The Impact of Exchange Rate and Dollarization on the Balance of Payment in Cambodia: An Autoregressive Distributed Lag (ARDL) Approach

Mon Sreyleak[1]

Abstract

Using Cambodia dataset, this paper identifies the effect of real effective exchange rate (REER) and dollarization on the balance of payment. The controlled variables are REER, broad money growth rate, and the ratio of foreign currency deposit to total deposit - dollarization indicator. I use the quarter dataset from 2008-Q1 to 2020-Q1 and conduct pre-statistical tests on all variables to avoid spurious regression. In line with variables' characteristics, I apply the autoregressive distributed lag (ARDL) model in the error correction form. There are three main contributions of this paper (i) the use of Cambodia's primary quarterly dataset, (ii) the implication of ARDL in error correction form by incorporating the index of dollarization (iii) the key findings for regulators, particularly the central bank – the National Bank of Cambodia.

Keywords: Exchange Rate, Dollarization, Balance of Payments, Autoregressive Distributed Lag (ARDL)

1. Introduction

The exchange rate reflects the relative price of one currency to another at a specific time and links domestic prices with international prices. It is crucial in characterizing the monetary system in an economy. Indeed, the exchange rate regimes refer to the applied system of one economy in managing the exchange of a home currency with other currencies. More importantly, the exchange rate is a key determinant of any country's balance of payment (BOP) position. The judicious determination of the exchange rate level will serve as a nominal anchor for price stability. Also, the exchange rate movement impacts the demand and supply of goods, foreign direct investments, and ultimately the employment.

Using the Cambodia dataset, this paper identifies the link of the real effective exchange rate (REER) and dollarization on the BOP. The controlled variables are REER, broad money growth rate, and the ratio of foreign currency deposit to total deposit - dollarization indicator. I use the quarter dataset from 2008-Q1 to 2020-Q1 and conduct pre-statistical tests on all

---

[1] PhD in International Development, Nagoya University. Deputy Division Chief, National Bank of Cambodia.

variables to avoid spurious regression. In line with variables' characteristics, I apply the autoregressive distributed lag (ARDL) model in the error correction form.

According to Berg and Borensztein (2001), a full dollarized economy does not typically face to BOP crisis but not exceptional to external crises. The dollarization encourages investment and involves low exchange rate risk that these two indicators limit the incidence of crisis. This paper provides an argument on dollarization from a different perspective. As Cambodia adopts managed exchange rate regime and maintains the exchange rate level in the condition of high dollarization, the National Bank of Cambodia (NBC) might implement two primary operations. First, increasing the money supply via auctions in the foreign exchange market and liquidity providing collateralized operations (LPCOs) will bring the local currency interest rate down, encourage local currency loans, and lower the demand for foreign currency loans leading to the decline of bank lending from foreign banks. This operation results in the decrease of BOP position as the international reserves decline. Second, absorbing foreign currency is associated with increasing international reserves, and BOP improves. By observing the data from NBC, the level of international reserves is rising with a high degree of dollarization.

There are three main contributions of this paper (i) the use of Cambodia's primary quarterly dataset, (ii) the implication of ARDL in error correction form by incorporating the index of dollarization (iii) the key recommendations from the findings for regulators, particularly the central bank – the National Bank of Cambodia – to address the dollarization issue in Cambodia economy.

2. Literature Review

2.1. Exchange rate and the balance of payment (BOP) relationship

Some studies examine the impact of exchange rate depreciation on the balance of payments in Nigeria:

- Odili (2014) uses the autoregressive distributed lag (ARDL) model with co-integration test covering the period from 1971 to 2012. The author also confirms a positive long-run relationship between BOP and exchange rate while the regression result is statistically insignificant for the short-run. The results suggest that the devaluation improves the balance of payment and that the Marshall-Lerner (ML) condition subsists for the Nigerian context.

- Oladipupo (2011) proves the exchange rate depreciation can lead to the improvement of the BOP by using an ordinary least square method of estimation for 1970-2008. The

persistent BOP deficits in Nigeria might be due to inappropriate allocation of domestic credit, fiscal indiscipline, misuse of expenditure policies.

- Umoru and Odjegba (2013) analyze the relationship between exchange rate misalignment and BOP mal-adjustment in Nigeria from 1973 to 2012 applying the vector error correction model (VECM). The result of the study shows that exchange rate misalignment improves the Nigerian's BOP position. The Nigerian government should implement economic policies that could enhance the appreciation of the Naira-USD exchange rate for possible favorable BOP effects.

Some further studies of other countries also embark on the relationship between exchange rate and balance of payment:

- Ahmad et al. (2014) use data from Pakistan from January 2007 to October 2013 by employing the autoregressive distributed lag model and Granger causality test. The authors assure a significant and positive relation between BOP and exchange rate. They conclude the stability of exchange rates might create a positive environment by encouraging trades which could improve the BOP.

2.2. Balance of payment crisis in a pegged exchange rate system

As Cambodia adopts a pegged regime[2], the lesson learned from BOP issues in such an exchange rate regime should be substantial. The evidence from Febrero and Bermejo (2018) shows that the BOP crisis occurs in a pegged exchange rate system when the government has no confidence whether to hold enough international reserves to fund the capital withdrawal to maintain the ongoing interest rate parity condition. An example of the Asian Financial Crisis in 1997 was when Indonesia and Thailand were most affected. This might be concerned as the BOP crisis since the foreign reserves of those countries depleted due to the aim of stabilizing exchange rate level in the situation of surge capital outflow. Then, they moved to inflation targeting and adopted a float exchange rate system.

3. Overview

3.1. Cambodia Dollarization Condition

Cambodia experienced hyperinflation in the late 1980s and early 1990s when the country transitioned to a market-based economy. The unstable macroeconomic condition and political uncertainty contributed to local currency depreciation, Khmer Riel (KHR) (Samreth and Sok, 2018). The influx of the U.S Dollar (USD) from the arrival of the United Nations Transitional

---

[2] More detail is discussed in section 3.2.

Authority in Cambodia for the national election in 1992 also accelerated Cambodians to use USD widely across the country. From the first quarter of 2008 to the first quarter of 2020, the average share of foreign currency deposits to broad money (FCDM2) and the share of foreign currency deposits to total deposits (FCDTD) are 83 percent and 95 percent, respectively. These two indexes indicate the persistent high dollarization in Cambodia.

