CHAPTER 2

MONETARY POLICY IN SMALL OPEN AND DOLLARIZED ECONOMY: AN EXPERIENCE OF CAMBODIA

By
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1. Introduction

Cambodia has experienced high average output growth with a stable macroeconomic and political environment after gaining peace for the first time in 1998 since the outbreak of the civil war in 1970. The civil war during the 1970-1975 period was accompanied by a massive U.S. bombing campaign (1970-1973) while the Khmer Rouge genocide during the 1975-1979 period had destroyed vast human and physical capital including teachers, doctors, engineers, schools, hospitals, factories and land- and water-transport infrastructures etc. Consequently, it took Cambodia around two decades after the end of the genocide in 1979 to attain the same level of the share of gross capital formation to GDP of approximately 13 percent achieved in 1970 (World Bank’s World Development Indicator, 2019).

Capital accumulation was further bolstered by the inflow of foreign direct investment (FDI) and foreign aid, which resulted in part from Cambodia’s regional and global integration by becoming a member of the Association of South-East Asian Nations (ASEAN) in 1999 and the World Trade Organization (WTO) in 2004. The stock of human capital had also improved as the mean years of schooling went up from 2.7 years in 1990 to 4.8 years in 2018. The human development index (HDI) rose from 0.38 in 1990 to 0.58 in 2018 (UNDP, 2019 p.3). As a result, Cambodia’s average annual GDP growth in the last two decades (1998-2018) was around 7.9 percent, while growth in 2018 was 7.5 percent (NIS, 2019). Figure 1 shows the levels of Cambodia’s real gross domestic product between 1993 and 2018.

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2. Share of growth capital formation to GDP was 17% in 1999, which later jumped to 23.4% in 2018 (World Bank’s World Development Indicator, 2019).

3. Net Official Development Assistance (ODA) as percentage of capital formation was 46.4% in 1999 and 32% in 2009, while the figure in 2017 was 16.6%. Its average rate during the 2007-2017 period was 28.2% (World Bank’s World Development Indicator, 2019).
Nevertheless, Cambodia is still faced with structural issues such as the narrow base of the economy (relying on a few industries, namely textile and garment, hotels and restaurants, construction, and real estate, as main sources of growth), limited institutional capacity and governance and high cost of infrastructural services, particularly electricity and transport. However, diversifying the base of the economy has also been underway as production has been expanded to include light manufacturing industries such as bicycle assembly and spare parts and agro-processing. Institutional reforms and governance enhancement programs have also been put in place as set out in the Government’s National Strategic Development Program 2019-2023 (NSDP) and Rectangular Strategy Phase IV (RSP IV).

Against this backdrop, there is also a phenomenon of dollarization originally propelled by the huge inflows of U.S. dollar currency from the United Nations into Cambodia in early 1990s to finance its peacekeeping forces and guarantee the success of the first multi-party democratic election in 1993. In the early days, the shares of foreign currency to broad money were 26.3 percent and 38.8 percent in 1992 and 1993, respectively, but increased to 51.8 percent in 1994 and 56.4 percent in 1995 (Baliño et al., 1999). Latest data of the same measure in July 2019 was 84.4 percent, which is considerably higher than the figure two decades ago (National Bank of Cambodia, 2019).

Figure 1
Cambodia’s Gross Domestic Product in Billion Riel (LCU), at 2000 Price

Source: Author’s estimation using data from National Institute of Statistics, 2019.
According to the traditional view, dollarization is viewed as an obstacle to the implementation of monetary policy, specifically by limiting the capacity of the transmission mechanism of monetary policy. This view is supported by the literature. Studies such as Acosta and Coble (2011); Mengesha, Shen and Lim (2017); Ize and Yeyati (2006); Dabla-Norris and Floerkemeier (2006); Isakova-Cerge-ei (2008); and, Alvarez-Plaza and Gracia-Herrero (2008), show that dollarization, financial in particular, restrains the capacity of monetary transmission mechanism, while others such as Armas and Grippa (2005); Rossini and Vega (2008); Leiderman et al. (2006); Billmeier and Banoto (2004); Reinhart et al. (2003); and, Quispe, (2000) find that dollarization does limit the monetary authority from implementing monetary policy, such as inflation targeting, to attain price stability goal.

Generally, monetary policy is transmitted through five channels, namely interest rate, exchange rate (both direct and indirect), credit, asset prices and expectation, to inflation which is the end goal. In the absence of an interbank and money market, particularly the market for government bonds, coupled with the high level of dollarization, attaining effective implementation of monetary policy has been a challenge for the Cambodian monetary authority. Stabilizing inflation through the nominal exchange rate anchor has been an effective tool of the Cambodian monetary authority, while other monetary policy instruments, such as reserve requirement, Negotiable Certificate of Deposits (NCDs) and Liquidity Providing Collateralized Operation (LPCO) have also been adopted to support the rapid development of the financial sector in Cambodia. However, such a high level of dollarization makes Cambodia’s monetary policy strongly connected with changes in the U.S. Federal Funds Rate, and the evidence of such a relationship has been shown in Duma (2011) and Samreth et al. (2019). Findings in this study also corroborate with those in the aforementioned studies.

This study is conducted as part of the research project on the “Distributional Impact of Monetary Policy” focusing on income distribution and inequality in Southeast Asian countries, initiated by the South East Asian Central Banks (SEACEN) Research Training Centre. Limitation in the quarterly data on income distribution and the extremely high dollarization prevents this study from examining the aforementioned topic at length. Nevertheless, in contribution to the project, this study uses relevant and available data and provides a narrative of the development of monetary policy under high dollarization in Cambodia.

