Two Economic Crisis and Dollarization for Cambodia, Laos, and Vietnam

Hee-Ryang Ra*

I. Introduction

Dollarization is a phenomenon where the three fundamental roles of domestic currency(a means of payment, unit of account and a store of value) are replaced by the U.S. dollar. As the dollarization process goes on, the U.S. dollar replaces the role of local currency as a store of value because the wealth measured by local currency could be devalued.[2] Typically, economic crisis or at least the acceleration of economic

* Department of International Trade, College of Commerce & Business, Pusan University of Foreign Studies(PUFS), Busan, Korea. Tel: (82-51)-640-3153; Fax: (82-51) -640-3563. Email: heeryang@pufs.ac.kr

2) Dollarization could be classified into three categories: Official(full) dollarization, semi-official dollarization, and unofficial dollarization(Meyer 2000). Official dollarization means that the local currency is completely replaced by a foreign currency(mainly U.S. dollars). This is the case in Panama and Ecuador. For semi-official dollarization means both domestic and foreign currencies are freely used. The government accepts the use of the dollar, although the dollar is not officially accepted as legal tender. This has been the case in Cambodia, Laos, and Haiti. Unofficial dollarization means that the local currency is the only legal tender. Dollar is used in black market or shadow market transactions. The government may place restriction on the use of the dollar. This is the case in Vietnam

instability brings about economic agents to increase the holdings of foreign or key currency, i.e., the U.S. dollar, to shield the real values of their wealth.

When economic imbalances are aggravated, the price of goods and services begins to be quoted in foreign currency and increasing numbers of transactions in the domestic economy are performed in a foreign currency. This occurs in, for example, Argentina, Bolivia, Brazil, Mexico, Peru, Uruguay, and others in Latin America. Also, from the early 1990s, the dollarization has been one of many topical issues in the transitional economies of Eastern Europe and the former Soviet Union. Along with this phenomenon, Cambodia, Laos, and Vietnam have been noticeably affected by dollarization from the onset of its economic reform process.[3] In particular, the prevalent use of the dollar has been noticed in Cambodia and Laos. The U.S. dollar is held in the form of cash in circulation and banking deposits. For example, for Cambodia, by the end of June 2010, the share of U.S. dollar deposits in domestic banks to broad monetary aggregates reached almost 70%. Despite the success of stabilization programs by the Cambodian government, which brought a low inflation rate and a stable exchange rate, the degree of dollarization is still high compared to other developing countries. This suggests the presence of hysteresis of currency substitution in Cambodia, or perhaps a continued lack of confidence in the domestic banking system. In addition, under-developed financial system, weak legal and institutional structures, and political and economic instability

---

3) The share of foreign currency ranges from about 20% of all currency in circulation in Vietnam, about 50% in Laos, and more than 90% in Cambodia(Vietnam banking finance news, 2010.10.15).

are also likely causes of this dollarization phenomenon(Menon 2008).

After two major economic crises(Asian economic crisis and global economic crisis) Southeast Asian countries, in common, have experienced instability in financial market and economic depression such as contraction of consumption and investment, and decrease in export, resulting in frequent and rapid depreciation of exchange rate. Especially, for the three developing and transitional economies, Cambodia, Laos, and Vietnam usually suffering from prolonged lack of trust on local currency and dependency on foreign aid and investment, it is expected there has been high exchange rate depreciation. As a result, U.S. dollars are used along with domestic currency as a means of payment, a unit of account, and a store of value(Menon 2008; Ra 2008; Hai 2004; Phetsathaphone 2004).

Figure 1 shows the trend of the U.S. dollar deposit to M2 ratio of the three countries. Overall, we can see that the dollarization is strongest in Cambodia, and then in Laos, and weak in Vietnam. The ratios fluctuate at around 0.6-0.8 for Cambodia, 0.4-0.7 for Laos, and 0.2-0.4 for Vietnam reflecting the reality of Cambodia's deep dollarization. Also we could see the ratios, in general, are rising right after the crises as expected, especially after Asian economic crisis by far.

Figure 1. US dollar deposit to M2 ratio(%)
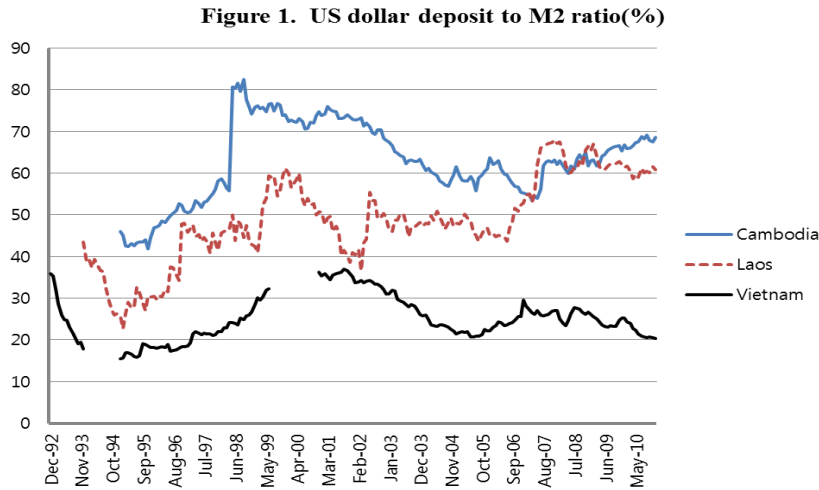
Assuming the economic crisis would have brought the economic agents of three countries to increase their holdings of dollars, we investigate and compare the dollarization process of the countries during the recent two economic crises, 1997.6-2000.12 and 2007.8-2010.12 for each.[4] For the analysis we introduce the Rojas-Suarez(1992) method, and estimate the effect of the expected rate of depreciation in market exchange rates on the holdings of US dollars. Further, we compare the effects of two economic crises on the dollarization. Mainly, our empirical results demonstrate that the effect of Asian economic crisis on the dollarization is stronger than that of global economic crisis. The result is consistent with general agreement that the effect of global economic crisis on Southeast Asian economy seems to be smaller than

