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Tracing exchange rate volatility in Cambodia, Laos, Myanmar and Vietnam (CLMV)

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The general aim of this paper is to examine the effectiveness of the Exchange Market Pressure (EMP) index in sufficiently tracing the presence of economic crises. The index was unveiled by Girton and Roper (1977) to assist policy makers in responding conclusively when severe compressions in currencies emerge. This study provides a better acumen for how small open economies maintain and stabilize their exchange rates and keep other macroeconomic variables under control through policy responses by means of an investigation of the CLMV countries (i.e., Cambodia, Lao People's Democratic Republic (LPDR), Myanmar and Vietnam). By computing the EMP index using the methods in Eichengreen et al. (1996), Sachs et al. (1996), and Kaminsky et al. (1998), we monitor and predict the future pace of the CLMV foreign exchange markets. Our findings reveal several EMP signals and its potential impact over the sample period. The EMP index plots also allow us to witness the quick recovery of CLMV from crises through policy responses. Findings indicate the effectiveness of the EMP index as an early warning system in detecting the market pressure on the Cambodian Riel, Laos Kip, Myanmar Kiat and Vietnam Dong especially during crises, through the different exchange rate regimes.

keywords: Exchange Market Pressure, CLMV.

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1 Introduction

The world economy is currently experiencing anxiety over the possibility of engaging in another global crisis relapse, as the global debt level is reaching levels that are higher than they were in 2008; hence, the world is facing the risk of a dollar based monetary system breakdown (Roubini, 2016). On that account, we witness an upsurge of literature in uncovering crises sources and policy measures (see for instances Akyüz 2013, 2014; Arestis and Sawyer 2016; Claessens et al. 2014; Krugman 2000). A majority of these studies have focused on highly developed regions or emerging markets, as these economies are the backbones of the global economy. However, it is also crucial to not lose sight in monitoring the economic performance of the less developed countries of ASEAN, Cambodia, Laos, Myanmar and Vietnam (CLMV).

The CLMV economies have strong investment and trade relationships with two groups of Asian countries (the ASEAN-6: Brunei, Indonesia, Malaysia, Philippines, Singapore, Thailand while the second grouping China, Japan and South Korea). This is due to their strategic geographical location. As such, Asian economies invest in the CLMV for its low-wage economies. Hence, it is important for CLMV countries to be aware of and take effective preventive measures for foreign exchange market management, in order to sustain their economic growth and experience financial stabilization, despite being less developed. Each of the CLMV economies have come a long way to reach their current state, through their courageous acts in transitioning to a market-oriented system in the late 1980s, with the aim of overcoming macroeconomic imbalances and slow growth through liberalizing their economies and financial markets.

Owing to the motivation previously discussed, this paper attempts to investigate the presence of economic crises by adopting a 'famous'modelling tool used to capture the currency densities: the exchange market pressure (EMP) index. The EMP index will be tested using CLMV as the case study.

The EMP index was unveiled by Girton and Roper (1977) to assist policy makers in responding conclusively as to when severe compressions in currencies emerge. Notable contributions have enriched the empirical literature such as Aizenman and Hutchison (2012), Feldkircher et al. (2013), Göksu et al. (2015), Tanner (2001, 2002), among others that suggest the EMP index has the ability to trace crisis symptoms sufficiently to allow governments and policymakers to undertake effective pre-emptive measurements. We will also trace how the construction of this index can be interpreted as an effective *signalling system*, telling us whether the Cambodian Riel, Laos Kip, Burmese Kiat and Vietnamese Dong were subjected to extensive market pressures before, during and after the crises.

Ever since the absconding of French colonialism in the 1950s, CLMV countries have undergone intensified economic reformation. This primarily occurred in the late 1980s and early 1990s with the purpose of achieving macroeconomic stability and promoting the economic growth. Despite being categorized as low income countries, the macroe-

conomic stability of CLMV countries has improved over the years. The momentum growth rates experienced by these countries consistently ranged from 6% to 8% while public debt and fiscal deficits are below 6%. Hence, the economic development of the CLMV has been gaining the center of attention for being the next frontier in solidifying the Asian economic gravity, making it more worthwhile to take a closer look at the internal structure and market condition of these countries.

The remainder of this study is structured as follows. Section 2 provides the theoretical consideration of the EMP and a discussion of some of the relevant literature. Section 3 discusses the methodology and data utilized in the analysis. Section 4 reports the empirical findings. Lastly, Section 5 concludes and provides recommendation for future studies.

2 Exchange Market Pressure: Theory and Related Literature

After the collapse of the Bretton Woods system, Girton and Roper (1977) introduced the concept of exchange market pressure (EMP) through a combination of monetary approaches in relation to the balance of payments and the exchange rate. Literally, *exchange market pressure* measures the total excess demand for a currency in international markets as the exchange rate change would have been required to remove this excess demand in the absence of an exchange market intervention, given the expectations generated by the exchange rate policy actually implemented (Weymark, 1995). Hence, the EMP is formulated based on money demand and money supply functions.

We follow Bahmani-Oskooee and Bernstein (1999) in providing the theoretical intuition behind the derivation of the EMP model. First, the equilibrium in the money market requires that:

$$M^d = M^s \tag{1}$$

where:M^d is the demand for nominal balances and M^s is the supply of nominal money. In return, the demand for and supply of nominal money is outlined by 2 and 3:

$$M^d = kPY \tag{2}$$

$$M^s = m(R + D) \tag{3}$$

where: P is the domestic price level, Y is the real output, m is the money multiplier and $(R + D)$ is the monetary base. R, as net foreign assets, is the foreign component of the monetary base, and D, as the domestic credit, is the domestic component.

To derive the EMP model, we formulate the PPP theory as in 4:

$$E = P^* = P \tag{4}$$

where: E[1] is the spot exchange rate, P^* is the foreign price level and P is the domestic price level.

By substituting 2 and 3 into 1, we get:

$$kPY = m(R + D) \tag{5}$$

We then substitute P with its equivalent from 4 (i.e., $P* = E$). Thus, we have:

$$k(P^* = E)Y = m(R + D) \tag{6}$$

If we assume the fraction of nominal income people hold in the form of cash (i.e., k) to be constant, 6 could be rewritten in the form of a percentage change:

$$p^* - e + y = a + r + d \tag{7}$$

where: p^* is the percentage change in the foreign price level; e is the percentage change in E; y is the percentage change in Y; a is the percentage change in m; $r = \Delta R = (R+D)$; and $d = \Delta D = (R + D)$.

Rearranging the terms in 7 results in the following exchange market pressure model:

$$r + e = p^* + y - a - d \tag{8}$$

Equation 8 states that for a given p^*, y, and a, an increase in the domestic credit creation d will result in a one-to-one decrease in foreign reserves and an equal proportionate depreciation in the domestic currency.

To determine the amount of pressure being captivated by e and r, Girton and Roper (1977), Connolly and Silveira (1979), Bahmani-Oskooee and Shiva (1998), recommend establishing variable $Q = (e - 1)=(r - 1)$ on the right-hand side of Equation 8. If more of the pressure is absorbed by the exchange rate depreciation relative to the loss of the reserves, Q will carry a significant and positive coefficient, while a significant and negative Q implies that more pressure is absorbed by the loss of the reserve. However, an insignificant coefficient indicates that the monetary authority is unresponsive to the components of EMP.

$$r + e = p^* + y - a - d + Q \tag{9}$$

The basic model of Girton and Roper (1977) has been improved by Eichengreen et al. (1996), Sachs et al. (1996) Kaminsky et al. (1998), by assigning weights to each EMP component. These authors shared a similar opinion on the inclusion of the interest rate as the third necessary component for the modelling and computation of the EMP index.

Eichengreen et al. (1996) argued that the interest rate hikes were a central banks response to speculative attacks. The idea here is that, since interest-rate hikes have been part of central banks responses to speculative attacks, interest rates are one way of capturing pressures in the foreign-exchange market. Differently from traditional approaches (Chung and Zhang, 2017), the incorporation of exchange rate international

[1]In this case, E is defined as the number of units of foreign currency per unit of domestic currency.

reserves and interest rate into a single index is often termed a model-independent approach (Eichengreen et al., 1996; Sachs et al., 1996; Kaminsky et al., 1998). It is the most widely-used method, which reflects its potential ability to capture specific factors affecting the currency pressure.

The model-independent approach has been applied to a wide range of countries, with most studies focusing on the bilateral exchange rate against the United States (US) dollar. Siregar et al. (2010) examined the evidence of the major Asian economies of the South East Asia Central Banks (SEACEN) group[2] against the USD and its severity during the sub-prime crisis of 2007-2009. Their findings suggest that SEACEN countries were affected by the sub-prime crisis. The demise of Lehman Brothers left most Asian currencies under severe depreciation, especially the Malaysian Ringgit, the Thai Baht, the Korean Won, the Indonesian Rupiah and the Singapore Dollar. Meanwhile, Bertoli et al. (2010) suggests that existing EMP-based crisis indicators may not be well suited for the study of currency crises in emerging countries, as they lead to a questionable selection of crisis episodes, suggesting that emerging countries are much less crisis-prone than developed countries.

We do acknowledge the limitations of adopting any single EMP measurement, especially in the identification of crisis episodes. This limitation has been portrayed in the work of Pontines and Siregar (2008) and Bertoli et al. (2010). In what follows, this paper will adopt the arrays of measurements by Eichengreen et al. (1996), Sachs et al. (1996), Kaminsky et al. (1998) for Cambodia and Vietnam. This will provide a much clearer picture of the extent of the EMP in CLMV; it will also promote consistency of the empirical results for prudent policy implications.

3 EMP Measurements and Data Description

According to Siregar et al. (2010) and McFarlane (2010) the arrays of EMP measurements proposed by Eichengreen et al. (1996), Sachs et al. (1996) and Kaminsky et al. (1998) are found to be suitable in fully capturing the periods of a currency crisis, as they provide information about the speculative pressure on a currency. In this paper, the US is used as our reference country.

