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Exchange rate coordination in Asia under regional currency basket systems.

Benjamin Keddad
Aix-Marseille Université (Aix-Marseille School of Economics)

Abstract

In this paper, I examine to what extent Asian exchange rates are coordinated around a synthetic Asian Currency Unit (ACU) defined as a basket of Asian currencies. Using a VAR model, the results provide some evidence of stabilization among Asian exchange rates around the ACU. Although the US dollar remains the dominant anchor within the region, these countries have allowed for more exchange rate flexibility against the US dollar since 2006, with the aim to adopt a basket peg in which Asian currencies have gained an increasing role. The empirical results also suggest that the official adoption of an undisclosed currency basket by the Chinese authorities in July 2005 has been an important factor in the decision of Asian countries to shift toward a de facto currency basket system.

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1. Introduction

This empirical paper gives new evidence concerning exchange rate coordination in Asia, by examining the degree of intra-regional exchange rate stability around the Asian Currency Unit (ACU), the US dollar and the euro. The 1997-98 currency crisis highlighted the close economic interdependence within the region. This leads the regional authorities to agree upon the need to promote a collective arrangement in order to stabilize their exchange rates and foster monetary policy coordination.[1] The market-driven integration, trough trade and foreign direct investment, is actually oriented toward the adoption of a common currency basket system. Prior to the crisis, the common US dollar pegging allowed implicit exchange rate stabilization (McKinnon , 1998; McKinnon and Schnabl , 2004). However, the crisis emphasized the fragility of rigid exchange rate arrangements notably for countries with a diversified trade pattern. The yen's depreciation against the US dollar from mid-1990 is particularly illustrative. Asian currencies that were linked to the US dollar became overvalued and vulnerable to the yen/dollar exchange rate volatility. This third-currency effect is believed to be some of the main causes of the 1997-98 crisis because Asian export competitiveness declined against Japanese products in regional and third markets as the yen depreciated (Kwan , 2001; Bird and Rajan , 2002).[2] Since then, it is commonly assumed that an exclusive anchor to the US dollar is neither a credible nor a desirable solution for the future.

Recognizing this, most of the crisis-hit countries have officially abandoned the US dollar as an unilateral anchor. Exchange rate regimes within the region have evolved considerably and exchange rate coordination appears to be difficult to achieve at the regional level. After the crisis, some countries have adopted a single currency peg (Hong Kong but also China and Malaysia up to July 2005), whereas other countries have officially operated flexible exchange rate regimes such as currency baskets or crawling bands (see Table 1). Although a full-fledged monetary union is regarded as unrealistic, at least in the short term, numerous recent studies advocate for the adoption of a gradual step approach starting with informal forms of policy coordination. Williamson (2005) proposes a common basket peg (BBC) composed of the US dollar, the yen and the euro for nine countries (China, Thailand, Philippines, Singapore, Taiwan, South Korea, Malaysia, Indonesia and Hong Kong). Kawai (2002), Mori et al. (2002) and de Brouwer (2004) consider the eventuality of an individual basket peg reflecting their own trade structure, before the introduction of a common basket.[3]

The aim of a common basket peg would be to reduce nominal and real effective exchange rates volatility in order to preserve countries from changes in their relative competitiveness. In this regard, a common trade-weighted basket peg in Asia would protect trading relationships from changes in third-country exchange rates. The proposal to use the ACU -as a coordination mechanism for exchange rate policies- has also gained momentum since the announcement by the Asian Development Bank (ADB) to create a basket of appropriately weighted Asian currencies. For instance, Ogawa and Shimizu (2006a, 2006b) propose the use of an Asian Monetary Unit (AMU) with the aim to monitor Asian exchange rate policies and stabilize their effective exchange rates. By comparing the deviation of each currency vis-à-vis the AMU, they find misalignments among Asian currencies and interpret their finding as an

[1] The prospect of launching a single currency was put forward by the Japanese prime minister on 23 October 2009 during the 15th summit of the Association of Southeast Asian Nations.

[2] A similar result has been observed during the 1997-98 crisis when their competitors' currencies depreciated sharply.

[3] For a comparative analysis between individual and common baskets, see Wilson et al. (2007) and Williamson (2009).

illustration of uncoordinated exchange rates policies. Eichengreen (2006) proposes a parallel currency approach with the introduction of an ACU playing an official role, similar to that played by the European Currency Unit (ECU) within the European Monetary System (EMS).

Exchange rate coordination is crucial for Asian countries given the level of intra-regional trade and economic spillovers from potential competitive devaluations and third-currency effects.[4] Indeed, country's authorities might be particularly willing to take into account the movement in neighbor currencies so as to protect their firms from exchange rate's uncertainty and maintain their international competitiveness. This could be achieved through the adoption of a currency basket where the weight of regional currencies would be relatively high. Several studies show that exchange rate volatility may constitute a barrier to trade by increasing currency risk that weighs on firms' profitability and investment decisions.[5] Furthermore, as a result of vertical intra-industry trade in parts, components and semi-finished products, trade structures tend to become similar, thus increasing the degree of competition among Asian products on third markets (international but also regional markets). Consequently, local firms seek to maintain their market shares by minimizing variation costs and limiting the movement of exchange rates. As argued by Bird and Rajan (2002) and Kawai and Takagi (2005), intra-regional exchange rate stability is therefore necessary to avoid the worsening of terms of trade and promote economic integration in Asia.