---

4) We note that Asian economic crisis started in 2007.6 by sudden fall of Thai Baht and global economic crisis started in 2007.8 by sub-prime mortgage crisis in U.S. Also, overall, GDP per capita of Southeast Asian countries have been recovered to the pre-crisis level in 2000 and 2010 for each crisis, respectively.

that of Asian economic crisis.

Reviewing literature on the dollarization in the next section, we explain the method for dollarization, and examine data for the estimation in section 3. Section 4 presents the empirical results from the estimations and implications. Finally, section 5 summarizes the main findings and concludes.

Ⅱ. Literature Review

Mainly, in the context of developing and transitional economies, the dollarization phenomenon has been prominent and has been the focus of many studies over the last two decades. For the previous studies, Ortiz(1983) examined the Mexican case; Fasano-Filho(1986) looked at Argentina's case; Ramirez-Rojas(1985) identified the currency substitution in Argentina, Mexico and Uruguay; Canto(1985) studied Dominica's case; and El-Erian(1988) checked the presence of currency substitution in Egypt and the Yemen Arab Republic. More recently, Rojas-Suarez(1992) tested dynamic inflation under the presence of currency substitution in the Peruvian economy. Sahay and Végh(1996) discussed currency substitution in transitional economies in Eastern Europe and the states of the former Soviet Union. Based on the Rojas-Suarez's study Ra(2008) examined the dollarization of three transitional economies in Cambodia, Laos, and Vietnam for the time period of 1992-2007 and found that there are positive effects(expected) of the expected rate of depreciation in market exchange rates on the holdings of U.S. dollars and the effect is strongest for Cambodia. The

study suggests this may reflect the fact Cambodia's dollarization is stronger than those of Laos and Vietnam.

In addition, we could see the literature on the benefit and cost of dollarization for the economy or the issue of whether the countries need to continue the dollarization. Dollarization could bring stability to the exchange rate and inflation, but it may also generate difficulties for the central banks in running an effective monetary policy, since it can control only part of the total broad money(Berg and Borensztein 2000a; Baliño and Borensztein 1999; Agénor and Moshin 1992). In addition, under the presence of dollarization, a government faces the loss of seigniorage and its ability to run an inflationary tax(Berg and Borensztein 2000b).

The prevailing literature also shows that dollarization may act as a transmission mechanism through which domestic monetary and fiscal policy impacts more heavily on inflation (Berg and Borensztein 2000b; Kompas and Leung 1999). For example, despite the success of stabilization programs by the Cambodian government, which brought a low inflation rate and stable exchange rate, the degree of dollarization (F/M) is still high compared to other developing countries. There are two factors related to the persistence of dollarization. The first relates to degree or magnitude of the reforms and the other relates to hysteresis or the fact that history matters. The Cambodian government continues to wrestle with the challenge of developing a banking system that emphasizes a solid supervisory framework. This Cambodian case is not much different from that of Laos and Vietnam(Hai 2004; Phetsathaphone 2004).

On the other hand, concerning the economic crises, the literature

reach general agreement that the effect of global economic crisis on Southeast Asian economy has not been severe as much as Asian economic crisis(Won 2010; Lim 2009; Ra 2008). The studies, in general, look into the responses and changes in Southeast Asian economy after the global economic crisis, including the comparative study between Asian economic crisis and global economic crisis. In average 6-12 months after the global economic crisis, stock indexes, exchange rates and macroeconomic indicators have been recovered to the pre-economic crisis level. On the contrary, for Asian economic crisis, it took over 1 year to recover the pre crisis level(Ra 2008). Also, by and large Asian economic crisis seems hit Southeast Asian countries' exports and imports harder than global economic crisis. Surprisingly global economic crisis turns out more or less statistically insignificant for those countries' export and import performances(Won 2010).

Several factors are considered for reasons. To overcome the economic downturn during global economic crisis, the governments have been implementing expansionary fiscal and monetary policy in prompt. The fast recovery may reflect that Southeast Asian economy have the bigger capability to overcome the economic crisis. It may be partly due to economic reform such as the restructuring of business and banking sector, and the establishment of law and institution for exchange and capital markets(Lim 2009). Also, it may be partly due to the accumulation of international reserves as the buffer against potential economic crisis(Ra 2008). Briefly, the negative effect of global economic crisis on Southeast Asian economy seems to be smaller than that of Asian economic crisis. This is the case for Cambodia, Laos, and Vietnam as well.

We have plenty of literature on dollarization and economic crisis. However, there are very few studies discussing how the dollarization process is going on especially after the economic crises in the region. Thus, to our knowledge, this study is the first study to examine how the economic crises influenced on dollarization of the three countries.

Ⅲ. Model and Data

1. Model

Following the Rojas-Suarez(1992) for its simplicity, we assume that there are two kinds of goods in an economy: tradable(with price P) and non-tradable(with foreign price P*). Let ε denote the nominal exchange rate. We assume that the price of foreign goods is equal to one, so that the real exchange rate can be written as ε/P. We assume also that money is the only form of wealth. Domestic residents may allocate their portfolio holdings between domestic money and foreign money. Foreign money is assumed to be an imperfect substitute for domestic money.

