of Lehman Brothers, and was smaller than the disparity in the real AMU deviation indicators.

By comparing the nominal and real AMU deviation indicators with the PPP-based AMU deviation indicator adjusted by Balassa–Samuelson effect, we found that the PPP-based AMU deviation indicator adjusted by Balassa–Samuelson effect shows a similar trend of fluctuation to the real AMU deviation indicator, but involves different movements from the nominal AMU deviation indicator.

On the other hand, based on the AMU deviation indicators and the PPP-based AMU deviation indicators adjusted by Balassa–Samuelson effect, we can identify in what currencies intra-regional exchange rate misalignments occur and how serious they are (e.g., Ogawa and Shimizu (2005) and Ogawa and Wang (2013a)). However, if the exchange rate misalignments
occurring in the East Asian currencies have linear relationships, this means that the currencies’ exchange rate fluctuations follow similar trends over the long term, and that exchange rate misalignments occurring in the East Asian countries are of a temporary nature. Thus, when we focus on intra-regional monetary cooperation and exchange rate surveillance in East Asia, it is essential that we clarify the exchange rate relationships among the currencies involved. Given this, the second purpose of this paper is to clarify the relationship of exchange rate misalignments in East Asian currencies.

The results of our empirical analysis show that the PPP-based AMU deviation indicators adjusted by Balassa–Samuelson effect follow non-stationary processes, as seen in the results of a unit-root test. This means that the PPP-based AMU deviation indicators adjusted by Balassa–Samuelson effect of East Asian currencies do not have the property of mean reversion, and that the indicators diverge from each other in the long term. Meanwhile, we also examined whether the PPP-based AMU deviation indicators adjusted by Balassa–Samuelson effect follow a similar trend of fluctuation over the long term, by using an error correction model. Of the 502 possible combinations of nine currencies, 50 combinations show cointegration relationships. Of these 50 combinations, most were rejected in an analysis of the statistical significance of the cointegration vector and the adjustment vector, as well as the consistency of the cointegration vector’s sign (i.e., positive or negative). Thus, it is clear that the exchange rates of East Asian countries respond to each other asymmetrically. To stabilize the macroeconomic variables of East Asian countries, it is important that exchange rate misalignment be addressed and rectified.

Furthermore, the global financial crisis of 2007–2008 inflicted harm on the economies of not only the United States but also Europe and emerging countries. The crisis was triggered by the BNP Paribas shock during the summer of 2007. As many U.S. and European financial institutions held several significant subprime mortgage-backed securities, excessive defaults on subprime mortgages inflicted heavy damage on U.S. and European financial institutions alike. Additionally, although most of the financial institutions in East Asia were not directly affected by defaults on subprime mortgages, the related economic slump in the United States and Europe had indirect adverse effects on the East Asian economy.

Defaults on subprime mortgages—which are housing loans for low-income households—are considered the principal cause of the 2008 global financial crisis. U.S. and European financial institutions, as well as other institutional investors, abruptly withdrew their funds from certain countries in which they had invested—specifically, those countries whose currencies drastically depreciated against the US dollar and the euro. Particularly, the exchange rate volatility of some East Asian currencies increased, and exchange rate misalignments widened too. It was also found that the Chinese monetary authority had re-pegged the Chinese yuan to the US dollar, in order to stabilize its exchange rate. Thus, the exchange rates of East Asian currencies were indirectly affected by the global financial crisis, even though each of these
East Asian countries had maintained a sound financial sector.

Given the aforementioned circumstances, the third purpose of this paper is to analyze how the East Asian currencies were misaligned before and after the global financial crisis. We obtained empirical results showing that the exchange rates of East Asian currencies were differentially affected by the global financial crisis. On the other hand, we found that some combinations of East Asian currencies had converged during the subsample periods, especially from the beginning of 2000 to the middle of 2005 and from the end of 2007 to the beginning of 2010. The global financial crisis reminded us of the importance of addressing exchange rate misalignments that had occurred among the East Asian currencies, in order to stabilize the macroeconomy in East Asia. Furthermore, from the viewpoint of regional monetary cooperation, it has become necessary to establish a surveillance system within the East Asian area, to ensure the early detection and prevention of exchange rate misalignments—something believed to be a reason for the Asian currency crisis of 1997.

This paper is organized as follows. In section 1, we provide an outline of the paper as a whole. In section 2, we review previous studies on the measurements of exchange rate surveillance. In section 3, we first calculate Balassa–Samuelson effect of each ASEAN6+3 country by using a simple model and then work out the PPP-based AMU deviation indicator adjusted by Balassa–Samuelson effect of each currency. Our simulation results could serve as a new measurement to complement the original AMU deviation indicators. In section 4, we employ data from the PPP-based AMU deviation indicators adjusted by Balassa–Samuelson effect to test the stationarity of East Asian currencies through a unit root test, and identify the long-term relationships between East Asian currencies through a cointegration test. Our empirical analysis results show that the exchange rates of East Asian countries respond to each other asymmetrically. In section 5, we employ the methodologies of β-convergence and σ-convergence to examine the exchange rate misalignments of East Asian currencies. We point out that one of the reasons for exchange rate misalignment arises from currency carry trade, and the exchange rate misalignments in East Asian countries are a structural problem on the exchange rate regime. In section 6, we discuss the contributions of this paper and directions for future research.

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2ASEAN6 consists of Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam.