Real Shock or Nominal Shock? Exchange Rate Movements in Cambodia and Lao PDR

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Abstract

This paper discusses a primary factor responsible for exchange rate fluctuations of the Cambodian riel and the Laotian kip against the US dollar. The dynamic effects of real and nominal shocks are examined through applying a vector autoregression (VAR) model of real and nominal exchange rates under the assumption of the long-run neutrality of nominal shocks on real exchange rates. This approach allows us to decompose exchange rate movements into two components, real and nominal factors, in order to identify how these factors influence exchange rate fluctuations. The empirical analysis demonstrates that real shocks in direction of depreciation lead to real and nominal depreciation, while nominal shocks induce long-run nominal depreciation but real appreciation in the short-run.

Keywords: Real and nominal exchange rates; Real and nominal shocks; SVAR analysis; Cambodia and Lao PDR

1 Introduction

Cambodia and Lao PDR have experienced the process of economic transition toward a market economy. Exchange rates have been liberalized to fulfill the need for the market system with the introduction of the floating exchange rate regime. At the same time, international capital mobility has intensified the level of dollarization, coupled with exchange rate instability. Dollarization may mitigate a fear of floating by partially diminishing the impact of exchange rate fluctuations on the economy at the aggregate level.[1] However, exchange rates are still one of the main concerns for monetary authorities, since a large portion of people, especially low-income people, receive their daily earnings in the local currency, so that the standard living of such people is vulnerable to exchange rate instability.[2] Thus, exchange rate managements are now an important measure in mitigating external and internal imbalances as a nominal anchor in Cambodia and Lao PDR.[3]

It has been acknowledged that real and nominal exchange rates are closely related, and exchange rate movements in both real and nominal terms are crucial for determining the conditions for external trade in emerging economies, like Cambodia and Lao PDR. Given the

[1] Viaene and Vries (1992) among others point out that exchange volatility has an adverse effect to international trade for developing countries. Calvo and Reinhart (2002) emphasize a 'fear of floating' psychology, where many emerging countries are reluctant to allow exchange rate to move freely. This fear is caused by the lack of credibility associated with high exchange rate volatility, high pass-through from exchange rates to domestic prices, and the sizable foreign currency dominated debt.

[2] For example, only non-poor people earn their income in the US dollar, whereas the rest (the poor) receive their income in the riel (Beresford et al, 2004; Kang, 2005). Moreover, the durable products with a high price are sold in the US dollar, and the prices of goods in the supermarkets and some shops are also labeled in the US dollar while the local currency is used only for the change.

[3] To intensify international trade, most transitional economies have exploited from exchange rates manipulation into free trade market. Drabek and Brada (1998) mention that in the absence of tariffs and subsidies, the change in the level of exchange rates can increase the competitiveness equivalently.

fact, the purpose of this paper is to investigate sources of fluctuations in real and nominal exchange rates in Cambodia and Lao PDR. Assuming that real and nominal exchange rates are subject to two types of orthogonal shocks, real and nominal shocks, our analysis identifies these shocks affecting real and nominal exchange rates by using a structural vector autoregression (SVAR) model with the long-run neutrality restriction of Blanchard and Quah (1989).

There have been a lot of studies on exchange rate movements in emerging economies (Hinkle and Montiel, 1999; Ito and Krueger, 1999; Edwards and Savastano, 1999). The recent trend in emerging economies is that the exchange rate regime has been shifting toward nominal exchange rate flexibility, although often managed due to a fear of floating. Moreover, since the real exchange rate is typically considered as a measure of international competitiveness, some emerging countries seem to pursue the exchange rate policies that try to set the real exchange rate at some target level through adjusting the nominal exchange rate (see Silva, 1999). Furthermore, some works, such as Sachs, Tornell, and Velasco (1996), Corsetti, Pesenti, and Roubini (1999), and Ha, Lee, and Cheong (2007), emphasize that real exchange rates have been related to currency crises in many emerging economies.

A number of studies investigate source of exchange rate fluctuations by decomposing the exchange rate series into the components induced by real and nominal factors. By using structural VAR model with the long-run neutrality restriction of Blanchard and Quah (1989), Latrapes (1992), Evans and Lothian (1993), Clarida and Gali (1994), and Enders and Lee (1997)

study the exchange rate movements in developed countries. Kim and Enders (1991) examine real

and nominal causes of real exchange rate movements in the Pacific Rim nations and show some

evidence of the long-run neutrality of nominal shocks. Dibooglu and Kutan (2001) demonstrate

that nominal shocks are a dominant source in determining real exchange rate movements in

Poland, while real shocks are dominant in Hungary. Moreover, Chowdhury (2004) reveals that

real shocks dominate nominal shocks in six emerging countries, and Ha, Lee, and Cheong (2007)

also finds that exchange rate fluctuations are primarily a result of real shocks in Korea.

To the best of our knowledge, few studies exist on exchange rate movements of

Cambodia and Lao PDR, and thus this study would be one of the first attempts to analyze on

exchange rate fluctuations in these countries.[4] Similar to the previous work, this paper attempts

to decompose real and nominal exchange rate fluctuations into real and nominal factors through

applying a SVAR model with the long-run neutrality restriction in that nominal shocks have only

a short-run effect but no long-run effect on real exchange rates. Real shocks are associated with a

change in economic fundamentals, such as technology and preference, while nominal shock with

a change in nominal variables, such as money supply. Lastrapes (1992) and Evans and Lothian

(1993) among others interpret temporary shocks as nominal disturbances and permanent shocks

as real disturbances. Ha, Lee, and Cheong (2007) regard real shocks as fundamental disturbances,

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[4] Exception may include the work of Joyeux and Worner (1997, 1998). Joyeux and Worner (1997)
examine stabilization policies and the bilateral exchange rate movements between Thailand and Lao PDR,
and Joyeux and Worner (1998) investigate the long-run PPP and exchange rate mechanism in Cambodia.
However, they do not examine the source of exchange rate fluctuations, which is our focus of this paper.

which come mainly from the term of trade, productivity differentials, and government expenditures, and nominal shocks as non-fundamental disturbances, such as multiple equilibria associated with self-fulfilling expectations.

Our empirical result from the SVAR analysis demonstrates that real shocks in direction of depreciation lead to real and nominal depreciation. The analysis also shows that nominal shocks in the direction of depreciation induce short-run real appreciation and long-run nominal depreciation. Moreover, real and nominal shocks appear to be more significant in Lao PDR than in Cambodia. Furthermore, the result of variance decompositions presents that real shocks have a stronger impact and dominate nominal shocks in explaining exchange rate movements in Cambodia and Lao PDR. We also discuss several economic implications based on our estimated results related to the impacts of nominal and real shocks on nominal and real exchange rates.

