Nominal versus Real Deposit Dollarization in Zambia: Determinants and Monetary Policy Insights

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Abstract

This study investigates the determinants of deposit dollarization in Zambia after transition of monetary policy to inflation targeting and introduction of a monetary policy rate. Using quarterly data from 2012 to 2023, we construct two measures of dollarization: a nominal index and a real index adjusted for exchange rate fluctuations. We find that while nominal dollarization has remained elevated, real dollarization has trended downward over time. Estimates from an Autoregressive Distributed Lag (ARDL) model indicate that nominal dollarization is primarily driven by money supply, output, and the exchange rate, whereas real dollarization is mainly influenced by output and exchange rate volatility. The monetary policy rate has a modest but statistically significant effect on nominal dollarization. Impulse responses obtained using a local projection framework show that hikes in the monetary policy rate yield short-term reductions in nominal dollarization, whereas exchange rate innovations have a more pronounced and sustained influence over both indices. These findings underscore the need for coordinated monetary and exchange rate stabilization policies to effectively manage dollarization pressures in developing economies with multiple currencies in circulation.

Keywords: Deposit dollarization; Real and nominal dollarization; Monetary policy; Zambia
JEL Codes: E52, E44, F41, O55

1 Introduction

Dollarization is a largely observed phenomenon in developing countries and emerging economies. Existing studies demonstrate the high level of dollarization among Latin American economies (Feige et al., 2002; Savastano, 1992) and moderately high levels in African countries (Bennett et al., 1999; Elkhafif, 2003; Mecagni et al., 2015; Raheem and Asongu, 2018; Yinusa and Akinlo, 2008). These studies focus on dollarization in a large sense which includes the use of all foreign currencies inside the country. Vargas and Sanchez (2023) further note that dollarized economies confront a range of significant risks stemming from their reliance on a foreign currency as medium of exchange and foremost is heightened vulnerability to exchange rate volatility. Dollarized economies may also suffer from amplified financial fragility and increased susceptibility to external and potential liquidity shortages during global financial turmoil.

Dollarization can be defined as the domestic holding of asset shares by residents in the form of foreign-currency-denominated assets (Bennett et al., 1999). In such instances, foreign currency

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is used as a substitute for the domestic currency in the traditional roles of unit of account, store of value, and medium of exchange, and this may complicate the execution of monetary and fiscal policies (Adom et al., 2009; Agénor and Khan, 1996). However, various other ways of defining or understanding dollarization exist. For instance, financial dollarization refers to residents holding significant share of their assets or liabilities in foreign currency, while 'real' dollarization captures the extent to which domestic prices and wages are denominated in foreign currency (Ize and Yeyati, 2003). Loan dollarization is defined as the proportion of foreign currency loans in total bank lending by Catão and Terrones (2000) and is similar to the dollarization analysis approach on Zambia used by Funyina et al. (2020) and Mecagni et al. (2015). We also have partial and full dollarization which are sometimes referred to as *de facto* or *de jure* dollarization depending on whether the local currency is being used in parallel with foreign currency or has been supplanted. Defined as such, full dollarization indicates that the national currency has been replaced by a foreign currency. The major benefit of this is the enhanced credibility of monetary policy in lower interest rates and the overall macroeconomic discipline in the economy because a government in an economy with full dollarization would have to maintain fiscal discipline. However, the cost of full dollarization is that the exchange rate would no longer be available as an adjustment mechanism and monetary authority functions are impeded (Elkhafif, 2003; Fischer, 2006). In contrast, partial dollarization refers to when at least two currencies perform the traditional functions of money to differing extents within the same economy. With partial dollarization, foreign currency is used partially as a substitute to domestic currency, and this may erode the control of the monetary authorities over its aggregates (Elkhafif, 2003). Partial dollarization usually results from past periods of economic instability, and usually periods of high inflation. As a result, economic agents prefer to hold assets that are safer and this can be done through the banking system offering foreign currency, or exchange-rate-linked accounts; and the banking system in turn will be inclined to lend in a similar form (Fischer, 2006). We focus on deposit dollarization in Zambia, a form of partial dollarization, identifying the macroeconomic determinants and assessing the effects of monetary policy changes.

Beyond the various definitions of dollarization, there are multiple ways to measure it. A common approach is to measure it as a nominal index constructed as the quantum of foreign currency deposits in either broadly defined money supply or total deposits (Ize and Yeyati, 1998; Kutan et al., 2010; Šonje, 2003; Tweneboah, 2016; Yinusa, 2009). However, modifications to this method exist in the literature. For instance, Yinusa (2009) adjust for money in circulation to prevent overestimating the relative weight of foreign currency deposits in the banking system while Ize and Yeyati (2003) adds cross border deposits to total domestic deposits and this is used as the denominator for the computation of the financial dollarization index. Though comprehensive measurement of financial dollarization includes foreign currency in circulation in the domestic economy (which will show the level of currency substitution) and foreign currency deposits held abroad by the country's residents, this data is usually not available for most developing countries, inclusive of Zambia, as discussed in Adam (2016). Further, Drenik and Perez (2021) measure price dollarization by analyzing the fraction of prices denominated in U.S. dollars on an e-trading platform in Latin America while Mwase and Kumah (2015) use foreign currency deposits but adjust for exchange rate movements to construct a real financial dollarization index. For Zambia, the financial dollarization index was computed as the ratio of foreign currency deposits to total money supply by Zgambo (2018) and as the ratio to

total deposits by Mecagni et al. (2015). In this study, we construct both nominal and real financial dollarization indices and compare determinants and monetary policy effects. The nominal deposit dollarization index is defined as the ratio of foreign currency deposits to broad money, excluding currency in circulation. The real deposit dollarization index adjusts this measure for exchange rate fluctuations by valuing foreign currency deposits at a constant exchange rate, thereby isolating underlying changes in the degree of deposit dollarization within the financial system. A detailed description of the construction of both variables is provided in Section 3.

Using data from 2012 to 2023, we document an upward trend in nominal deposit dollarization in Zambia, largely driven by money supply, output, and movements in the nominal exchange rate. In contrast, the real financial dollarization, which adjusts for the effects of exchange rate fluctuations on the share of foreign currency deposits, has been declining, primarily influenced by output and exchange rate volatility. Although the monetary policy rate exerts a more muted effect relative to these factors, it remains a statistically significant predictor of nominal dollarization dynamics. Impulse response analysis further reveals that the monetary policy rate is effective in managing short-term nominal dollarization. However, exchange rate stabilization emerges as a complementary tool, particularly over longer horizons. A coordinated approach involving prudent interest rate policy and exchange rate management may therefore strengthen confidence in the domestic currency and support broader efforts to contain dollarization in Zambia.

