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How Useful Is an Asian Currency Unit (ACU) Index for Surveillance in East Asia?

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Abstract

An Asian Currency Unit (ACU) index is constructed using an alternative procedure which minimizes a basket or portfolio of assets expressed in terms of national currencies. Using this estimated ACU index and an ACU Deviation Indicator, the main finding of this study based on the current trajectory of East Asian currencies relative to this regional ACU average or benchmark is that there is a formation of two contrasting groups of countries in the region—one a group of strong currencies and the other a group of weak currencies. We emphasize that the implication of this contrasting trajectory in East Asian intra-regional exchange rates is to disturb the competitive trading relationships in the region which may result in wasteful beggar-thy-neighbor policies in the region. As emphasized by other recent studies, e.g., Kawai and Takagi (2012), the region needs a kind of framework for exchange rate policy coordination that will promote intra-regional exchange rate stability. We suggest several ways in which the region can capitalize on using this ACU index in the immediate term for surveillance purposes, particularly, for purposes of assessing “over- and undervaluation” of the individual currencies from the regional ACU average and for flagging emerging vulnerabilities in individual economies in the region.

JEL Classification: F15, F31, F41

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1. INTRODUCTION

The issue of exchange rate regimes in East Asia, in particular the optimal composition of a basket-peg arrangement in East Asia, has been an enduring topic of great interest among scholars and observers alike. Some of the notable findings in this vast literature, including the soft-US dollar peg adopted by most countries in East Asia prior to the 1997–98 Asian financial crisis and the alleged reversion to a relatively similar US dollar peg in the aftermath of the Asian financial crisis, have been regarded by other related studies as the failure of economies in the region to appropriately coordinate their exchange rate policies (Girardin 2011; Ogawa and Ito 2002; Ohno 1999). The implication of this so-called coordination failure is that a unilateral decision by one country to achieve stability vis-à-vis another currency may not be the optimal option for all countries in the region. Interestingly, many studies have called for pegging East Asian currencies either to a basket comprised of the Group of Three (G-3) currencies (US dollar, Japanese yen, and euro) (Mundell 2003) or to a basket composed of regional currencies (Kawai and Takagi 2000; Kawai 2008; Kawai 2009; Kawai and Takagi 2012; Ogawa and Shimizu 2005), and there have even been calls for the harmonization of inflation targets in the region (Genberg 2006; Gudmundsson 2008).

The reasons for this intense interest in finding a suitable exchange rate arrangement for the region and not just purely for individual country considerations are not hard to find. In particular, the extent of intra-Asian trade—measured by an average of export and import shares—which at the time of writing continue to increase despite the current euro area financial crisis and the lackluster recovery in the United States (US) (ADB 2012); and the development of intra-Asian supply chains by multinational corporations since the early 1990s which has given rise to a growing intensity of vertical intra-industry trade in the region (Chow et al. 2010). Moreover, nearly two-thirds of all foreign direct investment (FDI) inflows in the region are between Asian countries in 2009 (ADB 2012). The closer trade and financial ties between East Asian countries have made these economies increasingly interdependent. One should then expect as a result that economies in the region are increasingly affected by shocks that originate from neighboring economies as well as being highly sensitive to policies adopted by their neighboring economies.

Exchange rates should form a vital link in this growing economic interdependence among East Asian countries. To illustrate the critical link of exchange rates in the East Asian region, one key piece of evidence I present in this paper is that East Asian monetary authorities have less willingness to tolerate exchange rate appreciations. This is due in part to the potential of losing competitiveness against other East Asian economies that compete with each other in markets within and outside of the region. As a consequence, the prospect of a beggar-thy-neighbor competitive depreciation strategy, which can be costly to the region in terms of a large and unnecessary reallocation of resources across the region, always looms large (Kawai and Takagi 2012). As emphasized by Kawai and Takagi (2012), what East Asia needs is a kind of regional framework for exchange rate policy coordination that will promote intra-regional exchange rate stability, thereby avoiding costly beggar-thy-neighbor policies, while at the same time allowing for sufficient flexibility against external currencies.

But despite the important underlying role of the exchange rate in the ongoing progress of economic integration in the East Asian region, there has been limited meaningful progress in moving toward a regional framework for exchange rate policy coordination. Arguably, this represents a major disconnect in the area of monetary and financial cooperation given the important strides achieved by the region in this area in recent years, e.g., Economic Review and Policy Dialogue (ERPD) process, multilateralization of the Chiang Mai Initiative (CMI), the Asian

Bond Markets Initiative (ABMI), and the establishment of the independent surveillance unit, the Association of Southeast Asian Nations (ASEAN)+3 Macroeconomic Research Office (AMRO).

I will show that such need for exchange rates coordination can be met in part by the creation of an Asian Currency Unit (ACU) index, which, in a general sense, is a weighted average of participating East Asian currencies which can serve to monitor the movements of participating regional currencies relative to this ACU benchmark as well as the collective movements of participating regional currencies against key external currencies such as the US dollar and the euro (Kawai 2009). Unlike the approach adopted in the existing literature to the construction of an ACU index which calculates the weights based on an arithmetic average of each of the participating country's PPP-based GDP and foreign trade, my approach is based on a methodology that directly estimates the optimal currency basket weights in the context of a minimized basket or portfolio of assets. Apart from the advantage of arriving at an optimal regional currency basket, such an approach can lessen the contentious and political nature of the construction of an ACU index.

Even the suggestion of the use of the ACU index in a regional framework for exchange rate policy coordination in East Asia can be rather controversial. The severe financial crisis that Europe is currently facing and the associated doubts about the very survival of the European Economic and Monetary Union (EMU) and its own currency, the euro, has made it questionable whether the euro area can still be regarded as a model for establishing a currency union in other parts of the world and in East Asia in particular. A valuable lesson from the current crisis in Europe is that it reiterates the important argument that any move toward monetary union in East Asia has to be approached in a very careful and gradual manner, especially in view of the infeasibility of such a decision for the region under present circumstances. The main objective of this study is to emphasize the benefit to the region of initially employing the more down-to-earth approach of using the ACU index as a surveillance indicator.¹ Nonetheless, if certain important preconditions are met, the study does not rule out the possibility of a monetary union in the long-term and suggest some means by which the ACU index can be fitted into this scenario.

I will suggest some ways in which AMRO can include the ACU index in its surveillance activities in the immediate term. I first propose the regular calculation and analysis of the ACU index and a certain exchange rate deviation indicator. Next, along with other statistically-proven significant early warning leading indicators of crises, the analysis and findings emanating from this regular exercise can be included in the surveillance reports submitted by AMRO to the senior finance and central bank officials of the ASEAN+3 economies. I make the case that the inclusion of the analysis from the regularly-calculated ACU index and the exchange rate deviation indicator in the surveillance reports submitted by AMRO not only aids in fulfilling the objective of intra-regional currency stability and thereby help avoid the unnecessary beggar-thy-neighbor policies within the region, but also helps to flag emerging vulnerabilities in the region. I argue that these dual objectives of promoting currency stability and identifying vulnerabilities in the region can be greatly facilitated by devising a consistent and common template for the region in the form of a scorecard approach. In this version of a scorecard approach, an important item called a threshold value for each of the chosen early warning indicators, including that for the exchange rate deviation indicator, shall be reported. The value-added of this reporting approach for the region is that it provides an objective way of assessing over/undervaluation of the individual currencies from the regional average as represented by the ACU index, on one hand, and

¹ It is interesting to note in this regard that in a recent survey of opinion leaders, comprising government officials, academics, and bankers, over two-thirds of those surveyed felt that the recently created independent surveillance unit, AMRO, should use an ACU index for regional surveillance (Rana et al. 2012).

determining the presence or absence of vulnerability in individual ASEAN+3 economies, on the other. Finally, in the event that the region desires to gradually move into a more formal exchange rate arrangement in the future, such as a monetary union, the paper argues that the ACU index can still play a continuing key role into this process, provided that the required political support from the region's policymakers and the institutional readiness and mechanisms in the countries concerned are in place.

The paper is organized as follows. Section 2 reviews the *de-facto* exchange rate arrangements in East Asia according to two well-known *de-facto* exchange rate classifications. In Section 3, the unwillingness to appreciate in individual countries in the region is assessed according to a type of regime-switching estimations. Section 4 presents the alternative method of constructing an Asian Currency Unit (ACU) index and goes on to calculate an exchange rate deviation indicator based on this ACU index, and compares the results with other recent similar constructions of an exchange rate deviation indicator. Section 5 interprets the results and suggests some ways of how the inclusion of the ACU and the corresponding exchange rate deviation indicator can be incorporated into the surveillance work of AMRO and discusses its possible important role in any formal exchange rate arrangement that may ensue in the region in the future. Section 6 concludes.

2. EXCHANGE RATE REGIMES IN EAST ASIA

Since the late 1990s, most studies refer to the official or *de jure* classification on the choice of exchange rate regimes by countries, which the International Monetary Fund (IMF) compiles and publishes based on the self-reporting of member countries' exchange rate policies. In other words, the classification is based on what countries declare they do. However, researchers eventually began to realize that there is a substantial difference between what countries say they do and what they actually do in practice. For instance, evidence provided by Calvo and Reinhart (2002) showed that currencies that were *de-jure* classified as pegs, often underwent frequent devaluations, which makes the exchange rate regime more similar to a flexible one. Conversely, countries that report they float exhibited what Calvo and Reinhart (2002) coined as "fear of floating", relying on exchange market interventions to smooth exchange rate movements. In East Asia, as noted by the ADB (2010), *de-jure* classification of East Asian exchange rate regimes have veered toward greater flexibility, while the movements in exchange rates have remained low in the region since after the Asian crisis.