The remaining of this paper is organized as follows. Section 2 describes recent development of exchange rates in Cambodia and Lao PDR. Section 3 conducts empirical analysis of exchange rate movements through decomposing the fluctuations of exchange rates into nominal and real components for the Cambodian riel and the Laotian kip. Related economic intuitions are also discussed. Section 4 provides some conclusions.

2   Recent Development in Cambodia and Lao PDR

Cambodia and Lao PDR are neighboring countries. Besides geographically adjacent location,

they have shared a similar phase of development from civil war to peace building, international

integration, and economic development. Concerning political systems, Cambodia adopted a

constitutional monarchy and a multi-party government system in the early 1990s, while Lao PDR

still maintains single-party government system. However, Cambodia and Lao PDR share a

similar trend in the evolution of economic transitions, including monetary and exchange rate

policies. According to the IMF's categories of exchange rate regime ('de facto classification of

exchange rate regimes and monetary policy framework' as of December 2005), Cambodia and

Laos PDR employ the same exchange rate regime, namely, managed floating with no

predetermined path for the exchange rate. Figures 1 and 2 present nominal and real exchange

rates of the Cambodian riel and the Laotian kip against the US dollar.[5]

Cambodia

Cambodia marked the turning of political and economic transition from a communist

government toward the multi-party system and from a planning economy to a market economy in

the early 1990s. At the beginning of this transition period, institutional development was fragile,

and the inflation rate was very volatile (see Joyeux and Worner, 1998). Figure 3 shows the log of

the price level measured by CPI in Cambodia, Lao PDR, and the US.[6] In Cambodia, the inflation

rate has been relatively stable and a little bit higher than in the US. This successful stability can

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[5] All graphs in Figures 1 and 2 show the logs of the exchange rate by setting the first period's exchange
rate at log(100).
[6] All graphs in Figure 3 show the logs of the CPI by setting the first period's CPI at log(100).

be attributed to sound monetary policies of the National Bank of Cambodia (NBC) with a high level of dollarization. However, the Cambodian riel lost its value drastically against the US dollar during the period from 1997 to 1998, due to the commodity and currency speculation and various restrictions put by foreign donors, associated with the 1997 political crisis and the 1997 Asian crisis (Figure 1). Since the late 1990s, the Cambodian riel has been relatively stable in nominal terms with a depreciating trend, although the spike in inflation appeared in 2007 and 2008.

Following the national election in 1993, there was a huge inflow of the US dollars into the country through trade, grant aid, loan, remittance, and foreign direct investment. This capital mobility has been stirring up the level of dollarization, although coupled with the instability of the Cambodian riel.[7] According to the NBC's quarterly report in 2007, the estimation of foreign currencies, mainly the US dollar, in the domestic markets is estimated to be approximately 90% of the banknotes in circulation. The Cambodian riel consists of only 8% of total money supply in the form of banknotes and bank deposits. As in conventional economic theories, dollarization would restrict the independency of monetary policy in Cambodia, i.e., monetary policy is difficult to implement effectively because of the high level of dollarization and absence of indirect instruments.

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[7] For a brief discussion of dollarization of Cambodia, Lao PDR, and Vietnam, see Watanabe (2006).

Lao PDR

The Bank of Lao was officially established as a central bank in 1990 and has been responsible

for its basic functions as well as controlling monetary policies for macroeconomic stabilization.

The 1997 Asian financial crisis starting from Thailand affected the Laotian economy and caused

the Laotian kip to be depreciated tremendously (Figure 2). In order to avoid spreading the loss of

confidence in the Laotian kip, contractionary monetary policy should have been required at that

time. Instead, extrabudgetary expenditures were implemented through drastic expansionary

monetary policies (see Iweala, Kwakwa, Beckwith, and Ahmed, 1999). As a result of huge

money expansion, the inflation rate was driven up tremendously associated with exchange rate

depreciation. Figure 3 shows that the Laotian inflation increased drastically after 1997, far higher

than that in Cambodia and the US. Such high inflation rates induced a large gap between nominal

and real exchange rates of the Laotian kip against the US dollar.

Like Cambodia, the level of dollarization in Lao PDR is also high so that typical

monetary policies may be ineffective. The ratio of foreign currencies (mostly the US dollar and

the Thai baht) to M2 amounts to 69% on average from 1997 to 2004. This might not reflect the

actual overwhelming level of dollarization since there is a huge amount of unaccountable foreign

currencies in the markets. Joyeux and Worner (1998) emphasize that the high dollarization of

these two developing countries, Cambodia and Lao PDR, could attribute to the broad economic

integration as well as the rapid economic growth in the Mekong region through intensifying

cross-border trades.

3 Empirical Analysis

3.1 Identification and Data

This section illustrates the model identification and data for the present study. The methods

employed in this paper largely rely on the works of Lastrapes (1992), Evans and Lothian (1993),

Clarida and Gali (1994), Enders and Lee (1997), Chowdhury (2004), and Ha, Lee, and Cheong

(2007), which are based on the technique developed by Blandhard and Quah (1989).

3.1.1 Model Specification

It is assumed that observed real and nominal exchange rates are subject to two types of

orthogonal shocks. The first shock is a "real shock," which mainly comes from fundamental

disturbances related to various structural macroeconomic conditions, such as resource

endowments, technology, and preference. This type of shocks generally affects the terms of trade

and international competitiveness. The second shock is a "nominal shock," which mainly

originates from non-fundamental disturbances, such as nominal money supply shocks and the

exchange rate devaluation. The nominal shock is not directly related to macroeconomic

conditions.

      To provide some important insights on the sources of real and nominal exchange rate

movements, we apply a bivariate SVAR analysis of real and nominal exchange rates through

decomposing the variables into real and nominal shocks. Although the two shocks, real and

nominal shocks, are not directly observable, they could be inferred from the examination of their

joint behavior with the long-run neutrality restriction that a nominal shock has no long-run or

permanent impact on real exchange rates. This restriction could be appropriate since the real

exchange rate, as a relative price between domestic and foreign prices, is consistent with

conventional economic models of exchange rate movements (see, e.g., Lastrapes, 1992).

The long-run neutrality restriction on SVAR models is applied for various issues, such

as the identification of fundamental economic shocks (see, e.g., Blanchard and Quah, 1989;

Shapiro and Watson, 1988; King, Plosser, Stock, and Watson, 1991, for the work on the sources

of business cycle fluctuation in the US). Notice that this study does not statistically test the

neutrality restriction in the SVAR model, but the restriction is simply required to make the

structural disturbances just-identified and to examine the dynamic behaviors of these shocks on

real and nominal exchange rates.[8]

To identify the sequence of real and nominal shocks to exchange rates, we consider the

infinite moving average representation in the structural shocks, following Lastrapes (1992) and

Enders and Lee (1997) among others:

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[8] See Huizinga (1987) and Mark (1990) for study on exchange rate movements without the long-run neutrality restriction.

$$\begin{bmatrix} \Delta r_t \\ \Delta n_t \end{bmatrix} = \begin{bmatrix} B_{11}(L) & B_{12}(L) \\ B_{21}(L) & B_{22}(L) \end{bmatrix} \begin{bmatrix} e_{rt} \\ e_{nt} \end{bmatrix}, \tag{1}$$

where r_t and n_t are the natural log of real and nominal exchange rates in period t,

respectively; e_{rt} the real shock in period t; e_{nt} the nominal shock in period t; Δ the

first-difference operator; $B_{ij}(L)$ a polynomial in the lag operator L. By construction, we assume

that the innovations are normalized with $\text{var}(e_t) = I$, that real and nominal exchange rates are

non-stationary and non-cointegrated, and that the first-differences of real and nominal exchange

rates are stationary.