Figure 1 - Dollarization Indicators

Q1 2008 - Q1 2020
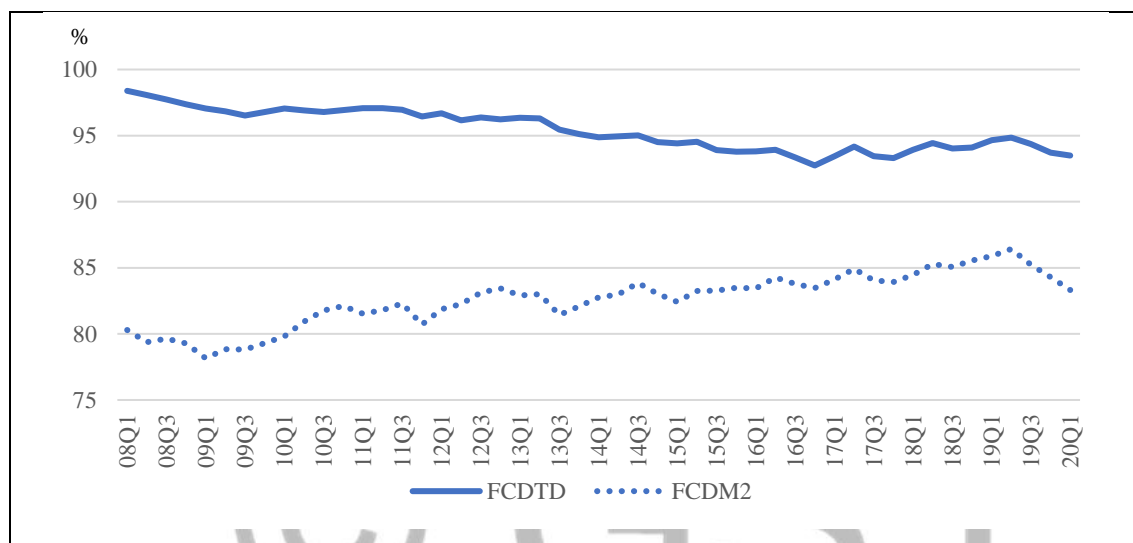
Source: National Bank of Cambodia

3.2. Real Effective Exchange rate in Cambodia

The National Bank of Cambodia (NBC), the central bank, announces the exchange rate regime as the managed float, de jure exchange rate[3]. It intervenes in the foreign exchange market to achieve price stability and to maintain the exchange rate under the determined objective. The official exchange rate is announced twice per day. It is explicitly used for the transactions of NBC and its third parties and is also a benchmark for the private sector. However, the exchange rate behaves more stable in more than a decade, particularly the Riel/USD rate. Moreover, the Riel/USD acts in a seasonal pattern where the lowest is in March and the highest is in August and September (Figure 3).

More importantly, to overview the strength of a country's price competitiveness, the policymakers need to calculate the effective exchange rates (i.e., nominal and real), which are a summary measure of the changes in the exchange rates of a country vis-à-vis its trading

---

[3] See: www.nbc.org.kh/english/monetary_policy/exchange_rate_policy.php

partners. The indicator of real effective exchange rates considers changes in market exchange rates and variations in relative prices using consumer prices.

In the case of Cambodia, the real effective exchange rate is calculated the following:

$$REER = 100 * \pi \left[E_i \left(\frac{P_i}{P} \right) \right]^{w_i} \tag{1}$$

where

- π: the multiplication
- E_i: the exchange rate (the ratio of Khmer Riels to other currencies)
- P_i: the consumer price index of foreign countries where 2010 is the base year
- P: the consumer price index of Cambodia where 2010 is the base year
- w_i: the weighted size of import and export of country i

If REER value increases meaning that the ratio of $\frac{P_i}{P}$ at time t is greater than time t-1, Cambodia's competitiveness improves. In other words, P_i increases or P declines if comparing to the previous period.

Figure 2 - Real Effective Exchange Rate Q1 2008 - Q1 2020

Index
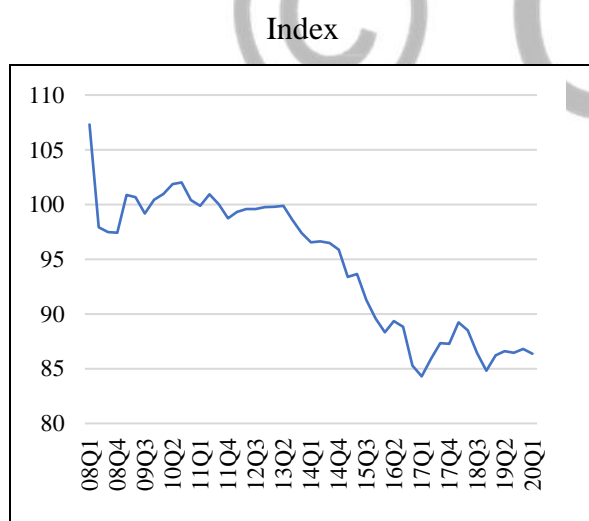
Figure 3 - Month-end Exchange Rate Movement, Mid-point Market Rate

(KHR/USD)
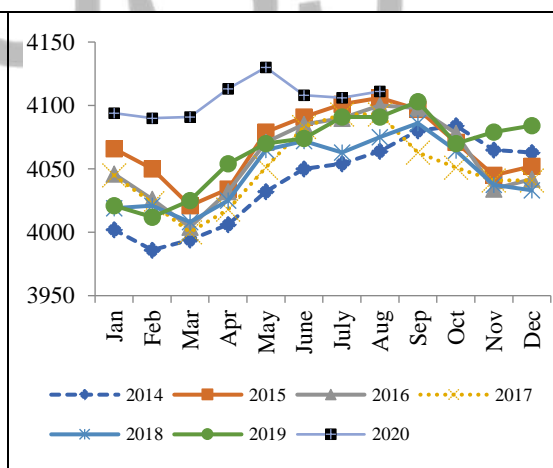
Source: National Bank of Cambodia

3.3. Balance of payment (BOP) position of Cambodia

For a specific period, the BOP records an economic transaction with the rest of the world. The major components are the current account, financial account, and capital account. Imports are debits, and exports are credit. If credits are more considerable than debits, it is called surplus current account balance. Otherwise, it is called deficit current account balance. The financial

account incorporates direct investment, portfolio investment, and other investments. The financial account balance is the net between financial assets and financial liability. The capital account consists of capital transfers and the acquisition/disposal of non-financial assets. The proportion of capital account is relatively small in calculating the overall balance. The BOP also helps to forecast a country's market potential in the short run.
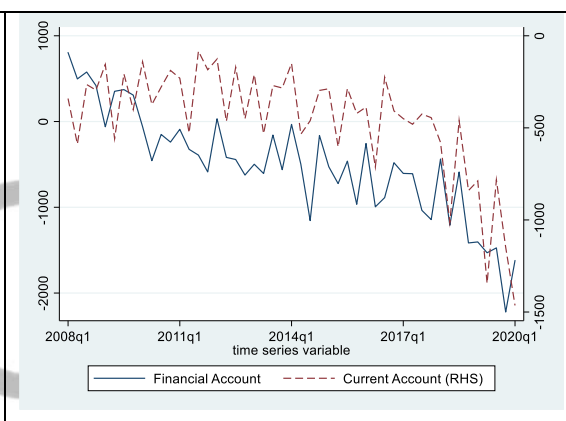
Using the analytical presentation of BOP, the overall balance (OB) is calculated as the following:

$$OB = CA + KA - FA + NEO = \Delta Reserves \qquad (2)$$

Figure 4 - Overall Balance in million USD, Q1 2008 - Q1 2020
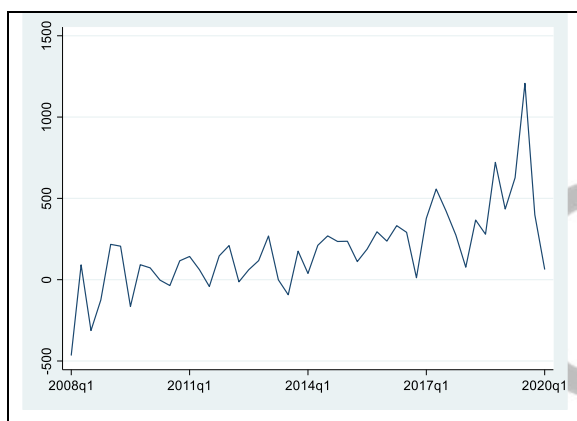
Figure 5 - Current Account and Financial Account Balance in million USD, Q1 2008 - Q1 2020

Source: National Bank of Cambodia

4. Theoretical framework

There are three main approaches to examine the effect of exchange rate volatility on the BOP. Those are the elasticity approach, the absorption approach, and the monetary approach. I describe those three approaches like the following:

- **The elasticity approach to BOP** emphasizes the trade balance and is established on the Marshall Lerner condition. If the sum of elasticities of demand for export and imports is greater than unity, the devaluation has a positive impact on BOP. If the sum is less than unity, the balance of trade should be improved by revaluation.

- **The absorption approach to BOP** assumes that the devaluation would only positively affect the balance of trade if the propensity to absorb is lower than the rate at which devaluation would induce increases in the national output of goods and services. The principle of this approach is to argue that the favorable result of price elasticity might not be good enough to

capture the BOP effect resulting from the devaluation if that devaluation does not reduce domestic expenditure.

- **The monetary approach to BOP** restores the equilibrium of the BOP. One might need to consider the appropriate level or the equilibrium of money demand and supply, which could be explained by variables such as income level, interest rate, domestic and foreign price level, and exchange rate. In addition, the depletion of international reserves, which reflects the imbalances of the prevailing money market condition, could deteriorate the BOP position. The author also argues that if the central bank increases the money supply in the fixed exchange rate system, the foreign reserves would be used up as the expenditure in the forms of purchasing foreign assets increases by domestic residents. To respond to the depletion of reserves, the central bank will buy foreign currency to accumulate reserves and improve the BOP position.

5. Research Methodology and data

5.1. Model Specification

In this paper, I mainly use the monetary approach as it well captures the current state of the BOP. As there is no quarterly income level (i.e., GDP or GDP per capita) dataset for Cambodia yet, I do not include it in this model. However, to improve the adjusted R^2, I incorporate the broad money growth (M2G), dollarization index, and year dummies in the regression.

I use IMF data for the overall balance and obtain the primary dataset for REER, M2G, dollarization index from the National Bank of Cambodia in quarterly frequency. Since I will apply time-series data, checking for stationarity is preliminary and essential to avoid spurious results. Series of studies proved that by including the I(1) series in the standard regression models, the variable relationship sometimes yields statistically significant impacts due to randomness (Grant and Lebo, 2016). To check unit-roots, I use four methods which are Augmented Dickey-Fuller (ADF), Dickey-Fuller GLS (ERS), and Phillips-Perron. Table 1 and Table 2 present the unit root test results for all variables in level and first different, respectively. All variables are I(1)[4].

Figure 6 shows a correlation between the dependent variable (overall balance) and the controlled variables – real effective exchange rate, broad money growth rate, ratio of foreign currency deposit to total deposit, and KHR market interest rate. So I suspect those I(1) series might be cointegrated.

---

[4] I(1) means stationary at first difference.

The autoregressive distributed lag model (ARDL) is the major workhorse in dynamic single-equation regressions. A particular attractiveness of the ARDL model is when it is in error-correction (EC) form. Its popularity in applied time series econometrics has even increased since it turned out for nonstationary variables that co-integration is equivalent to an error-correction mechanism[5]. By differencing and forming a linear combination of the nonstationary data, all variables are transformed equivalently into an EC model with stationary series only.

Table 1 - Unit Root Tests

For the variables in level

	OB	REER	M2G	FCDTD
Augmented Dickey-Fuller (ADF)	t-stat.: -0.76 No exogenous	t-stat.: -2.74 With drift and trend	t-stat.: -1.32 No exogenous	t-stat.: -1.90 With drift and trend
Dickey-Fuller GLS (ERS)	t-stat.: -0.24 with drift	t-stat.: -2.50 With drift and trend	t-stat.: -2.18* With drift	t-stat.: -1.78 With drift and trend
Phillips-Perron	adj. t-stat.: -3.16* No exogenous	adj. t-stat.: -2.92 With drift and trend	adj. t-stat.: -3.27* No exogenous	adj. t-stat.: -1.98 With drift and trend

Note:

- For each variable, I control different regressors in conducting the unit-root test according to its data behavior.
- The * means to reject the null hypothesis of a unit root.
- OB: Seasonally adjusted overall balance, REER: Seasonally adjusted real effective exchange rate, M2G: Seasonally adjusted broad money growth rate, FCDTD: dollarization index - the ratio of foreign currency deposit to the total deposit.

Given this algorithm and in line with the data's statistical characteristics, I use the method suggested by Jordan and Philips (2018) which is the Autoregressive Distributed Lag (ADL) in error correction form. The model specification is as the followings:

$$\Delta OB_t = \alpha + \beta_1 \Delta REER_t + \beta_2 \Delta M2G_t + \beta_3 \Delta FCDTD_t + \beta_4 OB_{t-1} + \beta_5 REER_{t-1} +$$
$$\beta_6 M2G_{t-1} + \beta_7 FCDTD_{t-1} + Year\ Dummies + \varepsilon_t \qquad (3)$$

where

- OB: seasonally adjusted overall balance in million USD.
- REER: seasonally adjusted real effective exchange rate (index). $\Delta REER_t = REER_t - REER_{t-1}$.

---

[5] see Granger's representation theorem in Engle and Granger (1987)

- M2G: seasonally adjusted broad money growth rate. $\Delta M2G_t = M2G_t - M2G_{t-1}$. This paper includes both REER and M2G on the explanatory variables to explain the BOP position. One might argue that there should be a multicollinearity problem since they are closely correlated according to economic theory per se. However, by conducting the correlation analysis using the dataset applied in this paper, the correlation between REER and M2G is positive, only around 9%. If the central bank increases the money supply, the competitiveness improves but in a small magnitude. Therefore, the concern of multicollinearity issue should be rejected.