This study is, therefore, aimed at revisiting monetary policy tools that are in operation and their contribution to the stabilization of the Cambodian macroeconomic environment will be discussed, as reflected by the low and stable inflation and low volatility of the exchange rate and international reserves during the last two decades. It also looks at the responses of inflation, interest rate, exchange rate, output gap, and Cambodia-US trade balance to a shock of the U.S. Federal Funds Rate to see whether the responses differ from those in previous studies, particularly Duma (2011) and Samreth et al. (2019). This study is organized as follows. Section 2 reviews the literature on transmission channels of monetary policy and effectiveness of the transmission mechanism in dollarized economies. Section 3 describes the trends of income inequality in Cambodia. Section 4 presents Cambodia’s macroeconomic conditions and monetary policy. Section 5 describes the empirical methodology followed by data collection in Section 6. Section 7 discusses empirical results. Finally, Section 8 concludes.
2. Literature Review

This section describes the basics of monetary policy transmission mechanism and discusses the effectiveness of the transmission mechanism in dollarized economies based on evidence from existing studies.

2.1 Monetary Transmission Mechanism

Generally, the primary objective or the overriding goal of the central bank is price stability, while other sub goals include potential output growth and full employment. The goal of stable price or low inflation is usually attained through the setting of its policy/official rate which is transmitted through a number of channels, namely interest rate, exchange rate, asset prices, credit (bank lending and balance sheet) and expectations, to affect inflation. Figure 2 below shows the details of the monetary policy transmission channels, each of which is not completely independent.

![Monetary Policy Transmission Channels](image)

Source: Adapted from Epstein and Tok, 2019.

The first transmission channel is interest rate, which runs from policy rate to market rate, and aggregate demand as measured by the change in firms’ and households’ investment. A change in aggregate demand would affect the output gap, resulting in a change of the price level. For instance, an increase in the official rate drives up the market rate, resulting in an increase in the cost of borrowing, which discourages households from spending on durable goods and firms from investing in productive assets. This affects aggregate demand and the output gap negatively, which leads to a decline in the price level. The second channel is the exchange rate which affects the output gap both directly and indirectly. For instance, a hike in the official rate causes the exchange rate to appreciate, leading to a drop in foreign demand for domestic goods (indirect effect) and a rise in the domestic demand for imported goods (direct effect). As a result, the aggregate demand and output gap are negatively affected, which pushes down the overall price level.
The third channel is asset price (wealth). An increase in the official rate makes household assets such as housing and stock less valuable; consequently, households cut back their spending on durable goods, which causes a decline in the aggregate demand as well as a drop in consumer prices. The credit channel works through either bank lending or the balance sheet. A rise in the official rate drives up the market rate because a contraction in money supply causes banks to cut back on their lending, discouraging households and firms from investing. The increase also reduces the prices of assets, which are often used by firms as collaterals for borrowing. This leads to firms’ having difficulty in acquiring credit to cover spending on their working capital. Later, firms incur a decline in profit and can lead to a rise in non-performing loans that worsens banks’ balance sheets. In such a situation, banks are inclined to cut down the supply of loans, which negatively affects firms’ investment. These two events negatively affect aggregate demand and the output gap, as well as inflation.

Expectation is the last channel but is considered by some economists as the most important relative to other monetary policy transmission channels. It is referred to the expectation of private agents, namely households and firms, about the future policy of the monetary authority. This channel works through a change in the policy rate affecting expectations of different economic agents about the future path of important economic variables, such as income, interest rate and inflation. Their expectations over these variables usually have influence on their consumption and investment. Therefore, clear and predictable monetary policy frameworks establish confidence of private agents, i.e., households and firms for the monetary authority and could serve as a price stabilization tool.

2.2 Monetary Transmission Mechanism in Dollarized Economies

Conventional view on the association between dollarization and the monetary transmission mechanism is that dollarization limits the monetary transmission mechanism, therefore, restraining the monetary authority from attaining their goal of price stability. Whether dollarization hinders the transmission mechanism of monetary policy has long been debated, and there has yet to be a consensus on this. While some studies show that dollarization matters for the transmission mechanism, others by contrast, show that it does not.

Studies that find the transmission mechanism in dollarized economies less effective than that of non-dollarized economies include Acosta and Coble (2011), Mengesha, Shen and Lim (2017), Ize and Yeyati (2006), Dabla-Norris and Floerkemeier (2006), Isakova-Cerge-ei (2008) and Alvarez-Plaza and Gracia-Herrero (2008). Acosta and Coble (2011) look at the effectiveness of the monetary transmission mechanism in the non-dollarized economies of Chile and New Zealand and highly dollarized Peru and Uruguay. They show that the interest rate channel is effective in attaining the inflation target in non-dollarized economies, but not effective in dollarized economies, where the exchange rate channel appears more relevant. Mengesha, Shen and Lim (2017) extended the work of Acosta and Coble (2011) by increasing their study sample to six partially dollarized economies and six non-dollarized countries and applying monthly data over the 1999-2014 period to examine
the degree of response of output and inflation to a shock of the policy rate. They show that output and inflation are responsive in all non-dollarized economies, while only some of the dollarized economies exhibit significant responses of output and inflation to the shock of the policy rate.

Despite abundant studies showing the limitation of the monetary policy transmission mechanism created by dollarization, a number of studies, in converse, support the view that dollarization does not restrain the transmission mechanism of monetary authority from reaching its targeted goal (i.e., targeted inflation). The studies include Armas and Grippa (2005), Rossini and Vega, (2008), Leiderman et al. (2006), Billmeier and Banoto, (2004), Reinhart et al. (2003) and Quispe, (2000). Armas and Grippa (2005) show that high financial dollarization did not preclude Peru’s monetary authority from maintaining low and stable inflation by the adoption of inflation targeting during the 2002-2004 period. This is supported by Rossini and Vega (2008), who surveyed the monetary transmission mechanism in Peru during the 1996-2006 period. Rossini and Vega (2008) show that there is evidence of an effect of financial dollarization on the transmission capacity of monetary policy tools, but the phenomenon is not an obstacle to Peru’s adoption of inflation targeting in 2002 to attain its targeted rate of inflation.