To impose the long-run neutrality restriction that nominal shocks have only a short-run

effect but no long-run effect on real exchange rates, we consider the restriction that the sum of

the coefficients in $B_{12}(L)$ is equal to zero, that is:

$$\sum_{k=0}^{\infty} b_{12}(k) = 0, \tag{2}$$

where $b_{12}(k)$ is the k-th coefficient in $B_{12}(L)$ and represents the effect of the nominal shocks,

e_{nt}, on the first-difference of the real exchange rate, Δr_t, after k periods. Thus, the restriction (2)

simply implies that the cumulative effect of e_{nt} on Δr_t is zero, i.e., nominal shocks have no

long-run effects on real exchange rates.

Some literature treats real and nominal shocks in a different, but related ways under the

assumption of the long-run money neutrality. For example, Chowdhury (2004) interprets the two

structural shocks as permanent and temporary disturbances. Moreover, Ha, Lee, and Cheong

(2007) call the two structural shocks as fundamental and non-fundamental disturbances. The

fundamental shock originates from structural macroeconomic conditions, resulting in permanent

changes in real and nominal exchange rates. In contrast, the non-fundamental shock stems from

monetary, non-fundamental factors, and has a permanent effect on nominal exchange rates but

only a temporary effect on real exchange rates due to the long-run money neutrality.

Chen and Wu (1997) mention some potential problems related to the interpretation of

the two structural shocks as real and nominal shocks. First, nominal shocks could have

permanent impacts on real exchange rates, as emphasized in the work of Baldwin (1988).

Although we admit this issue, the SVAR model with the long-run neutrality restriction would be

appropriate for our primary purpose, as long as this impact is relatively small compared to that of

real shocks, as shown in Blanchard and Quah (1989). Second, in reality exchange rates are

subject to various types of shocks, so that the model with only two structural shocks may be

inappropriate. However, since it is difficult to identify and test multiple shocks, the discussion

under the assumption of the two structural shocks would be helpful to access the sources of

exchange rate movements as an approximate methodology.

3.1.2 Data

The data are from the *International Financial Statistics* (IFS) of International Monetary Fund.

We use monthly data on nominal exchange rates and price level series from January 1995 to

December 2008. Nominal exchange rates are average-of-period rates and are expressed as

national currency units per the US dollar. The real exchange rates are obtained by adjusting the

nominal exchange rates with the ratio of the US price levels to domestic price levels. Consumer

price index is used as a measure of the price level. The log-level real exchange rate r_t is given

by $r_t = n_t - p_t + p_t^*$, where n_t is the log of the nominal exchange rate, p_t is the log of the

domestic price level, and p_t^* is the logs of the foreign price level (i.e., the US price level).

Table 1 presents the descriptive statistics of the differenced logs of nominal and real

exchange rates for the Cambodian riel and the Laotian kip against the US dollar. The volatility of

real exchange rates is almost the same as that of nominal exchange rates for the Laotian kip,

while the volatility of nominal exchange rates is smaller than that of real exchange rates for the

Cambodian riel. The average nominal depreciation rate is larger than the average real

depreciation rate for both currencies, which implies that both countries have experienced

relatively higher inflation compared to the US. In particular, the large gap between the average

nominal and real depreciation rates in Lao PDR reflects the significant inflation during the late

1990s. This phenomenon can be explained by inappropriate policies, such as huge injection of

money supply, by the Laotian authority in order to cope with the effect of financial turmoil in

1997, while Cambodia responded to the crisis with more appropriate policies (see Iweala,

Kwakwa, Beckwith, and Ahmed, 1999).

Table 2 shows the correlations among the first-differenced logs of nominal and real

exchange rates and domestic price level (CPI) for each country. Both countries have a similar

result. Nominal exchange rates are positively correlated with real exchange rates in terms of monthly returns. Moreover, inflation rates are associated with real appreciation but are associated with nominal depreciation for both countries.

3.2   Estimation

Before we conduct the formal estimation of the SVAR model, there are several preliminaries needed to do. First of all, we test the unit root for the real and nominal exchange rates to examine whether the variables getting into the SVAR model are all stationary. The augmented Dickey-Fuller (ADF) tests show that, for both countries, log-levels of real and nominal exchange rates are not stationary, but the first-differences of real and nominal exchange rates are stationary (Table 3). The non-stationarity of real exchange rates implies that the purchasing power parity (PPP) appears to be violated in the long-run for the underlying countries. This result could be consistent with the argument that the long-run PPP does not hold for most emerging economies, although it is controversial whether the long-run PPP holds for developed economies (see for example, Gan,1994; Taylor, 1995; Calvo, Reinhart, and Vegh, 1995).[9]

As another preliminary analysis, we check the long-run relationship between the first-differences of real and nominal exchange rates through examining whether the two non-stationary series are cointegrated for each country. We conduct a cointegration test through

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[9] Joyeux and Worner (1998) show the evidence supporting the relative version of the PPP hypothesis for Cambodia over the sample period from January 1991 to April 1997.

applying the two-step method of Engle and Granger (1987). For each country, the residuals are

obtained by regressing nominal exchange rates on real exchange rates, and then the derived

residual series are tested for the non-stationarity. The estimated results in Table 3 suggest that the

residual series is non-stationary for both countries, which implies that real and nominal exchange

rates are not cointegrated, i.e., there could be no clear exchange rates equilibrium in the long-run

for Cambodia and Lao PDR.

Given that real and nominal exchange rates are non-stationary at the level but stationary

at the first-difference, and that they are not cointegrated, the SVAR specification can be

appropriate to examine the dynamic effects of real and nominal shocks on real and nominal

exchange rates.

3.2.1   Impulse Response Functions

To investigate the effect of each type of shocks on the real and nominal exchange rates, we

estimate the SVAR model and compute impulse response functions (IRFs) for each country.

Figure 4 illustrates the dynamic response of real exchange rates to one standard deviation of real

and nominal shocks over a horizon up to 20 months. Figure 5 shows the dynamic response of

nominal exchange rates to one standard deviation of real and nominal shocks. Each plot is shown

in terms of cumulative sums of the differenced dynamics. Notice that a positive response of

exchange rates to a shock implies a depreciation of the domestic currency in this study. Our

results from the derived IRFs are summarized as follows.