3.1 Eichengreen et al. (1996)

The exchange market pressure index of Eichengreen et al. (1996)$[EMP_{E,t}]$ is expressed as:

$$EMP_{E,t} = \frac{1}{\sigma_e}\left(\frac{\Delta e_t}{e_t}\right) - \frac{1}{\sigma_r}\left(\frac{\Delta r_t}{r_t} - \frac{\Delta r_{US,t}}{r_{US_t}}\right) + \frac{1}{\sigma_i}\Big[\Delta\big(i_t - i_{US_t}\big)\Big] \tag{10}$$

[2]They included eleven member of SEACEN countries - Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam), Hong Kong, Korea, Sri Lanka, Taiwan with Australia as one of the long standing partner country. The South East Asian Central Banks (SEACEN) Research and Training Centre was established by a group of central banks and monetary authorities in 1982. To date they have twenty member Central Banks and Monetary Authorities.

where: e_t is the unit of country currency per US dollar in period t, r_t is the international reserves, $r_{US,t}$ indicates the international reserves for the US,i_t and $i_{US,t}$ are the domestic interest rate and US interest rate in period t,respectively. σ_e is the standard deviation (SD) of the relative change in the exchange rate $\left(\frac{\Delta e_t}{e_t}\right)$. Δ_r is the SD of the difference between the relative changes in foreign reserves in the domestic and the reference country $\left(\frac{\Delta r_t}{r_t} - \frac{\Delta r_{US,t}}{r_{US,t}}\right)$ and σ_i is the SD of the nominal interest rate differential $\left(i_t - i_{US,t}\right)$.

3.2 Sachs et al. (1996)

The exchange market pressure index of Sachs et al. (1996) $[EMP_{S,t}]$ is expressed as:

$$EMP_{S,t} = \frac{\frac{1}{\sigma_e}}{\left(\frac{1}{\sigma_e} + \frac{1}{\sigma_r} + \frac{1}{\sigma_i}\right)}\left(\frac{\Delta_{e_t}}{e_t}\right) - \frac{\frac{1}{\sigma_r}}{\left(\frac{1}{\sigma_e} + \frac{1}{\sigma_r} + \frac{1}{\sigma_i}\right)}\left(\frac{\Delta_{r_t}}{r_t}\right) + \frac{\frac{1}{\sigma_i}}{\left(\frac{1}{\sigma_e} + \frac{1}{\sigma_r} + \frac{1}{\sigma_i}\right)}(\Delta_{i_t}) \tag{11}$$

where: e_t is the unit of country currency per US dollar in period t; r_t is the international reserves in period t; i_t is the domestic interest rate in period t; σ_e is the SD of the rate of change in the exchange rate $\left(\frac{\Delta_{e_t}}{e_t}\right)$; σ_r is the SD of the rate of change in the reserves $\left(\frac{\Delta_{r_t}}{r_t}\right)$ and σ_i is known as the SD of the change in the nominal interest rate $[\Delta_{i_t}]$.

3.3 Kaminsky et al. (1998)

The exchange market pressure index of Kaminsky et al. (1998) $[EMP_{K,t}]$ is expressed as:

$$EMP_{K,t} = \frac{\Delta_{e_t}}{e_t} - \frac{\sigma_e}{\sigma_r}\left(\frac{\Delta_{r_t}}{r_t}\right) + \frac{\sigma_e}{\sigma_i}\left(\Delta_{i_t}\right) \tag{12}$$

where: e_t is the unit of country currency per US dollar in period t; r_t is the international reserves in period t; i_t is the domestic interest rate in period t; σ_e is the SD of the rate of change in exchange rate $\left(\frac{\Delta_{e_t}}{e_t}\right)$; σ_r is the SD of the rate of change in reserves $\left(\frac{\Delta_{r_t}}{r_t}\right)$ and σ_i is known as the SD of the change in the nominal interest rate $\left[\Delta_{i_t}\right]$.

As can be seen, Eichengreen et al. (1996), Sachs et al. (1996) and Kaminsky et al. (1998) proposed different computations for the EMP index (i.e., Equations 10 12) with a different precision weight schemes. More specifically, Eichengreen et al. (1996) used the inverse of each components variance as the corresponding weight to equalize the volatilities. This was conducted because the volatilities of the reserves, exchange rates and interest differentials are very different. In this way, the weighting helps prevent any one of the components from dominating the index. Furthermore, if a component has a higher variance, a lower weight would be assigned to it and vice-versa.

Sachs et al. (1996) calculated each weight in the EMP index with respect to the standard deviations of all of the components, instead of using only the standard deviation of the respective component to avoid the dominance of the most volatile variable.

Kaminsky et al. (1998) modified the original model by Eichengreen et al. (1996) where the interest rate differential is replaced by the relevant interest rate in the country analyzed. Hence, the weights on the reserves and interest rate terms are the ratio of the standard error of the percentage change of the exchange rate over the standard error of the percentage change of the reserves and the interest rate differential, respectively (Stavarek, 2008).

Eichengreen et al. (1996), Sachs et al. (1996) and Kaminsky et al. (1998) do not apply equal weights in constructing an EMP index. According to Li et al. (2006) it would be incorrect to impose the same weights in measuring the EMP index, since each country has a different economic structure and different sensitivities to exchange rate changes, with respect to the interest rate and reserve changes. In this sense, the concern raised in the literature would be minimized.

3.4 Data Source

The variables of which been explain in each model above are monthly data (in millions of US dollars) obtained from the *International Financial Statistics* (IFS) division of the International Monetary Fund (IMF)for the period 1994:M1 - 2012:M12.Basically there are exchange rate (e), reserve (r) and interest rate (i). The US is used as our foreign counterpart.

4 Empirical Results

Figure 1 shows the arrays of the EMP measurements plotted for the CLMV countries. There are two annotations highlighted to illustrate the crisis periods for each study.