Our paper is closely related to two distinct strands of literature. The first is the body of research which identifies dollarization determinants while the second is that which examines the consequences and/or implication for monetary policy. Related to the former, Alesina and Barro (2001) identified countries which were more likely to adopt dollarization as those with high and variable inflation, large trade volumes and reasonably stable relative prices with the anchor country, and with business cycles that co-varied with the potential anchor. In this respect, the anchor country refers to the country whose currency is adopted for use. National pride and the ability to pursue own monetary policy were other factors identified. For most Latin American countries and some African countries such as the case of Zimbabwe, the adoption of dollarization resulted from instances of hyperinflation (Calvo and Végh, 1993; Kairiza, 2009; Ramirez-Rojas, 1986; Salvatore, 2001). For example, Ecuador's decision to fully dollarize in 2000 was made in order to avoid a situation of near hyperinflation and massive flight away from the domestic currency, debased after a long period of monetary instability. Ecuador was also experiencing a massive fiscal deficit and most of the important banks had negative net worth (Beckerman, 2002). For Zimbabwe, the national currency lost the store of value function and was later unaccepted as a medium of exchange despite official recognition as the formal currency for the market. As the economic crisis progressed, demand for the Zimbabwean dollar decreased leading to significant currency substitution (Bonga and Dhoro, 2014). For Ghana, Tweneboah (2016) identified the main determinants of dollarization as exchange rate depreciation, which had a negative relation to dollarization, and financial development which was positively related. Raheem and Asongu (2018) found that in Sub-Saharan Africa, the ease of which local agents can access foreign earnings increased the level of dollarization in an economy. In addition, they found that the level of trade openness and financial liberalization were positive determinants of dollarization. For Serbia, high and volatile inflation, depreciation of the local currency, insufficiently developed capital mar-

kets, market imperfections and inadequate regulations were the main determinants of dollarization (Milenković and Davidović, 2013). A study by Catão and Terrones (2000) which looked at both deposit and loan dollarization identified interest rates, exchange rate risks as well as structural factors related to costly banking, market imperfections and availability of trade collateral as the main determinants. For the Maldives, which is relatively highly dollarized, the short run determinants were inflation volatility, unofficial restrictions on foreign exchange, tourism inflows and openness of the economy. The researchers found that macroeconomic stability was not an important factor for dollarization (Adam, 2016). Yinusa (2009) found that deposit dollarization in Botswana was driven by high inflation and uncertainty exacerbated by exchange rate instability. He also found that deposit dollarization became more pronounced in the mid-1990's in Sub-Saharan Africa following the introduction and implementation of Structural Adjustment Programs (SAPs) in these economies. This was because of the macroeconomic instabilities that resulted from the introduction of the SAP. By and large, the main determinants of increasing levels of dollarization identified in the literature and consistent with our findings are movements in the rate of inflation and the exchange rate. We contribute to the literature on dollarization by identifying the key drivers for Zambia and further highlighting how global capital flows, defined as the gap between domestic interest rates and the US federal rate, affect dollarization within a developing country setup.

Consequences of dollarization on monetary policy have also been widely documented by various empirical studies (Bennett et al., 1999; Chang, 2000; Gomis-Porqueras et al., 2000; Schuler, 2003; Yeyati and Sturzenegger, 2002). That dollarization has non-trivial implications for policy implementation, has been discussed by Calvo (2006); Chang (2000); Gomis-Porqueras et al. (2000) and Yinusa and Akinlo (2008), affecting the ability by government to conduct fiscal and monetary policy independently and effectively. McKinnon (1982) argues that currency substitution destabilizes the demand for money and distorts interpretation of movement between the annual monetary aggregates and inflation. The literature shows that in the presence of dollarization, three main negative consequences are the forfeiture by government of the revenue it enjoys from creating money (seigniorage), the loss of functionality as a lender of last resort to domestic banks by the Central Bank and the reduced control of domestic monetary policy. In a dollarized economy, domestic monetary policy is affected by the increased volatility of money demand because of reduced costs of switching to foreign currency as well as reserve money demand becoming more responsive to monetary expansions as shifts to readily available foreign-currency assets become less expensive. Benefits of dollarization, however, include lower inflation, a lower cost of foreign credit, and greater credibility of government policy (Calvo, 2006; Yeyati, 2006). Therefore, a careful weighing of the pros and cons is imperative before embarking on full dollarization, or allowing for co-existence of a foreign currency in transactions. Bennett et al. (1999) acknowledge the importance of this challenge for monetary authorities, arguing that to address this, monetary policy conduct must carefully consider the appropriate exchange rate/monetary policy regime and intermediate target. By including the monetary policy rate in our modeling strategy and identifying lagged effects of a change on dollarization in Zambia, when compared to exchange rate effects, we contribute to this strand of literature. This paper, however, stops short of discussing the impact of dollarization on monetary policy effectiveness in Zambia which is outside the scope.

In certain cases, it has been noted that episodes of dollarization can lead to a phenomena termed

as dollarization hysteresis. Hysteresis or the 'ratchet effect' refers to the continued existence of high levels of dollarization even when the initial impetus of financial market volatility is dealt with. Thus, once depositors become used to holding foreign currency-denominated deposits, they are slow to divest themselves of them even if the initial cause that triggered the holdings is reversed (Guidotti and Rodriguez, 1992; Honohan and Shi, 2002). The hysteresis effect occurs in dollarized countries when network externalities produce incentives for the continued use of foreign currency even after inflation or the exchange rate depreciation effects that caused the dollarization have moderated. This effect infers that once domestic residents substitute part of their monetary holdings with dollars, it is costly for them to return to the local currency, even after domestic inflation decreases (Gomis-Porqueras et al., 2000). Guidotti and Rodriguez (1992) note that hysteresis may be reversible if the expected value of domestic money balances exceeds the cost of doing so, inferring that the degree of dollarization depends not only on changes in the rate of inflation but also on its level. Repeated exchange rate depreciation are another reason for hysteresis with repeated depreciation making the currency undesirable to hold and encouraging people to move their wealth into a more stable foreign currency, such as the dollar. In Ecuador, once dollarization had began after repeated exchange rate depreciation, even offering high interest rates on the local currency holding to offset the currency's undesirability was ultimately futile, and once the crisis had commenced and depreciation became more potent, monetary and exchange rate policy finally became impotent. Dollarization from this perspective was simply the formal recognition of reality (Beckerman, 2002). The hysteresis or ratchet effect could also be due to the set-up costs of establishing a dollar deposit and adjusting one's business accordingly, with the additional benefit of risk-reduction that may accrue from holding a mixed portfolio of currencies (Guidotti and Rodriguez, 1992). Alternatively, the persistence of a high rate of dollarization long after the crisis could result from the persistence of long-lived residual anxieties of a recurrence that one episode of volatility can bring Honohan and Shi (2002). As African countries become more integrated in the global markets, dollarization hysteresis may become a common element of the economies and using trend analysis, we examine persistence of dollarization in Zambia.