A substantial literature has emerged to rectify the failing of the *de-jure* coding and which attempts to classify countries' exchange rate policies not merely in terms of their words (on what they declare they do) but by their deeds (on what they actually do)—based on actual exchange rate variability and observed policy actions—which resulted in a classification now commonly referred to as *de-facto* exchange rate regimes. The IMF, for one, has amended its *de-jure* coding with its own *de-facto* classification based on assessments of movements in reserves and official exchange rates. Table 1 lists the East Asian exchange rate regimes based on the new IMF's *de-facto* classification as of April 2008.

Table 1: De Facto IMF Classification of East Asian Exchange Rate Regimes

		Exchange Rate Arrangements				
		Currency Board	Other Conventional Fixed Peg Arrangement	Crawling Peg	Managed Float with no Predetermined Path	Independently Floating
Monetary Policy Framework	Exchange Rate Anchor US Dollar	Hong Kong, China	Viet Nam	People's Republic of China	Cambodia, Lao PDR, and Myanmar	
	Composite				Singapore	
	Others	Brunei Darussalam				
	Monetary Target					
	Inflation Targeting				Indonesia and Thailand	Rep. of Korea and Philippines
	Others				Malaysia	Japan

Source: IMF's De Facto Classification of Exchange Rate Regimes and Monetary Framework (2008).

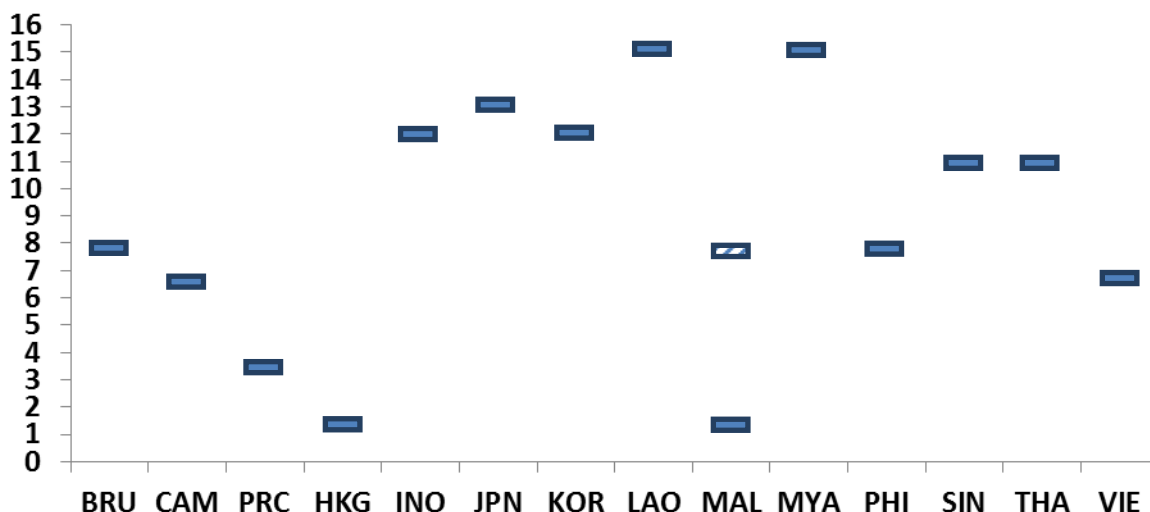
The striking observation from this table is that East Asian exchange rate arrangements cover a wide spectrum of regimes of varying degrees of flexibility ranging from the crawling peg of the PRC to independent floating regimes in the Republic of Korea (henceforth, Korea), Japan, and the Philippines. The only exceptions are Hong Kong, China; Brunei Darussalam; and Viet Nam, all three of which operate a fixed exchange rate arrangement anchored on a single currency. One contributing factor for the move toward more flexible exchange rate arrangement in these East Asian countries is that after the Asian financial crisis, almost all of the crisis-affected countries, i.e., Indonesia, Korea, Philippines, and Thailand, chose to abandon a conventional pegged exchange rate regime in favor of flexible exchange rates, while Malaysia implemented a conventional pegged arrangement until 2005 but has since shifted to a managed floating exchange rate regime (ADB 2010).

One other de-facto classification that produced a new cross-country dataset of de facto exchange rate arrangements is the pioneering work of Reinhart and Rogoff (2004) (henceforth RR).² The authors construct what they called a “natural classification” for 153 countries over the period 1940–2001 by focusing on dual and parallel exchange rates as well as a statistical analysis of observed behavior in the exchange rates.³ Unlike the IMF classification, their approach included a finer classification of 15 possible exchange rate arrangements. Figure 1 depicts the evolution of East Asian exchange rate arrangements over the period of 2000 to 2007 according to the RR classification.

² Another notable study is by Levy Yeyati and Sturzenegger (2003 and 2005). These authors provided a new de facto regime classification for 156 countries from 1974 to 2000 via the use of cluster analysis which then grouped countries based on the behavior of three variables, changes in the nominal exchange rate, the volatility of these changes, and the volatility of the ratio of net-reserves to the monetary base.

³ The Reinhart and Rogoff (2004) new *de facto* exchange rate regime classification had been recently updated by Reinhart, Rogoff and Ilzetzki (2008) and with the *de facto* regime classification extended up to 2007. We used this updated database in producing Figure 1 above.

**Figure 1: De Facto East Asian Exchange Rate Regimes
According to Reinhart-Rogoff (2008)**



Notes:

- | | | |
|--|-------------------------------|--|
| 1. No separate legal tender | 2. Currency board arrangement | 3. Pre-announced horizontal band = $\pm 2\%$ |
| 4. De facto peg | 5. Pre-announced crawling peg | 6. Pre-announced crawling band = $\pm 2\%$ |
| 7. De facto or crawling peg | 8. De facto crawling band | 9. Pre-announced crawling band = $\pm 2\%$ |
| 10. De facto crawling band = $\pm 5\%$ | 11. Moving band = $\pm 2\%$ | 12. Managed floating |
| 13. Freely floating | 14. Freely falling | 15. Dual market in which parallel market data is missing |

* For Malaysia = 2000-05 = 2006-07

BRU=Brunei Darussalam; CAM=Cambodia; PRC=People's Republic of China; HKG=Hong Kong, China; INO=Indonesia; JPN=Japan; KOR=Republic of Korea, LAO=Lao PDR; MAL=Malaysia; MYA=Myanmar; PHI=Philippines; SIN=Singapore; THA=Thailand; VIE=Viet Nam.

Source: Source of raw data: Reinhart and Rogoff (2008). Figure adapted from Gupta (2012).

According to Figure 1, with the exception of Malaysia, all other East Asian countries have not undergone a change in their exchange rate arrangements over the period of 2000 to 2007. Furthermore, a comparison of the IMF classification and the RR classification reveal interesting observations on their respective codings. Analogous to the IMF classification, the RR classification reveals the fact that East Asian exchange rate arrangements indeed cover a wide spectrum of regimes. In addition, there is no discrepancy between the IMF and the RR classifications in the respective exchange rate regimes of Hong Kong, China (currency board arrangement); Indonesia (managed floating); and Japan (floating)⁴. There are, however, a number of divergences between the two classifications. The IMF classifies the PRC as a crawling peg while RR classifies it as a de facto peg. Korea and the Philippines are both defined

⁴ The IMF classification calls this as an independent float while the Reinhart-Rogoff classification calls it freely floating.

by the IMF as independent floaters whereas it is characterized by RR as operating, respectively, a managed float and a *de facto* crawling band. Malaysia, Thailand, and Singapore are all described by the IMF as managed floaters while RR characterizes Malaysia as operating a *de facto* crawling band and Thailand and Singapore as based on a moving band (that is narrower or equal to $\pm 2\%$).

Notwithstanding these differences⁵ between the IMF and RR classifications, the so-called bipolar or hollowing out of the middle view⁶ are not clearly supported by these two *de facto* codings. In other words, most East Asian monetary authorities have not willingly assumed the responsibilities that come with operating a rigid peg let alone the alternative of a clean float. To be more specific, by and large, the middle has not really become hollow for the exchange rate policies of these East Asian countries, and more of them have the desired preference of managing exchange rates that are edged toward flexible exchange rates albeit not free floating.⁷

3. FEAR OF APPRECIATION IN EAST ASIA

The previous analysis simply makes apparent an earlier argument by the ADB (2010) that exchange rate management in Asia has been fashioned toward the implementation of a *de facto* “middle-ground” exchange rate regimes cum intervention in the foreign exchange market. However, the current understated nuance of East Asian middle-ground exchange rate management is that the extent of the management may have a strong bent on one side of the market in which some currency depreciations can be allowed while substantially limiting the extent of the currency appreciations. For some reasonable conjectures that will be discussed toward the end of this section, such behavior in exchange rate policy which can be adequately characterized as a form of an asymmetric exchange rate management, specifically an aversion to currency appreciations, has also been fittingly labeled by Levy-Yeyati and Sturzenegger (2007) as “fear of appreciation” or “fear of floating in reverse”.

The aim of this section is to investigate and assess the existence of such forms of asymmetric exchange rate behavior.⁸ In order to achieve this objective, I employ a class of a regime-switching model known as the smooth transition autoregressive model (STAR) and in particular a certain type of regime switching model known as the LSTR2 model. This is nothing but a logical method to capture this form of exchange rate behavior as the use of this model allows one to explicitly measure the thresholds on both sides of the market, i.e., appreciation and depreciation thresholds. A brief discussion of the underlying mechanics of the LSTR2 model and how these appreciation and depreciation thresholds are derived from this LSTR2 model is provided in Appendix A.⁹ In a nutshell, the LSTR2 model involves the estimation of two

⁵ Such noted divergences between the IMF and RR *de facto* classifications in a number of these East Asian countries' exchange rate regimes follow on from what recent studies have broached in more general terms—the apparent differences in *de facto* classification codings. See, for instance, the studies of Frankel (2004), Rose (2011), and Eichengreen and Razo-Garcia (2011).

⁶ This view is widely attributed to Fischer (2001).