4.1 Cambodia

Figures 1.1 to 1.3 displays extreme and wobbly fluctuations in the EMP during the period from 1994 and 1995. During the third quarter of 1994, the EMP indices were under serious buying pressure. This was later altered by a high selling pressure after entering the first quarter of 1995. Despite that, the EMP indices were mostly under a negative level, a condition where the Cambodia Riel was appreciating against the US Dollar, with low inflation rate and the large reserves [3]. This was endorsed by the success of the political and economic reform undergone by the government in late 1993 after the

[3] According to Zamaróczy and Sa (2002) the success of reinstating macroeconomic stability through launching of reform program (Enhanced Structural Adjustment Facility, ESAF) in 1994 have help the country making notable progress in bringing back inflation to a single digit through its high degree of dollarization. With this policy action, Cambodia maintain the with low inflation under the managed floating exchange rate policy accompany with the severe buying pressure evident from the EMP plots in 1994 1995 period.

Cambodian government realized the importance of refurbishing economic growth and financial stability after experiencing the legacy of war and wreckage.

There was a sudden increase in the EMP indices in mid-1997. Figure 1.1 shows that the EMP indices rose from 0.3% percent in July of 1997 to 5% in October of 1997. This was caused by the awakening of the regional crisis and political unrest chaos (upheaval of the first Cambodian prime minister), which initiated the globule in the currency and investment flows of the country. That being said, the Cambodian Riel fell less precipitously than other Asian currencies, because of the extensive dollarization of the Cambodian economy.

In 1999, after the formation of a second coalition government, the government enforced several fiscal measurements in helping to boost government revenue. One of the measurements was called the value-added tax (VAT); it was designed to tax imported products (Sok et al., 2001). Figure 1.1 displays the hike and magnitude of the EMP indices during the crisis period. Figures 1.2 and 1.3 illustrate firm volatility. Figure 1.1 shows that the global financial crisis spillover effects finally took place when the EMP experienced a sudden rise of 6% in the third quarter of 2009.

The Cambodian economy is vulnerable to crisis external shocks, since the US market is Cambodia's main exporter in terms of garment exports. The slowdown in Cambodian economic activities in 2009 was also caused by the sudden hike in the inflation rate in mid-2009. Due to the deterioration in Cambodian macroeconomic performance in 2009, its government turned to fiscal and monetary policies to warrant financial solidity to the country. In facing the counterattack of the subprime crisis, the government enforced their first fiscal policy by increasing the public spending on infrastructure, agriculture, transportation and social safety nets. This was further support to the evidence provided by Lay et al. (2012) showing negative aspects of dollarization in Cambodia, which may cause the exchange rate depreciation and the intense volatility of exchange rates.

4.2 Laos

Laos was experiencing intense positive EMP indices during the 1997 Asian crisis period, despite there being reports that claimed that Laos was not badly affected by the financial crisis, as compared to bigger Asian economies. The EMP illustrations show that Lao PDR was vulnerably affected by the crisis, since Laos Kip was rocked by the exchange rate volatility due to its close link to the Thai Baht, where the domestic currency lost 70% of its value against the US dollar between July 1997 and June 1998 (Okonjo-Iweala et al., 1999). In addition, the country couldn't entirely escape from the economic downturn, due to its weak currency and high inflation, since Lao PDR heavily relied on the region as an export market and for having large foreign savings. These savings led to a massive outflow in foreign investment and the banking system. By the end of 1998, the government managed to temper the regional financial crisis impact through the major domestic policies response to stabilise the economy.

Figure 1.4 shows that, in late 2008, Laos was experiencing high selling pressure. This was attributed to the effects of the fuel and price crisis that occurred in 2008. This was later followed by the impact of the global financial crisis. Compared to the Asian financial

crisis, Laos quickly overcame the global financial crisis, since its exports were in great shape. This was due to the forward looking government, which pursued policy measures ranging from exchange rate stabilization policy, regulatory changes, improvement of domestic payment and the usability of local currency, the nationwide promotion of the use of domestic currency for domestic transaction (Dalaloy, 2015).

4.3 Myanmar

Following the meltdown of the Thai Baht in June of 1997, most of the Asian exchange rate fell into an instant depreciation. This led to a surge in inflation, a slowdown in economic growth and financial market instability. Unexpectedly, Myanmar was one of the few countries that received a limited impact from the crisis. This is reflected in Figures1.7, 1.8 and 1.9. These figures display a relatively stable and manageable level of volatility of the EMP, as compared to the rest of CLMV countries, during the regional financial crisis. This was attributed to by the adoption of new administrative measures to reduce the demand of foreign exchange, including a tightening in import controls and a revocation of the foreign exchange licenses of the private banks (Gordon et al., 1999).

In 2008, Figure 1.7 points out that the country was suffering from intense currency depreciation, high interest rates and low reserves. This occurred as the EMP reached a peak of nearly 8% in early 2009. This was caused by the external shock of the economic, political, food and environmental (Cyclone Nargis) crisis that occurred in 2008. Figures 1.7, 1.8 and 1.9 show similarities as to where the EMP was largely fluctuating as it reached its highest peak in 2012, due to the pre- and after-effects of the intense national elections. These elections resulted in a drastic and biggest currency reformation conducted by the President, Thein Sien. The President demolished the 35 year long fixed exchange rate with a managed floating regime to strengthen the Kyat and weaken the grip of the black market.

To correct these distortions government introduced national agenda of the unification of the foreign exchange markets. The distortions which been able to track by the EMP arise when government-sanctioned marketbased on the official exchange rate and the allocation systemcoexisted with informal, parallel exchange rates and the presence of multiple rates was clearly a significant distortion. By April 2012, the two markets were unified under a managed float. This has narrowed the gap between the official rate and the parallel exchange rate (Nijathaworn et al., 2015).