The rest of the paper is structured as follows. Section 2 provides a brief summary of the monetary system in Zambia while trends in nominal and real dollarization which highlight the difference in directional changes are presented in section 3. Section 4 presents the conceptual framework, while the data and methodology are specified in section 5. Section 6 discusses the results, while Section 7 concludes.

2 Monetary System in Zambia

The sole legal tender which can be used as a means of payment in Zambia is the Zambian Kwacha and Ngwee.[1] There is a flexible exchange rate and no restrictions on the capital account. Residents and non-residents are allowed to hold foreign currency and open bank accounts denominated in dollars (domiciliary accounts). In addition, some contracts for foreign and domestic debts are valued and quoted in dollars, while in some cases, rental valuations are quoted in dollars. All these developments point to the existence of currency substitution in Zambia.

[1] Bank of Zambia Act No. 5 of 2022.

To understand dollarization in Zambia, an examination of the monetary system in Zambia is warranted. The monetary system can be divided into two phases. The first phase of monetary policy was pursued before 1992, and the second was after 1992. During the first phase, monetary policy targets were not well defined and implementation of monetary policy relied mainly on direct instruments which included fixed interest rates and credit allocation, core liquid assets and statutory reserve requirements time (Fundanga, 2008). The financing of the government fiscal budget also relied heavily on central bank borrowing (Kalyalya, 2001). The effects of direct controls manifested in poor financial intermediation characterized by negative real interest rates. As a result, economic agents shunned the banking system in preference for other forms of assets that could, under the circumstances provide a hedge against loss of value. With the previous history of macroeconomic instability, the new government in early 1992 initiated economic reforms to revamp the economy anchored on liberalization of markets. With liberalization, the design of monetary policy had to change in tandem. The Bank of Zambia's role in this regard was to create a stable macroeconomic environment largely by reducing inflation (Fundanga, 2008). In the second phase, various reforms were undertaken. These included changes in the monetary policy instruments with the introduction of treasury bill auctions in 1993, a primary market for government bonds in 1995, and commencement of open market operations in 1995. The open market operations were supplemented by foreign exchange auctions during the early stages of financial sector reforms before liberalization of the foreign exchange market, interest rates, current and capital accounts after 1994 (Fundanga, 2008).

Economic reforms were extended to the conduct of monetary policy, which was enhanced by the amendment of the Bank of Zambia Act in 1996 that pinpointed the central bank's objective to price and financial system stability.[2] The Bank of Zambia had the discretion to use monetary policy instruments at its disposal in managing liquidity conditions with the aim of achieving the inflation target. As such, the Bank of Zambia initially adopted monetary aggregates targeting, an approach premised on a strong, stable, and predictable relationship between the ultimate target (inflation) and money supply. However, a review of the money multiplier for Zambia by Zgambo and Chileshe (2014) suggested that it was not particularly stable during the period of the monetary aggregate targeting framework. The Bank of Zambia shifted to an inflation targeting regime in April 2012, marking the end of the monetary aggregate targeting framework which had been in existence since 1991. The inflation targeting regime uses the monetary policy rate as the nominal anchor for the control of price growth. The monetary policy rate signals the stance of monetary policy and provides a credible and stable anchor to financial market participants in setting their interest rates and by reflecting the opportunity cost of holding foreign currencies, may also affect the level of dollarization in the economy (Zgambo and Chileshe, 2014). Overall, the current mission of the Zambian Central Bank is to achieve and maintain price and financial system stability, and to foster sustainable and inclusive economic development.[3]

[2]Bank of Zambia Act No. 43 of 1996; Statutory Instrument 191 of 1996

[3]These powers are derived from the Bank of Zambia Act No 5 of 2022 and the Banking and Financial Services Act No. 7 of 2017

3 Trend in Dollarization

We use two measures of dollarization to capture nominal and real movements. Our nominal dollarization index (DI_{nom}) is computed as the ratio of foreign currency deposits within the domestic financial sector (composed of formal banking and other deposit taking institutions) to M3. M3 is money supply broadly defined and includes foreign currency deposits in non-financial institutions. Currency in circulation is subtracted from broad money supply so as not to under-estimate the relative weight of foreign currency deposits in the banking system, similar to Feige et al. (2002), Elkhafif (2003) and Yinusa (2009). The real financial dollarization index (DI_{real}), proposed by Mwase and Kumah (2015) and consistent with that by Sosa and Garcia-Escribano (2011), removes the effect of exchange rate fluctuations on the share of foreign currency deposits in the financial system and is calculated as a constant exchange rate indicator. This approach allows for a stable measure of foreign currency use in the financial system, isolating structural and behavioral factors underlying changes in the level of dollarization. The index is computed by converting foreign currency deposits and bank deposits to dollars (at the average prevailing interest rate per month) and then multiplying both (back to domestic currency) by a fixed base-year nominal exchange rate.[4] In this paper, we use 2012, the year when the monetary policy rate was introduced as part of the switch from monetary aggregate targeting to inflation targeting, as the base year.

The trends in nominal and real dollarization are presented in Figure 1. The two indices are both between 0 and 1, with an index closer to 1 indicating higher levels of dollarization and vice versa. Similarly to Mwase and Kumah (2015), we see divergent trend patterns depending on the measurement of dollarization. The nominal dollarization index has an upward trend and has remained relatively elevated over the study period while the real dollarization index has been on the downward path. The lower real dollarization index after 2015 has been attributed to the large exchange rate depreciation that has been experienced since 2015 (Figure A1 in the Appendix provides the full trend movements in all variables, including the exchange rate).

Compared to the real and nominal dollarization indices from Mwase and Kumah (2015), we see that our average nominal dollarization measure is just marginally higher than their index for Zambia (0.41 compared to 0.40) while our real dollarization index is much lower (0.25 compared to 0.47), highlighting the velocity of exchange rate movements in the two periods. Furthermore, our nominal index is higher than that found for Ghana, Nigeria and Tanzania but lower than that of Mozambique and some South American countries such as Bolivia. Our real index is lower than for the same countries, with the exception of Nigeria. Though the two indices move closely for most of the countries in Mwase and Kumah (2015), our finding of a gap between nominal and real dollarization