Table 2 - Unit Root Tests

For the variables in first different

	OB	REER	M2G	FCDTD
Augmented Dickey-Fuller (ADF)	t-stat.: -8.10* No exogenous	t-stat.: -10.29* With drift and trend	t-stat.: -7.36* No exogenous	t-stat.: -7.03* With drift and trend
Dickey-Fuller GLS (ERS)	t-stat.: -0.32* with drift	t-stat.: -1.92 With drift and trend	t-stat.: -0.93 With drift	t-stat.: -7.05* With drift and trend
Phillips-Perron	adj. t-stat.: -16.92* No exogenous	adj. t-stat.: -10.29* With drift and trend	adj. t-stat.: -31.3* No exogenous	adj. t-stat.: -7.2* With drift and trend

- FCDTD: the dollarization index - the ratio of foreign currency deposit to the total deposit. $\Delta FCDTD_t = FCDTD_t - FCDTD_{t-1}$. I do not use the ratio of foreign currency deposit to M2 as M2G is already one of the controlled variables in the model. By doing so, it is to avoid possible multicollinearity problems in the independent variables as well.

- Year Dummies: I include the dummies for the year 2008, 2009, 2013, 2018, and 2019 to cover the below events:
  - 2009: Global Financial Crisis (GFC).
  - 2019: Huge capital inflow, particularly from Chinese investors as the Cambodian government encouraged more foreign investments.

- ε: regression residuals

Table 3 - Pesaran, Shin, and Smith ARDL-bounds test for co-integration

F-state. = 10.57	<------- I(0) --------	------- I(1) -------->
10% critical value	2.205	3.421
5% critical value	2.593	3.941
1% critical value	3.498	5.149

Table 4 - Data Source and Description

Variable	Source	Obs	Mean	Std. Dev.	Min	Max
OB	IMF	49	-205.9916	231.7682	-1240.605	61.2080
CA	IMF	49	-457.1657	280.4196	-1543.1100	-142.9469
FA	IMF	49	-508.4812	617.3784	-2096.5690	630.7178
NBC_REER	NBC	49	94.5282	6.2452	84.7503	107.7429
IMF_REER	IMF	47	111.2953	10.5289	93.4361	127.6560
M2G	IMF	49	5.1597	3.5599	-4.7899	12.7453
FCDTD	NBC	49	95.3932	1.5165	92.7411	98.3874

Note:

For OB, CA, FA, I use the IMF's BOP format as defined in the 6th Edition of the Balance of Payments Manual (BPM6).

Figure 6 - Scatter Plots

Correlation coefficient: 0.66

Correlation coefficient: -0.13

Correlation coefficient: 0.54

Note:

These scatter plot graphs represent
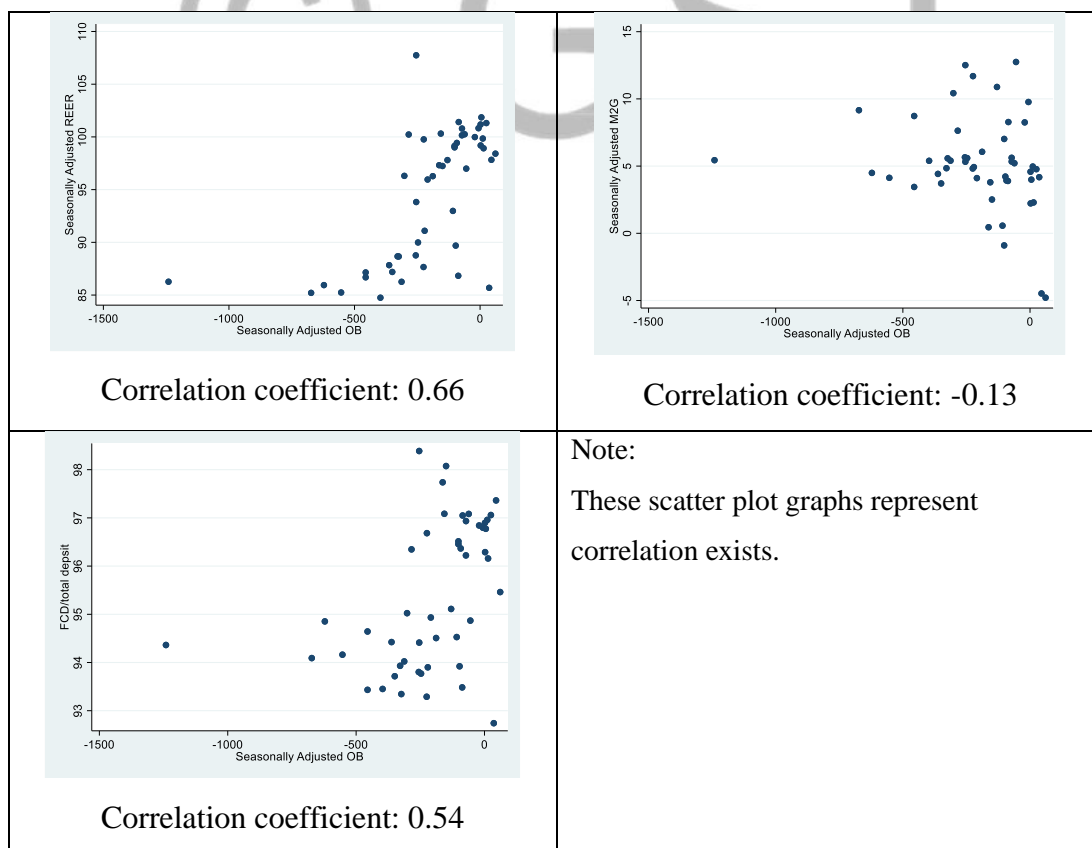
correlation exists.

Table 3 presents the result of the Pesaran, Shin, and Smith ARDL-bounds test for co-integration[6]. The F-statistic value, 13.48, is well above the I(1) critical value. Hence, I can conclude the evidence of co-integration at the 1% level.

5.2. Variable Behavior

In this section, I discuss the expected result for each explanatory variable as the followings:

- REER: Figure 7 explains the exchange rate behavior and its relation with the BOP. As mentioned above, external competitiveness for multi-lateral trade is typically measured using Real Effective Exchange Rate (REER). Theoretically, the greater external competitiveness, the better BOP position via improving trade balance.