Then, the representative agent is assumed to maximize the following function:[5] It is assumed that the utility function is separable in both goods and that $U(.)$ is strictly concave. That is, U_H and U_T are positive and diminishing.

$$V(M_t, F_t, P_t, \varepsilon_t) = MaxE_t \left\{ U_t(C_t^H, C_t^T) + \beta V(M_{t+1}, F_{t+1}, P_{t+1}, \varepsilon_{t+1}) \right\} \quad (1)$$

---

5) It is assumed that the utility function is separable in both goods and that U(.) is strictly concave. That is, U_H and U_T are positive and diminishing.

where:

C_t^H : the consumption of non-tradable goods

C_t^T : the consumption of tradable goods

M_t : the stock of domestic money

F_t : the stock of foreign money

β : the discount rate

E_t : expectation operator

Also, the representative consumer faces the following budget constraint:

$$Y_t + \frac{M_t}{P_{t-1}}\left(\frac{1}{1+\pi_t}\right) + \frac{\varepsilon_{t-1}F_t}{P_{t-1}}\left(\frac{1+x_t}{1+\pi_t}\right) = C_t^H + \frac{\varepsilon_t}{P_t}C_t^T + \frac{M_t}{P_t} + \frac{\varepsilon_t F_t}{P_t} \qquad (2)$$

where:

π_t : the inflation rate of the nontradable goods

x_t : the rate of change of the exchange rate, and

Y_t : total real income derived from the production of both goods. That is,

$$Y_t = Y_t^H + \left(\frac{\varepsilon_t}{P_t}\right)Y_t^T \qquad (3)$$

The individual also faces a liquidity-in-advance constraint of the form:

$$C_t^H + \left(\frac{\varepsilon_t}{P_t}\right)C_t^T \leq l\left(\frac{M_t}{P_t}, \frac{\varepsilon_t F_t}{P_t}\right). \qquad (4)$$

This equation follows Calvo and Végh(1990), where l(.) is the liquidity services production function and is assumed to be a linear homogenous function where the marginal productivities of domestic

and foreign real currencies (l_1 and l_2) are positive and diminishing. Also, we assume that $\dfrac{\dfrac{\partial l_1}{\partial \left(\dfrac{\varepsilon F}{P}\right)} < 0}{}$ to ensure that the domestic and foreign currencies are imperfect substitutes.

Maximizing (1) subject to (2) and (4), we get equation (5):

$$\frac{\left(\dfrac{M}{P}\right)}{\left(\dfrac{\varepsilon F}{P}\right)} = g\left(x, \frac{\left(\dfrac{M}{P}\right)}{\left(\dfrac{\varepsilon F}{P}\right)}\right) \tag{5}$$

where g is also a function of the stock of money balances.[6]

For g'(x) < 0, equation (5) says that, in the steady state, the ratio of the holdings of domestic to foreign currency(in terms of the domestic currency) and the rate of change of the exchange rate are negatively related. Equation (5) can be estimated by the following specification:

$$\log M_t - \log \varepsilon_t F_t = \alpha + \mu E(\log \varepsilon_{t+1} - \log \varepsilon_t) + u_t \tag{6}$$

where u_t is the residual term from the relationship, where u_t is distributed as $N(0, \sigma_u^2)$.

Equation (6) shows that a representative agent adjusts the holdings of domestic currency to achieve their desired ratio of domestic to foreign currency, and that the ratio depends on the expected rate of depreciation of the exchange rate. We apply this model to estimate the effects. Then from equation (6), the basic form of the estimated equation can be expressed as:

$$y_t = \alpha_0 + \alpha_1 x_t^e + u_t \tag{7}$$

where, y_t is the logged value of the foreign currency deposit to

---

6) The proof is not reported in the paper. Refer to the author for the proof.

domestic currency ratio, $\log\left(\dfrac{\varepsilon_t F_t}{M_t}\right)$; x_t^e is defined as the logged value of the expected rate of change in the exchange rate and u_t is the residual term from the relationship, where u_t is distributed as $N(0, \sigma_u^2)$.

Thus, equation (7) can be regarded as a long-run relationship between the holding of foreign currency and the expected rate of change in the exchange rate. Assuming that the total holdings of domestic and foreign currency remain unchanged at a given level of real income and the interest rate, then a positive α_1 would mean that an increase in the expected rate of depreciation of the domestic currency would imply an increase in the holdings of the foreign currency(U.S. dollars) relative to the domestic currency(riel for Cambodia, kip for Laos, and dong for Vietnam). Therefore, α_1 may capture the degree of substitution between U.S. dollars and the domestic currency.

Also, we may expect that α_1 would be proportional to the degree of the dollarization of each country, because as the dollarization of the economy continues, the residents of the economy are more willing to exchange domestic currency for U.S. dollars in response to the expected rate of change in the exchange rate. For this, we may examine whether α_1 is getting bigger according to the degree of dollarization among the three countries. If α_1 for Asian economic crisis is bigger than that of global economic crisis it means that the effect of Asian economic crisis on dollarization would be stronger than that of global economic crisis. Thus, if this is the case and statistically significant, we could accept the

hypothesis that in terms of dollarization, the effect of global economic crisis on Southeast Asian economy has been smaller than that of Asian economic crisis.