In this paper, I examine to what extent Asian exchange rates are stabilized against a common basket of regional currencies (i.e. the ACU) appropriately weighted by the countries' respective share in the intra-regional trade and GDP. More specifically, I examine to what extent the movement in Asian currencies is explained by the movement in the ACU, US dollar and euro. By considering the role of the ACU, the analysis conducted in this paper goes beyond the traditional framework of Frankel and Wei (1994) which focus only on major currencies. For this purpose, the econometric tool used for this investigation is a VAR model with Cholesky restrictions, applied to monthly data. Accordingly, one can estimate to what extent each currency is stabilized against other regional currencies and compare the weight of the ACU with those of international currencies (US dollar and euro) in their implicit *de facto* currency basket. This also allows one to take into account a wider range of possibility concerning the authentic currency basket on which Asian countries peg their currencies.[6] This study focuses on the nominal exchange rates of South Korea, Indonesia, Malaysia, Singapore, Thailand and the Philippines over the January 2000-March 2011 period.

The results support the hypothesis that Asian countries stabilize to some extent their exchange rates around the ACU and more specifically after October 2006. Although the US dollar remains the dominant anchor within the region, its decreasing role over these last years leads to conclude that stability on the US dollar is no longer a priority for these countries. The evidence suggests that Asian countries have begun a transition process toward a currency basket system where the weight of regional currencies has increased.

The rest of the paper is organized as follows. Section 2. reports the methodology to calculate the ACU and presents the econometric model. Section 3. presents the estimation results and discussion and Section 4. draws conclusions.

[4]The intra-regional trade among the ASEAN+3 countries accounts for 49,5% in 2009.

[5]Thorbecke (2008) and Chit et al. (2010) find a negative relationship between exports and exchange rate volatility in Asia.

[6]Basket peggers generally do not disclose the composition of their currency baskets.

Table 1: *De jure* and *de facto* Exchange Rate Regimes in Asia

Country	Official Policy Pronouncements	IMF de facto classification (2006)
China	China announced on July 21,2005 the adoption of a managed floating exchange rate regime with reference to a basket of currencies. The exchange rate of the yuan against the US dollar has been moving both upward and downward with greater flexibility.	Conventional fixed peg arrangements against a single currency and monetary aggregate target.
Indonesia	In July 2005, Bank Indonesia launched a new monetary policy framework know as the Inflation Targeting framework.Bank Indonesia is able to take some actions to keep the rupiah from undergoing excessive fluctuation.	Independently floating and monetary aggregate target.
Malaysia	On July 21, 2005, Malaysia shifted from a fixed exchange rate regime to a managed float against a basket of currencies. The Central Bank intervenes only to minimize volatility, and to ensure that the exchange rate does not become fundamentally misaligned.	Managed floating with no pre-determined path for the exchange rate. The Central Bank has no explicitly stated nominal anchor, but rather monitor various indicators in conducting monetary policy.
The Philippines	The adoption of Inflation targeting framework in January 2002 is aimed at achieving a low and stable inflation. The Monetary Broad determines the rates at which the Bangko Sentral buys and sell spot exchange, and establishes deviations limits from the effective exchange rate.	Independently floating and Inflation Targeting Framework.
Singapore	Since 1981, the Singapore dollar is managed against a basket of currencies of its major trading partners and competitors. The trade-weighted exchange rate is allow to fluctuate within an undisclosed band, rather than kept to a fixed value.	Managed floating with no pre-determined path for the exchange rate. The Monetary Authority of Singapore has no explicitly stated nominal anchor, but rather monitor various indicators in conducting monetary policy.
South Korea	The exchange rate is, in principle, decided by the interplay of supply and demand in the foreign exchange markets. However, the Bank of Korea implements smoothing operation to deal with abrupt swings in the exchange rate.	Independently floating and Inflation Targeting Framework.
Thailand	Since July 2, 1997, Thailand has adopted the managed-float exchange rate regime. The Bank of Thailand will intervene in the market only when necessary, in order to prevent excessive volatilities and achieve economic policy targets.	Managed floating with no pre-determined path for the exchange rate. The Bank of Thailand operates under the Inflation targeting framework.

Sources: Compiled from Cavoli and Rajan (2009) and IMF's De Facto Classification of Exchange Rate Regimes and Monetary Policy Framework.

2. Methodology

Frankel and Wei (1994) popularized a method to identify the weight assigned to major international currencies in the implicit basket peg. Using the Swiss-franc as an independent numeraire, the authors evaluate the extent to which the movements in Asian exchange rates are explained by the movements in the yen, mark and US dollar. The empirical model of Frankel and Wei (1994) is as follows:

$$e_t^{EA} = \alpha_0 + \beta_1 e_t^{USD} + \beta_2 e_t^{EUR} + \beta_3 e_t^{YEN} + \varepsilon_t \tag{1}$$

where e is the first difference of the natural logarithm of respective exchange rates against the Swiss-franc. According to Frankel and Wei (1994), estimates of β can be interpreted as the respective weights in the implicit basket peg. For instance, if changes in a given currency against the Swiss-franc are mainly explained by changes in the US dollar against the Swiss-franc, the corresponding coefficient will be close to unity. In this regard, one can conclude that this currency is virtually pegged to the US dollar.

Nonetheless, most of studies using the Frankel-Wei's regression are focusing only on major international currencies, excluding the role of Asian currencies. Given the reallocation of trade with industrialized countries to intra-zonal trade and third-currency effects, Asian countries are likely to directly stabilize their exchange rates against their regional partners and competitors rather than by relying on the US dollar. This could be done through a currency basket where the ACU has a non-negligible weight. By determining the role of the ACU in the management of Asian exchange rate policies, I check whether this has been the case during the last decade. For this purpose, I introduce the ACU in an extended version of the Frankel-Wei basic model.