4.4 Vietnam

Figures 1.10 1.12 revealed that Vietnam was affected by the regional financial crisis in 1997 and 1998, when the EMP indices were facing severe selling pressure (the Dong was depreciating and less competitive). This was especially the case in 1998[4], since the crisis

[4]According to Kato (1999), the crisis impact on the Vietnamese Dong was smaller, as compared to SEATE currencies. It was kept at the pre-crisis level throughout 1997, reflecting the fixed exchange rate system in Vietnam. However, it was devalued twice in 1998 by a total of 16%.

had weakened most of the Asian currencies. This caused Vietnamese FDI and exchange reserves to decrease rapidly.

Based on the UNCTAD (1999) report, Vietnamese FDI dropped from US $2.95 billion in 1997 to US $1.90 billion in 1998. To curb the fluctuation of the currency and increase FDI, the Vietnamese government immediately responded to the crisis through macro policy measures: it created a regulation where the policy was drafted to remove a large number of restrictions on foreign investments and streamline the registration procedures. In 1999, the State Bank of Vietnam (SBV) reintroduced a narrow band mechanism to contain the exchange rate market volatility and eliminate the rapid exchange rate movements. More specifically, the official Vietnamese Dong rate was set by the SBV through a process in which the official rate could move with the interbank market rate, but the interbank rate could not deviate beyond the official rate (Joiner, 2006). Through these macro interventions the EMP indices were on a manageable stage after 1999 (refer to Figures 1.10 1.12).

The eruption of the global crisis in 2007/2008 provided another external shock to the Vietnamese economy in 2009. Before the global crisis, the economy of the country was already facing macroeconomic instability in 2007. According to Le (2009), the economy had been suffering from twin deficits (fiscal and trade deficit) and surging inflation. Inflation had been in the double digits since 2007; it peaked at 28.32% in August of 2008. The fiscal deficit accounted for 4.5 to 5% of GDP in 2008. At the same time the trade deficit reached US$17.5 billion (or over 20% of GDP), a level that signals vulnerability to a sudden drop in external demand.

External shocks due to crisis caused public investment and export demand of the country to drop significantly. The Vietnamese Dong significantly depreciated against the US dollar during the second half of 2008. This was caused by the widening current account deficit, rapid inflation and the stock market slump (Pham, 2009).

Figure 1.10 shows that during the second quarter of 2008, EMP indices were under pressure of depreciating. Another reason behind the hike in the EMP was because the SBV had increased the benchmark interest rate on the Vietnamese Dong three times in the first half of 2008.This boosted the benchmark rate from 8.2 to 14.0% per annum on 11 June 2008 (Le, 2009). Afterwards, the EMP indices decreased immediately. They eventually reached a negative level in the last quarter of 2008 that showed that the Vietnamese Dong was appreciating. This was attributed to the SBV fiscal and monetary policy responses (Government's Resolution No. 10/2008/NQ-CP) to control inflation and keep the currency from deteriorating further. Their goal was to stabilize the economy and achieve sustainable growth.

Figure 1 illustrates more downward pressure that occurred on the Vietnamese Dong from the third quarter of 2009 until 2010, where the EMP indices were relatively high and volatile. They eventually reached the highest peak of selling pressure on December 2010. There are two causes behind these sudden shocks. The first reason was that the monetary authority had devalued the Dong in November 2009 and again in February and August 2010, amid concern that the nation would have been running short on the foreign capital needed to fund a trade deficit. The trade deficit reached $1 billion in January 2011, according to preliminary government figures (Bloomberg, 2011). Secondly, the

highest peak in the EMP indices was reached at the end of 2010, because Vietnamese economy (trade and capital flows) was deeply affected by the Euro crisis, since European countries are its main economic partners.

The Euro debt crisis had strong effects on the FDI flows to Vietnam, where the share of the European FDI in Vietnam decreased from 18% of the total registered FDI in Vietnam in 2009 (US$21.48 billion) to 11% of the total (US$14.7 billion) in 2011 (Mai, 2012). A more recent overview of significant events related to foreign exchange rate management is documented in Tables 1 and 2 of the work by Pham (2017).

5 Conclusions

From time to time, the currency value of a country is constantly under pressure due to the expose of global imbalance, economic and financial liberalization which could increase the risk of crisis outbursts. In this regards, we constructed an EMP index that was used to trace the presence of extreme market pressure on the CLMV economies where the emphasis was placed on the two economic crises (Asian Financial Crisis and Global Financial Crisis). Along the way, we have also been able to trace and monitor significant events like changes in government policies for CLMV countries. The inference drawn from the three different index models confirms several signals of the EMP, especially around the crises episodes.

Cambodian and Vietnamese quick recovery from crises was observed from the estimates. This was found to be the direct result of appropriate policy responses during turbulent times. The remaining two countries –Laos and Myanmar–which were not hardly hit from these two major crises due to the less integrated economy, the EMP trace well several significant events. Our findings confirm that the EMP index is an effective and promising signaling tool, due to its ability in models and trace crisis symptoms. This warning signal could be useful for the government in taking effective preventive actions. Also, this research pinpointed three important aspects: first, promoting greater exchange rate flexibility would allow the economy to better adjust to changing economic conditions via movements in the exchange rate. Secondly, management of interest rate and domestic credit should go side by side with maintenance of economic growth sustainability. This is important in order to convey the effectiveness of monetary policy tool for CLMV.