We begin by analyzing the impact of a real shock on exchange rates of the Cambodian riel and the Laotian kip (Figures 4 and 5). The response of real and nominal exchange rates to a real shock is positive with a persistent nature for both currencies. A real shock could induce a long-run real and nominal depreciation of both currencies, so that exchange rates converge to a new long-run equilibrium level. In addition, the dynamic response of nominal exchange rates to a real shock is with a similar magnitude as that of real exchange rates to a real shock particularly for Lao PDR. This implies that permanent changes in real exchange rates due to a real shock are mainly associated with changes in nominal exchange rates, but not so much with relative price levels.[10] Moreover, neither currency exhibits any clear evidence of overshooting in response to a real shock.

If technology shock is considered as one type of real shocks, the impact of a real shock on real exchange rates can be discussed in the framework of the Balassa-Samuelson argument in that real exchange rate movements in the long-run could be explained by the productivity growth in tradable sectors (see Balassa, 1964; Samuelson, 1964).[11] Based on this argument, a positive technology shock should induce real appreciation of exchange rates. Our results in Figure 4 illustrate that Cambodia has a relatively small response of real exchange rates to a real shock (around 0.02 in the long-run), while Lao PDR has a relatively large response (around 0.06 in the

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[10] This result is consistent with evidence reported for other countries. See Lastrapes (1992), Enders and Lee (1997), Chowdhury (2004), and Ha, Lee, and Cheong (2007).

[11] This argument of the Balassa-Saamuelson theory is also discussed in Chowdhury (2004).

long-run). In other words, a positive technology shock would induce a relatively small real appreciation in Cambodia, while it would a relatively large real appreciation in Lao PDR.

The different degree of real appreciation in response to a technology shock has an important implication for these two countries. For the Cambodian case with a relatively small response of real appreciation to a technology shock, it is more likely that the Cambodian riel achieves less-intense real appreciation compared to the degree of real appreciation insisted by the Balassa-Samuelson argument. This implies that a technology shock might cause the Cambodian riel to be under-valued. On the other hand, for the Laotian case with a relatively large response of real appreciation to a technology shock, the Laotian kip is likely to achieve more-intense real appreciation compared to the Balassa-Samuelson argument's suggestion. In this situation, a technology shock would cause the Laotian kip to be over-valued, so that the currency might be vulnerable to a higher risk of the currency crisis.

We now turn to analyze the effect of a 'nominal' shock on exchange rates of the Cambodian riel and the Laotian kip. For both currencies, the response of real exchange rates to a nominal shock is negative with real appreciation at the initial stage, but it converges to zero within one year. This long-run zero-effect of a nominal shock on real exchange rates is due to the identification restriction of the long-run neutrality. On the other hand, the response of nominal exchange rates to a nominal shock is permanently positive with nominal depreciation. As mentioned in Lastrapes (1992) and Ha, Lee, and Cheong (2007), this non-zero response of

nominal exchange rates to a nominal shock implies that a nominal shock could lead to a

permanent divergence between nominal and real exchange rates so that the relative prices are

permanently changing. This result would be related to why nominal exchange rates are not

cointegrated with real exchange rates. Moreover, there is no clear evidence supportive of

overshooting in response to a nominal shock, in contrast to the cases of Malaysia in Chowdhury

(2004) and of Germany in Lastrapes (1992).

In contrast to the cases of various countries, as shown in Chowdhury (2004) and Ha,

Lee, and Cheong (2007), our results show that a nominal shock is not associated with the

negative or opposite response of nominal exchange rates. This implies no clear evidence

supporting the famous exchange rate puzzle that nominal shocks, like an increase in money stock

as a result of huge capital flows, lead to an appreciation of the currency rather than a depreciation,

as studied in Grilli and Roubini (1996) and Ha, Lee, and Cheong (2007).

Enders and Lee (1997) argue that nominal shocks seem to have an insignificant role in

inducing exchange rate fluctuations. Our estimation, however, shows that nominal shocks have a

more significant effect on real and nominal exchange rates in Lao PDR than in Cambodia. Given

the fact that Lao PDR is a high inflation country, while Cambodia is a low inflation country, this

finding could be supported by the conjecture that countries with inflationary monetary policy

experience more significant effect of nominal shocks on real and nominal exchange rates.

Our results also give us some additional implications. Since a real shock induces a jump

in real and nominal exchange rates with almost the same magnitude particularly for Lao PDR, the implied relative price $p - p^*$ does not change significantly in response to a real shock (recall that $r_t = n_t - (p_t - p_t^*)$). On the other hand, since a nominal shock induces a rise in nominal exchange rates but a decline in real exchange rates at the initial stage, the implied relative price $p - p^*$ must increases, and thus a nominal shock induces a rise in the domestic price at the initial stage for both countries. As time goes on, the effect of a nominal shock on nominal exchange rates increases with the long-run neutrality of nominal shocks on real exchange rates, and thus a nominal shock could induce a rise in the domestic price in the long-run for both countries. This argument could be consistent with that of Enders and Lee (1997).

Furthermore, the response of nominal exchange rates to a nominal shock is smaller than that to a real shock during the early stages for both countries, but it ends up surpassing that to a real shock over the period after 4 months for Cambodia and after 15 months for Lao PDR. In explaining nominal depreciation for both countries, real shocks play an important role at the early stages, while nominal shocks become more pronounced during the late stages.

3.2.2   Variance Decompositions

Real and nominal exchange rates are represented by a dynamic combination of real and nominal shocks. Variance decompositions (VDCs) are a different way to summarize the information

contained in the moving-average (MA) representation; exchange rate series can be decomposed into real and nominal shocks. The VDC is used to assess the relative contribution to forecast error variance of each shock. While the IRF reveals the dynamic effects of a one-time shock, the VDC measures the relative importance of such shocks. Table 4 summarizes the result of the VDC for the log-differenced variables of real and nominal exchange rates for the periods up to 20 months. Note that Table 4 reports only the relative contribution of forecasted error variance that can be explained by a real shock.

For Cambodia, the relative contribution of a real shock in explaining the variation of real exchange rates is initially 92%, but it steadily declines to 87% with an increase in forecasting horizon. On the other hand, the relative contribution of a real shock explains about 62% of the variation of nominal exchange rates, and it also steadily declines to around 60% with an increase in forecasting horizon. For Lao PDR, the real shock explains 90% of the variation of real exchange rates over the entire horizon, while the relative contribution of a real shock on the variation of nominal exchange rates is initially 91% but it steadily declines to 75% with an increase in forecasting horizon.