When introducing the ACU in Eq. (1), the OLS estimation is biased and inconsistent because the ACU is correlated with the error term. Indeed, the ACU is endogenous as a result of simultaneity with the left-hand side currency because the two variables are co-determined, with each affecting the other. Second, given that Asian currencies and the ACU are affected simultaneously by the US dollar movements, collinearity arises among the two explanatory variables. Therefore, the variance of the estimators could be high while the associated t-students could be very low. Moreover, the OLS estimators would be highly sensitive to minor changes in the data. Finally, it would be difficult, if not impossible to separate effects of each explanatory variable on the dependent variable.

Therefore, I employ a VAR model with Cholesky restrictions, which represents an appropriate tool to solve the endogeneity bias and collinearity issue. I simulate shocks on the external currencies and ACU to determine the respective share of their innovations (i.e. their implicit weights) in the fluctuation of each Asian currency. More specifically, I perform variance decomposition and impulse response analyses from the following VAR model:

$$R_t = \phi_0 + \sum_{k=1}^{P} \phi_k(L) R_{t-k} + \varepsilon_t \tag{2}$$

where R_t represents the vector of variables $(e^{USD}, e^{EUR}, e^{ACU}, e^{EA_i})$, $\phi_k(L)$ is a (4×4) matrix, and ϕ_0 a vector of constants. Accordingly, the variance decomposition provides the relative weight of each currency (USD, EUR, ACU) in the implicit basket peg of each country (EA_i).

Following Ogawa and Shimizu (2006a), the weight of each currency in the ACU is defined as the arithmetic average of respective countries' share in the GDP (measured at purchasing power parity) and

intra-regional trade.[7] These shares are calculated as follows:

$$W_i^{trade} = \frac{X_i + M_i}{\sum(X_i + M_i)} \qquad W_i^{GDP} = \frac{Y_i}{Y_{REG}}$$

with X_i (resp. M_i) the exports from (resp. imports to) country i to (resp. from) other Asian countries, Y_i the GDP of the Asian country i and Y_{REG}, the regional aggregated GDP.[8] These weights are time-varying according to the evolution of the countries' respective share in GDP and intra-regional trade. This is mainly motivated by the rise of China as an important trading partner within the region. The weights are presented in Table 2.

Table 2: Weights of Asian currencies in the ACU (in %)

	Indo.	Mal.	Sing.	Thai.	Phil	Viet.	Korea	Japan	China
Periods:									
00-02	5.31	5.97	7.23	5.00	2.66	1.63	11.37	32.67	28.16
03-05	4.91	5.18	7.16	5.00	2.4	1.74	11.24	29.17	33.20
06-08	5.12	4.95	7.27	4.90	2.12	1.99	10.97	25.33	37.37
09-10	5.36	4.72	6.70	4.73	1.95	2.30	10.70	22.95	40.58

Notes: Each row equals to 100%.

The data set cover monthly nominal exchange rates for the January 2000 to March 2011 period ($T = 135$).[9] Following McKinnon and Schnabl (2004), I use low-frequency data because competitiveness could fluctuate sharply from one month to next when the domestic price level is relatively sticky. Furthermore, the incentive to anchor country's price level cannot be recover with high-frequency data because continual changes in exchange rate have little or no effect on domestic prices in the short run. Bilateral exchange rates are extracted from PACIFIC exchange rate service database.[10]

I apply the Bai-Perron methodology (see Bai and Perron , 1998, 2003) to identify endogenously dates of structural changes in the exchange rate regimes. The structural change analysis is performed on the US dollar-based exchange rates rather than CHF-based exchange rates because the latter is assumed to be purely flexible.[11]

I allow up to 4 breaks and use a trimming $\kappa = h/T = 0.15$ with $T = 135$, hence each segment has at least 20 observations ($h = 20$). The results are presented in Table 3. For all countries (except Indonesia),

[7]The exchange rate of the ACU is set at January 2000 = 1 in terms of the US dollar.

[8]Imports and Exports Data are extracted from the IMF DOTS database and GDP data are extracted from the World Bank database.

[9]I use the Swiss-franc (CHF) as an independent numeraire to measure exchange rate movements. For robustness check, the Special Drawing Rights (SDR) has also been used as numeraire. However, the findings not turn out to be qualitatively the same. Indeed, as mentioned by Bénassy-Quéré et al. (2006), when international currencies (i.e. USD, EUR or YEN) have a significant weight in this basket, it is easy to check that the right hand side of Eq. (1) is close to zero. Consequently, I will not report the results with the SDR but the latter remain available upon request.

[10]http://fx.sauder.ubc.ca/.

[11]I consider the case of a pure structural change model. The regression is given by: $y_t = z_t'\delta_j + u_t$ with $t = T_{j-1} + 1, \cdots, T_j$ for $j = 1, \cdots, m+1$. In this model, y_t is the observed dependent variable at time t; $z_t(q \times 1)$ is the vector of covariates and $\delta_j (j = 1, \cdots, m+1)$ is the corresponding vector of coefficients; u_t is the disturbance at time t. The indices T_j are the break points. I apply the procedure with only a constant as regressor (i.e. $z_t = 1$) in order to detect structural changes in the mean of the series.