Figure 7 - Conceptual Framework for Relation of Exchange Rate and Balance of Payment
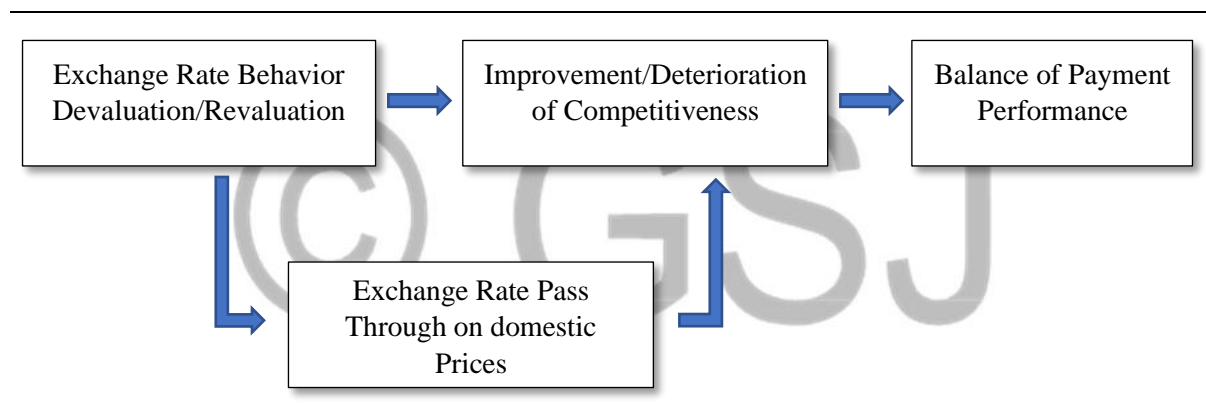
Source: Author

- M2G: If the central bank increases the money supply, such as quantitative easing or purchasing the assets, including the government bonds, the BOP improves. However, in the case of Cambodia, the increase of money supply is via auctions[7] and liquidity providing collateralized operations (LPCO) – where the financial institutions need to place a negotiable certificate of deposits (NCDs) as the collaterals. These operations bring the local currency depreciates; thus, the imported products are more expensive, or the domestic products are cheaper, leading to current account increases, and BOP improves.

---

[6] See the detail test procedure in Jordan and Philips (2018).
[7] NBC arranges the auctions at the predetermined amount (either in USD or KHR) by buying or selling foreign currency in the foreign exchange market.

- FCDTD: Regardless of the exchange rate regime adoption, the increase of dollarization in Cambodia mainly due to FDI inflow and the expansion of other investment (i.e., Bank lending from foreign banks) usually leads to increased international reserves associated with BOP improvements.

6. Results and discussion

By the structure of ARDL in ECM form, the current change in the dependent variable has two components. The first is the short-run which is proportional to the recent change in the regressors. The second is the long-run (equilibrium error), a partial correction from the equilibrium values (the lag regressors).

Table 5 captures the regression outcomes. The main purposes of this paper are to explain the effect of REER and dollarization on the BOP position. I also construct Figure 9 to exhibit the impact transmission of REER, M2G, and FCDTD on the BOP in Cambodia. I explain the results like the following:

- The coefficients of both ΔREER and $REER_{t-1}$ are negative and significant, meaning that the increase of REER or improvement of Cambodia's competitiveness leads to the decline of OB both in the short- and long run. REER is the underlying indicator that reflects a country's competitiveness from various economic activities. This finding is in contrast to the expectation explaining in the variable behavior section. The increase of REER (according to the NBC calculation) means local currency depreciates leading to the decline of other investments. For instance, if local banks borrow fund from foreign banks in foreign currency (mostly in USD) and in case domestic currency depreciates, those local banks will encounter exchange rate lost; as the result, they might slowdown the investments if local currency keep depreciating.

- The coefficient of broad money growth (M2G) is negative and significant both in the short- and long run, meaning the increase of M2 is in line with the rise in OB. NBC increases money supply via auctions in the foreign exchange market and liquidity providing collateralized operations (LPCOs). This operation should bring to the depreciation of the domestic currency associated with the increase of exports and current account balance; hence, OB and BOP improve. This finding is consistent with the theory and the expected outcome.

- The coefficient of the dollarized index – the ratio of foreign currency deposit to total deposit (FCDTD) – is positive and significant only in the long run. The increase of dollarization in the case of Cambodia is associated with the increase of FDI and bank lending from abroad

(classified as the other investments in the BOP); therefore, the financial account declines, and BOP improves.

Table 5 - Regression Results ARDL with ECM model

	Coefficients
OB_{t-1}	-1.3280***
	(0.1839)
$\Delta REER_t$	-28.8433**
	(12.7092)
$\Delta M2G_t$	24.5164***
	(6.8706)
$\Delta FCDTD_t$	6.9014
	(64.2947)
$REER_{t-1}$	-46.1337***
	(10.7961)
$M2G_{t-1}$	29.2771**
	(10.3150)
$FCDTD_{t-1}$	98.8495**
	(38.4035)
Y2009	-173.0062**
	(85.1738)
Y2019	391.1685***
	(113.4076)
Observation	48
R^2	0.6886
Adjusted R^2	0.6149

Figure 8 - Scatter Plot between REER and Exports
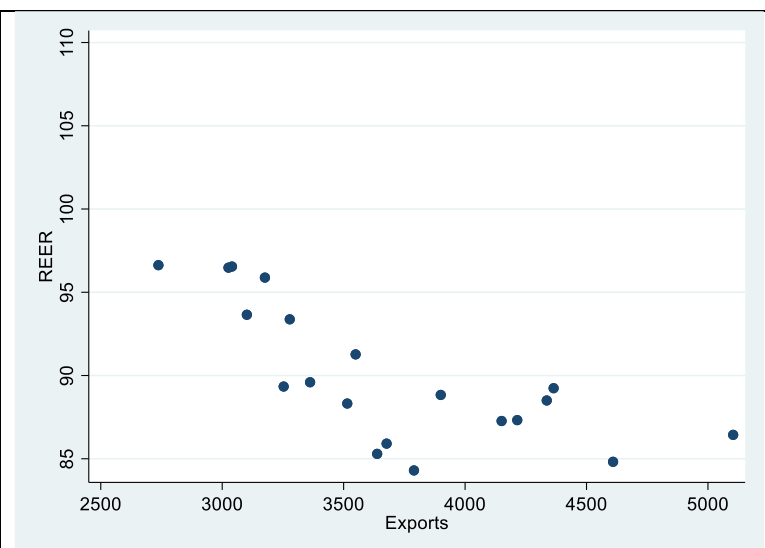
Note on Table 5:

- Dependent variable is ΔOB_t.
- Standard errors in parentheses.
- Significantly different from zero 90% (*), 95% (**), 99% (***) confidence level.
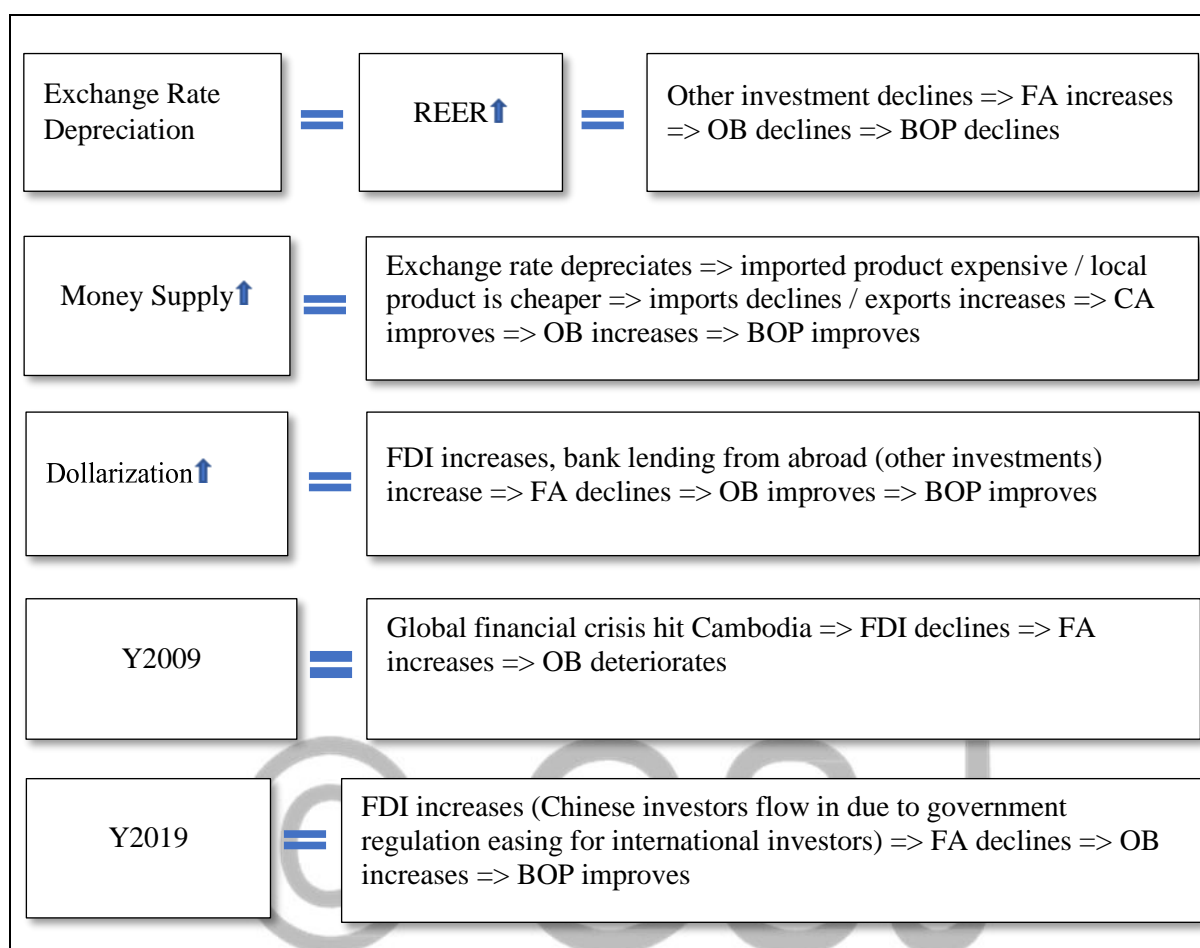
Note on Figure 8:

- There is an evidence of negative correlation between Exports and REER (NBC data). I suspect that the depreciation of REER might be associated with the decline of Exports.

- The coefficient of Y2009 is positive. In 2009, Global Financial Crisis hit Cambodia leading to the decline of capital flow. Therefore, the financial account increases, OB declines, and BOP deteriorates.

- The coefficient of Y2019 is positive, meaning that the outbreak of the COVID-19 pandemic in 2019 improves the OB. In 2019, Cambodia's government attracted more international investments leading the increase in foreign direct investments and overall balances.

Figure 9 - Impact Transmission Diagram

In the Case of Cambodia – Highly Dollarized Economy

Exchange Rate Depreciation	**=** REER↑ **=**	Other investment declines => FA increases => OB declines => BOP declines
Money Supply↑	**=**	Exchange rate depreciates => imported product expensive / local product is cheaper => imports declines / exports increases => CA improves => OB increases => BOP improves
Dollarization↑	**=**	FDI increases, bank lending from abroad (other investments) increase => FA declines => OB improves => BOP improves
Y2009	**=**	Global financial crisis hit Cambodia => FDI declines => FA increases => OB deteriorates
Y2019	**=**	FDI increases (Chinese investors flow in due to government regulation easing for international investors) => FA declines => OB increases => BOP improves

Source: Author

6.1. Robustness Check

For the robustness check with the regression results in Table 5, I run three more regressions[8] by applying the REER calculated by the IMF, substituting the data obtained from the NBC, and using the current account, financial account, and overall balance as an alternative dependent variable. Table 6 explains these regression results. The results obtained are well in line with the regression outcomes in Table 5 as the following:

- Under OB as a dependent variable, the coefficients of REER are positive and significant only for the long run. By IMF's definition, if REER increases, the country's competitiveness declines where this setting is opposite to the NBC's REER formula. The regression outcome suggests that the coefficient of REER is positive, meaning that the increase in REER (i.e., the

---

[8] I also run the regressions using CA and FA as the dependent variables and NBC's REER. I got significant coefficients of ISP and REER and the signs are consistent to the results under Table 3. However, the R^2 and adjusted R^2 are relatively low; hence, I put these regressions in the appendix just only for references.

decline of a country's competitiveness) deteriorates the BOP. The coefficient of M2G is positive for both the short- and long-run. The coefficient of FCDTD is positive for only the long run. The coefficients of Y2009 and Y2019 are negative and positive, respectively.

	Table 6 - Robustness Check Regressions IMF's REER		
	Dep. Variable: ΔOB_t	Dep. Variable: ΔFA_t	Dep. Variable: ΔCA_t
	Coefficients	Coefficients	Coefficients
Dependent Var$_{t-1}$	-1.2473***	-1.2372***	-0.8484***
	(0.2331)	(0.1688)	(0.1903)
$\Delta REER_t$	15.8351	-27.2589	-6.7074
	(11.4947)	(21.8273)	(11.3021)
$\Delta M2G_t$	26.3259***	-19.4183	-3.3050
	(6.6768)	(12.2354)	(6.2479)
$\Delta FCDTD_t$	52.1633	-33.8613	-49.9930
	(59.8328)	(113.0645)	(55.8125)
REER$_{t-1}$	40.3317***	-37.1889**	-9.8538
	(9.5445)	(14.5197)	(7.4493)
M2G$_{t-1}$	35.6537***	-23.3186	1.2598
	(10.9542)	(17.2220)	(8.6610)
FCDTD$_{t-1}$	189.671***	-74.9024	1.0946
	(55.8043)	(92.9367)	(46.7313)
Y2009	-140.9469*	256.1408*	68.5080
	(82.1664)	(152.3358)	(76.1913)
Y2019	227.3703*	-698.0652***	-329.868**
	(113.6543)	(232.4626)	(130.9738)
Observation	46	46	46
R^2	0.6023	0.6376	0.3809
Adjusted R^2	0.5029	0.5470	0.2261

Note
- Standard errors in parentheses.
- Significantly different from zero at 90% (*), 95% (**), 99% (***) confidence level.