In sum, real shocks play more important roles in explaining the variation of real and nominal exchange rates in both countries. This result would be consistent with the high importance of real shocks in most developed and emerging countries (Lastrapes, 1992; Enders and Lee, 1997; Chowdhury, 2004), but is in contrast to the high importance of nominal shocks in

Korea (Ha, Lee, and Cheong, 2007).

4 Conclusion

This paper has investigated the sources of the movements of real and nominal exchange rates in

Cambodia and Lao PDR by employing a structural VAR model. By defining shocks as real and

nominal shocks, our main results have demonstrated that real shocks in direction of depreciation

lead to real and nominal depreciation, while nominal shocks induce long-run nominal

depreciation but real appreciation in the short-run. We have also discussed several important

implications based on our results.

Two distinct differences in exchange rate dynamics between the Cambodian riel and the

Laotian kip should be emphasized. First, the relatively small response of exchange rates to a

nominal shock in Cambodia and the relatively large response to a nominal shock in Lao PDR

would be consistent with the argument that nominal shocks seem to have less significant roles in

inducing exchange rate movements for the low inflation economy. Second, the different degree

of real appreciation in response to a technology shock for Cambodia and Lao PDR suggests that

a technology shock might cause the Cambodian riel to be under-valued but the Laotian kip to be

over-valued. This reveals that the Laotian kip might be more vulnerable to a possible currency

crisis.

Notice that a significant impact of real shocks on exchange rates could provide some

implications from a policy point of view. Cambodia and Lao PDR now adopt the de facto

managed floating exchange rate regime, partly due to a fear of floating (see, e.g., Calvo and

Reinhart, 2002). Under this regime, the objective of monetary and exchange rate policies in

emerging countries, like Cambodia and Lao PDR, should be to make an effort in offsetting the

effect of real shocks for the purpose of economic stabilization.

Our empirical model specification might be too simple since it would be difficult to

capture any possible shocks by decomposing the shocks into only two types of shocks, nominal

and real shocks. In practice, exchange rate policy is complicated by the fact that policy makers

cannot identify, ex ante, whether the shock being felt is real or nominal, nor whether it is

temporary or permanent. At the same time, it should also be noted that there might exist some

structural changes over the sample period due to the changes in economic policies and economic

environments. Although we admit these issues to be addressed, it is our belief that this paper

could contain some important implications on exchange rate movements in Cambodia and Lao

PDR, and we hope that more careful researches would be conducted in the near future.

References

Balassa, B. (1964). The Purchasing Power Parity Doctrine: A Reappraisal. Journal of Political
    Economy, 72, pp. 584-596.

Balwin, R.E. (1988). Hysteresis in Import Prices: The Beachhead Effect. American Economic
    Review, 78, pp. 773-785.

Beresford, M., S. Nguon, R. Roy, S. Sau, and C. Namazie (2004). The Macroeconomics of Poverty Reduction in Cambodia. United Nations Development Programme, Phnom Penh.

Blanchard, O. and D. Quah (1989). The Dynamic Effects of Aggregate Demand and Supply Disturbances. American Economic Review, 79, pp. 655-673.

Calvo, G.A. and C.M. Reinhart (2002). Fear of Floating. Quarterly Journal of Economics, 2, pp. 379-408.

Calvo, G.A., C.M. Reinhart, and C.A. Vegh (1995). Targeting the Real Exchange Rate: Theory and Evidence. Journal of Development Economics, 47, pp. 97-133.

Chanthachack, S. (2009). Laos's Experience on Monetary Policy in Recent Year. Regional High-Level Workshop on Strengthening the Response to the Global Financial Crisis in Asia-Pacific, United Nations Economic and Social Commission for Asia and the Pacific.

Chen, S. and K. Wu (1997). Sources of Real Exchange Rate Fluctuations: Empirical Evidence from Four Pacific Basin Countries. Southern Economic Journal, 63, pp. 776-787.

Chowdhury, I.S. (2004). Sources of Exchange Rate Fluctuations: Empirical Evidence from Six Emerging Market Countries. Applied Financial Economics, 14, pp. 697-705.

Clarida, R.H. and J. Gali (1994). Sources of Real Exchange Rate Fluctuations: How Important are Nominal Shocks?. Carnegie Rochester Conference Series on Public Policy, 41, pp. 1-56.

Corsetti, G., P. Pesenti, and N. Roubini (1999). What Caused the Asian Currency and Financial Crisis?. Japan and the World Economy, 11, pp. 305-373.

Dibooglu, S. and A.M. Kutan (2001). Source of Real Exchange Rate Fluctuations in Transition Economies: The Case of Poland and Hungary. Journal of Comparative Economics, 29, pp. 257-275.

Drabek, Z. and J.C. Brada (1998). Exchange Rate Regimes and the Stability of Trade Policy in Transition Economies. Journal of Comparative Economics, 26, pp. 642-668.

Edwards, S. and M.A. Savastano (1999). Exchange Rates in Emerging Economies: What do We Know? What do We Need to Know?. NBER Working Paper, No. 7228.

Enders, W. and B. Lee (1997). Accounting for Real and Nominal Exchange Rate Movements in the Post-Bretton Woods Period. Journal of International Money and Finance, 16, pp. 233-254.

Engle, R.F. and C.W.J. Granger (1987). Cointegration and Error Correction: Representation, Estimation and Testing. Econometrica, 55, pp. 233-254.

Evans, M.D.D. and J.R. Lothian (1993). The Response of Exchange Rates to Permanent and Transitory Shocks under Floating Exchange Rates. Journal of International Money and Finance, 12, pp. 563-586.

Gan, W. (1994). Characterizing Real Exchange Rate Behaviour of Selected East Asian Economies. Journal of Economic Development, 19, pp. 67-92.

Grilli, V. and N. Roubini (1996). Liquidity Models in Open Economies: Theory and Empirical Evidence. European Economic Review, 40, pp. 847-859.

Ha, I., B. Lee, and C. Cheong (2007). What Caused the Korean Currency Crisis in 1997?: Weak Fundamentals or Self-fulfilling Expectations. Asian Economic Journal, 21, pp. 195-206.

Hinkle, L.E. and P.J. Montiel (1999). Exchange Rate Misalignment: Concepts and Measurement for Developing Countries. Oxford University Press, Oxford and New York.

Huizinga, J. (1987). An Empirical Investigation of the Long Run Behavior of Real Exchange Rate. Carnegie-Rochester Conference Series on Public Policy, 27, pp. 149-215.

Ito, T. and A.O. Krueger (1999). Changes in Exchange Rates in Rapidly Developing Countries: Theory, Practice, and Policy Issues. NBER-East Asia Seminar on economics, Vol. 7., University of Chicago Press, Chicago and London.

Iweala, N.O., V. Kwakwa, R. Beckwith, and Z. Ahmed (1999). Impact of Asia's Financial Crisis on Cambodia and the Lao PDR. International Monetary Fund, Finance and Development,

Quarterly magazine of the IMF No. 3/36.