⁷ In terms of Figure 1 above, for instance, this is reflected as a greater concentration of the horizontal bar lines from the middle to the uppermost area of the figure.

⁸ Most of the discussion on this point on is based on Pontines and Siregar (forthcoming).

⁹ In general, the construction of STAR models follows the same steps as in the ARIMA-Box-Jenkins modeling approach, wherein the modeling cycle consists of model specification, parameter estimation, and diagnostic evaluation.

threshold parameters c_L (the lower or appreciation threshold) and c_H (the upper or depreciation threshold).¹⁰ The comparison of the magnitudes of these lower (c_L) and upper (c_H) threshold parameters reflects the relative tolerance of monetary authorities to exchange rate variations. To be specific, if the upper threshold, c_H is larger than the (absolute value of the) lower threshold, c_L , this suggests an aversion of monetary authorities to currency appreciations. In line with what we observed in the previous section, both of these estimated thresholds are presented in Table 2 below for the case of East Asian countries that operate a middle-ground management of the exchange rate.¹¹

Table 2: Threshold Values

	c_L	c_H
PRC yuan	-0.011 (0.00)***	-0.006 (0.00)***
Cambodia riel	0.001 (0.00)***	0.008 (0.00)***
Indonesian rupiah	0.008 (0.00)***	0.027 (0.00)***
Japanese yen	-0.042 (0.00)***	0.066 (0.00)***
Korean won	0.052 (0.00)***	0.150 (0.00)**
Laos kip	0.006 (0.00)***	0.124 (0.000)***
Malaysian ringgit	0.007 (0.00)***	0.032 (0.00)***
Philippine peso	0.010 (0.00)***	0.026 (0.00)***
Singapore dollar	-0.027 (0.00)***	0.034 (0.00)***
Thailand baht	0.016 (0.00)***	0.033 (0.00)***
Viet Nam dong	0.011 (0.00)***	0.020 (0.00)***

Note: Numbers in square parentheses are p -values. Significance levels: **5%, ***1%. c_L , c_H are the lower and higher threshold values, respectively. The estimation of the LSTR2 models is based on monthly data for the period 2000:01 to 2012:03, except for the PRC yuan and the Malaysian ringgit which is for the period 2005:07 to 2012:03.

The lower and upper thresholds are at 0.1% and 0.8%, respectively, for the Cambodia riel; 0.8% and 2.7% for the Indonesian rupiah; 4.2% and 6.6% for the Japanese yen; 5.2% and 15% for the Korean won; 0.6% and 12.4% for the Lao PDR kip; 0.7% and 3.2% for the Malaysian ringgit; 1% and 2.6% for the Philippine peso; 2.7% and 3.4% for the Singapore dollar; 1.6% and 3.3% for the Thailand baht; and, 1.1% and 2.0% for the Viet Nam dong. This shows that in all of these East Asian currencies, the upper threshold, c_H is larger than the (absolute value of the) lower threshold, c_L , which indicates to varying degrees a revealed preference for limiting the extent of the appreciations of their currencies against the US dollar while substantially allowing for currency depreciations against the US dollar. This result is in line with available recent evidence for a number of these East Asian currencies which also points to an aversion to or a fear of appreciation.¹²

The interesting exception to this result is the case of the PRC yuan for which an upper threshold, c_H , that is significantly negative and smaller (in absolute value terms) than the lower threshold,

¹⁰ It should be noted at this point that since the exchange rate data used in the estimation is defined in terms of the local currency with respect to the US dollar, an appreciation of the local currency corresponds to the "lower" threshold. The converse is true for a depreciation of the local currency in which it denotes the "upper" threshold.

¹¹ We exclude from our estimation of both thresholds Brunei Darussalam in view of its currency board arrangement according to the IMF *de facto* classification and Hong Kong, China also by virtue of its currency board arrangement according to both the IMF and RR *de facto* classifications.

¹² See, for instance, the studies of Pontines and Rajan (2011) which examines the case of India, Indonesia, Korea, Philippines, Singapore, and Thailand, while Pontines and Siregar (2012) and Pontines and Siregar (forthcoming) squarely deals with the issue in the context of an announced pursuit of inflation targeting regimes by Indonesia, Korea, Philippines, and Thailand.

cL, suggest the PRC's partiality to allowing its currency to appreciate somewhat against the US dollar since the July-2005 reform of its exchange rate system. This finding corroborates observations of actual yuan movements since the July 2005 exchange rate reform in the PRC.¹³ Nonetheless, the relatively narrower spread or difference between the estimated cH and cL (-0.6% to -1.1%) can be interpreted as a telltale preference on the part of the PRC's monetary authority for a rigidly managed pace of appreciation of its currency.

Given the lesser willingness of East Asian monetary authorities to tolerate exchange rate appreciations, it comes as no surprise that monetary authorities in this part of the world have intervened in their respective foreign exchange markets by buying reserves that "lean against the wind" in times of upward pressures on their exchange rates, largely brought about by the influx of massive capital inflows into the region in recent years. This has resulted, over the past two decades, in East Asian economies' accumulation of a massive amount of international reserves, contributing to the problem of global macroeconomic imbalances. In fact, more than half of the world's international reserves are stockpiled in the region and four of the six biggest reserve "hoarders" are in East Asia—the PRC; Japan; Taipei,China; and Korea.¹⁴

Part of the reason for the unwillingness to tolerate exchange rate appreciations has to do with the potential of losing competitiveness against other East Asian neighboring economies that compete with each other in markets outside the region such as the US, Japan, and other advanced economies as well as inside the region.¹⁵ To be more specific, the rapid growth of intra-regional trade in the East Asian region that is centered on the PRC has brought about three related manifestations of this potential fear of losing competitiveness against other regional export competitors (Roubini 2010). One is the concern that Asian economies would lose competitiveness relative to the PRC in third markets such as in the US, Japan, and other developed economies, once their currencies appreciate. Second, as the PRC produces and exports labor-intensive manufactured goods to neighboring Asian economies, a currency appreciation in these regional economies outside of the PRC can trigger a "competitive squeeze" that can hurt domestic and import-competing manufacturing industries in these economies. And finally, a currency appreciation in one Asian economy that is not equivalently matched to the same degree in other neighboring Asian economies can also harm the former's market share relative to the latter in the PRC's market.

4. AN ALTERNATIVE METHOD IN CONSTRUCTING AN ASIAN CURRENCY UNIT (ACU) INDEX

The foregoing analysis suggests that resolving this collective action problem on East Asian exchange rate policies would involve the initiation of some form of exchange rate policy coordination within the region to promote intra-regional exchange rate stability, and hence,

¹³ See, for instance, The Economist's two articles on this topic entitled, "China, an appreciation", 16 October 2011 and "Enough appreciation for now", 12 March 2012; and Gudmundsson (2008).

¹⁴ The other two are Russia and Saudi Arabia as of 2010-Q2 data.

¹⁵ The reserves accumulation in the region has triggered a rich literature that tried to explain the motivations for the reserves build-up and the reason advanced above is linked to the role of mercantilist motives triggered by concerns about export competitiveness. A competing explanation that was also advanced in this literature is the so-called precautionary or self-insurance motive in which countries hoard reserves as a cushion against sudden stops or the sudden reversal of capital flows. Empirical research has, however, showed the limited explanatory power of the self-insurance motive to account for the recent trends in reserves accumulation in Asia. On this evidence, see for instance, Bird and Rajan (2003) and Jeanne (2007).

avoid beggar-thy-neighbor policies, while still allowing for sufficient inter-regional exchange rate flexibility (ADB Asia Economic Monitor 2010; Kawai and Takagi 2012). As emphasized at the beginning of this paper, the importance of such policy coordination emanates from deepening integration in the region through ever increasing intra-regional trade, investments, and significantly tighter financial linkages between economies in the region. The corresponding rise in trade and finance interdependencies means that economies in the region are increasingly affected by shocks that originate from neighboring economies as well as being highly sensitive to policies adopted by these economies. One arrangement that can facilitate such coordination in exchange rates is the creation of an Asian Currency Unit (ACU) index, which in a general sense is a weighted average of participating East Asian currencies to monitor the movements of participating regional currencies relative to this ACU benchmark and the collective movements of participating regional currencies against key external currencies such as the US dollar and the euro (Kawai 2009).¹⁶ One possible construction of an ACU is based on a methodology that estimates optimal currency basket weights in the context of a minimized basket or portfolio of assets expressed in terms of national currencies.

4.1 An ACU Index¹⁷

In a seminal paper, Hovanov, Kolari, and Sokolov (2004) showed that the values of any given currency (e.g., British pounds) depend on the chosen base currency (e.g., U.S. dollars, euros, Japanese yen), which creates ambiguity in the valuation of a currency, making it difficult to examine the dynamics of the time series of currency values. It should be noted that the choice of base currency is critical for obtaining a stable exchange rate. For example, using the US dollar as a base currency as opposed to the Japanese yen changes the relationship between the euro and the British pound. To overcome this base currency problem, they proposed a reduced (to the moment t_0) normalized value in exchange of i th currency:

$$\text{RNVAL}_i(t/t_0) = \frac{c_{ij}(t)}{\sqrt[n]{\prod_{k=1}^n c_{kj}(t)}} \bigg/ \frac{c_{ij}(t_0)}{\sqrt[n]{\prod_{k=1}^n c_{kj}(t_0)}} = \sqrt[n]{\prod_{k=1}^n \frac{c_{ik}(t)}{c_{ik}(t_0)}} \quad (1)$$

where $c_{ij}(t)$, $i, j = 1, \dots, n$, are cross-currencies of exchange rates of n currencies at the moment t . Through division by the geometric mean of a basket of currencies, the value of any currency is the same regardless of the base currency chosen.