In addition, Leiderman, Maino and Parrado (2006) examine the efficacy of the transmission mechanism and types of money policy regimes in two highly dollarized economies (Peru and Bolivia) and two other economies with low levels of dollarization (Chile and Columbia) during the 1993-2005 period. The study shows that although dollarization clearly affects the transmission capacity of monetary policy instruments, it does not fully obstruct countries in the sample from using inflation targeting as a policy regime. Furthermore, a unique and interesting study by Billmeier and Banoto on the exchange rate pass-through in Croatia in 2004 shows that despite a high level of dollarization, the empirical investigation of the study does not detect evidence of high exchange pass-through in the country. Nevertheless, the study cautions that the policy drawn based on the result should be conditional on the endogeneity of the pass-through to the policy regime.

In sum, the literature on the efficacy of monetary transmission channels in dollarized settings tends to focus more on two key transmission channels, namely interest rate and exchange rate, and inflation targeting as the monetary policy regime. Although there are studies indicating the influence of dollarization, financial dollarization in particular, on the monetary transmission mechanism, such influence does not preclude dollarized economies, such as Peru and Bolivia from adopting inflation targeting to attain low and stable inflation and low volatility of the exchange rate. The literature also highlights the important role of the exchange rate in financial and real dollarized economies.
3. Trends of Income Inequality and Income Shares Held by Key Income Groups

The topic of inequality in Cambodia gained attention from policymakers, development partners, researchers, and academia only after the first release of the World Bank’s Equity Report in 2007 revealing significant growth (45 percent) of daily per capita consumption of the top 20 percent compared with a slim growth (8 percent) of that of the bottom 20 percent between 1997 and 2004 (World Bank, 2007). This inequality is concentrated primarily in the rural areas where villages that are better connected by roads tended to have better access to public services and markets than those in more remote areas although moderate income gaps were also observed in the urban areas. Considerable gaps in innate abilities, human capital (health and education status), endowment of land and other productive assets among households further exacerbate inequality among households in the rural communities in Cambodia. However, Figure 3 which is generated from the standardized world income inequality database compiled by Solt (2019), paints a completely different picture of the inequality trend in Cambodia over the same period of 1997-2004, while the downward trend of the Gini index measured at both market and disposable incomes extended into 2012, but at a gradual and slower pace. The contribution of monetary policy to this drop appears unlikely given the limited monetary capacity of the National Bank of Cambodia and the high level of dollarization during this period. Moreover, this is not clearly known as there has not been any assessment of the distributional impact of monetary policy given the limitation of data and dollarization issue.

Figure 3
Gini Index for Cambodia between 1997 and 2012

Note: Solid lines indicate mean estimates; shaded regions indicate the associated 95% uncertainty intervals.
Source: Standardized World Income Inequality Database V8.2 (Solt 2019).
Figure 4 provides, in part, the explanation for the downward trend of the Gini index between 2007 and 2012 as income shares held by the highest 10 percent and top 20 percent exhibited a moderate decline over the period, while the income shares held by other lower-income groups grew gradually and continuously over the same period. Nevertheless, the highest 10 percent and 20 percent groups still held substantial proportions of the national income over the 1997-2012 period, while shares of income held by the lowest 10 percent and 20 percent showed sluggish growth over the same period. Improved transportation infrastructures, along with the advance of modern information communication technology (ICT), may have helped facilitate the movement of low-skilled workforce in the traditional agricultural sector in rural areas to the labor-intensive-manufacturing industry, textiles and garments in particular, in urban areas, thus allowing these low-skilled workers to move up the income ladder. Productivity gains among low-skilled rural-urban migrant workforce resulting from the increase in the demand for non-tradable goods in urban cities is also likely a facilitating mechanism of the continued drop of the Gini index.

Figure 4
Share of Income Held by Key Income Groups between 2007 and 2012

Source: World Bank World Development Indicator, 2019

4. Cambodia’s Macroeconomic Conditions and Monetary Policy

4.1 Macroeconomic Conditions

Cambodia showed a remarkable growth in its GDP during the last two decades, thanks to real and genuine peace fully restored in 1998 when the Khmer Rouge rebel soldiers were demobilized and reintegrated into the Royal Government Armed Forces. Figure 5 shows that growth in Cambodia was remarkable relative to its CLMV (Cambodia, Lao P.D.R, Myanmar, Vietnam) peers during the 1995-2018 period although Cambodia was hit hardest relative to other CLMV countries by the global economic crisis in 2009. The
average GDP growth during the 1998-2009 period was 8.5 percent, higher than the growth rates of its neighboring Lao P.D.R. and Vietnam except Myanmar. After the crisis, growth stayed at around 7 percent during the last ten years, while its CLMV peers maintained the rate between 6 and 8 percent.

**Figure 5**


**Figure 6**

Per Capita GDP, PPP at 2011 US$

Note: PPP: Purchasing Power Parity.
Despite its high GDP growth relative to other CLMV nations, Cambodia’s per capita GDP measured using purchasing power parity (PPP) at US$2011 was considerably lower than that of Lao P.D.R., Myanmar and Vietnam during the last decade (Figure 6). It is quite astounding that Myanmar’s per capita GDP was below Cambodia’s during the second half of the 1990s, but it overtook Cambodia’s during early 2000s and by 2018, its per capita was around 53 percent higher than Cambodia’s. However, we observe continued and gradual growth of per capita GDP for Cambodia, but the pace is less rapid than those of its CLMV peers.