Joyeux, R. and W.E. Worner (1997). Stabilization Policies and Exchange Rate Determination in Laos. In Than, M. and J.L.H. Tan (eds.), Laos's Dilemmas and Options: The Challenge of Economic Transition in the 1990s, Institute of Southeast Asian Studies, Singapore, St. Martin's Press.

Joyeux, R. and W.E. Worner (1998). Price and Exchange Rate Determination between the Mekong River Economies of Cambodia and Thailand. Journal of the Asia Pacific Economy, 3, pp. 424-445.

Kang, K. (2005). Is Dollarization Good for Cambodia?. Global Economic Review, 34, pp. 201-211.

Kim, J.O. and W. Enders (1991). Real and Monetary Causes of Real Exchange Rate Movements in the Pacific Rim. Southern Economic Journal, 57, pp. 1061-1070.

King, R., C. Plosser, J. Stock, and M. Watson (1991). Stochastic Trends and Economic Fluctuations. American Economic Review, 81, pp. 819-839.

Lastrapes, W.D. (1992). Sources of Fluctuations in Real and Nominal Exchange Rates. Review of Economics and Statistics, 74, pp. 530-539.

Mark, N.C. (1990). Real and Nominal Exchange Rates in the Long-run: An Empirical Investigation. Journal of International Economics, 28, pp. 115-136.

Sachs, J., A. Tornell, and A. Velasco (1996). The Mexican Peso Crisis: Sudden Death of Death Foretold?. Journal of International Economics, 41, pp. 265-283.

Samuelson, P. (1964). Theoretical Notes on Trade Problems. Review of Economics and Statistics, 46, pp. 145-154.

Shapiro, M. and M. Watson (1988). Sources of Business Cycle Fluctuations. NBER Macroeconomics Annual.

Silva, M.L.F. (1999). Modern Exchange-Rate Regimes, Stabilisation Programmes and

Co-ordination of Macroeconomic Policies. Aldershot, Brookfield.

Taylor, M.P. (1995). The Economics of Exchange Rates. Journal of Economic Literature, 33, pp. 13-47.

Viaene, J.M. and C.G. de Vries (1992). International Trade and Exchange Rate Volatility. European Economic Review, 36, pp. 1311-1321.

Watanabe, S. (2006). Dollarization, Remittances, and Monetary Policies in Cambodia, Lao PDR, and Vietnam. Asian Development Bank Institute.

Table 1: Descriptive Statistics of Nominal and Real Exchange Rates

	Δr	Δn
Cambodia		
Average	-0.0000	0.0026
Standard Deviation	0.0185	0.0169
Lao PDR		
Average	-0.0005	0.0148
Standard Deviation	0.0431	0.0494

Note: Δr is the first difference of logarithm of the real exchange rate and Δn is the first difference of logarithm of the nominal exchange rate.

Table 2: Summary Statistic: Correlations Matrix

Cambodia					Lao PDR			
	Δr	Δn	Δp			Δr	Δn	Δp
Δr	1	-	-		Δr	1	-	-
Δn	0.66	1	-		Δn	0.50	1	-
Δp	-0.47	0.32	1		Δp	-0.16	0.78	1

Note: Δr is the first difference of logarithm of the real exchange rate, Δn is the first difference of logarithm of the nominal exchange rate, and Δp is the first difference of the logarithm of the consumer price index.

Table 3: Stationarity and Cointegration Tests

Country/Variable	Level		First-Difference	
	ADF Test	PP Test	ADF Test	PP Test
Cambodia				
n	-2.28	-1.13	-8.85*	-9.76*
r	-1.16	-1.15	-10.99*	-10.98*
u_t	-1.097	-0.11		
$n = \underset{(0.60)}{-1.20} + \underset{(0.07)}{1.15}r + u_t$				
$R^2 = 0.60$				
Lao PDR				
n	-2.63	-2.60	-7.73*	-7.89*
r	-2.01	-1.79	-9.42*	-9.09*
v_t	-1.13	-1.04		
$n = \underset{(-3.27)}{-16.50} + \underset{(0.35)}{2.71}r + v_t$				
$R^2 = 0.26$				

Note: n is the Logarithm of the nominal exchange rate, and r is the logarithm of the real exchange rate. The lag length was selected basing on Schwarz's Bayesian Information Criterion. * represents statistical significance at 1%. Numbers in parentheses below the coefficients are standard error.

Table 4: Variance Decompositions of Real and Nominal Exchange Rates

| Forecast Horizon	Cambodia Relative Contribution of Real Shock to			Lao PDR Relative Contribution of Real Shock to	
	Δr	Δn		Δr	Δn
1-month	92.03	62.42		90.26	90.78
2-month	92.12	62.84		90.62	90.24
4-month	91.30	61.46		90.39	80.84
6-month	87.94	60.39		90.02	77.26
8-month	87.40	60.37		89.85	75.88
10-month	87.39	60.37		89.78	75.32
12-month	87.38	60.38		89.75	75.10
14-month	87.38	60.38		89.74	75.01
16-month	87.38	60.37		89.73	74.97
18-month	87.38	60.37		89.73	74.95
20-month	87.38	60.37		89.73	74.95

Note: Δr is the first difference of logarithm of the real exchange rate and Δn is the first difference of logarithm of the nominal exchange rate. Contribution of a nominal shock is 100 minus the contribution of a real shock.