Third, with the ASEAN Economic Community (AEC) at hand, the CLMV –especially Laos and Myanmar–should gauge and tap the opportunity of a potential collaboration with the remaining member states of ASEAN. Furthermore, Devadason (2013) argued that as connectivity within the Greater Mekong Sub-region (GMS) programme improves, the linkages between CLMV and the remaining ASEAN member states may also be enhanced. This can be done through various programs, outlined in the blueprint, which are focused on facilitation of exchange rate management and on further support to economic integration in ASEAN. After all, the ASEAN countries were one big family in promoting one vision, one identity and one community!

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References

Aizenman, J. and Hutchison, M. H. (2012). Exchange market pressure and absorption by international reserves: Emerging markets and fear of reserve loss during the 2008–2009 crisis. *Journal of International Money and Finance*, 31:1076–1091.

Akyüz, Y. (2013). Waving or drowning: Developing countries after the financial crisis. *Research Papers*, 48. Geneva, South Centre.

Akyüz, Y. (2014). Crisis mismanagement in the United States and Europe: Impact on developing countries and longer-term consequences. *Research Papers*, 50. Geneva, South Centre.

Arestis, P. and Sawyer, M. (2016). *Emerging Economies During and After the Great Recession*. Palgrave Macmillan UK.

Bahmani-Oskooee, M. and Bernstein, D. J. (1999). Exchange market pressure during the current managed float. *Applied Economics Letters*, 6:585–588.

Bahmani-Oskooee, M. and Shiva, R. (1998). A method of detecting whether a central bank engages in the black market for foreign exchange: Evidence from Iran. *Economics Letters*, 60:97–103.

Bertoli, S., Gallo, G. M., and Ricchiuti, G. (2010). Exchange Market Pressure: Some Caveats in Empirical Applications. *Applied Economics*, 42:2435–2448.

Bloomberg (2011). Vietnam Devalues Dong by 7%, Risking Faster Inflation. [Online; posted 11-February-2011].

Chung, S. and Zhang, S. (2017). Volatility estimation using support vector machine: Applications to major foreign exchange rates. *Electronic Journal of Applied Statistical Analysis*, 10(2).

Claessens, S., Kose, M. A., Laeven, L., and Valencia, F. (2014). *Financial crises: Causes, consequences, and policy responses*. International Monetary Fund.

Connolly, M. and Silveira, J. D. D. (1979). Exchange market pressure in postwar Brazil: An application of the Girton-Roper monetary model. *The American Economic Review*, 69:448–454.

Dalaloy, V. (2015). Dollarization Or De-dollarization: Lao Experience On De-Dollarization. Conference Jointly Organized by the IMF and Japan International Cooperation Agency (JICA) International Conference Hall, JICA Research Institute, Tokyo, Japan.

Devadason, E. S. (2013). Whither Sub-Regional Cooperation? The CLMV perspective. *Institutions and Economies*, (5):1–36.

Eichengreen, B., Rose, A. K., and Wyplosz, C. (1996). Speculative attacks on pegged exchange rates: an empirical exploration with special reference to the European Monetary System. In Canzoneri, M., Eithier, W., and Grilli, V., editors, *The new transatlantic economy.*, pages 191–222. Cambridge: Cambridge University Press.

Feldkircher, M., Horvath, R., and Rusnak, M. (2013). Exchange market pressures during the financial crisis: A Bayesian model averaging evidence. Bank of Finland (BOFIT)

Discussion Papers No. 11.

Girton, L. and Roper, D. (1977). A monetary model of exchange market pressure applied to the postwar Canadian experience. *The American Economic Review*, 67:537–548.

Göksu, G., Kadioğlu, E., and Kücükkocaoğlu, G. (2015). Predicting Crises in Turkey Using an Exchange Market Pressure Model and Four-Way Decomposition Analysis of Gross Capital Flows. *International Business Research*, 8:26–38.

Gordon, J., Stone, M., Hong, L., and Barinshtein, G. (1999). Myanmar: Recent Economic Development. Technical report, IMF Staff Country Report, No.99/134.

Joiner, A. (2006). Examining the Vietnamese Dong. Economic @ Australia and New Zealand Banking Group Limited (ANZ).

Kaminsky, G., Lizondo, S., and Reinhart, C. M. (1998). Leading indicators of currency crises. *Staff Papers*, 45(1):1–48.

Kato, T. (1999). The Asian Financial Crisis and the Southeast Asian Transitional Economies: Impact, Policy Responses and Lessons. SEATES (ed), Impact of the Asian Financial Crisis on the Southeast Asian Transitional Economies, Conference papers.

Krugman, P. (2000). *Currency crises*. University of Chicago Press.

Lay, S. H., Kakinaka, M., and Kotani, K. (2012). Exchange rate movements in a dollarized economy: The case of Cambodia. *ASEAN Economic Bulletin*, 29(1):65–78.

Le, T. T. V. (2009). The Global Crisis and Vietnams Policy Responses. *East Asian Policy*, 1:63–74.

Li, J., Rajan, R. S., and Willett, T. (2006). Measuring currency crises using exchange market pressure indices: the imprecision of precision weights. Retrieved from http://www.freewebs.com/rrajan01/EMP.pdf.

Mai, T. T. (2012). The Impacts of European Debt Crisis on the Prospects of Some Economic Areas in Vietnam. *Taiwan ASEAN Studies Center*, pages 35–46.

McFarlane, L. (2010). Exchange market pressure, currency crises and monetary policy: Evidence from Jamaica. Technical report, Working Paper Bank of Jamaica.