Table 3: Test results of the structural changes test in the mean process of the bilateral exchange rates

	idr_usd		myr_usd		php_usd		thb_usd		sgd_usd		krw_usd		cny_usd	
Breaks	BIC	LWZ	BIC	LWZ	BIC	LWZ	BIC	LWZ	BIC	LWZ	BIC	LWZ	BIC	LWZ
0	13.38	13.41	-2.89	-2.85	3.08	3.11	3.08	3.11	-3.66	-3.63	9.77	9.80	-0.88	-0.85
1	13.32	13.38	-4.34	-4.27	2.53	2.60	1.52	1.59	-5.19	-5.12	9.53	9.59	-3.15	-3.08
2	13.27	13.37	-4.60	-4.50	1.99	2.09	1.22	1.32	-5.67	-5.57	8.60	8.70	-4.24	-4.14
3	-	-	-	-	1.93	2.07	-	-	-5.98	-5.84	8.56	8.69	-4.75	-4.62
4	-	-	-	-	-	-	-	-	-6.26	-6.09	-	-	-4.92	-4.75
$SupF_T(1\|0)$	13.93**		456.57***		105.10***		521.69***		505.35***		43.07***		1196.06***	
$SupF_T(2\|1)$	11.37***		44.88***		102.50***		53.82***		89.40***		214.74***		277.74***	
$SupF_T(3\|2)$	-		-		12.86**				53.30***		10.42*		94.89***	
$SupF_T(4\|3)$	-		-		-		-		48.67***		-		29.67***	
						Number of breaks selected								
Sequential	2		2		3		2		4		3		4	
LWZ	2		2		3		2		4		3		4	
BIC	2		2		3		2		4		3		4	
$\hat{T}_1$	2007:11		**2006:11**		2001:08		2003:08		2003:11		2004:10		2005:07	
	(04:06-10:03)		(06:04-06:12)		(01:07-03:10)		(03:01-05-09)		(03:07-04:07)		(04:09-05:05)		(05:05-05-07)	
$\hat{T}_2$	2009:07		2009:07		2003:05		**2006:11**		**2006:03**		**2006:03**		**2006:10**	
	(09:05-13:04)		(07:07-11:07)		(01:08-04:01)		(06:08-07:01)		(06:01-06:05)		(05:04-06:07)		(06:04-06:07)	
$\hat{T}_3$	-		-		**2006:09**		-		2007:09		2008:08		2008:01	
	-		-		(06:05-06:11)		-		(06:12-07:11)		(08:02-08:09)		(07:12-08:03)	
$\hat{T}_4$	-		-		-		-		2009:09		-		2009:12	
	-		-		-		-		(08:10-10:09)		-		08:08-10-12	

Notes: The null hypothesis of $SupF_T(\ell+1|\ell)$ test is ℓ structural breaks versus the alternative $\ell+1$ structural breaks. "LWZ" indicates the modified Schwarz criterion of Liu et al. (1997). In parentheses are the 95% confidence interval for the estimated break points. *,**,*** denote significance at 10, 5 and 1 % respectively.

the estimates detect a break date in 2006, which could be related to the decision of the Chinese authorities to adopt a more flexible regime with reference to an undisclosed basket of currencies. These findings are confirmed by the break test performed on the yuan/dollar exchange rate since we can also observe a break date that took place in 2006.[12] Indeed, the official change of the Chinese exchange rate policy was followed by a yuan's appreciation of 3% during 2006, which is higher than the appreciation observed during the second half of 2005.[13] Since trade with China accounts for an important share of Asian foreign trade, these countries may have considered such an event in the conduct of their exchange rate

[12] A lower trimming parameter has been employed for the yuan/dollar exchange rate ($\kappa = h/T = 0.10$) considering the time interval between the adjustments operated by the Chinese authorities after 2005.

[13] Yuan appreciation has begun to accelerate in the mid of 2006 up to October 2008, when the yuan was re-pegged to the US dollar in response to the outbreak of the global financial crisis.

policies.[14] Accordingly, the sample is divided into two sub-samples, one on each side of the 2006 break point (2000:1-2006:9 and 2006:10-2011:3).

Before turning to the VAR analysis, I check for the presence of unit roots in the exchange rate series (in terms of Swiss-franc). The ADF (Augmented Dickey-Fuller) tests indicate that all the variables appear to be integrated of order one, suggesting possible cointegration relationships among them. The results of the Johansen tests indicate no cointegration relationships, so I employ a VAR model in difference as presented in Eq.(2) (see the Appendix for ADF and Johansen test results). In the VAR model, the optimal lag length is selected according to the Akaike Information Criteria. The number of lags (p) in the model is therefore one for all countries in the pre-2006 sample and three in the post-2006 sample. The interpretation of shocks is subjected to the identification of structural parameters of the model. Cholesky decomposition is applied to recover the underlying structural shocks by recursive orthogonalization. I constrain the response of Asian currencies to zero in the face of their respective innovations in order to recover the composition of the currency baskets normalized to one. Finally, I adopt the following causal ordering ($e^{USD}, e^{EUR}, e^{ACU}, e^{EA_i}$) to reflect their level of exogeneity. Here, the assumption is that the US dollar (and the euro) are exogenous to contemporaneous shocks on the ACU.

3. Empirical results

3.1. Variance decomposition analysis: the role of the ACU

Table 4 reports the corresponding forecast error variance decomposition derived from the structural VAR. It shows the corresponding explicative share of the structural shocks in the fluctuation of Asian currencies. The variance decomposition are for 12-month forecast horizon.

Table 4: Variance decomposition of forecast errors in % of the total variance of Asian exchange rates.