The inflation rate in Cambodia has been kept well under control except for the global oil and food prices increase in 2008 that pushed inflation up to 25 percent, higher than those in Lao P.D.R. (7.6 percent) and Vietnam (23 percent), but slightly below that of Myanmar (26.8 percent). It is quite surprising that Lao P.D.R. was not hit by the global oil and food price shock. The average rate of inflation in Cambodia during the 2014-2018 period stood at 2.7 percent, which is quite close to the rate in Lao P.D.R. (2 percent) and Vietnam (3.2 percent) during the same period (Figure 7).

In addition to strong GDP growth and stable prices, the nominal exchange rate in Cambodia was also stable during the 2012-2018 period. The nominal exchange rate varied between -1 percent and +1 percent and stayed between 4,030 riel and 4,051 riel per US$. Lao P.D.R. and Vietnam except Myanmar were also able to stabilize their exchange rate during the same period (Figure 8). Substantial fluctuations in the nominal exchange rate in Myanmar reflected the floating exchange rate regime adopted by the country.
In spite of favorable macroeconomic conditions categorized by robust growth and stable price and exchange rate, dollarization continues to be deeply rooted in the Cambodian economy. Foreign currencies, US dollars in particular, dominate the local currency across the three functions of money: medium of exchange, store of value and unit of account. Figure 9 shows the volume of foreign currency deposits and its share in broad money between January 2003 and July 2019. Foreign currency deposits in the banking system was only US$522 million in January 2003, but went up to around US$20 billion in July 2019. Meanwhile, its
share in broad money was 84.4 percent in July 2019, higher than the 70 percent in January 2003, suggesting a high level of dollarization, which is higher than level of dollarization in Lao P.D.R. at 49.4 percent in 2018 (IMF, 2019).

As indicated above, the share of foreign currency deposits in broad money for Cambodia was twice as large as the size of the same indicator for Lao P.D.R. in 2018. However, Figure 10 below shows the exponential rise in Khmer riel deposits between January 2004 (US$29 million) and July 2019 (US$1.1 billion), suggesting a gradual increase in riel use, although at a slower pace relative to the rise in US dollar deposits, over the period. This in effect implies that riel substitution for the US dollar has been extremely weak.

![Figure 10](image)

Riel Deposits in Banking System

Source: Author’s estimate using data from the National Bank of Cambodia, 2019.

### 4.2 Monetary Policy Framework

As indicated in Article 3 of the Law on the Organization and Conduct of the National Bank of Cambodia passed on January 26, 1996, the principal mission of the National Bank of Cambodia is to “determine and direct the monetary policy aimed at maintaining price stability in order to facilitate economic development within the framework of Cambodia’s economic and financial policy.” The current monetary policy framework of the National Bank of Cambodia is operated under the constraint of dollarization and the absence of a money market and the market for government bond.

At present, there are three monetary policy tools implemented by the National Bank of Cambodia, and they are reserve requirement (RR), Negotiable Certificate of Deposits (NCD), and Liquidity Providing Collateralized Operation (LPCO). The RR has been the Bank’s traditional monetary tool, while the latter two have just been adopted in recent years. Meanwhile, the managed floating exchange regime is adopted by the National Bank to maintain price stability.
4.2.1 Reserve Requirement

Reserve requirement is the primary monetary policy tool that the National Bank of Cambodia uses to affect liquidity in the banking system. The rates had long been applied equally to both KHR and US$ deposits until 2008, when Cambodia was hit by the global financial crisis. The required reserves for US$ went up from 8 percent in 2008 to 16 percent in 2009, later dropping to 12 percent during the 2009-2011 period and 12.5 percent during the 2012-2018 period (Figure 11). Required reserves for KHR remained at 8 percent between 1997 and 2018. The hike in US$ reserve requirements was intended primarily to promote the use of the Khmer riel and discourage the use of US$ in the economy. The role of reserve requirements should not be underestimated in a dollarized economic environment since it has the potential to have significant effect on US$ liquidity in the banking system.

![Figure 11](source: National Bank of Cambodia, 2019)

4.2.2 Negotiable Certificate of Deposits (NCDs)

The second monetary policy instrument is the Negotiable Certificate of Deposits which is a short-term interest-bearing debt issued by the National Bank of Cambodia. Its operation started in September 2013 following the Prakas on “the Issuance of Tradable Securities” issued on October 10, 2010. The primary objective of this instrument is to absorb idle excess liquidity in the banking system, while also aiming to promote the development of the money market and interbank lending on a secured basis.

The NCDs are issued in both Khmer riel and US$ so as to absorb excess liquidity of both currencies in the banking system. All financial institutions can make NCD purchase requests through either the NBC web platform known as NBCP, electronic email or over the counter. The minimum invested amount of NCDs is KHR200 million equivalent to around US$50,000. Maturities of KHR-denominated NCDs comprise 2 weeks, 1 month, 2 months, 3 months, 6 months, 9 months and 1 year, while the USD-denominated NCDs have maturities...
similar to those of KHR-denominated NCDs except for the 9-month maturity. Financial institutions cannot return NCDs to the NBC prior to maturity, but can sell them to other financial institutions under the Repo Master Agreement guaranteed by the NBC.

**Figure 12**

**Interest Rates on NCDs and Deposits in KHR and USD**

![Graph showing interest rates on NCDs and deposits in KHR and USD between September 2017 and August 2019. The graph illustrates that interest rates on KHR- and US$-denominated NCDs are generally lower than those of deposits in KHR and US$ at banks, while rates on KHR-denominated NCDs are usually higher than those on US$-denominated NCDs. In 2018, interest rates on KHR-denominated NCDs varied from 0.53 percent (one week) to 2.25 percent (one year), while interest rates on US$-denominated NCDs stayed between 0.27 percent (one week) and 1.1 percent (one year).]