2. Data

For estimation we collect monthly data for Cambodia, Laos, and Vietnam, covering the period 1997.6-2000.12 for Asian economic crisis, and 2007.8-2010.12 for global economic crisis, respectively.[7] The average market exchange rate for the exchange rate, and the foreign currency deposits and domestic currency (M1 and M2) for the holdings of foreign currency, are collected from the International Financial Statistics(IFS) provided by the International Monetary Fund(IMF).

It is important to understand clearly the components of the currency substitution ratio (*F/M*), which is the dependent variable for estimating Equation (7). The foreign currency stock *F* is approximated by the foreign currency deposits, *FCD*(expressed in terms of the national currency), of the banking sector. There is no necessary one on one relation between the level of *F* and that of the actual stock of foreign currency(the U.S. dollar), but we may assume implicitly that the *FCD* changes proportionally in response to changes of the actual stock of U.S. dollars in the economy. In addition, since it is hard to measure the stock of U.S. dollars in the economy accurately, the *FCD* is used as a proxy for the actual stock of U.S. dollars, which is the normal procedure in related

---

7) We acknowledge that our sample size may not be big enough to get the non-biased estimation that is the long-run relationship between the holding of foreign currency and the expected rate of change of the exchange rate.

literature.

Also, there are two definitions of domestic money used in the F/M ratio, namely $M1$, and $M2$. $M1$ is composed of domestic currency held outside banks and demand deposits. $M2$ consists of $M1$ plus quasi-money, which includes time and saving deposits plus foreign currency deposits(in terms of the domestic currency). We use both $M1$ and $M2$ as the domestic currency for estimation.

Following El-Erian(1988) and Rojas-Suarez(1992), for the expected rate of domestic currency depreciation, x^e, we choose the actual change of the exchange rate as a proxy to represent the expected rate of change of the exchange rate. Rojas-Suarez, in particular, argues that this is possible for Peru because the rate of change of the exchange rate was found to be a stationary AR(1) process.

Table 1. Description of Data Set

Variables	Measure of	Proxy	Measure of	Data Source	Frequency
F	Stock of foreign currency	FCD	Foreign currency deposit	IFS	Monthly
M	Stock of domestic currency	$M1$	Stock of M1	IFS	Monthly
		$M2$	Stock of M2	IFS	Monthly
x^e	Expected rate of domestic currency depreciation	x	Actual rate of domestic currency depreciation	IFS	Monthly

Ⅳ. Empirical results

1. Stationarity test

First, we investigate the order of integration of the variables to avoid the spurious regression problem. The results of the Augmented Dickey-Fuller(ADF) unit root tests on the levels and the first differences of the variables are summarized in Table 2 and Table 3.[8]

For both cases, except for x_t, the log of the expected rate of change in the exchange rate, the unit root tests do not reject the unit root in level for the currency substitution ratio y_t^1 log of the foreign currency deposit to *M1* ratio and y_t^2 log of the foreign currency deposit to *M2* ratio. However, we reject the unit root in the differenced data at the 1% significance level. Thus, we may believe that x_t has an I(0) process, which means that the data are stationary in levels, but that y_t^1 and y_t^2 have an I(1) process, which means that the data are non-stationary in levels.

Table 2. The ADF Unit Root Tests on the Variables
(Asian economic crisis, 1997.1-2000.12)

Variables	Cambodia		Laos		Vietnam	
	Level	1st difference	Level	1st difference	Level	1st difference
x_t	-4.581***	-7.195***	-5.641***	-8.926***	-9.672***	-8.971***
y_t^1	-2.105	-6.816***	-1.346	-6.256***	-1.598	-5.987***
y_t^2	-1.698	-6.115***	-1.052	-10.697***	-2.136	-6.295***

Notes: Significance levels are 10% *, 5% **, and 1% ***. We selected the augmentation lags for each Dickey-Fuller regression in order to minimize

---

[8] The Phillip-Perron unit root test is an alternative method to the ADF test that controls for serial correlation when testing for a unit root. The results are not reported here because the results are not much different from those of the ADF test.

the Schwarz Information Criterion(SIC). Each regression contains an intercept but no time trend. x_t is the log of the expected rate of change in the exchange rate; y_t^1 is the log of the foreign currency deposit to M1 ratio; y_t^2 is the log of the foreign currency deposit to M2 ratio.

Table 3. The ADF Unit Root Tests on the Variables
(Global economic crisis, 2007.1–2010.12)

Variables	Cambodia		Laos		Vietnam	
	Level	1st difference	Level	1st difference	Level	1st difference
x_t	-5.128***	-11.516***	-6.398***	-10.826***	-8.316***	-6.528***
y_t^1	-0.819	-8.582***	-1.258	-9.792***	-2.105	-5.698***
y_t^2	-1.289	-7.226***	-1.116	-7.225***	-2.111	-7.262***

Notes: Significance levels are 10% *, 5% **, and 1% ***.