Nijathaworn, B., Chaikhor, S., Chotika-arpa, S., and Sakkankosone, S. (2015). Monetary policy and foreign exchange management: Reforming central bank functions in myanmar. ADB Working Paper Series No. 431.

Okonjo-Iweala, N., Kwakwa, V., Beckwith, A., and Ahmed, Z. (1999). Impact of Asia's Financial Crisis on Cambodia and the Lao PDR. *Finance and Development*, 36(3):48–51.

Pham, N. Q. (2009). Impact of the Global Financial and Economic Crisis on Viet Nam: a Rapid Assessment. ILO Regional Office for Asia and Pacific, Bangkok, and Policy Integration and Statistics Department, Geneva.

Pham, T. H. A. (2017). Are global shocks leading indicators of currency crisis in Viet Nam? *Research in International Business and Finance*, 42:605–615.

Pontines, V. and Siregar, R. (2008). Fundamental pitfalls of exchange market pressure-based approaches to identification of currency crises. *International Review of Eco-*

nomics & Finance, 17:345–365.

Roubini, N. (2016). Is the world economy having a 2008 moment? Retrieved from https://www.theguardian.com/business/2016/mar/02/is-the-world-economy-having-a-2008-moment-stock-markets-financial-crisis.

Sachs, J., Tornell, A., and Velasco, A. (1996). Financial crises in emerging markets: the lessons from 1995. Technical report, National bureau of economic research.

Siregar, R. Y., Pontines, V., and Hussain, N. M. (2010). *The US Sub-prime Crises and Extreme Exchange Market Pressures in Asia*. The South East Asia Central Banks (SEACEN), Staff paper No. 75.

Sok, H., Chea, H., and Sik, B. (2001). *Cambodias Annual Economic Review*. Cambodia Development Resources Institute (CDRI).

Stavarek, D. (2008). Comparative analysis of the exchange market pressure in Central European countries with the Eurozone membership perspective. *South East European Journal of Economics and Business*, (3):7–18.

Tanner, E. (2001). Exchange market pressure and monetary policy: Asia and Latin America in the 1990s. *IMF Staff papers*, 47:311–333.

Tanner, E. (2002). Exchange Market Pressure, Currency Crises, and Monetary Policy: Additional Evidence from Emerging Markets. *IMF Working papers*, (14).

UNCTAD (1999). *World investment report*. Geneva: UNCTAD.

Weymark, D. N. (1995). Estimating exchange market pressure and the degree of exchange market intervention for Canada. *Journal of International Economics*, 39:273–295.

Zamaróczy, M. D. and Sa, S. (2002). Macroeconomic Adjustment in a Highly Dollarized Economy: The case of Cambodia. *IMF Working paper No 92.*