Figure 12 shows the average interest rates for all maturities (maximum of one year) on NCDs and deposits at banks between September 2017 and August 2019. Rates on KHR- and US$-denominated NCDs are generally lower than those of deposits in KHR and US$ at banks, while rates on KHR-denominated NCDs are usually higher than those on US$-denominated NCDs. In 2018, interest rates on KHR-denominated NCDs varied from 0.53 percent (one week) to 2.25 percent (one year), while interest rates on US$-denominated NCDs stayed between 0.27 percent (one week) and 1.1 percent (one year).

4.2.3 **Liquidity Providing Collateralized Operation (LPCO)**

The third monetary policy instrument is Liquidity提供ing Collateralized Operation which is a loan provided by the NBC in Khmer riel to financial institutions that are required to own NCDs and use them as collateral. Its operation has started since September 2019. LPCO has five main objectives: 1) promote the use of Khmer riel; 2) support agricultural sector; 3) promote interbank market development; 4) develop secondary market of NCDs; and 5) develop the Repo market. To acquire KHR liquidity from the NBC, eligible financial institutions have to participate in an open auction, which is intended to ensure transparency. The auction is conducted on a monthly basis. The appropriate haircut is applied to US$-denominated NCDs to mitigate foreign exchange risks, which means financial institutions can use US$-denominated NCDs as collateral to acquire LPCO.

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4. Interest rates for both KHR- and US$-denominated NCDs are applied rates, which are rates for NCDs purchased by financial institutions every month.

5. According to the Repo Master Agreement, haircut refers to “adjusted securities price” or overcollateralization at the initiation of the Repo transaction. The current rate is 5 percent.
Being able to use US$-denominated NCDs as collateral to obtain LPCO, financial institutions that are short of KHR liquidity, especially microfinance deposit-taking institutions (MDIs) and microfinance institutions (MFIs) that are main lenders to agriculture sector, can smooth out their liquidity shortage and provide KHR loan at lower interest rates. At present, these MDIs and MFIs obtain funds in US$; and therefore, they offer loans at high interest rates. The LPCO has emerged to help relax these high rates of interest. Figure 13 shows that the average interest rate on LPCO (3 percent) is far below that for loans in Khmer riel at around 16.6 percent, and the association between the two rates is extremely weak or negligible as far as the Figure 13 indicates.

### 4.2.4 Foreign Exchange as Monetary Policy Instrument

The last monetary instrument is exchange rate stabilization through the purchase and sale of currency in the foreign exchange market in order to maintain low and stable inflation. Such intervention in the context of high financial and real dollarization is also in line with suggestions made in the literature. For instance, Leiderman et al. (2006) postulate that the pass-through of exchange on prices in a financially dollarized economy categorized by high US$-denominated deposits and loans is usually higher than that in non-dollarized economy as the nominal anchoring role of the exchange rate is more important in a dollarized economy. In addition, Ize and Yeyati (2001) indicate that in an extreme case, if prices and wage are set in US dollar (real dollarization), monetary policy becomes ineffective. As a result, the targeting exchange rate is the only possible strategy (cited in Billmeier and Bonato, 2004).
Foreign exchange market intervention has been undertaken during the last two decades as KHR/US$ has stabilized and so has the inflation rate (Figure 14). This suggests the presence of a pass-through effect from the exchange rate to domestic prices, which was confirmed by a study by the Bank of Korea in 2017, showing positive association between the exchange rate and inflation in Cambodia (BOK, 2017).

Overall, given the absence of a money market, i.e., government bonds, it does not allow the NBC to utilize the policy rate but rather four monetary policy instruments, which include reserve requirement, NCDs, LPCO and the nominal exchange rate anchor. Reserve requirement has not been the prime instrument because its rate has not been changed frequently. NCDs help absorb excess liquidity in the banking system, while LPCO helps channel KHR credit into MFIs that are short of KHR liquidity to smooth out their liquidity shortage and supply KHR loans to households and businesses in the agricultural sector at more favorable interest rates. While this indicates the limitation of monetary policy implementation, nevertheless, active foreign exchange intervention has helped stabilize the exchange rate and thereby achieve low and stable inflation, while dollarization continues to restrain the capacity of monetary transmission of the policy implementation by the NBC.

5. **Empirical Methodology**

As indicated in the previous sections, the absence of a money market prevents the National Bank of Cambodia from using a policy rate to affect a macroeconomic variable such as the money market rate to achieve its core monetary objective of price stability. This in effect limits the National Bank’s monetary policy operations to the use of its current monetary policy instruments, of reserve requirement, Negotiable Certificate of Deposits, Liquidity Providing Collateralized Operation, and its foreign exchange policy of managed floating. Moreover, given the high level of dollarization in Cambodia, the country’s monetary policy is influenced by U.S. monetary policy, specifically by a change in the U.S. Federal Funds rate.
Therefore, rather than examining the effect of the policy rate which is not relevant for Cambodia, we follow Duma (2011) and Samreth et al. (2019) by looking at the effect of the U.S. Federal Funds rate on Cambodia’s key economic variables, namely, interest rates on loans, trade balance with the U.S., nominal bilateral exchange rate with US$, GDP gap and inflation. To examine this effect, we apply VAR-based impulse responses of the aforementioned variables to a shock of U.S. Federal Funds rate. Our model specification below is set up in line with those of Mengesha, Shen and Lim (2017) and Acosta-Ormaechea and Coble (2011) with the consideration of Duma (2011). In other words, the Vector Autoregressive (VAR) model is applied and the specification of VAR is expressed as follows:

\[ G_t = A(L)G_{t-1} + B(L)X_t + u_t \]  

(1)

where \( A(L) \) and \( B(L) \) are n by n and n by k polynomial matrices in the lag operator \( L \), respectively, while \( G_t \) and \( X_t \) are vectors of endogenous and exogenous variables. In addition, \( u_t \) is a vector of error terms. Endogenous variables \( G_t \) comprises interest rate on loan \( (R_t) \), inflation rate \( (P_t) \), GDP gap \( (Y_t) \), nominal exchange rate \( (NER_t) \), broad money \( (BM_t) \), U.S. Federal Funds rate \( (FFR_t) \) and trade balance \( (TB_t) \) and is expressed as follows:

\[ G_t = [Y_t \ P_t \ NER_t \ R_t \ BM_t \ TB_t] \]  