2. Estimation and implication

Based on the previous ADF test results, we may estimate equations (8)-(11) as alternative methods to equation (7), because x_t is stationary in levels, but y_t^1 and y_t^2 are non-stationary in levels. If we estimate equation (7) from the theory, the estimation results produce very low Durbin-Watson statistics implying that the error terms are serially correlated which results in the bias problem in α_1. To solve the serial correlation and bias problems, we may add a lagged dependent variables, y_{t-1}^1 or y_{t-1}^2, in equation (7).[9] Then, the

---

9) We note that alternative estimations like $\Delta y_t^1 = \alpha_0 + \alpha_1 x_t + u_t$, $\Delta y_t^2 = \alpha_0 + \alpha_1 x_t + u_t$,

estimations can be expressed as:

Estimation I: $y_t^1 = \alpha_0 + \alpha_1 x_t + \beta y_{t-1}^1 + u_t$ (8)

Estimation II: $y_t^2 = \alpha_0 + \alpha_1 x_t + \beta y_{t-1}^2 + u_t$ (9)

Also, we may include lagged independent variables, $x_{t-1}, x_{t-2}, \ldots$, because the foreign currency deposit(*FCD*) also can be dependent on the expected rate of change in the past period. If we add only x_{t-1} in equations (8) and (9), the basic estimations can be expressed as:

Estimation III: $y_t^1 = \alpha_0 + \alpha_1 x_t + \alpha_2 x_{t-1} + \beta y_{t-1}^1 + u_t$ (10)

Estimation IV: $y_t^2 = \alpha_0 + \alpha_1 x_t + \alpha_2 x_{t-1} + \beta y_{t-1}^2 + u_t$ (11)

Tables 4-5 show the estimation results of equations (8) and (9), respectively. First, for Asian economic crisis, Table 4 shows that α_1, the coefficients of x_t present the expected positive sign for all cases, and is significant at the 1% significance level for Cambodia and Laos, and 10% level for Vietnam. The coefficients of x_t are 0.865, 0.498, and 0.259 for Cambodia, Laos, and Vietnam, respectively. These results may imply that, for Cambodia, U.S. dollars are substituted for riles more easily compared with that of Laos and Vietnam in response to the expected rate of change in the exchange rate. Also, this is consistent with the fact that the dollarization of Cambodia is significantly greater than that of Laos and Vietnam, and the dollarization of Vietnam is much less when compared with that of Cambodia and Laos(Ra 2008).

---

using differenced independent variable could be considered to solve spurious regression problem. However, we skip the estimation because of difficulty in the interpretation of the results.

On the other hand, for global economic crisis, we can see that α_1, the coefficients of x_t present the expected positive sign for all cases, but is significant at the 5% significance level only for Cambodia. The coefficients of x_t are 0.376, 0.309, and 0.148 for Cambodia, Laos, and Vietnam, respectively. The coefficients are much less than those of previous one. It may imply that the effects of global economic crisis on dollarization of the three countries seem to be much weaker than that of Asian economic crisis. Also, we can see that the dollarization of Cambodia is still greater than that of Laos and Vietnam and the dollarization of Laos and Vietnam got much less influential after global economic crisis.

Table 5 presents similar results. Both of the coefficients x_t and x_{t-1} present the expected positive sign and are significant at the 1% and 5% significance level, respectively, except in the case of Vietnam. The coefficients x_t for Asian economic crisis are 0.687, 0.429, and 0.367, and those of x_{t-1} are 0.408, 0.312, and 0.176 for Cambodia, Laos, and Vietnam, respectively. The coefficients x_t for global economic crisis are 0.339, 0.230, and 0.067, and those of x_{t-1} are 0.209, 0.198, and 0.035 for Cambodia, Laos, and Vietnam, respectively and statistically significant only for Cambodia. For both cases, the coefficients of x_t and x_{t-1} for Cambodia outnumber those of Laos and Vietnam, which may also reflect the deep dollarization of Cambodia as compared to Laos and Vietnam. Also, we can say that the effects of global economic crisis on dollarization of the three countries got much weaker than that of Asian economic crisis like

the result of previous test.

Further, the tables present the diagnostic tests on the residuals. Q(15) and ARF statistics demonstrate no autocorrelation, and $Q^2(15)$ and ARCH-F present no ARCH effect, implying that the model is correctly specified. The Jarque-Bera test rejects the normality, and White's heteroskedasticity test shows that the existence of heteroskedasticity in the residuals(which may be due to the small sample size). Overall, our diagnostic tests indicate that there are no significant concerns about the specification.

Table 4. Results of Estimation I

Variables	Cambodia		Laos		Vietnam	
	Asian	Global	Asian	Global	Asian	Global
	y_t^1	y_t^1	y_t^1	y_t^1	y_t^1	y_t^1
C	0.021 (0.011)	0.019 (0.013)	0.025 (0.019)	0.023 (0.016)	0.017 (0.015)	0.029 (0.011)
x_t	0.865*** (0.201)	0.376** (0.198)	0.498*** (0.121)	0.309 (0.287)	0.259* (0.198)	0.148 (0.200)
y_{t-1}^1	0.981*** (0.009)	0.901*** (0.013)	0.914*** (0.024)	0.952*** (0.032)	0.988*** (0.013)	0.941*** (0.018)
Adjusted R^2	0.965	0.971	0.941	0.955	0.978	0.966
Q(15)	12.158	11.397	13.295	14.166	14.754	14.812
$Q^2(15)$	5.311	5.285	6.314	7.125	5.437	5.589
Jarque-Bera	12.568***	11.792***	14.285***	14.185***	16.125***	15.698***
ARF	1.302	1.327*	0.577	0.498	1.245	1.147
ARCH-F	0.658	0.415	1.986*	1.785*	0.755	0.814
Heteroskedasticity F	4.689***	4.258***	4.104***	3.502**	3.254**	3.266**
Observations	43	41	43	41	43	41

Note: Significance levels are 10% *, 5% **, and 1% ***.