[4] We closely follow Mwase and Kumah (2015) and compute real dollarization as

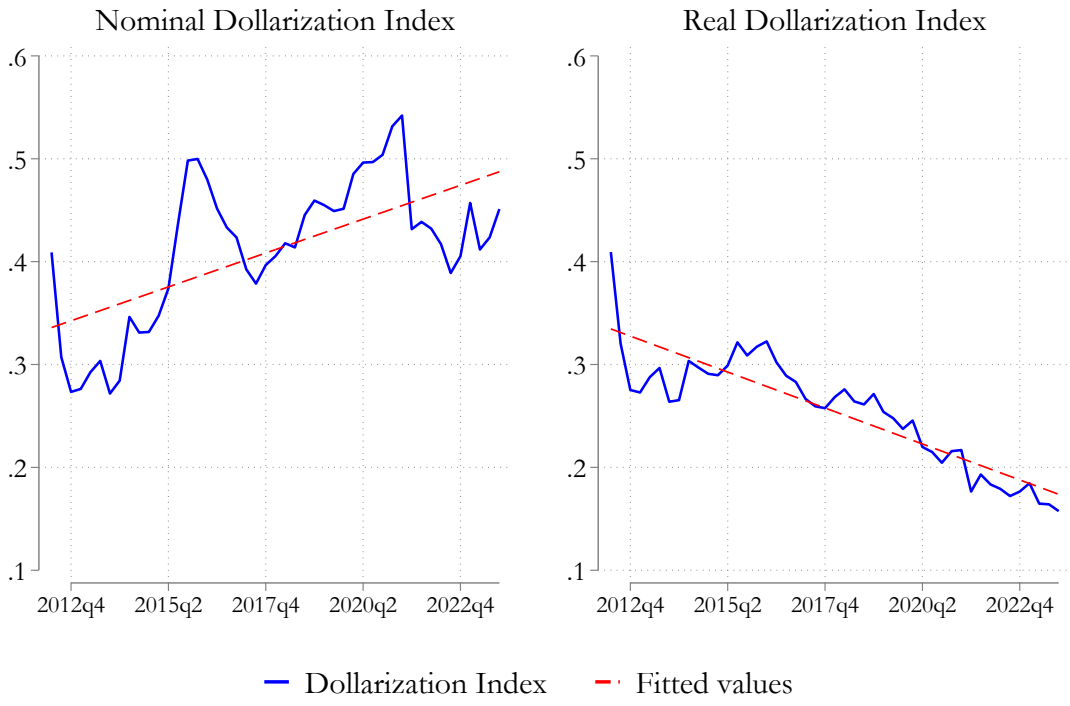
$$\frac{adj.FCD_t}{(adj.FCD_t + LCD_t)} \tag{1}$$

where

$$adj.FCD_t = \frac{FCD_t}{NER_t * NER_{t==2012,m4}} \tag{2}$$

NER is the nominal exchange rate (local currency per dollar), $adj.FCD_t$ refers to the adjusted foreign currency deposit and LCD_t is the local currency deposit. The exchange rate used is the average exchange rate for April, 2012.

FIGURE 1: TRENDS IN NOMINAL AND REAL DOLLARIZATION



Notes: The figure shows the trends in nominal and real dollarization between 2012 and 2023.

levels that is increasing in magnitude is akin to their results for Ghana, Moldova, Sao Tome and Principe and Ukraine.[5]

We compared the two dollarization indices to the trend in the monetary policy rate, the nominal anchor, in Figure 2. We see that before 2015, there was a distinct negative relation between the interest rate and the two dollarization indices, which were very closely aligned. The negative relationship is only seen again for nominal dollarization after mid-2017, with a positive correlation in the interim period. However, the real dollarization index appears to be positively correlated with the monetary policy rate from end-2017 to 2023. The inconsistency in correlations provides further motivation to the need to identify the determinants of and assess the impact of movements in the nominal anchor on these two measures of dollarization.

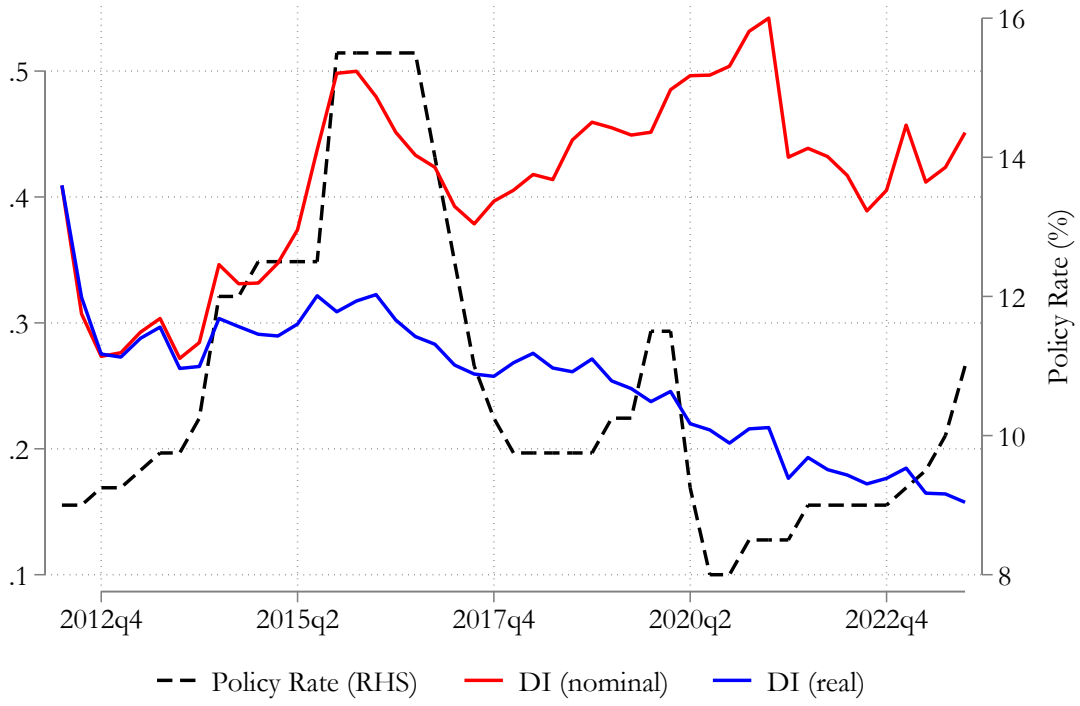
4 Conceptual Framework

Studies about the theoretical underpinnings of dollarization can be framed within the broader theory of money demand in economies with multi-currency systems (Giovannini and Turtelboom, 1992). According to Savastano (1992), most macroeconomic effects attributed to dollarization stem from assumptions about the behavior of the money demand function. Two principal approaches have been used to model money demand empirically: the transactions theory and the portfolio balance theory.

The transactions theory posits that money is held as an inventory for transaction purposes, em-

[5]The quarterly dollarization index between 2012 and 2023 is presented in the appendix.

FIGURE 2: TREND ANALYSIS: MONETARY POLICY RATE, NOMINAL AND REAL DOLLARIZATION



Notes: The figure shows the trends in the monetary policy rate and the nominal and real dollarization indices between 2012 and 2023.

phasizing its role as a medium of exchange. Under this framework, domestic and foreign currencies are considered substitutes for facilitating transactions, with their roles as stores of value dependent on the availability of like-denominated bonds (Miles, 1978; Thomas, 1985). However, the transactions theory has limitations. It fails to distinguish between capital mobility and currency substitution, and it does not adequately account for income as a determinant of money demand (Mizen and Pentecost, 1996). For these reasons, we do not use the transactions theory.