This reduced normalized value in exchange ($\text{RNVAL}_i(t/t_0)$) of a currency is useful for comparing the movements of individual currencies and basket currencies. Why? Typically, one makes statements like “the US dollar appreciates against the yen but depreciates against the euro”. In contrast, if the reduced normalized value in exchange of the US dollar rises, it means that the value of the US dollar rises on average against the national currencies used in the computation

¹⁶ An ACU index based on a weighted average of regional currencies recalls the European Currency Unit (ECU) which was created in March 1979 under the European Monetary System (EMS) and remained in operation until the launch of the euro in January 1999.

¹⁷ A major part of this section is based on Pontines and Rajan (2008) and Pontines (2009).

of the geometric mean of the basket of national currencies (Hovanov, Sokolov, and Kolari, 2004).

Furthermore, it also allows the computation of a unique optimal, minimum-variance currency basket regardless of the base currency choice. The derivation of this minimum variance currency basket is calculated by the optimal weight vector w^* that solves the following optimal control problem:

$$\text{Min} \left(S^2(w) = \sum_{i,j=1}^n w_i w_j \text{cov}(i, j) = \sum_{i=1}^n w_i^2 s_i^2 + 2 \sum_{\substack{i,j=1 \\ i < j}}^n w_i w_j \text{cov}(i, j) \right) \quad (2)$$

under the constraints, $w_i \geq 0$, for all $i = 1, \dots, n$, $w_1 + \dots + w_n = 1$, where $\text{cov}(i,j)$ is the covariance between $\text{RNVAL}_i(t/t_0)$ and $\text{RNVAL}_j(t/t_0)$, and s_i^2 is the variance of $\text{RNVAL}_i(t/t_0)$ for all $i, j = 1, \dots, n$ and all $t = 1, \dots, T$.¹⁸ The optimal weights can also be transformed into optimal currencies' amounts $q_1^*, q_2^*, \dots, q_n^*$ as follows:

$$q_i^* = \frac{w_i^* \sum_{r=1}^n q_r c_{rj}(t)}{c_{ij}(t)}, \quad \text{Let } \mu = \sum_{r=1}^n q_r c_{rj}(t), \quad \text{thus } q_i^* = \frac{w_i^* \mu}{c_{ij}(t)} \quad (3)$$

Here the positive factor μ can be easily solved with the identification of the optimal weights $w_1^*, w_2^*, \dots, w_n^*$ derived from the minimization of the variance in Eq. (2), and $c_{1j}(t), c_{2j}(t), \dots, c_{nj}(t)$. Substituting μ into Eq. (3) we obtain the optimal currencies' amounts $q_1^*, q_2^*, \dots, q_n^*$, which constitute the minimum variance currency basket.

Since we are minimizing a basket or portfolio of assets expressed in terms of national currencies, the currency weights are primarily determined by two main factors—the variance of the reduced normalized value in exchange ($\text{RNVAL}_i(t/t_0)$) of the national currencies included in the currency basket; and the covariance of the reduced normalized value in exchange ($\text{RNVAL}_i(t/t_0)$) of the national currencies included in the currency basket, and, hence, their correlations.

Recent estimates of the ACU currency basket weights have been based on some economic indicators across the regional currencies.¹⁹ For instance, in a widely cited work, Ogawa and Shimizu (2005), proposed the construction of an ASEAN+3 regional currency basket a la the European Currency Unit (ECU) and calculated the weights of the ASEAN+3 currencies as an

¹⁸ The optimal weights that minimize the variance of a currency basket can be easily computed using familiar optimization methods for diversifying a portfolio of assets. See Hovanov, Kolari, and Sokolov (2004) for details.

¹⁹ For a thorough review of other currency baskets, refer to Kawai 2009.

arithmetic average of the country's respective shares of PPP-based GDP and foreign trade. A similar method of construction was undertaken by Gupta (2012) except that the set of regional currencies in the currency basket included not just the ASEAN+3 but also Hong Kong, China and India. More recently, two alternative constructions to the original ASEAN+3 regional currency basket of Ogawa and Shimizu (2005) have also been made—one calculating a regional currency basket for the Chiang Mai Initiative (CMI) member countries (i.e., ASEAN+3 plus Hong Kong, China) and the other, a wider regional currency basket that not only includes the ASEAN+3 countries but also Australia, India, and New Zealand.²⁰ The former uses as weights in the construction of the currency basket, the contribution shares according to the Chiang Mai Initiative Multilateralization (CMIM), whereas the latter uses the method of Ogawa and Shimizu (2005) based on the same arithmetic average of the country's respective shares of PPP-based GDP and foreign trade to calculate the currency weights.

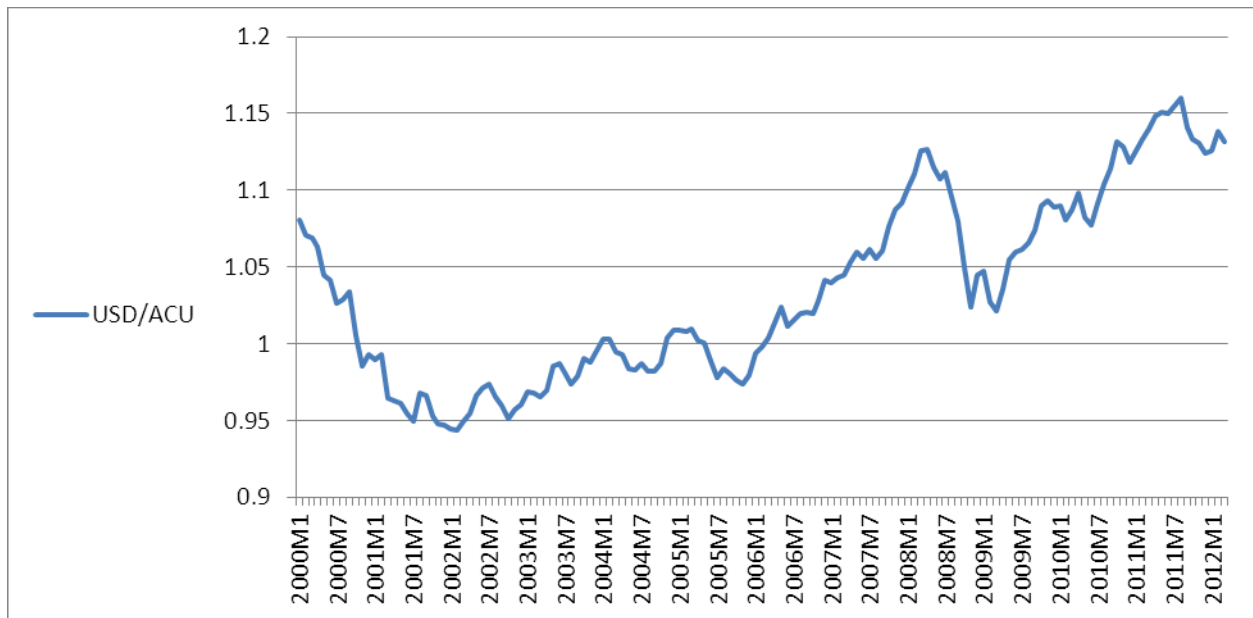
How does the technique presented above differ from these recent estimates of an ACU index? In addition to the argument based on technical grounds that the technique expounded above is for calculating the optimal currency basket weights, and thus arrive at an optimal regional currency basket that is guaranteed to deliver intra-regional exchange rate stability, one other major difference of the above technique from recent estimates of an ACU index is that it sidesteps the controversial issue of the selection of the most appropriate economic variables and indicators that should be used in calculating the appropriate numbers of currency units in the basket. The advantage of this alternative technique is that it can lessen the contentious and political nature of the construction of such an ACU index.

4.2 Results

The above methodology is used to calculate an optimal ACU index composed of the ASEAN10+3 economies as well as Hong Kong, China. As previously mentioned, these economies comprise what is known as the Chiang Mai Initiative (CMI). Once this optimal ACU index is constructed, one can obtain relevant exchange rates such as the value of the ACU against the individual regional currencies included in the currency basket, e.g., the value of the ACU against the PRC yuan, Japanese yen, Korean won, Thai baht, etc., as well as the value of the ACU against external currencies like the US dollar and the euro. For instance, Figure 2 shows the changes in the value of the ACU against the US dollar since January 2000.

²⁰ It should be noted at this point that the Ogawa and Shimizu (2005) study and the subsequent alternative constructions of the regional currency baskets were all undertaken under the joint auspices of Japan's Research Institute of Economy, Trade and Industry (RIETI) and Hitotsubashi University.

Figure 2: Movement of the US Dollar vis-à-vis the Asian Currency Unit (ACU)