	2000:01 - 2006:09			2006:10 - 2011:03		
Innovations:	ε_{USD}	ε_{Euro}	ε_{ACU}	ε_{USD}	ε_{Euro}	ε_{ACU}
Malaysia	99.510	0.412	0.078	63.831	7.541	28.628
Indonesia	30.831	31.910	37.259	41.051	28.886	30.062
Singapore	89.806	1.019	9.175	63.492	8.220	28.288
Thailand	78.400	4.341	17.259	63.330	17.474	19.196
The Philippines	90.497	2.293	7.209	60.556	9.9588	29.855
South Korea	66.398	0.351	33.251	27.540	38.797	33.663

Notes: The optimal lag length were selected according to the Akaike Criterion. The lag lengths are 1 and 3 for all countries for the pre- and post-sample periods, respectively.

As a first step, I focus on the estimation results from the first sub-sample. Overall, the explicative share of the ACU is quit low, except for Indonesia and South Korea.[15] Indeed, its explicative share is

[14]For instance, on July 21, 2005, Malaysia quickly followed China and shifted officially from a fixed exchange rate regime to a managed float against an undisclosed basket of currencies.

[15]No currency stands out for Indonesia, reflecting that the country has maintained an exchange rate regime close to a free float given the difficulty of Indonesian authorities to restore exchange rate stability against the dollar in the aftermath

0.078%, 37.259%, 9.175%, 17.259%, 7.209% and 33.251% for Malaysia, Indonesia, Singapore, Thailand, the Philippines and South Korea, respectively. Moreover, the US dollar is the dominant anchor in the implicit basket peg of all countries (except for Indonesia). After the currency crisis of 1997-98, it is frequently argued that many Asian countries shifted from rigid currency pegs to managed float systems with varying degrees of foreign exchange rate intervention. However, evidence suggests that these countries have returned to a soft US dollar pegging in the aftermath of the 1997-98 crisis. This finding is in line with many empirical studies. For McKinnon and Schnabl (2004), the rationale of the return to official or *de facto* US dollar pegging is its microeconomic role in facilitating international transactions and its macroeconomic role for anchoring regional and national price levels. The return to a soft US dollar pegging after the crisis can also result from the need to be competing against neighbors' exporters (i.e. to avoid potential economic spillovers resulting from change in relative prices) who are officially or *de facto* pegged to the US dollar. According to Kenen and Meade (2008), the aversion to exchange rate flexibility derives also from the fear of real appreciation given their export-led growth strategy and competitive pressure in regional and international markets (see, also, Coudert et al. , 2013). In this regard, a common US dollar peg within the region enhances the anchoring effect of any Asian dollar pegger. For Ito et al. (1998) and Ogawa and Ito (2002), this aspect refers to a coordination failure in choosing a desirable exchange rate arrangement since no country would have interest to abandon its US dollar peg as long as other countries continue to stabilize their exchange rates against it.

The estimation results from the second sub-sample display a very different picture. The ACU shocks explain now approximately 30% of the total variances, which is significantly higher than the shares observed in the first sub-sample, especially for Malaysia, Singapore and the Philippines. For other countries, the share of the ACU is stable over the full period and remains relatively high. These results bring evidence that Asian countries have initiated a shift away from a *de facto* US dollar peg to a currency basket system in which Asian currencies and the euro have gained an increasing role. Although the US dollar shocks explain the largest part of the total variance in most cases, Asian countries have loosened their US dollar pegging since 2006. Indeed, the share of the US dollar has declined for all countries (except Indonesia) in the second sub-sample. For instance, the share of the US dollar has decreased by approximately 40% for Malaysia and South Korea, 30% for Singapore and the Philippines and 15% for Thailand.

The impulse responses to shocks to the US dollar, the euro and the ACU are reported in Figure 1 (pre-2006 sample) and Figure 2 (post-2006 sample).[16] Figure 1 shows that the response to a US dollar shock immediately determines a positive rise in the movement of the home currency. The impulses decrease largely after 2 months and die out after roughly 4-5 months. As expected, the response to the ACU shock is moderate in the first sub-sample (compared to the US dollar shock) for all countries with the exception of Indonesia and South Korea. Furthermore, the response to the euro shock is close to zero for all countries excepted for Indonesia. Concerning the second sub-sample, the magnitude of the response to a shock in the US dollar is smaller for Malaysia, the Philippines, Singapore and South Korea. Finally, the impulse responses to the ACU shock produce an increase in the movement of the exchange rates that becomes negative after roughly 2-3 months. The exchange rates of Malaysia, the Philippines and

of the 1997-98 crisis. Concerning South Korea, findings result from competitive relationship with Japan in capital-intensive products. Accordingly, the higher share of the ACU partially reflects the increasing role of the yen in the South Korea's basket peg (see the next section).

[16]The confidence intervals are based on +/- one standard error bands.