The portfolio balance theory, by contrast, provides a more comprehensive framework. The demand for money is modeled as part of a broader portfolio optimization problem, where agents allocate their wealth among available assets to maximize returns. In this framework, the demand for domestic money is influenced by variables such as income, the returns on domestic and foreign bonds, and expected exchange rate movements. This approach is particularly suitable for analyzing dollarization, as it accounts for capital mobility and explicitly incorporates the role of expectations about exchange rate movements as determinants of money demand and is adopted in this study (Cuddington, 1983; Yinusa and Akinlo, 2008).

According to Friedman (1956), a general money demand function based on the theory of asset demand can be specified as follows:

$$\frac{M}{P} = f\left(y_p, r_b - r_m, r_e - r_m, \pi_e - r_m\right), \tag{3}$$

Where $\frac{M}{P}$ represents the demand for real money balances; y_p is permanent income, r_b is the expected return on bonds, r_m is the expected return on money, r_e is the expected return on stock and π_e is the expected rate of inflation also known as the expected return on a good. It is assumed that demand for real money balances is positively related to permanent income, y_p, and negatively related to the yield on the other assets. Friedman considers money as one of many alternative assets within the spectrum of wealth. A set of interest rates is used to explain the demand for money. Consequently, Friedman's theory is closely connected to the portfolio approach of Tobin (1958), developed in the vein of a general equilibrium framework. The model was extended by Meltzer (1963) who defines the demand for money as dependent on the yields on financial, physical assets and human/ non human wealth. Under this specification, demand for money is expected to be negatively related to these variables. Recent contributions to the theory of the demand for money are summarized by Duca and VanHoose (2004) and Serletis (2007). However, Friedman's model is only applicable to a closed economy.

The portfolio balance approach was adapted for the open economy by Branson and Henderson (1985), Cuddington (1983) and Mizen and Pentecost (1996), with a recent discussion contained in the work by Fratzscher et al. (2019). According to the open economy portfolio balance approach, agents in a given country may hold four types of assets: domestic currency (M), foreign currency (N), domestic bonds (B) and foreign bonds (F). When inflation is not zero in both the home country and the foreign country, the return on cash holding is the inverse of the inflation rate. Thus, the relative return on the cash part of the portfolio is given by the expected depreciation of the exchange rate. This means that if the domestic rate of inflation is higher than the foreign rate of inflation, the domestic currency will be expected to depreciate and the demand for domestic currency will fall relative to the demand for foreign currency (Mizen and Pentecost, 1996). For each of the four assets, Cuddington (1983) postulates that an aggregate demand function which is dependent on the real level of income (Y), wealth (W), and the rate of return of each asset can be specified as:

$$M^d = M^d \quad m(r, r^* + x, x, Y, W), \qquad m_1 < 0, m_2 < 0, m_3 < 0, m_4 > 0, m_5 > 0 \tag{4}$$

$$B^d = B^d \quad b(r, r^* + x, x, Y, W), \qquad b_1 > 0, b_2 < 0, b_3 < 0, b_4 < 0, b_5 > 0 \tag{5}$$

$$F^d = F^d \quad f(r, r^* + x, x, Y, W), \qquad f_1 < 0, f_2 > 0, f_3 < 0, f_4 < 0, f_5 > 0 \tag{6}$$

$$N^d = N^d \quad n(r, r^* + x, x, Y, W), \qquad n_1 < 0, n_2 < 0, n_3 > 0, n_4 > 0, n_5 > 0 \tag{7}$$

Subject to the wealth constraint where total domestic financial assets equal:

$$W(e) \equiv M + B + eF + eN, \quad W^{'}(e) = F + N >< 0 \tag{8}$$

Where e is the exchange rate or domestic price of foreign currency, r is the return on domestic bonds, r^* is the nominal return on foreign bonds, x is the expected rate of domestic currency depreciation. All asset demand functions are dependent on income and domestic wealth. To incorporate currency substitution within the portfolio balance framework, it is assumed that assets are gross substitutes. We also assume that partial effects with respect to x reflect only the direct impact of exchange rate depreciation, excluding indirect effects transmitted through changes in the net return on foreign

bonds. Consequently, the direct effect of an increase in the return on foreign money is a reduction in the demand for all other assets. Moreover, an increase in the expected rate of exchange rate depreciation also influences the net return on foreign bonds, $(r^* + x)$. Therefore, the asset demand function for F^d can be rewritten as:

$$F^d = f(r, r^*, x, Y, W), \qquad f_1 < 0, f_2 > 0, f_3 > 0, f_4 < 0, f_5 > 0 \tag{9}$$

Though typical portfolio balance models assume positive income elasticity for money demand and negative for all other assets, in currency substitution models, domestic demand for foreign and local currency increased with income, reflecting the transactions motive of holding real money balances. The coefficient representing dollarization in this model is m_3 from Equation 4, reflecting how expected depreciation of the domestic currency shifts preferences toward foreign currency to preserve purchasing power (Mizen and Pentecost, 1996). This theoretical foundation supports the estimation of the money demand function in empirical dollarization studies (e.g., (Adom et al., 2009; Yinusa and Akinlo, 2008)).

5 Data and Methodology

We used quarterly data spanning the period Q2 2012 - Q4 2023. Data sources and transformations are presented in Table A1 of the appendix. We include six main variables in our model, the monetary policy rate, domestic interest rate, money supply, nominal exchange rate, output, the foreign interest rate and the inflation rate. In other specifications of the model, we include the interest rate gap (the difference between domestic and foreign monetary policy interest rates) and measures of exchange rate and inflation volatility.

5.1 Variable definition and measurement

Domestic monetary policy is proxied the Bank of Zambia's Monetary Policy Rate, pr, while the opportunity cost of holding domestic money as a financial asset compared to other assets is captured by the domestic interest rate, i, proxied by the 91 day or three month Treasury bill rate.

The nominal exchange rate variable, ner, captures the impact of dollarization on money demand, where an expected depreciation of the nominal exchange rate leads to a decline in the demand for domestic money and an increase in the demand for foreign money. As discussed by Lane (1999) and Yinusa and Akinlo (2008), the nominal and real effective exchange rates tend to move together so that the real exchange rate inherits the asset price nature of the nominal one. Hence, our results are not biased by the use of the nominal rather than the real exchange rate.

Capital mobility is proxied by the Federal funds rate, our foreign interest rate variable, i^*. An increase in the foreign interest rate increases the return on foreign bonds and subsequently leads to a decline in demand for domestic currency (McKinnon, 1982). We also take into account the

relative opportunity cost of holding domestic versus foreign currency through our measure of the interest rate gap, i_{gap}, computed as the monetary policy rate less the foreign interest rate ($i*$). Ize and Yeyati (2003) argue that higher foreign than domestic interest rates might incentivize dollarization as individuals and businesses convert savings into foreign-denominated assets to capitalize on these returns or hedge against local currency instability. Alternatively, an improvement in the domestic interest rate differential should enhance the desire to hold home currency deposits, thereby reducing deposit dollarization.