Table 5. Results of Estimation II

Variables	Cambodia		Laos		Vietnam	
	Asian	Global	Asian	Global	Asian	Global
	y_t^1	y_t^1	y_t^1	y_t^1	y_t^1	y_t^1
C	0.031 (0.009)	0.021 (0.016)	0.015 (0.018)	0.007 (0.025)	0.022 (0.015)	0.018 (0.021)
x_t	0.687*** (0.158)	0.339** (0.163)	0.429*** (0.101)	0.230 (0.155)	0.367 (0.225)	0.067 (0.188)
x_{t-1}	0.324*** (0.202)	0.259*** (0.068)	0.312** (0.136)	0.198 (0.182)	0.176 (0.188)	0.034 (0.155)
y_{t-1}^1	0.966*** (0.028)	0.957*** (0.016)	0.941*** (0.021)	0.957*** (0.011)	0.987*** (0.015)	0.974*** (0.024)
Adjusted R^2	0.954	0.941	0.966	0.967	0.952	0.949
Q(15)	13.222	12.859	17.689	16.145	13.521	14.112
Q^2(15)	5.438	5.258	8.598	7.924	5.159	4.283
Jarque-Bera	18.592***	17.289***	18.105***	19.288***	14.328***	15.988***
ARF	1.325*	1.325*	0.673	0.673	1.325*	1.325*
ARCH-F	0.877	0.877	1.980*	1.980*	0.877	0.877
Heteroskedasticity F	4.289***	4.728***	3.111**	3.125**	3.528**	3.466**
Observations	43	41	43	41	43	41

Note: Significance levels are 10% *, 5% **, and 1% ***.

Next, Tables 6-7 present the estimation results of equations (10) and (11), respectively.[10] First, for Asian economic crisis, Table 6 shows that α_1, the coefficients of x_t present the expected positive sign for all cases, and is significant at the 1% significance level(except for Vietnam). The coefficients of x_t are 0.476, 0.332, and 0.113 for Cambodia, Laos, and Vietnam, respectively. These results are not much different from previous results(Table 1).

---

10) We do not report other estimation results adding x_{t-2}, x_{t-3}, … because the coefficients are not statistically significant.

For global economic crisis, we can see that α_1, the coefficients of x_t present the expected positive sign for all cases, but is significant at the 5% significance level only for Cambodia. The coefficients of x_t are 0.249, 0.210, and 0.102 for Cambodia, Laos, and Vietnam, respectively. Although the coefficients are less than those of previous one, the effects of global economic crisis on dollarization of the three countries seem to be much weaker than that of Asian economic crisis as we see Table 5.

Table 7 presents similar results. Both of the coefficients x_t and x_{t-1} present the expected positive sign and are significant at the 1% and 5% significance level, respectively, except in the case of Vietnam. The coefficients x_t for Asian economic crisis are 0.336, 0.225, and 0.203, and those of x_{t-1} are 0.265, 0.227, and 0.098 for Cambodia, Laos, and Vietnam, respectively. The coefficients x_t for global economic crisis are 0.216, 0.201, and 0.074, and those of x_{t-1} are 0.158, 0.144, and 0.028 for Cambodia, Laos, and Vietnam, respectively. For both cases, the coefficients of x_t and x_{t-1} for Cambodia outnumber those of Laos and Vietnam, which may also reflect the deep dollarization of Cambodia as compared to Laos and Vietnam. Also, we can say that the effects of global economic crisis on dollarization of the three countries got much weaker than that of Asian economic crisis like the result of previous test.

Further, the tables present the diagnostic tests on the residuals. As discussed in Tables 6-7, overall, our diagnostic tests indicate that there are no significant concerns about the specification.

Table 6. Results of Estimation III

Variables	Cambodia		Laos		Vietnam	
	Asian	Global	Asian	Global	Asian	Global
	y_t^2	y_t^2	y_t^2	y_t^2	y_t^2	y_t^2
C	0.017 (0.017)	0.021 (0.014)	0.022 (0.012)	0.014 (0.017)	0.027 (0.014)	0.015 (0.011)
x_t	0.476*** (0.158)	0.249** (0.047)	0.332*** (0.101)	0.210 (0.152)	0.113 (0.087)	0.102 (0.058)
y_{t-1}^2	0.977*** (0.011)	0.945*** (0.017)	0.944*** (0.012)	0.937*** (0.014)	0.958*** (0.016)	0.955*** (0.014)
Adjusted R^2	0.921	0.936	0.942	0.958	0.966	0.968
Q(15)	18.598	17.999	17.582	16.223	14.514	14.796
Q^2(15)	7.412	7.625	6.913	6.311	5.597	5.222
Jarque-Bera	16.115***	16.205***	18.698***	19.113***	17.982***	17.147***
ARF	1.111	1.206	0.985	0.781	1.415*	1.339*
ARCH-F	0.699	0.851	0.858	0.975	0.714	0.799
Heteroskedasticity F	4.698**	4.582**	3.222**	3.285**	3.365**	3.144**
Observations	43	41	43	41	43	41

Note: Significance levels are 10% *, 5% **, and 1% ***.