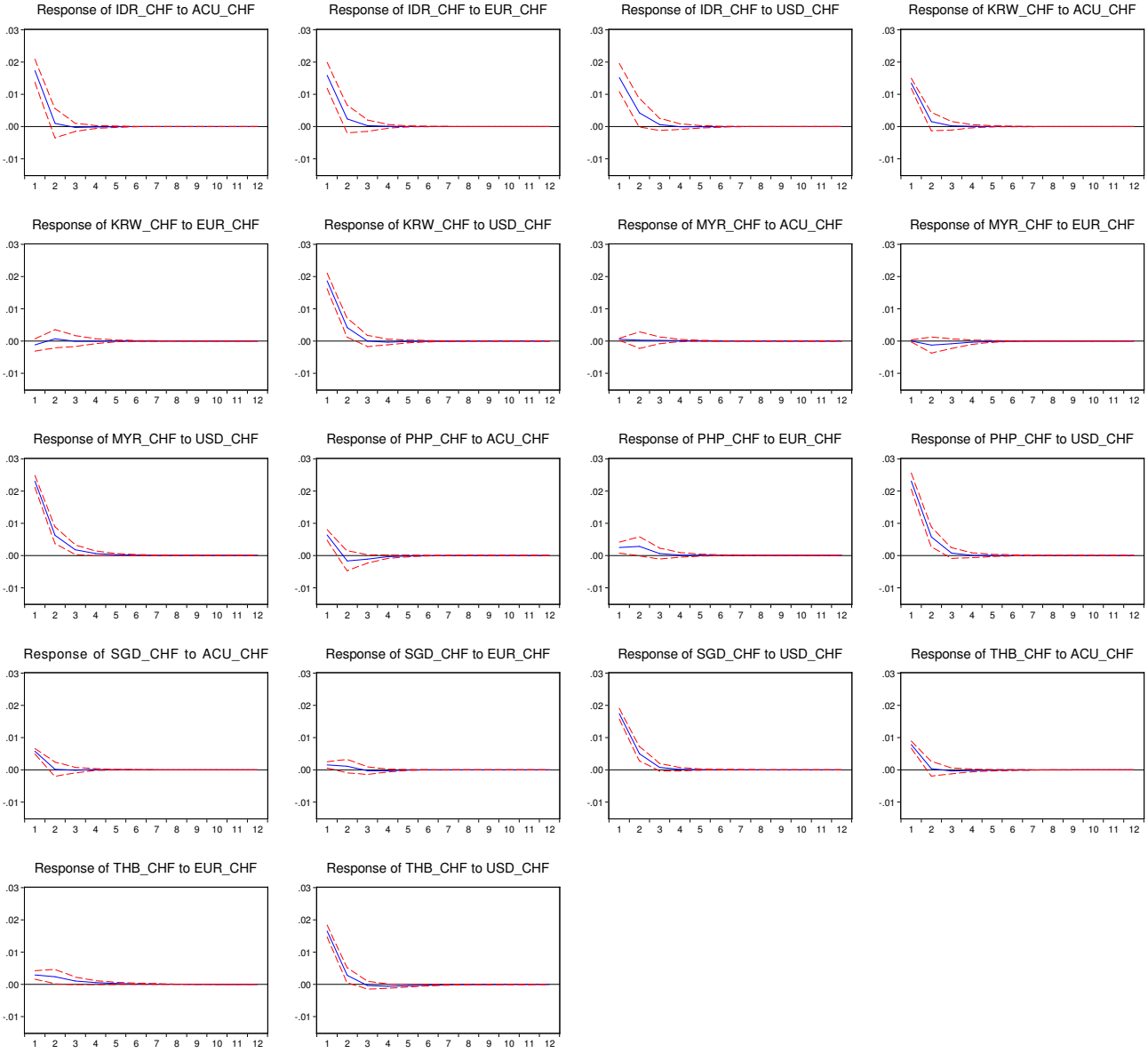

Figure 1: Impulse responses of Asian exchange rates - Period 2000:01-2006:09

Singapore are more responsive to innovation in the ACU after 4 months, before finally dying out in the 8th-9th month. This concurs with the variance decomposition results whereby the ACU shocks are larger in determining home currency movements in the second sub-sample.