(2)

Additionally, an exogenous variable \( X_t \) is added to the model to control for the external environment that may exert influence on the dynamics of the model as Cambodia is a small and open economy. Since the U.S. and EU are Cambodia’s main trading partners, we add inflation in the U.S. \( (\pi_t) \), world commodity price index \( (WCP_t) \), interest rate in the Euro zone \( (EUR_t) \) and inflation rate in EU \( (EUP_t) \) to the model as exogenous variables and it can be expressed as follows:

\[ X_t = [\pi_t \ FFR_t \ WCP_t \ EUR_t \ EUP_t] \]  

(3)

Since severe econometric consequences may arise when using nonstationary series in the model specification above, it is therefore important to conduct the unit root or augmented Dickey-Fuller test, which is very common in time series econometric practice at the start of the analysis to detect stationarity of each series or variable. The procedure of the test is as follows. First, least square regression (OLS) is applied to estimation equation below:

\[ \Delta y_t = \alpha + \gamma y_{t-1} + \sum_{s=1}^{m} a_s \Delta y_{t-s} + \nu_t \]  

(4)

where \( \Delta y_{t-1} = (y_{t-1} - y_{t-2}) \), \( \Delta y_{t-2} = (y_{t-2} - y_{t-3}) \), etc. The number of these lagged first differenced terms is determined by examining the autocorrelation function (ACF) of the residuals \( \nu_t \) or the significance of the estimated lag coefficients \( a_s \) in order to ensure that autocorrelation in the errors is eliminated (Hill, Griffiths and Lim, 2018). It should be noted that \( y_t \) represents each variable considered in our model. The one-sided test hypothesis of non-stationarity of the variable is expressed as follows:

\[ H_0: \gamma = 0 \]

\[ H_1: \gamma < 0 \]
The null hypothesis is that $y_t$ is nonstationary, which means if we do not reject the null hypothesis, $y_t$ is a stationary process. More importantly, rejection is made when the $\tau$ statistics is smaller than the critical $\tau_c$ value, which is specifically determined to -3.43 at 1 percent, -2.86 at 5 percent and -2.57% at 10 percent significance levels, respectively (Hill, Griffiths and Lim, 2018). It is important to keep in mind that when a series is stationary, it is said to have an integration of order zero $I(0)$. Non-stationary series that can be made stationary by taking the first difference is said to have an integration of order one $I(1)$.

6. Data Collection

We use quarterly data spanning over the period between first quarter of 1995 and fourth quarter 2018. Data are collected from various reliable sources. GDP is obtained from the National Institute of Statistic (NIS) of the Ministry of Planning (MOP), while the GDP gap which is the difference between actual GDP and potential GDP is obtained by using Hodrick-Prescott (HP) filter to extract the gap (cyclical components) from the actual GDP. Since GDP is measured on a yearly basis, we apply linear interpolation in order obtain quarterly GDP data before employing the HP filter. Inflation for Cambodia is obtained from the IMF and is a quarterly year-on-year percentage change of the consumer price index, while nominal exchange rate per US$ is from the National Bank of Cambodia. Cambodia’s average lending rate is from the World Bank’s World Development Indicator. These are endogenous variables as indicated in the model specification.

The quarterly data of the year-on-year percentage change in CPIs for the U.S. and the Euro areas are seasonally adjusted and retrieved from Federal Reserve Bank of St. Louis. The nominal interest rates for the U.S. (U.S. Federal Funds rate) and the Euro area (3-month interbank lending rate) are also collated from the Federal Reserve Bank of St. Louis, while the world commodity price index is from the IMF Primary Commodity Price System. These are controls for the external environment over the dynamics of the model under consideration.

7. Results and Discussion

This section describes the results of the stationarity tests for vectors of both endogenous and exogenous variables used in the analysis and presents findings of the effect of the shock of U.S. Federal Fund rate to the endogenous variables in the model. The former uses the Augmented Dickey-Fuller test method as described in the empirical methodology, while the later applies the VAR-based impulse response technique.

7.1 Augmented Dickey-Fuller Test

Table 1 shows the results of the Augmented Dickey-Fuller test for all variables included in the model. The GDP gap ($Y_t$), domestic inflation rate ($P_t$), U.S. inflation rate ($\pi_r$), Euro area inflation rate ($EUP_t$) and the nominal exchange rate ($NER_t$) have $\tau$-statistics that are smaller than their respective $\tau$ critical values at 1 percent and 5 percent significance levels, suggesting that the variables are stationary. Since we reject the null hypothesis of non-stationarity of the nominal exchange rate at 5 percent level, we use the first difference of this

6. It is worthwhile noting that the actual critical $\tau$ values from our analysis vary slightly above or below these critical values based on the variable as well as the number of lags.
variable, while its unit root test shows that its null hypothesis is rejected at 1 percent level of significance (Table A1 in the Appendix).

Other variables that have $τ$-statistics larger than their respective $τ$ critical values include the average interest rate on loan ($R_t$), broad money ($BM_t$) and trade balance with U.S. ($TB_t$), U.S. Federal Funds Rate ($FR_{t}$), world commodity price index ($WCP_t$) and Euro area interest rate ($EUR_t$) indicating that first difference for the variables need to be taken to make them stationary. However, to ensure the stationarity of the first difference of this second group of variables, we further conduct the Augmented Dickey-Fuller test. The results confirm that all first-difference variables are stationary (Table A# in the Appendix). In sum, the former group of variables has an integration of order zero $I(0)$, while the latter group has an integration of order one $I(1)$. We also take first difference of the domestic inflation rate and the nominal exchange rate with US$ to ensure that all variables are stationary.