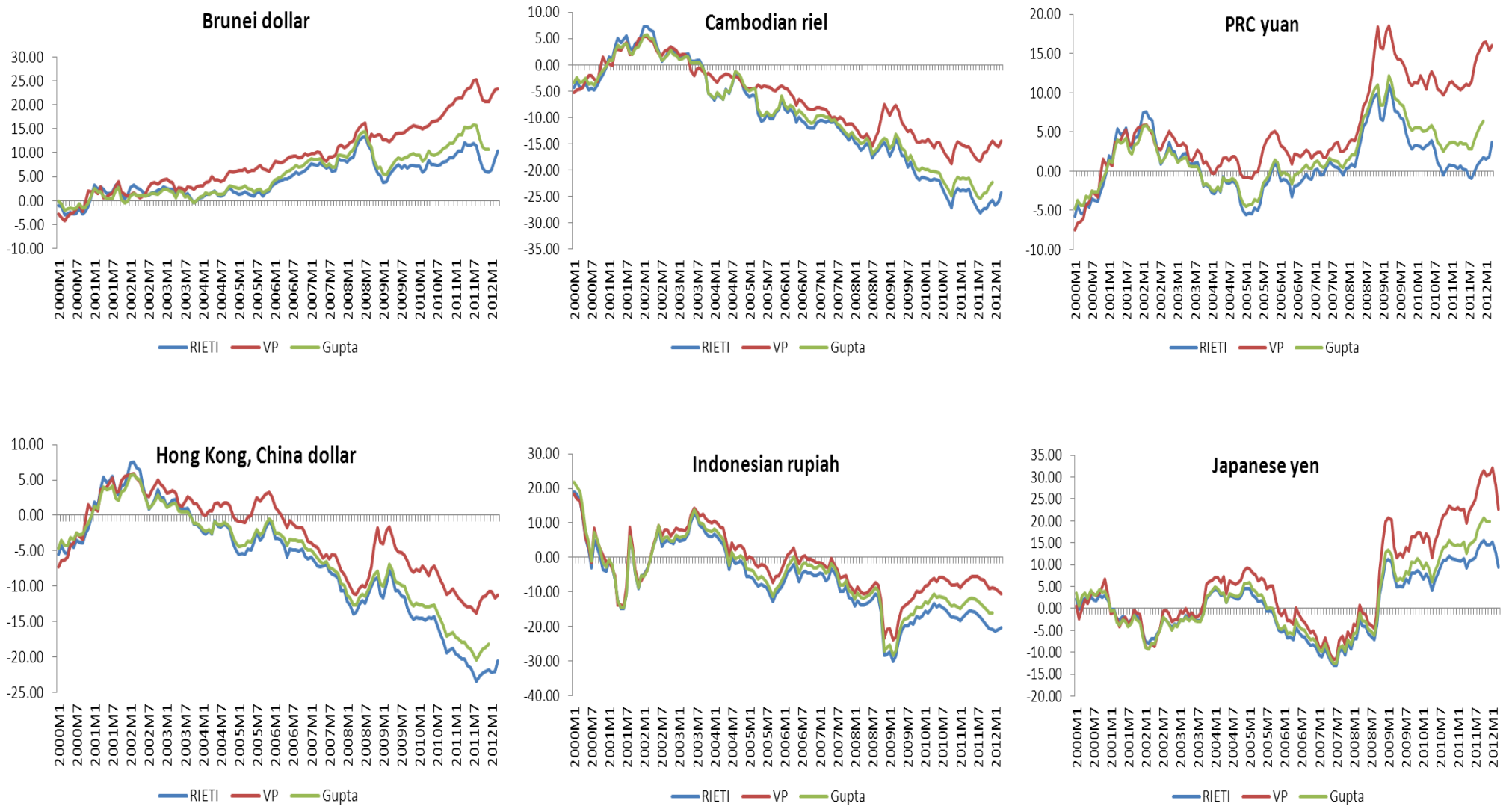
Source: Author's calculations.

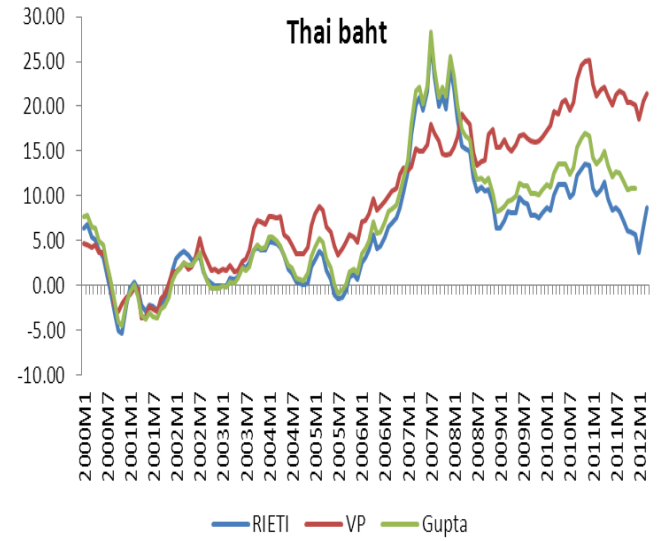
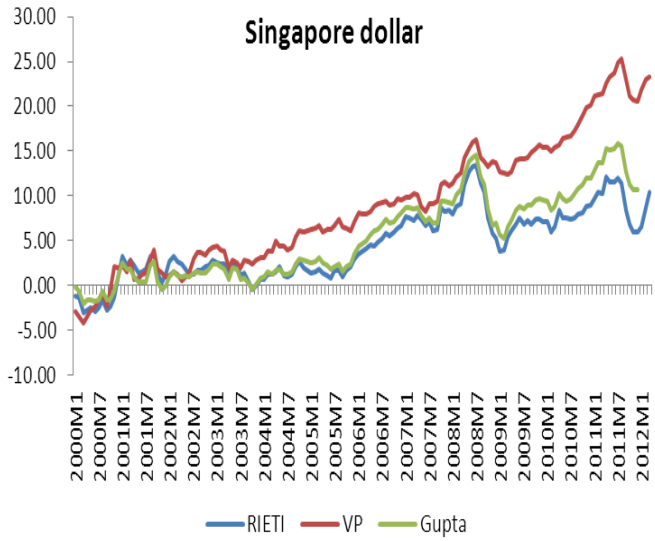
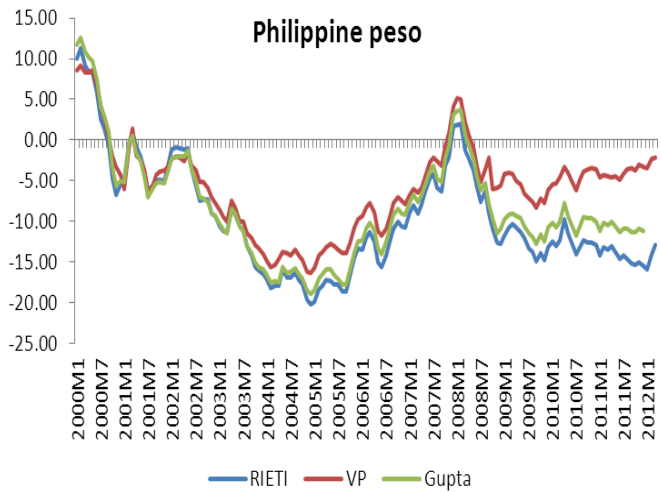
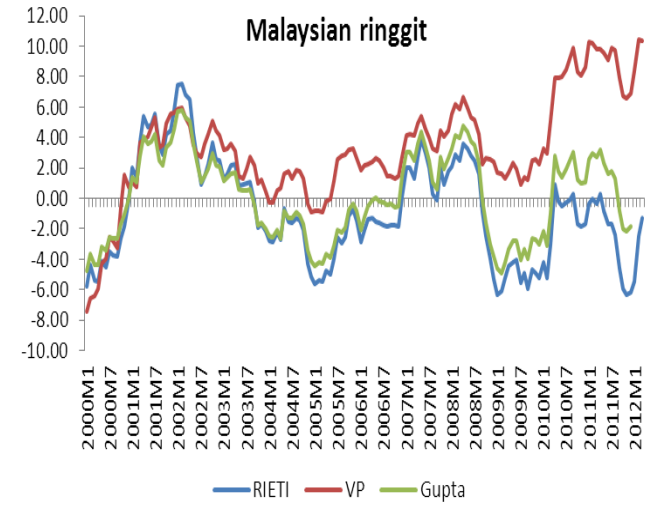
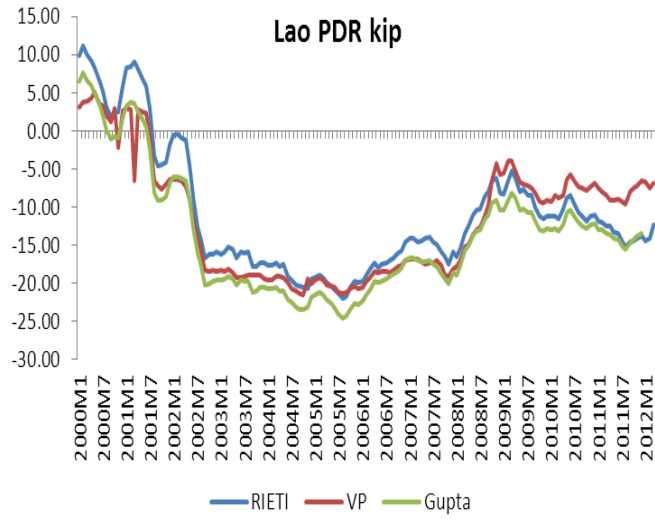
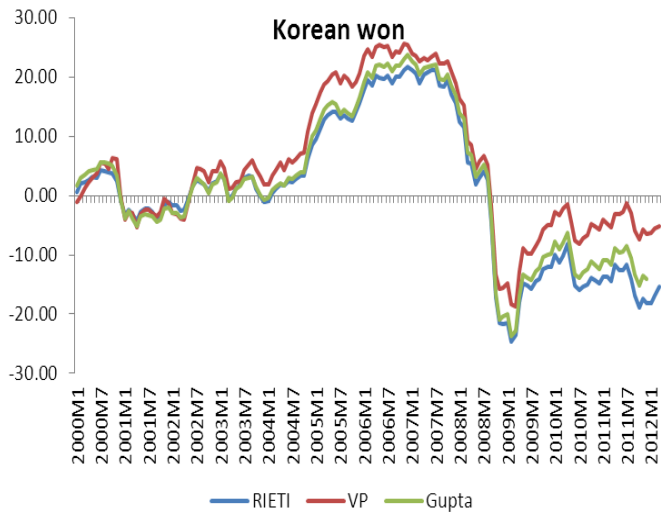
Since March 2002, albeit with some intermittent disruptions especially in the few months after the collapse of Lehman Brothers in September 2008, the overall direction of the ACU against the US dollar was to appreciate by about 19%. The appreciation of the yuan against the US dollar was about 30% since the decision in July 2005 to introduce some flexibility in the renminbi-US dollar exchange rate. The appreciation of the Japanese yen for the same period since March 2002 was 59%, which also saw the strengthening of the Malaysian ringgit, the Singapore dollar, and the Thailand baht against the US dollar, all of which contributed to the overall appreciation trend in our estimated ACU against the US dollar.