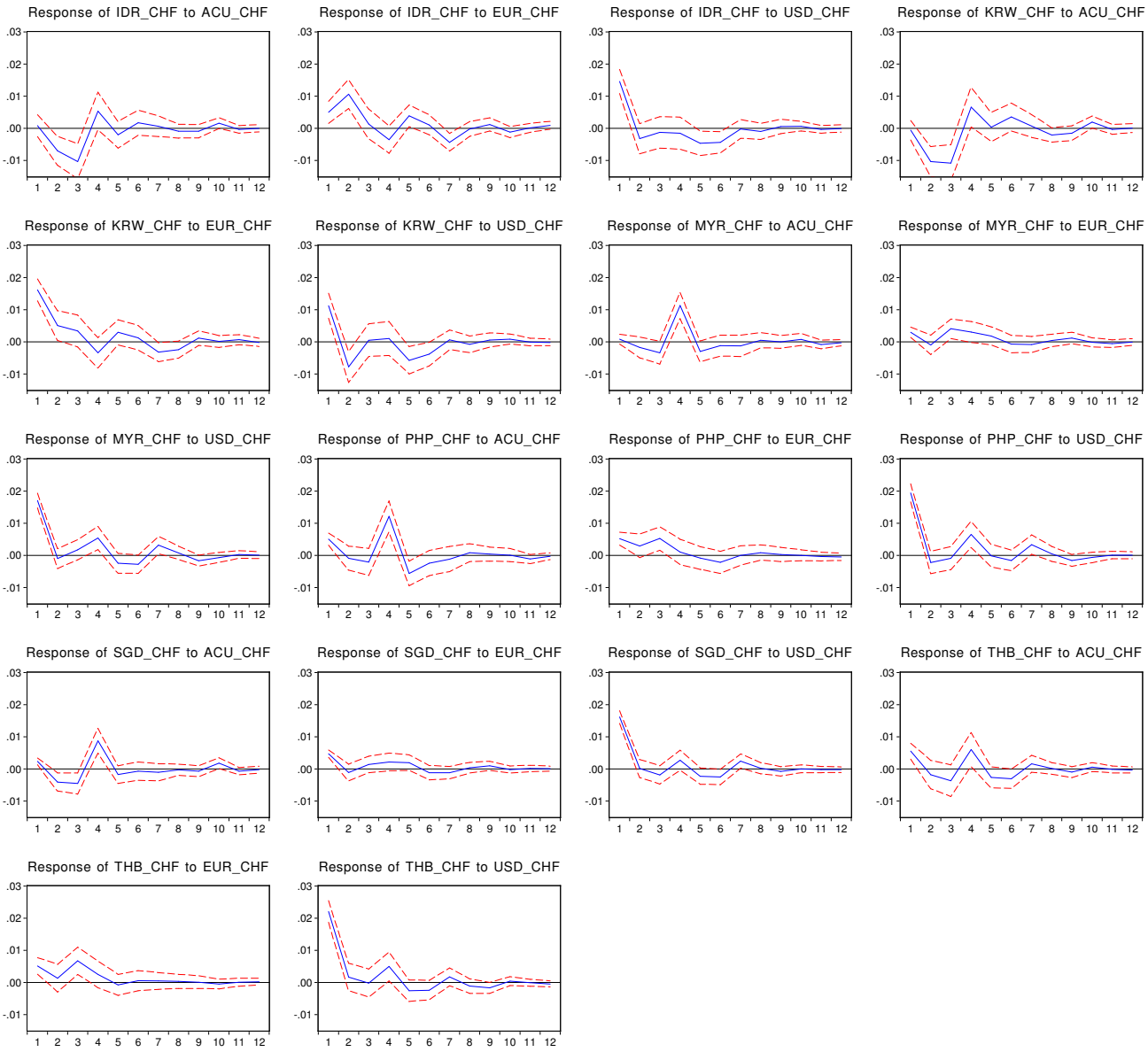

Figure 2: Impulse responses of Asian exchange rates - Period 2006:10-2011:03

3.2. Is there a yuan effect?

Does the official adoption of a currency basket in China has influenced the other Asian countries? Considering the weight of the yuan in the ACU and the structural breaks observed in 2006, the significant decrease of the US dollar could be attributable to the increasing share of the yuan.[17] This issue might be

[17]Indeed, the true story may be that all local currency are targeted at a common currency such as the yuan or maybe the yen, which generates an observationally equivalent result when applying the VAR approach. I owe thanks to an anonymous

Table 5: Shares of the yen and the yuan in the variance decomposition of forecast errors.

Innovations:	2000:01 - 2006:09			2006:10 - 2011:03		
	ε_{USD}	ε_{Euro}	ε_{Yuan}	ε_{USD}	ε_{Euro}	ε_{Yuan}
Malaysia	99.510	0.410	0.080	73.622	6.518	19.859
Indonesia	45.608	47.701	6.691	36.371	40.523	23.106
Singapore	98.799	1.135	0.066	70.816	8.060	21.124
Thailand	91.982	7.165	0.854	68.316	13.648	18.036
The Philippines	96.175	3.566	0.259	73.335	8.984	17.681
South Korea	99.044	0.433	0.523	43.362	40.044	16.594
Innovations:	ε_{USD}	ε_{Euro}	ε_{Yen}	ε_{USD}	ε_{Euro}	ε_{Yen}
Malaysia	99.49	0.414	0.097	79.431	6.619	13.950
Indonesia	43.508	44.087	12.405	41.069	19.881	39.050
Singapore	93.965	1.040	4.995	78.323	10.599	11.078
Thailand	84.470	5.289	10.241	77.156	13.920	8.924
The Philippines	94.045	2.542	3.413	76.645	10.649	12.706
South Korea	76.365	0.340	23.295	29.068	41.767	29.165

Notes: The optimal lag length were selected according to the Akaike Criterion. The lag lengths are 1 and 3 for all countries for the pre- and post-sample periods, respectively. Application of the cointegration test indicates that there is no long-term relationship among the US dollar, the euro, the yuan, the yen and Asian currencies.

investigated because the yuan could play a leadership role in the future as a regional monetary anchor.[18] Indeed, the fast pace of the yuan's internationalization, along with the China's rise on Asian economic integration, has raised the issue of whether a yuan bloc could be formed within the region. For instance, Park (2010) argues that market integration between China and ASEAN are likely to lead to the emergence of the yuan as an anchor currency. Fratzscher and Mehl (2011) assert that the Chinese exchange rate developments since 2005 are found to exert a strong and growing influence on other Asian exchange rate policies. Accordingly, it would be interesting to analyze the extent to which Asian countries have pegged their currency against the yuan, after China decided to untie its US dollar peg in July 2005. I perform variance decomposition analysis with the yuan instead of the ACU to answer this question. Results are displayed in Table 5.

I find some evidence of increasing exchange rate co-movements between the yuan and Asian currencies since the decision by the Chinese authorities to introduce more exchange rate flexibility. Indeed, the yuan shocks explain in average 19% of the total variance in the second sub-sample, substantially higher than the first sub-sample (1.412%). However, it is very difficult to assert that a yuan bloc has emerged in Asia. The variance decomposition analysis is also performed with the yen instead of the ACU so as to clarify the identification scheme (Table 5). The results show that Asian countries' dependence on Japan

referee for pointing out this issue.