Table 7. Results of Estimation IV

Variables	Cambodia		Laos		Vietnam	
	Asian	Global	Asian	Global	Asian	Global
	y_t^2	y_t^2	y_t^2	y_t^2	y_t^2	y_t^2
C	0.024 (0.017)	0.017 (0.015)	0.015 (0.016)	0.015 (0.016)	0.024 (0.017)	0.024 (0.017)
x_t	0.336*** (0.102)	0.216*** (0.221)	0.225*** (0.074)	0.201 (0.149)	0.203 (0.220)	0.074 (0.252)
x_{t-1}	0.265*** (0.110)	0.158** (0.068)	0.227*** (0.089)	0.144 (0.127)	0.098 (0.114)	0.028 (0.118)
y_{t-1}^2	0.947*** (0.011)	0.952*** (0.016)	0.952*** (0.017)	0.958*** (0.018)	0.931*** (0.013)	0.925*** (0.021)
Adjusted R^2	0.977	0.958	0.966	0.947	0.946	0.955
Q(15)	13.256	14.145	16.297	17.113	14.585	14.669

$Q^2(15)$	6.325	5.785	7.222	7.418	5.435	5.223
Jarque-Bera	17.985***	17.144***	19.911***	19.525***	15.689***	16.114***
ARF	1.321*	1.302*	0.858	0.779	0.105	1.111
ARCH-F	0.667	0.747	0.858	0.779	0.876	0.758
Heteroskedasticity F	3.335**	3.352**	2.988**	3.101**	3.147**	3.195**
Observations	43	41	43	41	43	41

Note: Significance levels are 10% *, 5% **, and 1% ***.

As above, for both periods, as expected by the Rojas-Suarez study(1992), the expected rate of depreciation of the exchange rate has positive impact on the desired ratio of foreign to domestic currency in all three countries implying the consistency of the model. Also, our empirical results support our hypothesis that the effect of Asian economic crisis on dollarization of the three countries seems to be much stronger than that of global economic crisis. This is consistent with the fact that the effect of global economic crisis on Southeast Asian economy seems to be smaller than that of Asian economic crisis.

We could see the coefficient of currency substitutions, α_1, for Asian economic crisis, in general, are bigger than that of global economic crisis. Furthermore, for Cambodia, the coefficient of currency substitutions, α_1, is statistically significant at the 1% significance level for Asian economic crisis period, but 5% and 10% significance level for global economic crisis period. For Laos, α_1 is statistically significant at the 1% or 5% significance level only during the period of Asian economic crisis, but not statistically significant for global economic crisis period. Further, for Vietnam α_1 is only statistically significant for estimation I(Table 4).

V. Conclusion

In this paper, we examine the responses and changes of Southeast Asian economy in terms of "dollarization" after economic crisis, focusing on three developing and transitional economies in Southeast Asia: Cambodia, Laos, and Vietnam, which have been undergoing a transition and reform of the economies. We perform the comparative study between after Asian economic crisis in 1997-2000 and after global economic crisis in 2007-2010.

Based on the Rojas-Suarez(1992) method, first, we examine whether the holdings of U.S. dollars depend on the effect of the expected rate of depreciation in market exchange rates, as expected by the model. Also, we examine whether the effects are proportional to the degree of the dollarization of the economy. Finally, we compare the effects between two economic crises.

Our empirical results show that in the case of Asian economic crisis, there are positive effects(expected) of the expected rate of depreciation in market exchange rates on the holdings of U.S. dollars. The coefficients are statistically significant for Cambodia and Laos, but not for Vietnam. The effect is strongest for Cambodia, which may reflect the fact that Cambodia's dollarization is stronger than those of Laos and Vietnam. On the contrary, in the case of global economic crisis, there are positive effects(expected) of the expected rate of depreciation in market exchange rates on the holdings of U.S. dollars. The coefficients are statistically significant only for Cambodia in low significance level, but not for Laos and Vietnam. The empirical results show that the effect of Asian economic crisis is stronger than that of global economic crisis

which is consistent with general agreement that the effect of global economic crisis on Southeast Asian economy seems to be smaller than that of Asian economic crisis.

Finally, we acknowledge that there would be other potential factors that affect dollarization of the countries like the difference of financial regulation and system among three countries, and the rapid rising of Chinese yuan as a key currency in the region after global economic crisis. We leave the subject for further research.

Key words: Dollarization, Asian economic crisis, Global economic crisis, Cambodia, Laos, Vietnam

<References>

Agénor, Pierre-Richard and Moshin, S. Khan. 1992. "Foreign Currency Deposits and the Demand for Money in Developing Countries," *IMF Working Paper*, WP/92/1.

Baliño, Tomás J.T.. Bennett, Adam, and Borensztein, Eduardo. 1999. "Monetary Policy in Dollarized Economies," *IMF Occasional Paper,* No. 171.

Berg, Andrew and Borensztein, Eduardo. 2000a. "The Choice of Exchange Rate Regime and Monetary Target in Highly Dollarized Economies," *IMF Working Paper, WP/00/29.*

_____. 2000b. "The Pros and Cons of Full Dollarization," *IMF Working Paper, WP/00/50.*

Calvo, Guillermo A. and Rodriguez, Carlos A.. 1977. "A Model of

Exchange Rate Determination under Currency Substitution and Rational Expectations," *Journal of Political Economy*, No. 85, pp. 617-25.

Calvo, Guillermo A.. 1985. "Currency Substitution and the Real Exchange Rate: the Utility Maximization Approach," *Journal of International Money and Finance*, No. 4, pp.175-88.

Calvo, Guillermo A. and Végh, Carlos A.. 1992. "Currency Substitution in Developing Countries: An Introduction," *IMF Working Paper,* WP/92/40.

Canto, Victor A.. 1985. "Monetary Policy, 'dollarization' and Parallel Market Exchange Rates: The Case of the Dominican Republic," *Journal of International Money and Finance*, No. 4, pp.507-21.

Clements, Benedict and Schwartz, Gerd. 1992. "Currency Substitution: The Recent Experience of Bolivia," *IMF Working Paper*, WP/ 92/ 65.

Cuddington, J.. 1989. "Review of Currency Substitution: Theory and Evidence from Latin America," by V.A. Canto and G. Nickelsburg, Kluwer Academic Press, *Journal of Money, Credit and Banking*, No. 21, pp.267-71.