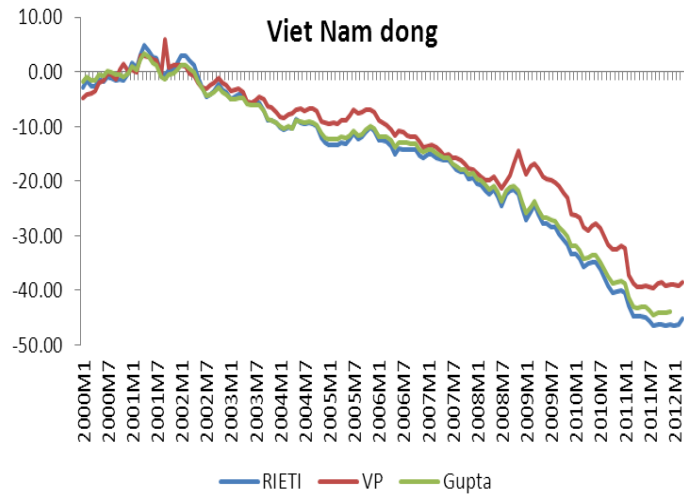
More importantly, in order to facilitate the monitoring of the movements of these regional currencies relative to this ACU index, I examine the changes since January 2000 in a Deviation Indicator which essentially measures the changes in relative value for each of the regional currencies against all the other currencies comprising this ACU benchmark.²¹ These are presented in Figure 3. For the sake of comparison with previously constructed ACU indexes, I also include in the figure the Deviation Indicator estimates from previously constructed ACU indexes—RIETI Deviation Indicator estimates and the actual estimates of Gupta (2012).

²¹ The Deviation Indicator used here simply follows on from the pioneering suggestion of Ogawa and Shimizu (2005).

Figure 3: Comparison of Nominal Deviations from Various Alternative Constructions of the ACU Index







Notes: PRC = People's Republic of China; Lao PDR = Lao People's Democratic Republic.

RIETI = Revised Ogawa and Shimizu Nominal Deviation Indicator; VP = Pontines Nominal Deviation Indicator; Gupta = Gupta Nominal Deviation Indicator.

A rise in the Deviation Indicator is a currency appreciation relative to the ACU benchmark, whereas a fall in the Deviation Indicator is a currency depreciation relative to the ACU benchmark.

Sources: The Pontines Nominal Deviation Indicator is based on the author's own calculations. The RIETI Nominal Deviation Indicator estimates were obtained from <http://www.rieti.go.jp/users/amu/en/cmi.html> while the Gupta Nominal Deviation Indicator estimates were graciously provided by A. S. Gupta based on the same author's previous work.

While the RIETI and Gupta Deviation Indicator estimates show an almost indistinguishable resemblance to each other in most, if not, all of the individual Asian currencies due to the similarity in the method of construction, one encouraging result of the current study's own nominal deviation indicator estimates (henceforth VP) that were obtained as discussed in the previous sub-section from a relatively distinct method that calculates a certain optimal ACU index, is its remarkably close tracking of the respective movements in the RIETI and Gupta Nominal Deviation Indicator estimates. This striking result suggests that either the technical issue of the choice of economic variables and indicators used in the calculation of the weights matter little in the construction of the ACU index (Takagi 1988), or, simply that the RIETI and Gupta ACU indexes can be considered as already equivalent to optimal currency basket constructions.

An analysis of the individual movements of the ASEAN10+3 currencies including the Hong Kong dollar according to these three (VP, RIETI, and Gupta) alternative ACU benchmarks reveal the following key observations. The yuan had remained fairly steady but strengthened against all other currencies around the period of May 2008 to April 2009 after which it started to weaken by varying extent according to the three ACU benchmarks. However, more recently, since the last quarter of 2011, the yuan has again started to appreciate somewhat according to all three ACU benchmarks, but the average size differs among the three ACU benchmarks.²² The yen had weakened by around 7% across all the other Asian currencies between the period of November 2005 to September 2008 but since then had consistently appreciated by nearly 10 to 20% depending on the ACU benchmark looked at. The won appreciated for the most part of the early and mid-2000s reaching its highest value against all the other Asian currencies in December 2006, but weakened considerably at the beginning of September 2008 and thereafter.²³

The Hong Kong dollar by virtue of its close link to the US dollar, had depreciated since early 2006 and thereafter. The Singapore dollar and the Brunei dollar, the latter in view of its tight currency link to the former, had both continuously strengthened since the early 2000s. The Malaysian ringgit had closely mirrored the movements in the PRC yuan from the early 2000s until late 2008, but more recently according to the three alternative ACU benchmarks, there had been indications again that the movements of the ringgit relative to the other Asian currencies closely tracked that of yuan movements vis-à-vis the other currencies. The Indonesian rupiah had exhibited considerable volatility from the early 2000s to mid-2000s but has since experienced a consistent weakening, reaching its lowest point during the peak of the global financial crisis in late 2008 to early 2009.

The Thai baht after experiencing some mild appreciation against all the other Asian currencies in the early to mid-2000s had experienced since then a steady appreciation of between 10 to 15% depending on which ACU benchmark is used. The Philippine peso, on the other hand, had experienced a steady depreciation from the early 2000s until mid-2008 after which it strengthened slightly for a brief period, but then weakened again against all the other currencies. While the Cambodian riel, the Lao PDR kip, and the Viet Nam dong had started to depreciate at various times in the early 2000s, the three CLV currencies had continued to steadily weaken vis-à-vis the three alternative ACU indexes, the more pronounced being the Cambodian riel and the Viet Nameese dong.

²² Around 10%, 5%, and 2% for the VP, Gupta, and RIETI Nominal Deviation Indicator estimates in that respective order.

²³ One should note at this point the striking divergent movements between the Korean won and the Japanese yen that was highlighted in a recent study by Kawai and Takagi (2012).

5. EXCHANGE RATE POLICY COORDINATION VIA AN ASIAN CURRENCY UNIT

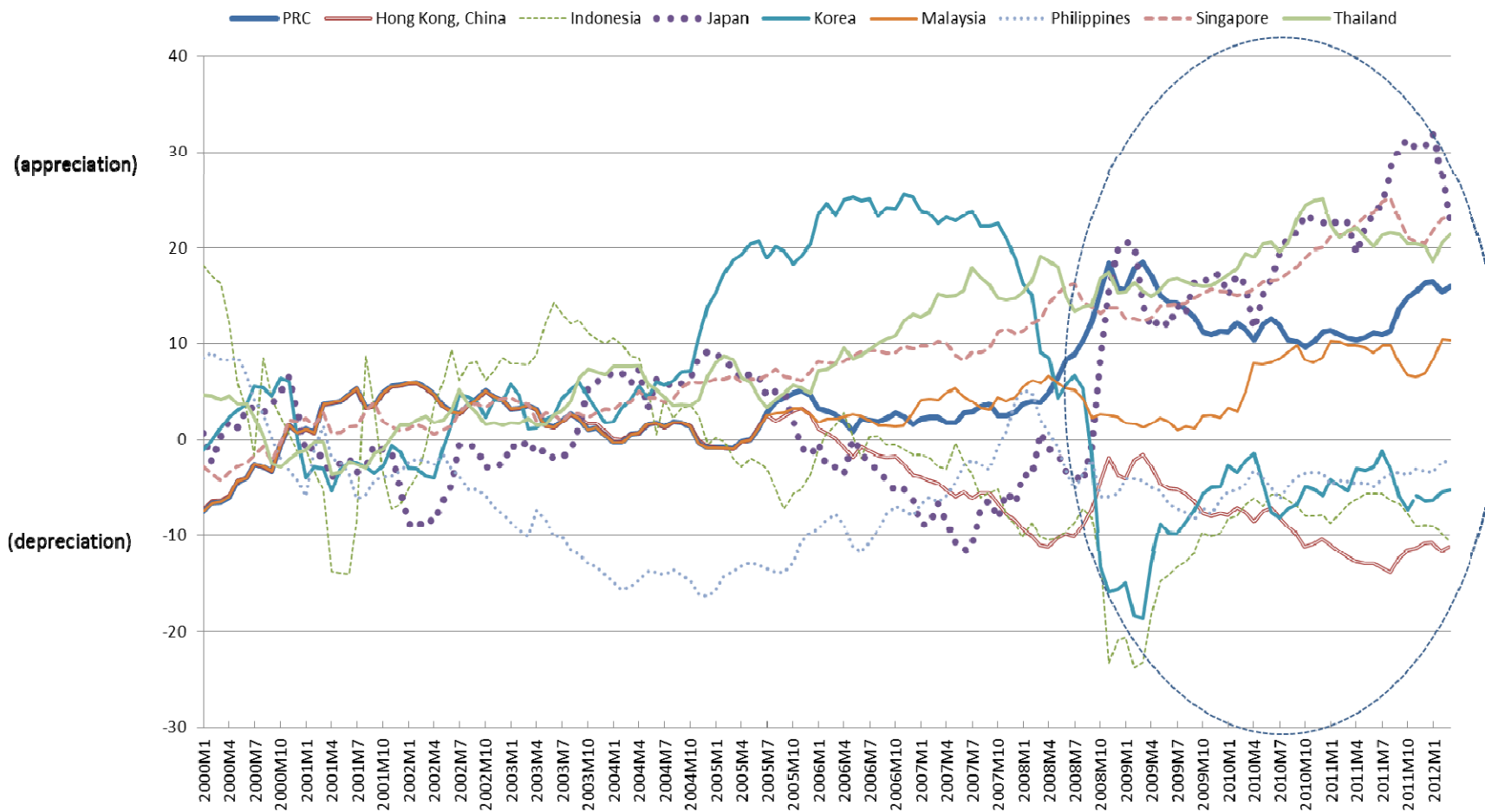
There are a number of gradations of exchange rate policy coordination that are available for the East Asian region, ranging from the softer form involving regional policy dialogue and surveillance in which the region can then evolve toward greater exchange rate cooperation, to a stronger form such as an economic and monetary union much like the experience of the euro area economies in which a common currency and a single monetary policy is adopted in the region. While there is currently no consensus about the form that an exchange rate policy coordination in the region will take, for a variety of reasons, particularly the heterogeneity of countries in the region, and, more recently, the problems experienced in the euro area, it seems that the balance of opinion among observers is that a full-blown monetary union is not viable in the near to medium-term. Nevertheless, as mentioned above, the combination of the region's deepening economic integration and the highly contagious nature of shocks or crises, the need to cooperate and coordinate exchange rate policies in the region, should be considered a priority. Specifically, a gradual and calibrated approach in which policy dialogue and surveillance takes center-stage in the near term is the more realistic option at this stage (Gupta 2012). Subsequently, once sufficient trust and confidence are harnessed into the process, the region's economies could consider more formal arrangements such as a common currency (ADB 2010). In the near term, as envisaged by Takagi (2010) and Kawai and Takagi (2012), the use of objective indicators such as an ACU and, hence, an indicator of exchange rate divergence can be a valuable analytical tool to help achieve exchange rate stability in the region. As an exposition of how this proposal in the immediate term can be made to work is presented below.