[18]This implies liberalizing and opening its financial system, allowing the yuan's full convertibility and improving the yuan's role in real and financial transactions or foreign exchange reserve holdings.

has been declining in recent years in favor of China because for all local currency (except for those of Indonesia and South Korea) the yuan's share is greater than the yen's share in the second sub-sample.[19]

Comparing these results with those of the preceding section, it follows that the increase in weights of the ACU can only be to a certain extent explained by the Chinese and the Japanese currency, thus highlighting the explicative share of other currencies composing the ACU. Consequently, it would be more appropriate to claim that these countries have allowed for more exchange rate flexibility against the US dollar since 2006, with the aim to adopt a basket peg where the yuan, the yen but also the other Asian currencies have gained an increasing role. Given the similarity of their trade-weighted NEER, Asian countries that peg their currency to a basket are likely to enjoy greater stability across their bilateral exchange rates. In this regard, the Chinese exchange rate system reform may have produced greater intra-regional exchange rate stability. This view is also supported by Ma and McCauley (2011) who find that the 2006-2008 experience has rendered Asian currencies quite stable against each other.

4. Concluding remarks

This paper has considered the eventuality of an ACU in the implicit basket peg of several Asian countries to assess exchange rate coordination and recover the composition of their *de facto* basket peg. The key findings of the paper can be summarized as follows. The assessment of the variance decomposition demonstrated that innovations in the US dollar dominate the euro and ACU shocks after and before 2006. However, the explicative share of the US dollar in the movement of Asian exchange rates has decreased from roughly 76% to 53% in average, while the explicative share of the ACU has increased from 17% to 29%. Moreover, the decreasing share of the US dollar is also attributable to the euro which has increased from 7% to 18%. These results suggest that an unilateral US dollar peg is no longer a priority for Asian countries since 2006. Evidences support the view that these countries have moved toward a *de facto* currency basket system in which regional currencies play a non-negligible role. Consequently, the recent exchange rate developments in Asia seem to validate many studies which claim that a basket peg would be better suited for them, and that the weight of the US dollar in the aftermath of the 1997-98 crisis was well above its theoretical one (see, e.g., Bird and Rajan , 2002; Bénassy-Quéré , 1999; Ito et al. , 1998). As advocated by Ogawa and Shimizu (2006b), one possible mechanism to strengthen exchange rate coordination inside the region would be to keep a stable relationship with the ACU. This transition step would then pave the way to more advanced forms of monetary integration.

[19]For robustness check, the analyses performed in section 3.1. and 3.2. have been repeated with others plausible causal ordering. In addition, a VAR model including simultaneously the yen and the yuan has been estimated. The corresponding results, not reported here but available upon request, produce the same conclusions.

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Appendix

Table 6: Augmented Dickey-Fuller test of stationarity - Period 2000:1- 2006:09

	Intercept	First difference	Intercept and trend	First difference
idr_chf	-1.910	-7.991***	-2.672	-8.022***
krw_chf	-1.821	-6.634***	-1.354	-6.761***
myr_chf	-1.021	-6.717***	-1.977	-6.682***
php_chf	-1.770	-6.670***	-0.433	-6.988***
sgd_chf	-1.321	-7.273***	-0.651	-7.372***
thb_chf	-2.064	-6.923***	-1.441	-7.276***
usd_chf	-0.871	-6.876***	-2.336	-6.824***
eur_chf	-1.689	-7.041***	-2.502	-7.436***
amu_chf	-1.474	-7.279***	-1.063	-7.363***

Notes: *** significant at 1%. The lags were selected through the Schwarz criterion. In all cases the lag is equal to 1. The ADF tests could not reject the null of a unit root in any of these exchange rates in level.

Table 7: Augmented Dickey-Fuller test of stationarity - Period 2006:10-2011:03

	Intercept	First difference	Intercept and trend	First difference
idr_chf	-1.465	-6.306***	-1.627	-6.259***
krw_chf	-0.886	-5.798***	-1.301	-5.745***
myr_chf	-1.257	-7.177***	-2.068	-7.127***
php_chf	-0.775	-7.125***	-2.428	-7.168***
sgd_chf	-1.894	-8.341***	-2.854	-8.286***
thb_chf	-1.113	-6.377***	-2.202	-6.406***
usd_chf	-0.452	-6.335***	-1.672	-6.323***
eur_chf	0.923	-6.868***	-1.897	-7.161***
amu_chf	-1.755	-7.148***	-3.648	-7.094***

Notes: *** significant at 1%. The lags were selected through the Schwarz criterion. In all cases the lag is equal to 1. The ADF tests could not reject the null of a unit root in any of these exchange rates in level.

Table 8: Cointegration tests - Period 2000:01-2006:09

	Trace Stat.	5% Critical Value	Max-Eigen. Stat.	5% Critical Value
With idr_chf	51,821	63,876	18,160	32,118
With krw_chf	57,762	63,876	29,037	32,118
With myr_chf	53,321	63,876	19,968	32,118
With php_chf	60,515	63,876	24,011	32,118
With sgd_chf	56,583	63,876	27,229	32,118
With thb_chf	52,248	63,876	21,165	32,118

Notes: the other variables are usd_chf eur_chf amu_chf. The tests indicate no cointegration at 5% and the results are robust to lag choice and different deterministic trend specifications.

Table 9: Cointegration tests - Period 2006:10-2011:03

	Trace Stat.	5% Critical Value	Max-Eigen. Stat.	5% Critical Value
With idr_chf	52,272	63,876	22,322	32,118
With krw_chf	47,764	63,876	19,507	32,118
With myr_chf	41,064	63,876	17,770	32,118
With php_chf	59,492	63,876	27,875	32,118
With sgd_chf	44,326	63,876	19,065	32,118
With thb_chf	58,632	63,876	27,944	32,118

Notes: the other variables are usd_chf eur_chf amu_chf. The tests indicate no cointegration at 5% and the results are robust to lag choice and different deterministic trend specifications.