Figure 1: Cambodian Nominal and Real Exchange Rates
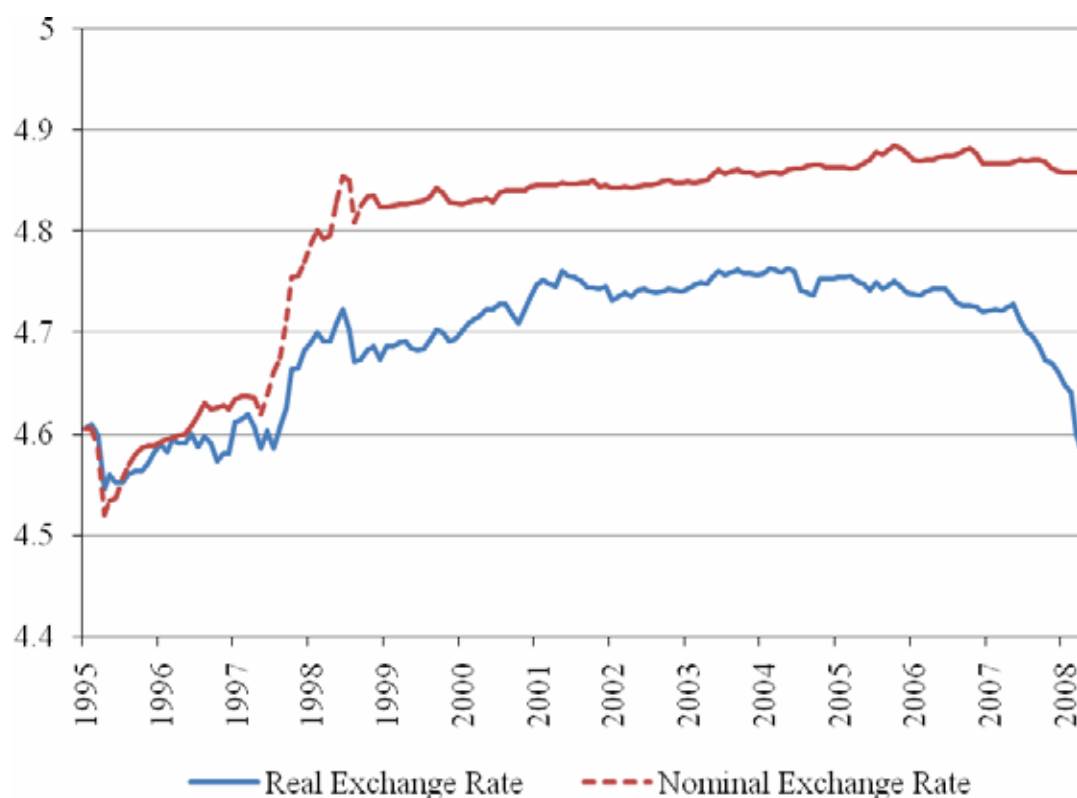
Note: The solid line indicates the logarithm of the real exchange rate. The dashed line indicates the logarithm of the nominal exchange rate. The exchange rates in the first period (January 1985) are set to log(100).
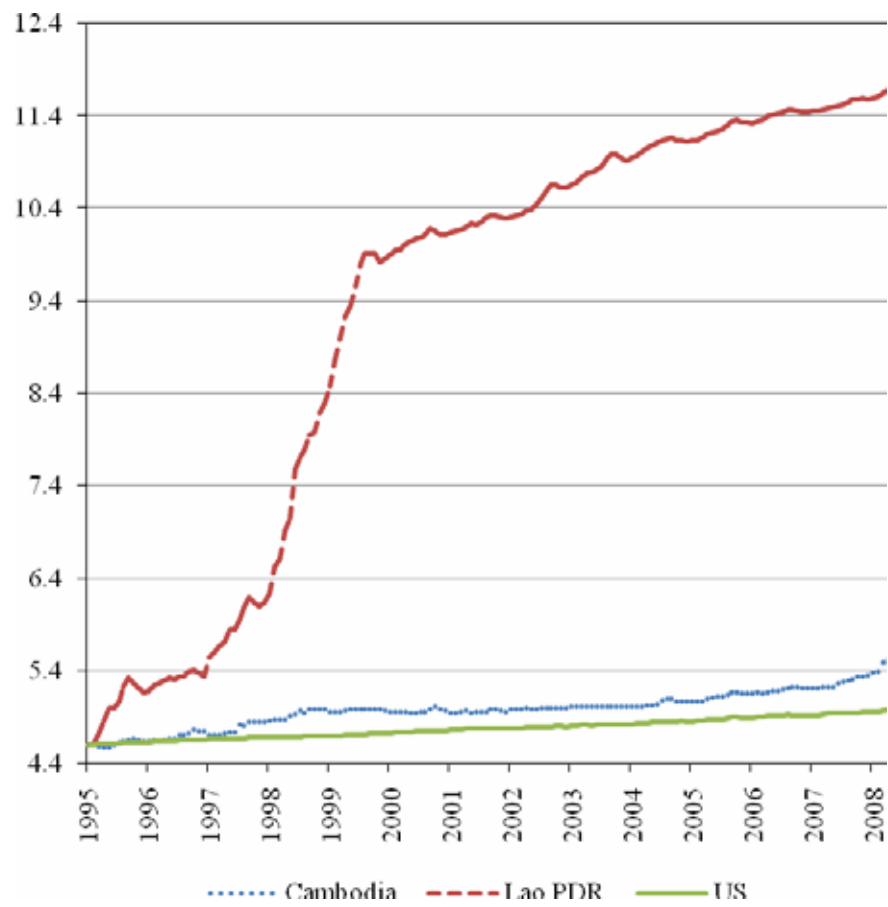
Figure 2: Laotian Nominal and Real Exchange Rates
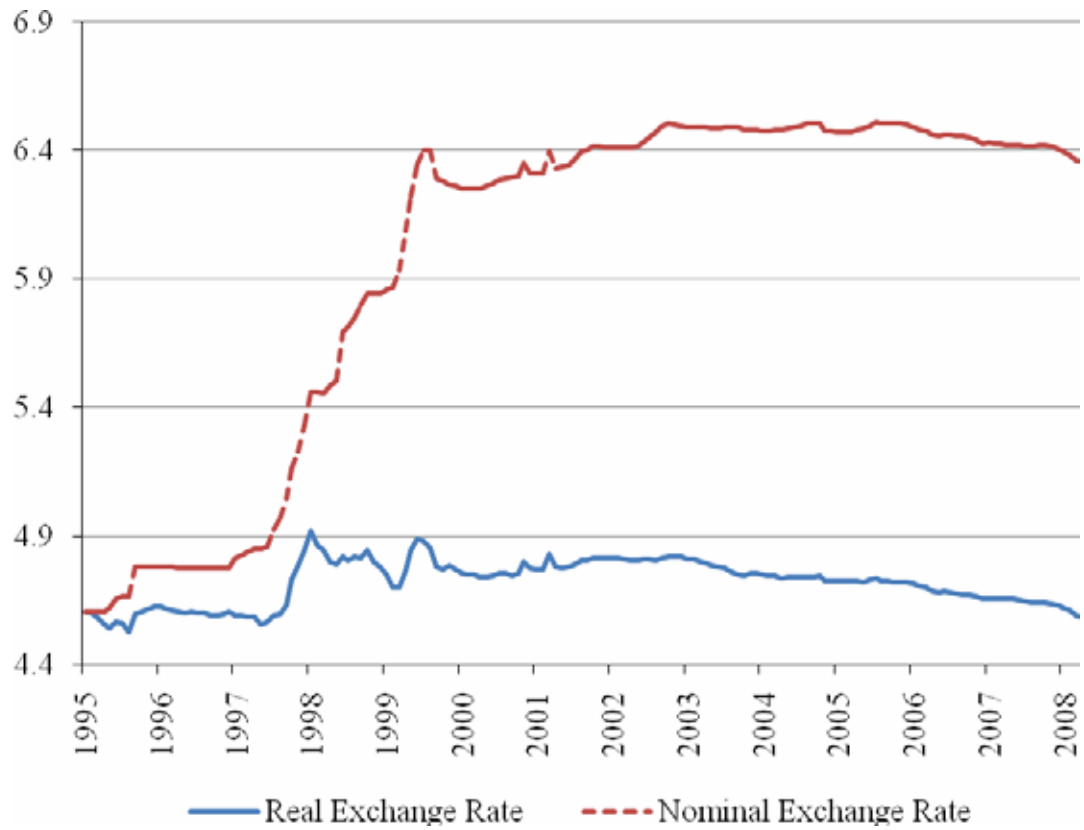
Note: The solid line indicates the logarithm of the real exchange rate. The dashed line indicates the logarithm of the nominal exchange rate. The exchange rates in the first period (January 1985) are set to log(100).
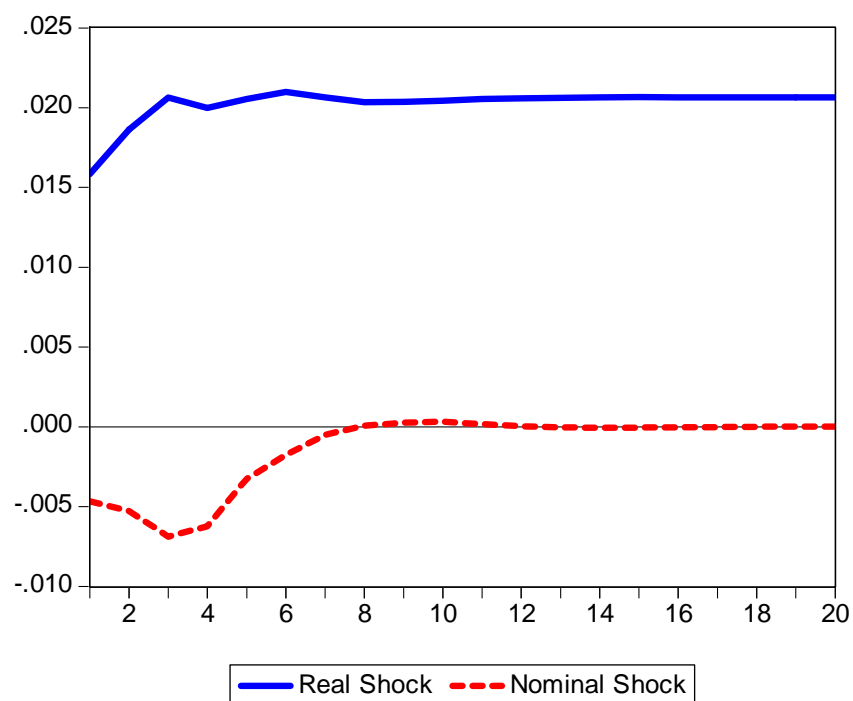
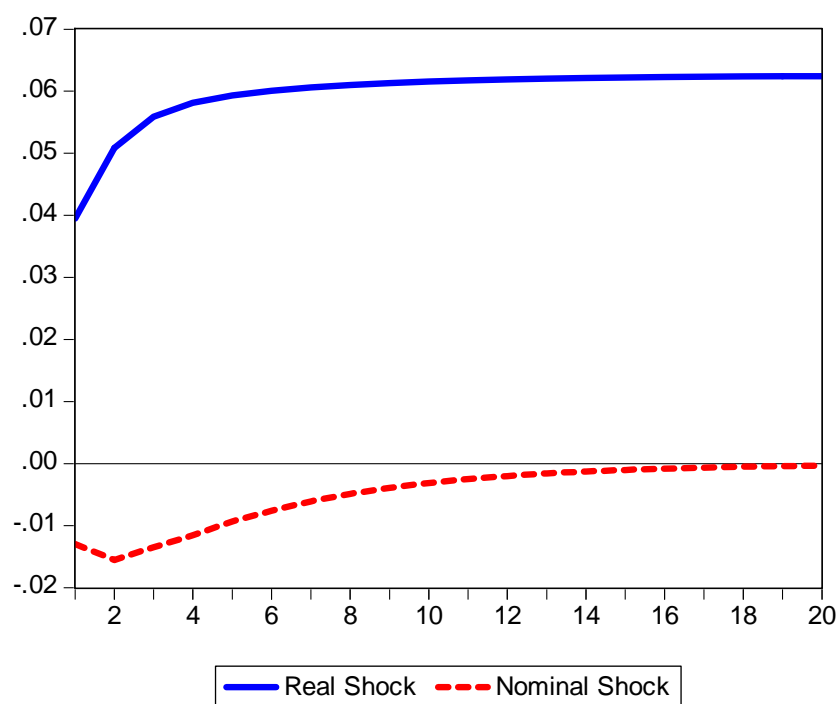**Figure 3: Consumer Price Index in Cambodia, Lao PDR, and the US**