5.1 The Immediate Path: The ACU Deviation Indicator as a Regional Surveillance Indicator

As an illustration of how the ACU and an indicator of exchange rate divergence can be made a useful monitoring device of the movements of participating East Asian currencies relative to the regional average in a given period, the estimates of the ACU Nominal Deviation Indicator²⁴ of our individual East Asian economies (the earlier VP index) are presented in Figure 4 below.

²⁴ Other studies have also calculated an inflation-adjusted Deviation Indicator obtained from a particular ACU index. However, I did not adopt this approach in this study in the belief that the benefit of arriving at inflation-adjusted measures of exchange rate divergence in the region does not outweigh the costs of introducing so much noise to the measures of exchange rate divergence due to the non-comparability of price data gathering and indexing methods employed in the region let alone the tough requirement of a reasonably accurate estimate of the inflation rate for the whole of the East Asian region.

Figure 4: Nominal Deviation Indicators of Several East Asian Currencies according to the VP Optimal ACU Index



Note: An increase denotes an appreciation against the regional average.

Source: Author's calculations and figure adapted from IIMA (2011).

The figure shows clearly that around the time Lehman Brothers collapsed in September 2008, the trajectory of most East Asian currencies relative to the regional average is a movement in two contrasting directions—one group comprises strong currencies, e.g., the Japanese yen, the Thailand baht, the Singapore dollar, the Malaysia ringgit, and, more recently, the PRC yuan; and, the other group is made up of weak currencies such as the Korean won, the Philippine peso, the Indonesian rupiah, and the Hong Kong, China dollar. This observed bipolarity (group of strong currencies and another group of weak currencies) in intra-regional exchange rate fluctuations reiterates the significance and sensitivity of exchange rate movements within the region. One repercussion of this contrasting trajectory in intra-regional exchange rate movements is that it has apparently altered competitive trading relationships in the region. For instance, without barring other possible reasons that may contribute to this alleged change, we are learning of accounts where Japanese companies are relocating their manufacturing production bases from the PRC to other locations in Asia.²⁵ This observation should make sense as evidence obtained for instance by Thorbecke (2010) shows that changes in competitiveness through currency movements in the region can have significant impacts on exports.

In addition, and perhaps more importantly, Kawai and Takagi (2012) proposed that a logical and effective mechanism that can promote currency stability in the region without running the risk of altering price competitiveness in individual economies in the region is for a joint or regional action in which economies can collectively appreciate, for instance, against the US dollar. The attraction of this proposal is that this can facilitate the contribution of the region to the global rebalancing process (Kawai 2010). Indeed, a recent review of the empirical evidence suggests that concerted appreciations in East Asia would help to rebalance processing trade in the region (Thorbecke 2012). However, the noted recent trajectory of the bipolarity in exchange rate movements within the East Asian region renders this obvious need for collective action more challenging.

The over a year old independent regional surveillance unit, ASEAN+3 Macroeconomic Research Office (AMRO), established to support the Chiang Mai Initiative Multilateralization (CMIM) should play a critical and constructive role in this regard. AMRO can begin calculating, on a regular basis, alternative versions of the ACU indexes and their corresponding Deviation Indicators similar to the empirical strategy undertaken in this study and the incorporation of the analysis and findings derived from these estimates into the quarterly independent surveillance reports prepared for the direct submission to senior officials of the respective Ministry of Finance and Central Banks of the ASEAN+3 economies. This proposal would not require radical institutional changes, but facilitate AMRO's surveillance efforts by crucially helping avoid beggar-thy-neighbor exchange rate policies within the region and provide a common starting point to which countries in the region can work toward some kind of convergence in exchange rate policies in the near term, thus contributing to overcoming the collective action dilemma emphasized above.

The discussions in the high-level meetings among the finance ministers and central bank officials should include the issues identified in the surveillance reports, most especially on the economic reasons why the deviation indicator for a particular currency is heading in a particular

²⁵ See, for instance, Ito and Shimizu (2009). As pointed out by these two authors, the relocation of Japanese manufacturing bases had been to weaker regional currencies, such as Viet Nam. For examples of this alleged de-concentration of production bases, see for instance the PriceWaterhouseCoopers study on Viet Nam's Automotive Component Industry as well as the Bloomberg article entitled, "Nissan Ships Cars Home as Yen Erodes Century of Made-in-Japan (30 August 2012)."

direction (Kawai and Takagi 2012). This turns on the usefulness of the deviation indicator in flagging emerging vulnerabilities in the economy which serves to underscore the role of the deviation indicator as an early warning indicator for monitoring financial crisis. For instance, in view of uncertainties in the usage of equilibrium exchange rates to assess the presence and extent of misalignment of a particular currency, the deviation indicator can be utilized as a reasonable alternative measure of the degree of deviation of a particular currency from its regional “equilibrium” or benchmark exchange rate (ACU index) (IIMA 2011). Moreover, a persistent appreciation trend in the deviation indicator for a particular currency can reflect the surge in large capital inflows, most especially short-term flows that are widely agreed to be highly destabilizing in the face of limitations of countries to absorb such flows. An equivalent mirror image to this idea is that a consistent depreciation trend in the deviation indicator can in turn signal large capital outflows.

It stands to reason, therefore, that the deviation indicator should only be one of the indicators that AMRO would monitor in carrying out its surveillance activities for the ASEAN+3 economies. Early warning leading indicators that have proven useful in past crises as well as leading indicators that have been identified by the voluminous academic studies on early warning systems to be statistically significant predictors of crises or exchange market pressures should be considered by AMRO as among its top choice of indicators to include in its surveillance reports.²⁶ While it is indispensable for AMRO to carry-out a thorough scrutiny of relevant economic and financial indicators when assessing the vulnerability of ASEAN+3 countries to a crisis, it is also important to recognize the timeliness and comparability of the indicators across the ASEAN+3 economies in view of the varying constraints and limitations in these economies as far as data availability is concerned.²⁷

That said, it is advisable that AMRO devises a consistent and common template in its surveillance reports and one strategy would be to adopt a scorecard approach in which the following two important items are recorded:

- the actual performance of the individual ASEAN+3 economies against the considered choice of early warning leading economic and financial indicators including that of the currently proposed indicator of exchange rate divergence; and,
- the inclusion of an appropriate minimum and maximum threshold value for each chosen early warning leading indicator (including a threshold value as well for the indicator of exchange rate divergence)

The latter item needs some elaboration. The introduction of a threshold value provides a further mechanism that can help in the detection of the presence of vulnerability and thus in the prevention of a crisis, while in the case of the threshold value for the indicator of exchange rate divergence can also be used as a tool to monitor the extent of the over/undervaluation of the individual currencies from the regional average. The crucial part of this idea is on the determination of the threshold or “cut-off” value against which the presence or otherwise of vulnerability in the individual ASEAN+3 economies can be made. In this regard, a statistical

²⁶ See, for instance, the recent study by Frankel and Saravelos (2012) on the usefulness of leading indicators as predictors of crises with particular application to the recent Global Financial Crisis. This particular study found that international reserves followed by recent real appreciation were the strongest predictor of the 2008–2009 global financial crises. Other indicators found useful were: credit growth, current account, saving rate, external and short-term debt.

²⁷ Based on this argument, the inclusion of an indicator of exchange rate divergence in the surveillance work of AMRO offers an additional advantage as its calculation involves the utilization of a lesser amount of time and resources in the form of the availability of high-frequency data on exchange rates.

approach that is based on the distributions of the values of the individual indicators at the upper and lower quartile of the distributions can be considered as a method for determining the threshold value.²⁸

While the principal objective of the surveillance work carried out by AMRO should not be to “catch out” any individual ASEAN+3 economies, discussions in the high-level official meetings must be open and candid. More importantly, in order for the surveillance activities of AMRO to be effective, the ASEAN+3 economies, individually or collectively, must be ready to accept policy recommendations emanating from the surveillance reports submitted by AMRO. Furthermore, as proposed by Wang and Woo (2004), in order to facilitate the implementation of the surveillance recommendations agreed upon by the member economies, the surveillance report should also include, in a separate chapter, the progress made in adopting the recommendation of policy changes. This will help ensure that the actions of the member economies to the policy recommendations of surveillance reports are made observable and verifiable by their regional counterparts, thereby reinforcing peer-pressure in the surveillance process.