Income, y, represents a key determinant of real money demand in most of African countries since the average household maintains a sizable amount of domestic balances to pay for day to day expenses. Higher income levels are associated with a higher amount of transactions in both foreign and domestic currency, and a higher level of wealth (Adom et al., 2009). A possible explanation for increased foreign currency holdings when there is an increase in income is that because of the fees associated with holding dollar denominated accounts, only high income people can afford to deposit in foreign currency (Gomis-Porqueras et al., 2000). Inflation (π) erodes the value of nominal money holdings and hence an increase in inflation rate reduces the demand for domestic currency and assets. It increases demand for foreign assets and currencies (Gomis-Porqueras et al., 2000). Thus, the expected sign is positive.

We also control for the effects of money supply, ms, in our model, motivated by the argument from that in dollarized economy, the foreign currency component of broad money cannot be directly influenced by the monetary authorities. This implies that money supply is not completely set by domestic monetary authorities but, rather, influenced by the behavior of agents holding foreign and domestic-currency denominated assets, complicating the authorities' ability to control inflation (Alvarez-Plata and García-Herrero, 2008).

Exchange rate volatility, erv, is modeled as an exponential generalized autoregressive conditional heteroskedastic (EGARCH) process. This is in line with Diebold and Nerlove (1989),Epaphra (2016) and Lastrapes (1989) who show that exchange rate series exhibit characteristics such as volatility clustering, non-stationarity, non-normality and serial correlation that justify the application of the latent variable ARCH methodology. Inflation volatility is also measured in a similar way, though with some adjustment to take into account the underlying structure of the inflation series.[6] We include volatility measures to capture the argument by Ize and Yeyati (2003) that when considering the minimum variance portfolio equilibrium, the second moments of inflation and exchange rate are more relevant for explaining dollarization than the first moments.

All variables were tested for seasonality using the X-13 ARIMA-SEATS quarterly seasonal adjustment Method and we detected seasonality in the GDP series which was then seasonally adjusted. We further transformed GDP and broad money into logarithms for analysis. Summary statistics of our variables are presented in Table 1 and show that the mean nominal foreign currency deposits as a ratio of broad money between 2012 and 2023 in Zambia was 0.41 or 41 percent with the maximum index level being recorded at 0.54. Real dollarization was lower at an average 25 percent over the same period. Inflation was high at 11.14 percent while the average monetary policy rate was 10.70 percent.

[6]Specifically, we do not generate the log return of the inflation series before running the EGARCH model.

TABLE 1: SUMMARY STATISTICS

Variable	Mean	SD	Min	Max	N
Monetary Policy Rate (pr)	10.70	2.16	8.00	15.50	47
Dollarization Index (nominal)(DI_{nom})	0.41	0.07	0.27	0.54	47
Dollarization Index (real) (DI_{real})	0.25	0.05	0.16	0.41	47
Inflation Rate(π)	11.14	5.39	6.27	23.70	47
Domestic Interest Rate (i)	12.43	4.13	6.10	21.83	47
GDP (y, logged)	10.42	0.11	10.21	10.64	47
Broad Money (MS, logged)	17.88	0.56	16.93	18.88	47
Interest Differential (i_{gap})	9.59	2.82	4.43	15.14	47
Nominal Exchange Rate (ner)	2.39	0.48	1.60	3.14	47
Federal Funds Rate (ffr)	1.11	1.49	0.06	5.33	47
Inflation Volatility (inf_{vol})	5.38	7.65	1.93	32.77	47
Exchange Rate volatility(ner_{vol})	0.05	0.01	0.04	0.13	47

An examination of the correlation between variables reveals that the inflation rate and the exchange rate are both positively related to DI_{nom} but negatively related related to DI_{real}. The monetary policy rate is positively related to both dollarization indices, though the correlation is only significant for DI_{real}. Nominal dollarization is most strongly correlated to the exchange rate followed by the inflation rate and the domestic interest rate, while real dollarization shows strong co-movements with money supply, output and the exchange rate as shown in Table 2.

TABLE 2: CROSS-CORRELATION MATRIX

Variables	PR	DI_{nom}	DI_{real}	π	r	GDP	MS	I_{GAP}	ER	FFR	π_V	ER_v
PR	1											
DI_{nom}	0.097	1										
DI_{real}	0.508*	-0.283	1									
π	0.098	0.689*	-0.283	1								
r	0.635*	0.663*	0.155	0.502*	1							
GDP	-0.246	0.594*	-0.842*	0.318*	0.137	1						
MS	-0.346*	0.648*	-0.891*	0.472*	0.118	0.958*	1					
I_{GAP}	0.840*	-0.026	0.677*	0.145	0.554*	-0.567*	-0.581*	1				
ER	-0.250	0.806*	-0.793*	0.604*	0.310*	0.904*	0.966*	-0.443*	1			
FFR	-0.163	0.184	-0.543*	-0.170	-0.109	0.709*	0.589*	-0.665*	0.471*	1		
π_V	0.079	0.465*	-0.110	0.862*	0.391*	0.142	0.256	0.195	0.358*	-0.273	1	
ER_v	0.315*	0.221	0.076	0.352*	0.167	-0.04	0.02	0.252	0.097	-0.108	0.215	1

Notes: I_{GAP} refers to the gap between the monetary policy rate and the federal funds rate. It is calculated as the monetary policy rate minus the federal funds rate.

The Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests were used to check for the presence of unit roots in the respective series. Results from the unit roots shown in Table 3 that aside from the real dollarization index and volatility indices which are stationary in levels, all variables are integrated of order one, I (1) .

5.2 Methodology and Model Specification

The methodology follows a two-stage estimation method. Firstly, we identify the short- and long-run determinants of deposit dollarization using the autoregressive distributed lag (ARDL) approach of Pesaran et al. (2001) and Palley (2003). This approach allows us to model the relationship between our economic variables in a single-equation time-series setup. The bounds procedure further enables the

TABLE 3: UNIT ROOT TEST RESULTS

Variable	ADF Statistic		PP Statistic		KPSS Statistic		Order of integration
	First	Level	First	Level	First	Level	
Monetary Policy rate	-1.95	-4.51	-1.72	-4.52	0.28	0.14	I(1)
Inflation	-3.23	-4.00	-2.20	-4.02	0.28	0.07	I(1)
Domestic interest rate	-2.25	-4.47	-2.05	-4.54	0.16	0.14	I(1)
GDP	-2.09	-8.10	-2.09	-7.99	0.10	0.11	I(1)
FFR	-1.95	-2.64	-0.23	-2.70	0.45	0.20	I(1)
Broad money	-2.39	-5.58	-2.19	-5.60	0.12	0.05	I(1)
Real Dollarization	-3.95	-7.43	-4.36	-13.86	0.16	0.11	I(0)
Nominal Dollarization	-2.33	-6.19	-2.67	-6.28	0.13	0.09	I(1)
Nominal Exchange Rate	-0.54	-5.05	-0.62	-5.09	0.84	0.05	I(1)
Inflation Volatility	-4.06	-4.56	-2.50	-5.56	0.13	0.12	I(0)
Exchange rate volatility	-7.19	-13.09	-7.19	-30.55	0.08	0.49	I(0)
Interest gap	-1.48	-4.11	-1.07	-4.14	0.46	0.18	I(1)

testing of the existence of a long-run relationship based on the error-correction representation of the ARDL model. This methodology is chosen because it has certain advantages over other co-integration procedures. Firstly, this approach can be applied regardless of the orders of integration of the series. Secondly, it allows for inferences on long-run estimates which are not possible under alternative co-integration procedures and provides reliable and consistent results even in the estimations obtained with small samples. Finally, the ARDL Model can accommodate more variables when compared to other methods such as the Vector Autoregressive methods.