<table>
<thead>
<tr>
<th>Variables</th>
<th>$τ$ statistics</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP gap ($Y_t$)</td>
<td>-3.748</td>
<td>***</td>
</tr>
<tr>
<td>Domestic inflation rate ($P_t$)</td>
<td>-4.474</td>
<td>***</td>
</tr>
<tr>
<td>Nominal exchange rate ($NER_t$)</td>
<td>-3.456</td>
<td>**</td>
</tr>
<tr>
<td>Average interest rate on loan ($R_t$)</td>
<td>-0.291</td>
<td>-</td>
</tr>
<tr>
<td>Broad money ($BM_t$)</td>
<td>6.544</td>
<td>-</td>
</tr>
<tr>
<td>Trade balance with U.S. ($TB_t$)</td>
<td>-1.043</td>
<td>-</td>
</tr>
<tr>
<td>U.S. inflation rate ($π_t$)</td>
<td>-4.563</td>
<td>***</td>
</tr>
<tr>
<td>U.S. Federal Funds rate ($FR_{t}$)</td>
<td>-2.304</td>
<td>-</td>
</tr>
<tr>
<td>World commodity price index ($WCP_t$)</td>
<td>-1.437</td>
<td>-</td>
</tr>
<tr>
<td>Euro area interest rate ($EUR_t$)</td>
<td>-2.45</td>
<td>-</td>
</tr>
<tr>
<td>Euro area inflation rate ($EIP_t$)</td>
<td>-3.554</td>
<td>***</td>
</tr>
</tbody>
</table>

Note: Significance at 1% (***) and 5% (**); not significant at any level (-).

In order to identify the maximum lag length of the variables, we apply the post-estimation lag order selection method (varsoc) and consider the lag order selection statistics of Akaike’s Information Criterion (AIC) shown in Table 2 below. In our estimation, the AIC selection is a model with two lags as its lag order selection statistics is significant at 10 percent at lag order 2.
Table 2
Post-estimation Lag Order Selection Criteria

<table>
<thead>
<tr>
<th>lag</th>
<th>LL</th>
<th>LR</th>
<th>df</th>
<th>p</th>
<th>FPE</th>
<th>AIC</th>
<th>HQIC</th>
<th>SBIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-2611.35</td>
<td>2.10E+17</td>
<td>56.9322</td>
<td>57.328</td>
<td>57.9125</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>-2420.47</td>
<td>381.74</td>
<td>36</td>
<td>0.000</td>
<td>7.70E+15</td>
<td>53.6016</td>
<td>54.3933</td>
<td>55.5623*</td>
</tr>
<tr>
<td>2</td>
<td>-2365.97</td>
<td>109.01*</td>
<td>36</td>
<td>0.000</td>
<td>5.3e+15*</td>
<td>53.2036*</td>
<td>54.3912*</td>
<td>56.1447</td>
</tr>
</tbody>
</table>

Note: Significance at 1% (***) , 5% (**) and 10% (*), LL: Likelihood Ratio, df: degree of freedom, FPE: Final Prediction Error, AIC: Akaike’s Information Criterion, HQIC: Hannan and Quinn Information Criterion, SBIC: Schwarz’s Bayesian Information Criterion.

7.2 Results from Impulse Responses

This section provides results of the adjustment paths of the GDP gap, inflation, exchange rate, broad money, interest rate on loan and US-Cambodia trade balance to the shock (innovation) of a standard deviation (2.3 percent) increase in U.S. Federal Fund Rate. Figure 15 presents the time path of each of the endogenous variables over nine consecutive quarters.

Figure 15 shows that an initial one-quarter shock in U.S. contractionary monetary policy, meaning a standard deviation increase in the U.S. Federal Fund rate was followed by two consecutive quarters of contractionary monetary policy before it gradually converged to zero in the next six consecutive quarters implying the paths that the key macroeconomic indicators of Cambodia would take in response. Broad money reacted to the shock by exhibiting a negative gap in the first quarter, followed by two consecutive quarters of a positive gap of broad money as the U.S. contractionary monetary policy started to loosen before the gap began to converge to zero in the following quarters. Likewise, the nominal exchange reacted accordingly by showing a positive change in the logarithm of the nominal exchange before it started to approach zero in the sixth and following quarters. The first two quarters of the drop in money demand is consistent with the nominal exchange rate over the same quarters. However, the effect on the nominal exchange rate persisted over the next couple of quarters. This indicates the effectiveness of the exchange rate channel of monetary transmission mechanism that passes from the U.S. to Cambodia due to high dollarization (financial and real), implying the strong influence of U.S. monetary policy on the Cambodian exchange rate.

Cambodia’s trade balance tended to benefit from the shock as it responded positively, which is also consistent with the depreciation of Cambodian riel against U.S. dollar. The positive effect persisted over the next five quarters before it began to converge to zero when U.S. contractionary monetary policy subsided. This clearly indicates that Cambodia has a strong bilateral trade and foreign exchange market linkage with the U.S. This adjustment path is also consistent with those shown in Duma (2011) and Samreth (2019). This demonstrates the effect of the direct and indirect exchange rate channel of U.S. monetary transmission mechanism on Cambodia-US trade balance.
For the domestic interest rate on loans, it responded positively to a standard deviation increase in the U.S. Federal Funds rate for three quarters before the rate turned negative for the next couple of quarters and began to converge in the ninth quarter. The shock pushed the Cambodian economy into contraction as the interest rate went up, limiting the availability of loans. The lending rate was later cut in the third and following quarters in response to the slowdown in economic activities. The fact that the Cambodian interest rate tended to move in tandem with the U.S. Federal Funds rate suggests that the Cambodian financial market is largely influenced by U.S. monetary policy implementation, due to the high dollarization. More importantly, it should be noted that the indirect interest channel is also at work as financial institutions in Cambodia, namely banks, microfinance deposit-taking institutions (MDIs) and microfinance institutions (MFIs), source significant proportions of their funding from offshore banks.
Lastly, we observe negative responses of both inflation and GDP gaps to the shock in the first quarter indicating that economic activities contracted, while the price level dropped. Interestingly, although both the Federal Funds rate and domestic interest rate continued to rise for the next two quarters, the output gap turned positive in the third quarter and gradually improved over the next couple of quarters. The inflation rate in turn started to increase only in the fourth quarter suggesting the stickiness of prices and it converged to zero after a couple of quarters as the U.S. contrationary monetary policy continued to loosen. Notably, although the U.S. conractionary monetary policy definitely slowed Cambodian economic activities, the pace of recovery was quite rapid as output turned positive in the third quarter, thanks to proactive responses of domestic financial institutions in cutting the interest rates (Figure 15).