- Under FA as a dependent variable, the coefficient of REER is negative for the long run. The increase of IMF's REER (decline of competitiveness) is associated with the decline of FA balance. In other words, the improvement of competitiveness is in line with the increase of FA, leading to the deterioration of OB and BOP. Therefore, this finding is consistent with the result in Table 5. The coefficients of Y2009 and Y2019 are positive and negative, respectively (opposite to the signs of Y2009's and Y019's coefficients stated in Table 5). Due to GFC in 2009 (reflected by Y2009), Cambodia's FDI inflow declines leading to the increase of FA, meaning BOP declines. Also, the increase of capital flow in 2019 is aligned with the drop of FA, meaning BOP improves.

- The magnitude of the coefficient of Y2019 under FA is more prominent than under CA. Hence, the increase of FDI in 2019 leads to the improvement of the BOP.

6.2. Residuals Diagnostic
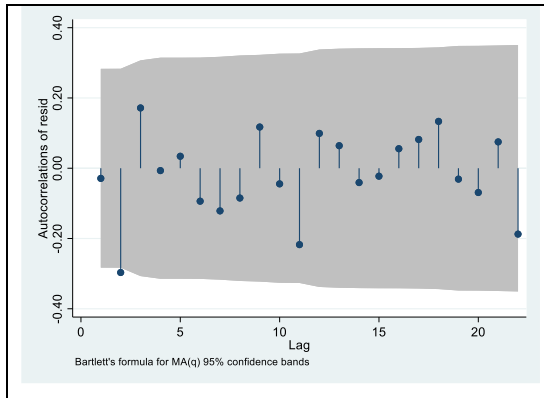
Figure 10 - Autocorrelations of Residuals

Table 7 - Unit Root Test of the Residuals

Null Hypothesis: RESIDUAL_REGRESSION_USED has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.338047	0.0000
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

The regression residuals (specified in equation 3) behave like white noise, as shown in Figure 10 and Table 8. Also, the Durbin-Watson d-statistic is 1.98, which is very close to 2, which means no autocorrelation is detected in the residuals. The unit root test concludes the residuals are white noise.

7. Conclusion

This paper explains the relationship between BOP and REER also BOP and dollarization for Cambodia. Not limited to these main variables, I incorporate the growth of money supply and year dummies in the analysis. The regression outcomes serve as the essential policy guidance, particularly for the National Bank of Cambodia.

The higher the trade competitiveness – an increase of REER according to the NBC calculation – is associated with the drop of BOP position in both short- and long-term. The increase of money supply via open market operations and/or LPCOs is associated with BOP improvement. The increased dollarization level, which is proxied by the ratio of foreign currency deposit to total deposit, is in line with BOP improvement. I also employ the REER using IMF data in the regression for robustness check, and the results are all consistent.

However, there are still some challenges that impose the limitation of this analysis. Cambodia does not have a long horizon of the high-frequency dataset. I hope in the model specification; one should include income level as if the high-frequency data is ready. I do not

include the policy rate in the model as Cambodia does not have it yet. Therefore, for better analysis and to cover a wider scope, the NBC should make this data available, and by having policy rate, the NBC could (i) influent the economy effectively and (ii) drive the interest rates in different currencies in the banking and financial system.

Reference

Ahmad, Ahmed, Khoso, Palwishah, Raza. 2014. Impact of exchange rate on the balance of payment: An investigation from Pakistan. *Research Journal of Finance and Accounting*. 5(13): 2222-1697.

Berg, Borensztein. 2001. Full dollarization: The pros and cons (No. 24). *International Monetary Fund*.

Febrero, Bermejo. 2018. The financial crisis in the eurozone: a balance-of-payments crisis with a single currency? *Review of Keynesian Economics*. 6(2): 221-239.

Grant, Lebo. 2016. Error correction methods with political time series. *Political Analysis*. 3-30.

Jordan, Philips. 2018. Cointegration testing and dynamic simulations of autoregressive distributed lag models. *The Stata Journal*. 18(4): 902-923.

Odili. 2014. Exchange rate and balance of payment: An autoregressive distributed lag (ARDL) econometric investigation on Nigeria. *IOSR Journal of Economics and Finance*. 4(6): 21-30.

Oladipupo. 2011. Impact of exchange rate on the balance of payment in Nigeria. *African Research Review*. 5(4).

Samreth, Sok. 2018. Revisiting the Impacts of Exchange Rate Movement on the Dollarization Process in Cambodia.

Umoru, Odjegb. 2013. Exchange rate misalignment and balance of payment adjustment in Nigeria. *European scientific journal*. 9(13).
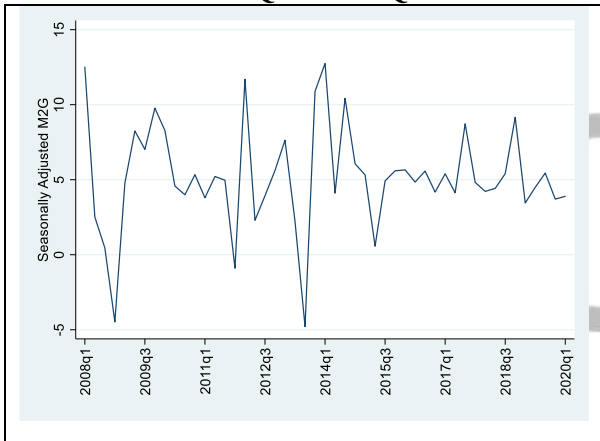
Appendix

**Figure 11 - Seasonally Adjusted Overall
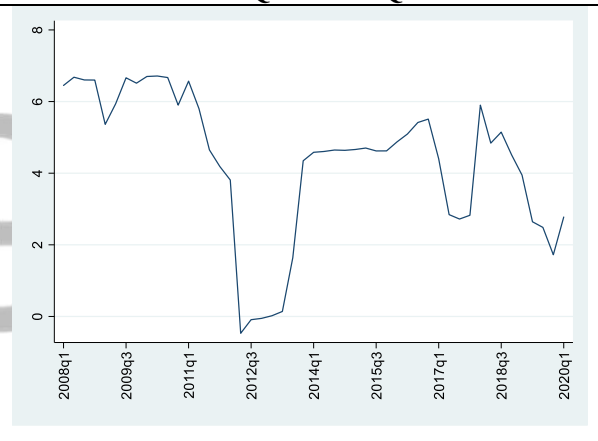Balance
2008 Q1 – 2020 Q1**
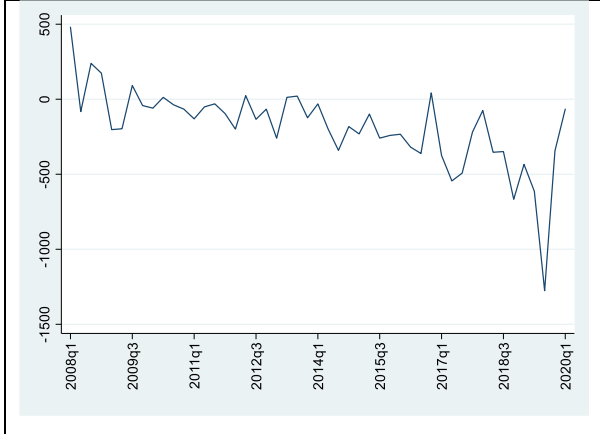
**Figure 12 - Seasonally Adjusted REER
2008 Q1 – 2020 Q1**

**Figure 13 - Seasonally Adjusted M2G
2008 Q1 – 2020 Q1**

**Figure 14 - Market Interest Rate Spread
2008 Q1 – 2020 Q1**

**Figure 15 - Foreign Currency Deposit to
Total Deposit
2008 Q1 – 2020 Q1**

Note: Some variables need to be seasonally adjusted according to data behavior.