The long run model for nominal dollarization, ARDL(h, j, k, m, n, o, q, r), is specified as follows:

$$DI_{nom_t} = \beta_1 + \gamma_1 DI_{nom_t} + \gamma_2 \pi_t + \gamma_3 r_t + \gamma_4 y_t + \gamma_5 MS_t + \gamma_6 ER_t + \gamma_7 FFR_t + \gamma_8 PR_t + \epsilon_t \tag{10}$$

In other model variations, we replace the monetary policy rate and the federal funds rate with the interest gap, I_{GAP}, and inflation and exchange rate with their volatility measures, i.e. π_{V_t} and ER_{V_t}. In terms of lag length selection, we considered three information criteria, namely, the Schwartz Bayesian Information Criterion (SIC), the Hannan-Quinn criterion (HQ) and the Akaike Information Criterion (AIC) respectively. In cases of differences in order selected by the three criteria, Lütkepohl (2004), who provides a review of these criteria, recommends using the SIC which is considered to be a more parsimonious specification than HQ and AIC. Further, considering the limited number of observations, given that our data is quarterly, the SIC was selected as the preferred measure. Therefore, optimal lags h, j, k, m, n, p, q and r for each of the variables were determined by the SIC, an approach also in line with Pesaran and Pesaran (1997). This is particularly important given the potential risk of overfitting when estimating richer ARDL specifications. Nonetheless, some risk of overfitting remains, and the results should therefore be interpreted with caution, in line with concerns about the over-parameterization of models with limited sample sizes.

The short run specification is as follows:

$$\Delta DI_{nom_t} = \beta_1 + \sum_{i=1}^{n} \gamma_{1i} \Delta DI_{nom_{t-i}} + \sum_{i=1}^{n} \gamma_{2i} \Delta \pi_{t-i} + \sum_{i=1}^{n} \gamma_{3i} \Delta r_{t-i} + \sum_{i=1}^{n} \gamma_{4i} \Delta GDP_{t-i} + \sum_{i=1}^{n} \gamma_{5i} \Delta MS_{t-i} + \sum_{i=1}^{n} \gamma_{6i} \Delta ER_{t-i} + \sum_{i=1}^{n} \gamma_{7i} \Delta FFR_{t-i} + + \sum_{i=1}^{n} \gamma_{8i} \Delta PR_{t-i} + \lambda ECT_{t-1} + \epsilon_{it} \quad (11)$$

Where λECT_{t-1} represents the error correction term and shows how much of the disequilibrium in the previous period is being corrected (Nkoro and Uko, 2016). We also consider the case where the dependent variable is the real dollarization index in both long and short run estimations.

As discussed in the previous section, all variables were tested for unit roots. This testing is necessary to avoid the possibility of spurious regression and given that the presence of I(2) variables may invalidate the computed F-statistics from the bounds testing procedure of Pesaran et al. (2001). The stability of the short- and long-run coefficients is further examined using the traditional cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests.[7] For the short-run analysis, we compute the sum of its coefficients across all included lags to obtain an estimate of the cumulative short-run effect of a unit change in the variable on the dependent variable.

In the second stage of the analysis, we focus on the second objective of the article, vis-a-vis monetary policy and the control of dollarization in Zambia. We use impulse response functions to assess the response of the dollarization indices to changes in the main monetary policy indicator, the monetary policy rate. We compare this to the effect of changes in the exchange rate, another monetary policy tool that can be used for currency management as explained in Bennett et al. (1999). To obtain the impulse response functions, we use the local projection framework as set out in Jordà (2005). This method, which is an alternative to estimating impulse responses from standard vector autoregressive methods, is relatively new but has been extensively used and advantages of this approach include the use of a simpler estimation approach (least squares using a single-equation method); provision of appropriate inference (individual or joint) which does not require asymptotic delta-method approximations or numerical techniques for its calculation and robustness against mis-specification of the underlying data generation process (Jordà, 2005).

Specifically, given that y_t is the outcome variable of interest, x_t the vector of exogenous variables inclusive of the lags and policy intervention, s_t, an impulse response can be defined as:

$$R_{s \longrightarrow y}(h, \delta) \equiv E[y_{t+h} \mid s_t = s_0 + \delta; x_t] - E[y_{t+h} \mid s_t = s_0; x_t]; \qquad h = 0, 1, ..., H; \quad (12)$$

Where δ is the size of the intervention and is usually normalized to 1. The subscript $s \longrightarrow y$ indicates that the chosen intervention affects the outcome and the value s_0 is the baseline value which cancels out in linear models. Therefore, the local projection of y_{t+h} on s_t can be estimated using the

[7] The CUSUM and CUSUMSQ plots are presented in the Appendix.

following regression:

$$y_{t+h} = \alpha_h + \beta_h s_t + \gamma_h' x_t + \upsilon_{t+h}; \qquad h = 0, 1, ..., H; \tag{13}$$

with $R_{s \longrightarrow y}(h, \delta) = \beta_h$. We assume that $E(s_t, \upsilon_{t+h}) = 0$ inferring that s_t is determined at random. Under the assumption of linearity, interventions have symmetric effects, are linearly proportional and are independent of recent history, as embedded in controls (Jordà and Taylor, 2024). We use local projection impulse response functions to trace the dynamic impact of monetary policy shocks on both real and nominal dollarization over various horizons, h.

6 Results

We estimated four different model specifications and the results are presented in Tables 4, 5, 6 and 7. Model 1 is considered as the baseline and includes inflation, short run interest rate, output, money supply, the exchange rate, the federal funds rate and the monetary policy rate. Model 2 includes the interest gap (constructed as the difference between the monetary policy rate and the federal funds rate) rather than the federal funds and monetary policy rates. Model 3 includes the inflation and exchange rate volatility in place of inflation and nominal exchange rates, while Model 4 is similar to Model 3, with the difference being that we use the interest gap.