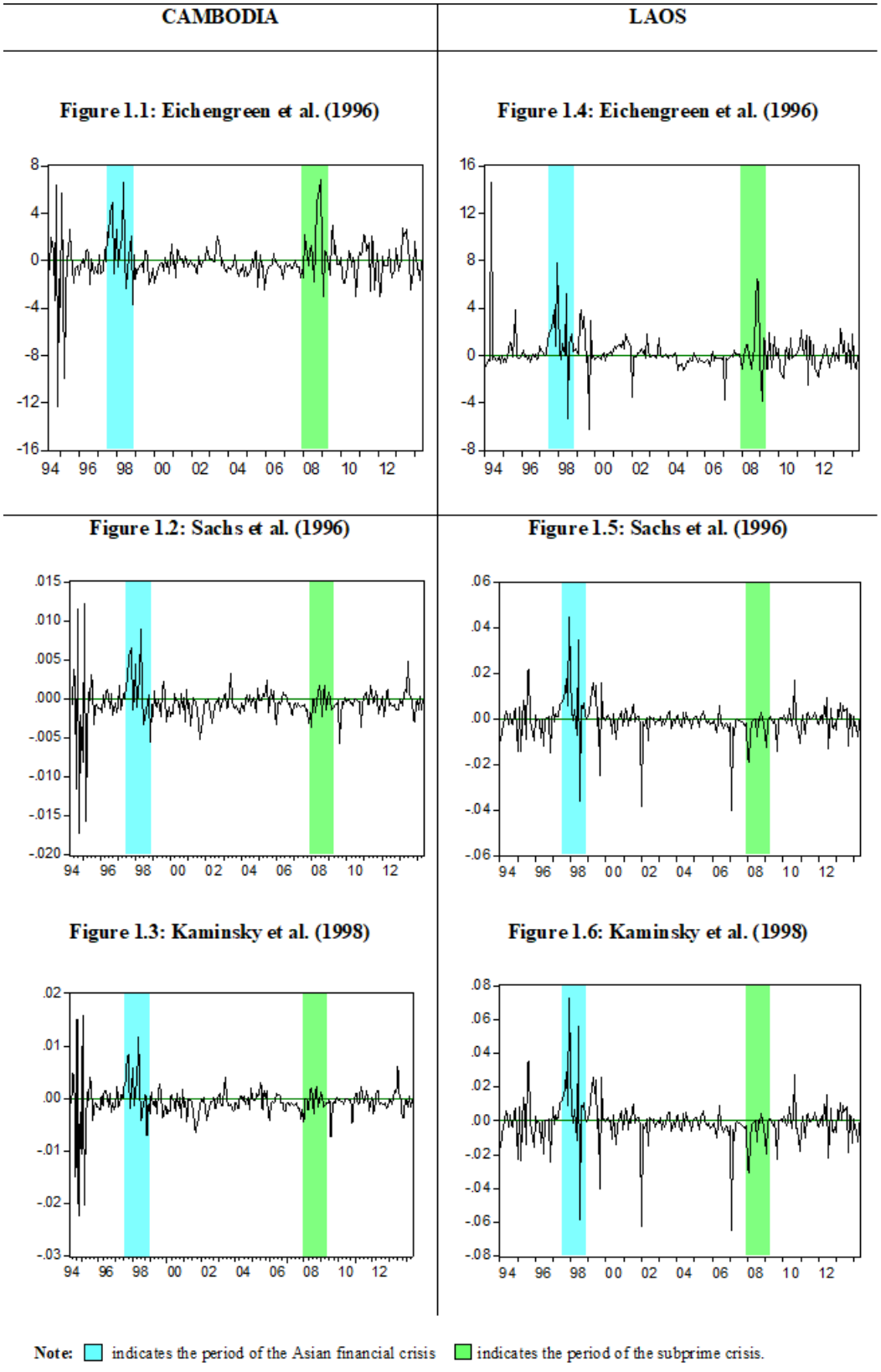


Figure 1: Trends of the EMP indices

MYANMAR	VIETNAM
Figure 1.7 Eichengreen et al. (1996)	**Figure 1.10: Eichengreen et al. (1996)**

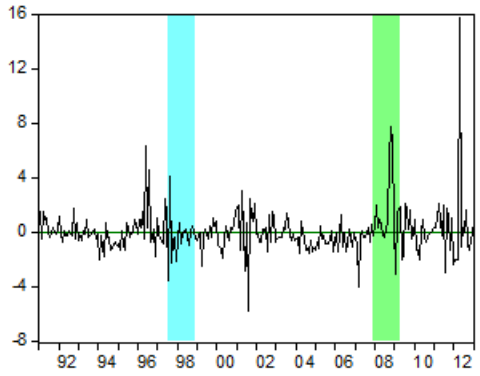
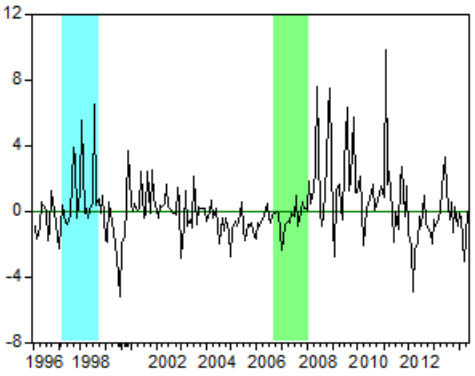

	

Figure 1.8: Sachs et al. (1996)	**Figure 1.11: Sachs et al. (1996)**

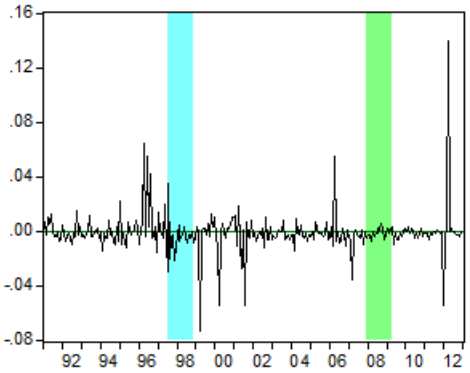
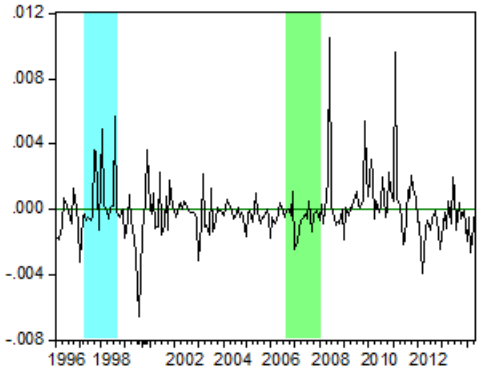
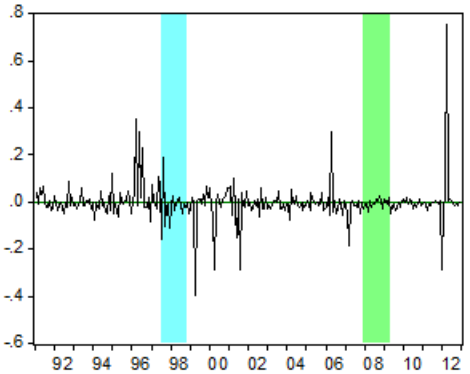
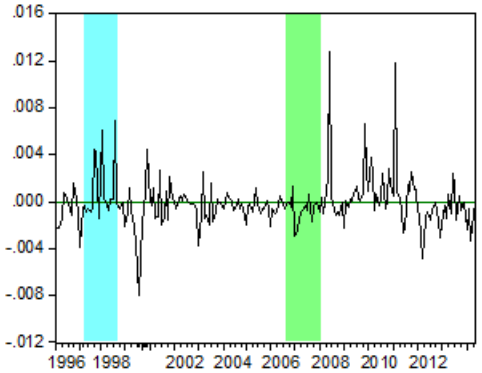

	

Figure 1.9: Kaminsky et al. (1998)	**Figure 1.12: Kaminsky et al. (1998)**
	

Note: indicates the period of the Asian financial crisis indicates the period of the subprime crisis.

Figure 1: Continued