Source: National Bank of Cambodia

Table 8 - Other Regressions		
	Dep. Variable: ΔCA_t **NBC's REER**	**Dep. Variable: ΔFA_t** **NBC's REER**
	Coefficients	Coefficients
$\Delta REER_t$	7.6193 (15.9576)	-6.8270 (32.3364)
ΔISP_t	-9.1171 (25.7247)	92.1379* (54.3048)
$\Delta M2G_t$	-0.7000 (7.7879)	-16.2381 (16.5015)
$\Delta FCDTD_t$	2.2905 (69.9594)	-41.3397 (149.4068)
Dependent Var$_{t-1}$	-0.1998 (0.1572)	-0.5616*** (0.1572)
REER$_{t-1}$	14.7491 (13.3195)	37.3584* (22.4378)
ISP$_{t-1}$	12.7998 (13.8349)	54.8574 (31.8025)
M2G$_{t-1}$	1.5550 (11.2656)	-9.6178 (23.6867)
FCDTD$_{t-1}$	-20.9773 (47.8151)	-2.0989 (91.6747)
Observation	48	48
R^2	0.1105	0.3729
Adjusted R^2	-0.1001	0.2244

Note

- Standard errors in parentheses.

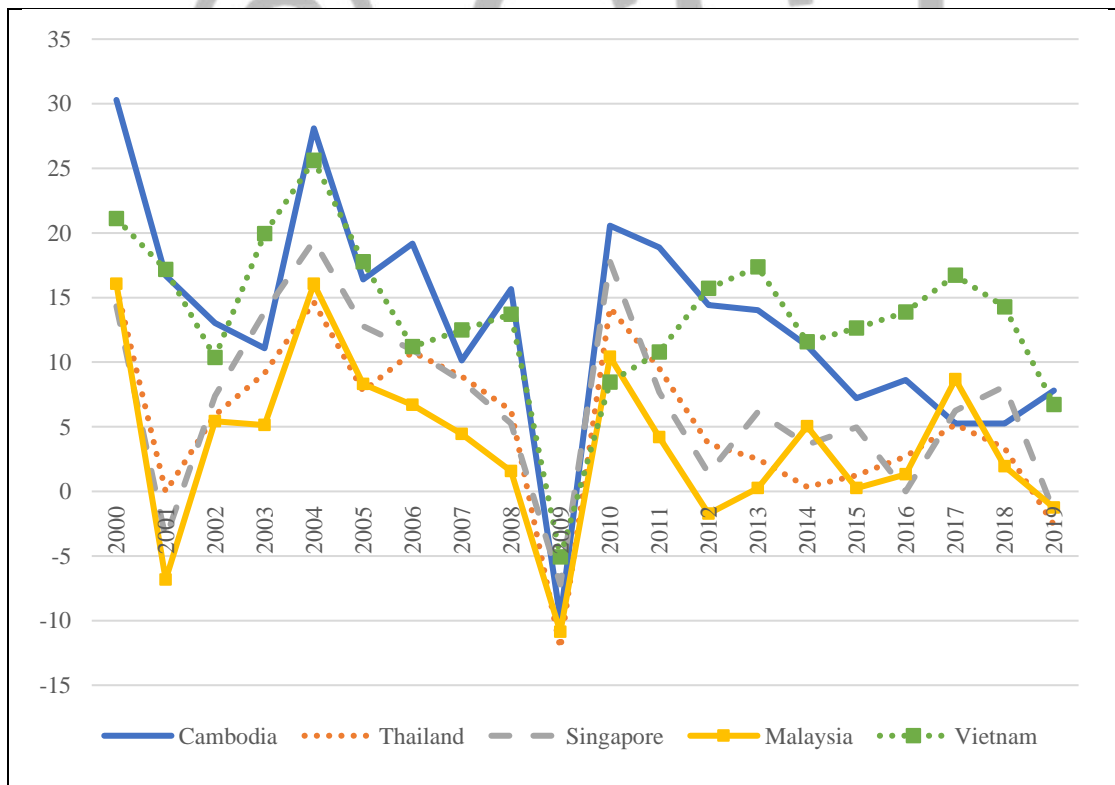- $* p < 0.05$, $** p < 0.01$, $*** p < 0.001$.

Figure 16 - Cambodia's International Reserves
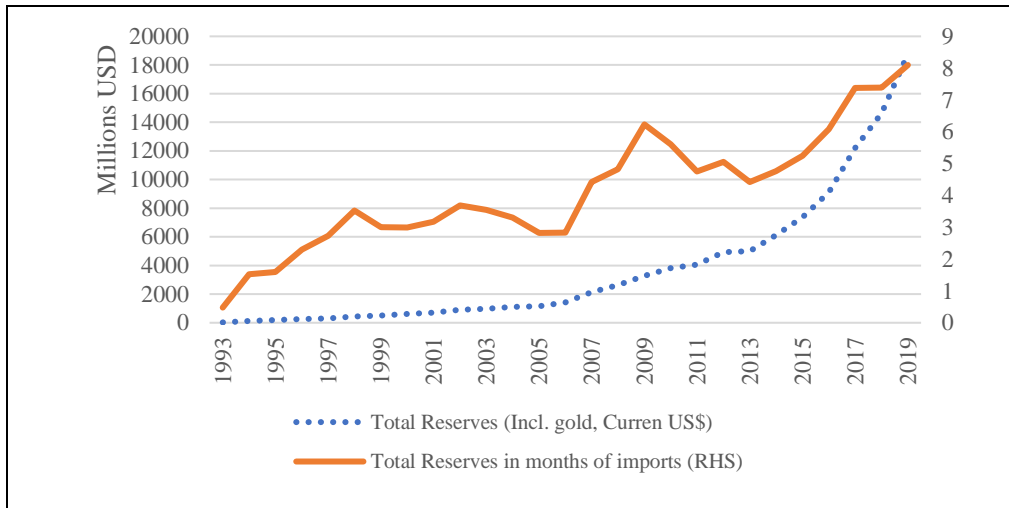
Source: World Bank

Note: Cambodia adopts a pegged regime and is a highly dollarized economy. To keep the exchange rate stable, the central bank needs to utilize more of the international reserves. However, in the last decades, the level of international reserves kept increasing which means the central bank has absorbed more of a foreign currency or has attempted to accumulate the international reserves.

Figure 17 - Exports of goods and services
annual % growth

Source: World Bank