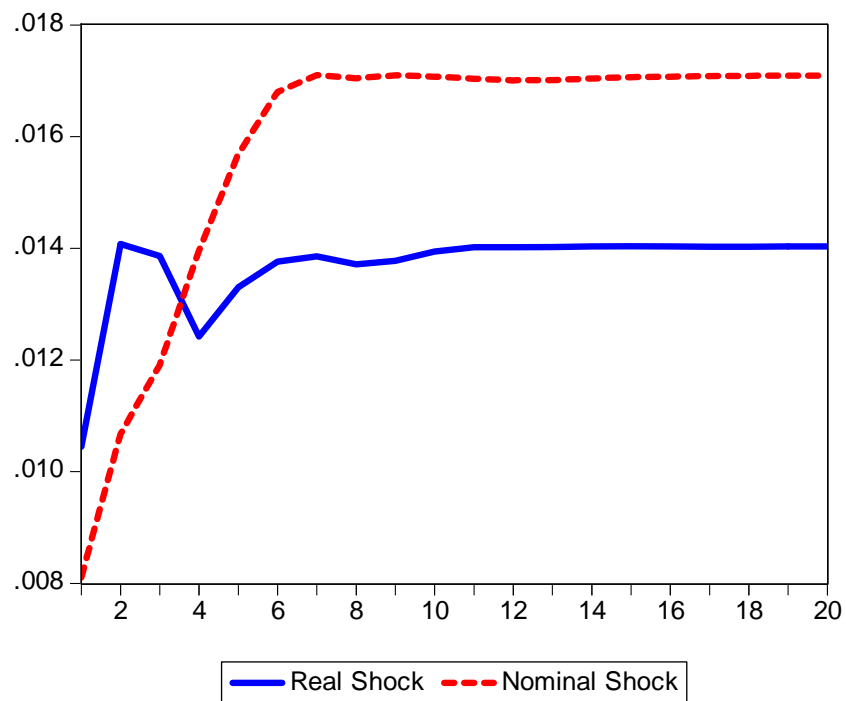**Figure 4: Impulse Response Functions**

Real Cambodian Riel

Real Laotian Kip

Figure 5: Impulse Response Functions

Nominal Cambodian Riel

Nominal Laotian Kip