Our results are consistent with those of Duma (2011) and Samreth et al. (2019), showing that U.S. conractionary monetary policy exerts influence on Cambodia’s real and financial sectors, indicating that dollarization ties Cambodian monetary policy as well as real and financial sectors to U.S. monetary policy. This implies that the knot can possibly be untied only when dollarization retreats from the Cambodian economy. At present, there are only three active monetary policy instruments, namely reserve requirement, NCDs, and LPCO, along with foreign exchange interventions. There is also absence of an interbank and money market as well as a market for government bonds in particular. This along with dollarization restrains the NBC from fully implementing its monetary policy through adopting, for instance, a policy rate in addition to its current nominal exchange rate anchor. International experience of countries such as Peru which has high financial dollarization suggests that such a phenomenon does not preclude a country’s monetary authority from adopting inflation targeting to achieve price stability. This experience could be a model that Cambodia could explore for its practicality as well as feasibility.

8. Conclusion

Cambodia has gone through decades of civil war starting from 1970 to 1998 when the last front of the Khmer Rouge rebel fighters was dismantled without bloodshed with the rebels demobilized and reintegrated into the Royal Government Armed Forces. Notably, the massive U.S. bombing campaign during the 1970-1973 and the genocide 1975-1979 had destroyed vast human and physical capital that took Cambodia almost two decades after the end of the genocide in 1979 to recover the stock of the capital to the 1970 level. Nevertheless, growth has been remarkable during the last two decades, but structural problems such as a narrow economic base, limited institutional and governance capacity, high costs of production, among others, continue to plague the economy. To tackle these problems, several steps have been outlined in policy documents such as the National Strategic Development Plan 2019-2023 (NSDP) and Government’s Rectangular Strategy IV (RS IV).

Underlying this remarkable path of development is the dollarization phenomenon which started as early as 1990 when huge amounts of U.S. dollars flowed into the Cambodia through the United Nations’ peace keeping force to support and secure the first multi-party democratic election in 1993. Dollarization, be it financial and real, is deeply rooted in the Cambodian economy as the share of foreign currency (U.S. dollar) deposits to broad money was 84.4 percent in July 2019. This has restrained monetary implementation of the NBC for decades.
Such a restraint is consistent with the traditional view that dollarization limits the capacity of the monetary transmission mechanism. However, there are two lines of arguments in the literature where dollarization could either restrain or have no influence on the implementation of monetary policy.

The absence of an interbank and money market as well as a government bond market in particular, has limited the NBC from adopting a policy rate to attain its price stabilization goal. Nevertheless, three monetary policy instruments including the reserve requirement, NCDs and LPCOs along with its foreign exchange market interventions have been implemented to achieve stable and low inflation and low volatility of foreign exchange. However, dollarization has tied the Cambodian real and financial sectors, as well as Cambodian monetary policy to U.S. monetary policy as indicated in previous studies.

To be sure, we should revisit this research area by using empirical VAR method to examine responses of the GDP gap, inflation, exchange rate, broad money, domestic interest rate on loans, and trade balance between U.S. and Cambodia. Our results corroborate with those in previous studies suggesting the connection between U.S. and Cambodian monetary policies. While U.S. contractionary monetary policy negatively affects Cambodia’s GDP gap, inflation, broad money and nominal exchange rate, it positively affects interest rate and trade balance. This further confirms the connection between monetary policies of the two countries and suggests that the connection can be untied only when dollarization retires from the Cambodian economy. Additionally, international experience of countries such as Peru, shows that dollarization need not restrain the monetary authority of a country from adopting inflation targeting to attain price stability. This could be a model that Cambodia should explore.
References


Appendix

Table A1
Augmented Dickey-Fuller Test for First-differenced Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>T statistics</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average interest rate on loan ( D.R_t )</td>
<td>-6.968</td>
<td>***</td>
</tr>
<tr>
<td>Domestic inflation rate ( D.P_t )</td>
<td>-6.265</td>
<td>***</td>
</tr>
<tr>
<td>Broad money ( D.BM_t )</td>
<td>-6.474</td>
<td>***</td>
</tr>
<tr>
<td>Trade balance with U.S. ( D.TB_t )</td>
<td>-7.177</td>
<td>***</td>
</tr>
<tr>
<td>Nominal exchange rate ( D.NER_t )</td>
<td>-5.281</td>
<td>***</td>
</tr>
<tr>
<td>US Federal Funds rate ( D.FFR_t )</td>
<td>-3.671</td>
<td>***</td>
</tr>
<tr>
<td>World commodity price index ( D.WCP_t )</td>
<td>-7.214</td>
<td>***</td>
</tr>
<tr>
<td>Euro area interest rate ( D.EUR_t )</td>
<td>-4.882</td>
<td>***</td>
</tr>
</tbody>
</table>

Note: Significance at 1% (***), 5% (**) and 10% (*).