El-Erian, M.. 1988. "Currency Substitution in Egypt and the Yemen Arab Republic: A Comparative Quantitative Analysis," *IMF Staff Papers*, 35 (1), pp.85-103.

Fasano-Filho, Ugo. 1986. "Currency Substitution and Liberalization: The Case of Argentina," Aldershot, UK: Gower.

Hai, N. T.. 2004. "Dollarization in Viet Nam," Paper prepared for the 12th Annual Conference on Pacific Basin Finance, Economics, Accounting, and Business, Bangkok.

Giovannini, Alberto and Turtelboon, Bart. 1992. "Currency Substitution," *NBER Working Paper*, No. 4232, pp.1-61.

Girton, L. and Roper, Don. 1981. "Theory and Implications of Currency Substitution," *Journal of Money, Credit, and Banking,* Vol. 13, No. 1, pp.12-30.

Guidotti, Pablo E. and Carlos, A. Rodriguez. 1992. "Dollarization in Latin America: Gresham's Law in Reverse?" *IMF Staff Papers*, Vol. 39 (3), pp.518-44.

Kompas, Tom and Leung, Suiwah. 1999. "Inflation and Dollarization in Vietnam," in *Working Paper*, ANU, Canberra.

Leung, S. and Ngo, D.H.. 1999. "Dollarization and Financial Sector Developments in Vietnam," in *Vietnam and the East Asian Crisis*, Edward Elgar Publishing Ltd., UK.

Lim, C. Y.. 2009. "The Asian Financial Crisis," in *Southeast Asia: The Long Road Ahead*, 3rd edition, World Scientific Publishing Ltd., UK.

Menon, J.. 2008. "Cambodia's persistent dollarization: Causes and Policy Options," *ADB Economic working paper*, No. 19.

Ortiz, G.. 1983. "Currency Substitution in Mexico: the Dollarization Problem," *Journal of Money, Credit, and Banking*, No. 15, pp.174-85.

Phetsathaphone, K.. 2004. "Dollarization in Laos: Evidence, Causes, and Policy Implication," Ph. D dissertation in Graduate School for International Development and Cooperation(IDEC), Hiroshima University.

Ra, H. R.. 2008. "Modeling the Dollarization," *Global Economic Review*, 37 (2), pp.157-169.

Ra, H. R.. 2010. "Southeast Asian Economy after the Global Economic Crisis," *The Southeast Asian Review,* 20 (1), pp.143-180.

Ramírez-Rojas, C.. 1985. "Currency Substitution in Argentina, Mexico and Uruguay," *IMF Staff Papers*, 32 (4), pp.629-67.

Rojas-Suarez, L.. 1992. "Currency Substitution and Inflation in Peru," *IMF Working Paper*, WP/92/33.

Sahay, R. and Végh, C.A.. 1996. "Dollarization in Transition Economies: Evidence and Policy Implications," in P. Mizen and E.J. Pentecost (eds), *The Macroeconomics of International Currencies*, Edward Elgar Publishing Ltd., UK.

Savastano, M.A.. 1996. "Dollarization in Latin America: Recent Evidence and Policy Issues," in P. Mizen and E.J. Pentecost (eds), *The Macroeconomics of International Currencies*, Edward Elgar Publishing Ltd., UK.

Won, Y.. 2010. "Recent Economic Crisis and Foreign Trade in Major ASEAN Countries," *The Southeast Asian Review,* 20 (3), pp.41-64.

<국문초록>

양대 경제위기와 달러화 현상:

캄보디아, 라오스, 베트남 사례 연구

나 희 량

(부산외국어대학교 국제무역학과)

본 논문에서는 아시아 경제위기(1997-2000)와 글로벌 경제위기(2007-2010)의 양대 경제위기 이후 진행된 동남아시아 지역의 달러화 현상에 대해 후발국이면서 체제전환국 성격이 강한 캄보디아, 라오스, 베트남을 중심으로 분석하였다. 이를 위해 로하스-수아레즈(Rojas-Suarez 1992) 모형을 활용하여 양대 경제위기의 위 3개국의 달러화 현상에 대한 영향을 비교 분석하였다. 동 모델에 의하면 경제위기는 자국화폐에 대한 신뢰를 떨어뜨려 자국 화폐가치에 대한 예상평가절하율(예상환율상승률)이 크면 클수록 자국화폐 대비 달러화에 대한 수요는 증가될 것으로 예상된다. 분석 결과 아시아 경제위기의 경우 모델의 예상대로 자국 화폐의 예상평가절하 시 달러화의 수요를 나타내는 탄력성 계수가 통계적으로 유의하였다. 국가별로는 캄보디아, 라오스, 베트남의 순서로 탄력성이 크게 나타났으며 이는 각 국의 달러화 수준과 비례하는 결과이다. 이에 비해 글로벌 경제위기의 경우에는 캄보디아를 제외하면 탄력성 계수가 유의하지 않은 것으로 나타났다. 또한 캄보디아의 경우에도 탄력성 계수가 아시아 경제위기의 경우에 비해 감소된 것으로 나타났다. 이러한 결과는 달러화 현상에 있

어서 아시아 경제위기에 비해 글로벌 경제위기의 영향이 상대적으로 작다는 것을 의미한다. 이는 동남아시아에 대한 글로벌 경제위기의 부정적 영향이 상대적으로 작았다는 기존의 연구들의 주장과 일치한다.

주제어: 달러화 현상, 아시아 경제위기, 글로벌 경제위기, 예상평가 절하, 캄보디아, 라오스, 베트남