5.2 Some Long-Term Considerations for the Role of the ACU Deviation Indicator

While there is no shortage of proposals put forward in the literature on how greater exchange rate policy coordination can be fostered in the future, the likely form that an intra-regional exchange rate stabilization scheme could take has been the most contentious issue. On that note, the discussion laid out in this study of the usefulness of the ACU index as an exchange rate monitoring device for the region in the near term alludes to the argument that an internal currency basket makes more sense for the region in reducing intra-regional exchange rate variability over time. This suggestion of an internal currency basket may seem to mimic the experience of the European Monetary System (EMS). However, the operational mechanics of this internal currency basket for the East Asian region can be made distinct from the EMS experience via the determination of a fluctuation limit for the ACU Deviation Indicator instead of following the EMS’s model of setting a fluctuation limit for the foreign exchange rates between the EMS member currencies (called the parity grid in the EMS). This proposal is quite suitable for the particular circumstance of the East Asian region since setting a fluctuation band for the ACU Deviation Indicator could promote convergence toward some average level of economic conditions in the region in view of the construction of the ACU index as an average of the component regional currencies, as opposed to the parity grid adapted in the then EMS which has the tendency to promote convergence toward the economic conditions prevailing in the anchor country/currency in the region (IIMA 2008). This sounds appealing to East Asia where the absence of a natural anchor or center country, like what Germany provided then to the EMS, is a real concern.

Another appeal of the suggestion of setting up a fluctuation limit for the ACU Deviation Indicator in the long-term is that it presents itself as a logical follow-up to the earlier immediate-term proposal of the inclusion of maximum and minimum threshold values for the ACU Deviation as these values can then serve to become the negotiated choice for the fluctuation band of the

²⁸ For a similar proposal, see for instance, European Commission (2011). One specific statistical approach is the use of extreme value distribution. For a recent survey of its empirical applications, see for instance, Rocco (2012). Some particular examples of the application of the extreme value distribution were made in the context of identification of currency crises, e.g., Pozo and Dorantes (2003), Pontines and Siregar (2007, 2008) as well as in asset price booms, e.g., Cecchetti (2006) and Gochoco-Bautista (2008).

ACU Deviation Indicator. The fluctuation band of the ACU Deviation Indicator can be made to work to promote greater intra-regional exchange rate stability in the future for the region by the joint intervention between strong and weak currencies when these same pairs of regional currencies move outside or closer to the edge of the fluctuation limits of the ACU Deviation Indicator. Consequently, the region would evolve into what is called in the seminal literature a target-zone system. This target-zone system does not preclude the possibility that over time a hardening or narrowing of the fluctuation limits of the ACU Deviation Indicator can occur. Specifically, countries in the region can take a multi-track or multi-speed approach in which those that have shown relative bilateral exchange rate stabilities in terms of the fluctuation limits of the ACU Deviation Indicator as well as exhibited sufficient real and financial convergence among each other, can begin the process of a formal exchange rate arrangement, even to the point of a sub-regional single currency arrangement. These sub-regional currency arrangements can eventually be linked into a wider and unified regional monetary zone.

It goes without saying that the region's future is a matter of speculation. A stronger form of economic policy coordination such as the eventual establishment of a currency union in the region is undoubtedly a function of the required political support among the region's policymakers and their readiness to create the requisite range of institutions at every stage of the process. Indeed, the recent euro area crisis shows that stronger institutions than previously thought are required for monetary unions to function properly (ADB 2010). Be that as it may, this study makes the case that the creation and introduction of the ACU Index for surveillance purposes can serve an important and valuable role for the region in terms of the promotion of stable currency values both in the immediate and long-term course of monetary cooperation in the region.

6. CONCLUSION

In this study we have shown that there appears to be a general move in East Asian economies toward flexible exchange rates albeit not clean floating ones. Furthermore, the management of exchange rates in the region is no less ordinary in the sense that countries have tended to tolerate currency depreciations, but to a lesser extent currency appreciations. This is further made apparent by the fact that over the past two decades East Asian economies have accumulated huge international reserves, contributing to the problem of global macroeconomic imbalances. In fact, four of the six biggest reserve "hoarders" are from East Asia. Part of the lesser willingness to tolerate exchange rate appreciations is due to a fear of losing competitiveness against other East Asian economies, particularly against the PRC in markets within and outside the region. This has brought closer the prospect of an unnecessary and wasteful beggar-thy-neighbor competitive depreciation strategy in the region.

What is needed is to tie loose ends in the area of financial and monetary cooperation in the region. It is interesting that despite important strides achieved by the region in this area in recent years, given the critical role of the exchange rate in the ongoing progress of economic integration in the region, there has been limited progress in exchange rate policy cooperation. In this study I made the case that exchange rate and monetary cooperation can be facilitated by the creation and use for surveillance purposes of an Asian Currency Unit (ACU) in the near-term for ASEAN+3 economies. Its creation can be achieved by developing alternative methodologies that will determine appropriate basket weights and that "appropriateness" is measured in terms of ensuring a regional currency basket that has minimal variance, and hence deliver stability in intra-regional exchange rates. Its use in the immediate term as a surveillance indicator can be for the purpose of serving as an early warning signal for excessive inflows of capital as well as

their sudden reversal, and for assessing whether regional currencies are over or undervalued relative to the regional average or ACU benchmark. This argument of using an ACU index as the lynchpin of exchange rate and monetary cooperation is supported by a recent finding of Girardin (2011) that East Asian countries have started targeting a regional monetary unit by stealth and, accordingly, that it may be better for all of these countries to start doing this in a more coordinated fashion.

The multilateralization of the CMI and its independent surveillance arm, AMRO, is currently the most discernible and important achievement in the area of monetary and financial cooperation in the region. Based on this observation and in spite of criticisms leveled against it in view of the size of its resources and the tight link of its conditionality to the IMF, AMRO should nonetheless play a critical and constructive role through the use and inclusion of an ACU index in its surveillance reports submitted to senior finance and central bank officials in the ASEAN+3 region as part of its regional surveillance work. The inclusion of the ACU index (and other useful leading indicators of past crises) in AMRO's surveillance reports can be tailored in such a way as to emphasize the ACU index's dual purpose (early warning signal and alternative misalignment measure) and assessments conducted in an objective manner (use of scoreboard approach with threshold or "cut-off" value for each indicator). The proposals offered in this paper are meant to facilitate an open and candid discussions in the high-level official meetings of the senior finance and central bank officials in the ASEAN+3 region. That said, for surveillance in general to be effective, at the level of single economies or collectively, economies in the ASEAN+3 region should be ready to accept policy recommendations of surveillance reports submitted by AMRO, even to the point of sacrificing some domestic concerns for the collective well-being of the grouping, albeit ultimately for national benefit. Once sufficient trust and confidence are built into this process, economies in the ASEAN+3 region can better realize and understand the benefits of stable intra-regional exchange rates. This would help to set the stage for a move toward more ambitious plans for more formal and stronger forms of exchange rate coordination in the region.

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APPENDIX A

Applying a Regime Switching Method to Test for the Presence of Fear of Appreciation

The STAR model is a non-linear time series model that allows the variable under investigation, which in the present case is denoted as $\Delta \ln exr$, the first difference of the log of the nominal exchange rate (local currency per US dollar) to adjust smoothly every moment within different regimes. This model may be written as:

$$\Delta \ln exr = \alpha_0 + \sum_{i=1}^p \alpha_i (\Delta \ln exr_{t-i}) + \left[\beta_0^* + \sum_{i=1}^p \beta_i^* (\Delta \ln exr_{t-i}) \right] F(\Delta \ln exr_{t-d}) + \varepsilon_t \quad (A1)$$

where α_0 is the linear intercept term; α_i ($i = 1, \dots, p$) stands for the linear autoregressive parameters; β_0^* is the nonlinear intercept term, β_i^* ($i = 1, \dots, p$) stands for the nonlinear autoregressive parameters, $F(\Delta \ln exr_{t-d})$ is the transition function which characterized the smooth transition in between 2 regimes that depend on the lagged term of the first difference of the log of the nominal exchange rate, $\Delta \ln exr_{t-d}$ where d is the delay lag length, and ε_t is a white noise with zero mean and constant variance.

The theoretical and empirical aspects of this model are rather involved and extensively discussed in a number of studies. Interested readers should refer to Terasvirta and Anderson (1992) and Dijk et al. (2002) for a thorough discussion of STAR models. Nonetheless, depending on the specification of the transition function, the natural starting point in describing the STAR model is the two-regime LSTR1 model with the following general logistic transition function, which takes values in the interval between zero and one:

$$F(\gamma, c; y_{t-d}) = \frac{1}{1 + \exp(-\gamma(y_{t-d} - c))}, \quad \gamma > 0 \quad (A2)$$

where γ is the slope parameter (the magnitude of which measures the speed of transition between the two regimes), c is the threshold parameter (the value of which indicates the location of the transition), and y_{t-d} is the transition variable with the associated delay parameter d .

It turns out that a variant of the LSTR1 model is well-suited to testing whether East Asian currencies exhibit aversion to appreciations. In particular, one can resort to the LSTR2 model suggested in Terasvirta (1998).²⁹ The transition function of the LSTR2 model is the second-order logistic function:

$$F(\gamma, c_L, c_H; y_{t-d}) = \frac{1}{1 + \exp(-\gamma(y_{t-d} - c_L)(y_{t-d} - c_H))}, \quad \gamma > 0 \quad (A3)$$

Notice that the LSTR2 transition function resembles the transition function of the LSTR1 model but the LSTR2 transition function involves two threshold parameters— c_L (the lower or

²⁹ The other possible choice for the transition function is given by the exponential transition function:

$F(\gamma, c; y_{t-d}) = 1 - \exp(-\gamma(y_{t-d} - c)^2)$. One limiting behavior though of the ESTAR model is that for large values of γ this model becomes practically indistinguishable from a linear model.

appreciation threshold) and c_H (the upper or depreciation threshold). These lower (c_L) and upper (c_H) threshold parameters can be utilized to test for asymmetrical exchange rate behavior as these thresholds reflect the relative tolerance of monetary authorities to exchange rate variations. To be more specific, if the upper threshold, c_H is larger than the (absolute value of the) lower threshold, c_L , this suggests an aversion of monetary authorities to currency appreciations.