Given that our variables are integrated both in levels and first difference, as per ARDL approach, we tested for cointegration within the framework of the Bounds test. The results confirm the presence of cointegration among the variables. Models 1 and 2 show strong evidence of a long-run relationship for both nominal and real dollarization, with large negative and significant error-correction terms indicating fast adjustment to equilibrium. Models 3 and 4 for the real dollarization index show moderate cointegration with significant adjustment terms, indicating slower but still meaningful convergence. However, models 3 and 4 for nominal dollarization initially show weaker evidence of cointegration, but supplementary Engle–Granger tests reject the null of no cointegration at the 5 percent level, suggesting moderate to strong evidence of a long-run relationship. Model stability results from the CUSUM and CUSUMSQ plots show that the models are structurally stable, meaning that the relationships estimated should hold consistently over time (Figures A2, A3, A4, and A5 presented in the appendix).

6.1 The long run relationships

We first present results from models where nominal dollarization is the dependent variable. We find that most of the macroeconomic variables exert statistically significant effects on nominal dollarization in the long run, though the strength and direction of these effects vary across model specifications (Table 4). Specifically, we find that inflation and the domestic nominal interest rate are positively associated with dollarization. This suggests that rising domestic prices and nominal returns may heighten depositor incentives to hold foreign currency deposits, reflecting reduced confidence in the Kwacha under inflationary conditions. This is consistent with Alesina and Barro (2001) who argued that by

undermining confidence in domestic monetary assets, inflation may reinforce dollarization through expectations of continued macroeconomic volatility. An increase in the nominal interest rate that, a priori, is expected to support higher anticipated returns to holding the local currency and encourage domestic savings, appears insufficient to offset perceived inflationary risks, a finding that differs from other studies on the determinants of deposit dollarization in Botswana (Yinusa, 2009), Ecuador (Beckerman, 2002) and Nigeria (Yinusa and Akinlo, 2008), where higher domestic interest rates were found to reduce dollarization. Instead, our results imply that in the Zambian context, increases in the nominal interest rate may signal macroeconomic instability or short-term monetary tightening, prompting precautionary shifts toward foreign currency holdings particularly when inflation is perceived as persistent. That said, it would reflect endogenous central bank responses to inflationary expectations, exchange rate pressures, or heightened macroeconomic risk rather than a causal effect of higher domestic interest rates on dollarization, consistent with the instability signaling hypothesis as noted by Calvo and Végh (1999). Nonetheless, these results are consistent with findings for Zambia by Funyina et al. (2020), who show that higher domestic interest rates, rather than reducing dollarization, are associated with shifts in the currency composition of new lending, specifically increased foreign currency lending and reduced local currency lending. The findings also align with evidence on the effects of interest rates on foreign currency borrowing reported by Brzoza-Brzezina et al. (2010) and Rosenberg (2008). More broadly, this result is supported by empirical evidence from other emerging and dollarized economies. For example, domestic deposit interest rates have been found to positively influence financial dollarization in Turkey, reflecting heightened macroeconomic risk (Eren et al., 2022), while cross-country evidence shows that systemic risk simultaneously increases both domestic interest rates and dollarization (Bacha et al., 2009). These findings support the interpretation that higher domestic interest rates may signal underlying macroeconomic instability, thereby reinforcing incentives to hold foreign currency rather than encouraging a shift toward local currency assets.

Real output is positively and significantly associated with dollarization implying that economic expansion may coincide with increased foreign currency holdings, possibly due to greater trade exposure or portfolio diversification among depositors. This may also in part reflect increasing import demand for inputs and raw materials as production rises lead to greater foreign exchange needs. Conversely, money supply is negatively and significantly associated with dollarization indicating that monetary expansion may reduce the need for foreign currency holdings by improving domestic liquidity. This supports the view that expansionary monetary conditions can enhance confidence in the Kwacha and reduce currency substitution. The nominal exchange rate exhibits a strong and consistent positive effect in Models 1 and 2, reinforcing the role of depreciation expectations in driving deposit dollarization. This finding is consistent with theoretical expectations and prior studies such as Bocola and Lorenzoni (2020) and Rennhack and Nozaki (2006), which emphasize the precautionary response of depositors to currency instability. Meanwhile, monetary conditions captured by the Federal Funds Rate and the domestic monetary policy rate are weakly significant and negative in Model 3, suggesting that tighter global or domestic monetary stances may modestly curb dollarization, though these effects are not robust across specifications.

Of the two volatility measures, we find that exchange rate volatility is positively associated with dollarization, while inflation volatility remains statistically insignificant. These findings suggest that

uncertainty in the exchange rate may amplify precautionary behavior, whereas inflation volatility may be less salient in shaping depositor preferences. Overall, the results highlight the multifaceted nature of dollarization in Zambia, where both domestic fundamentals and external conditions interact to shape currency preferences. They reinforce the need for coherent monetary and exchange rate policies aimed at enhancing macroeconomic stability, improving policy credibility, and reducing reliance on foreign currency deposits.

TABLE 4: LONG RUN DETERMINANTS OF NOMINAL DOLLARIZATION IN ZAMBIA

Dependent Variable : Nominal Dollarization								
	Model 1		Model 2		Model 3		Model 4	
	Estimate	(t-stat)	Estimate	(t-stat)	Estimate	(t-stat)	Estimate	(t-stat)
Inflation	0.002**	(2.71)	0.003***	(3.28)				
TB Interest Rate	0.002**	(2.13)	0.003***	(3.06)	0.012***	(6.94)	0.009***	(3.41)
Output	0.294**	(2.51)	0.297***	(3.01)	0.589**	(2.65)	0.342	(1.17)
Money Supply	-0.257***	(-7.84)	-0.207***	(-6.74)	-0.034	(-0.85)	0.018	(0.33)
Exchange Rate	0.332***	(7.94)	0.270***	(8.92)				
Federal Funds Rate	-0.000	(-0.13)			-0.010*	(-1.83)		
Monetary Policy Rate	-0.002	(-1.07)			-0.008*	(-1.93)		
Interest Gap			-0.000	(-0.30)			0.003	(0.67)
Inflation Volatility					0.001	(1.14)	0.002	(1.53)
Exchange Rate Volatility					1.163*	(1.82)	-0.050	(-0.09)

Notes: Significance levels * 10% ** 5% *** 1%. Model 1 specification: ARDL(2,0,0,0,2,0,1,0); Model 2 specification: ARDL(2,0,0,0,2,0,2); Model 3 specification: ARDL(2,0,1,1,0,1,0,1); Model 4 specification: ARDL(2,0,0,0,0,1,0). The interest gap is calculated as the monetary policy rate minus the federal funds rate.

The largest effects on dollarization arise from movements in output and exchange rates. In particular, the strong influence of the nominal exchange rate and the volatility measure is consistent with the hysteresis dynamics highlighted by Guidotti and Rodriguez (1992), whereby past currency instability can entrench dollarization even after macroeconomic conditions improve. Exchange-rate uncertainty may also prompt firms to diversify production internationally as a hedge against adverse cost shocks, as suggested by Palley (2003). These findings underscore the importance of managing exchange rate volatility, alongside maintaining broader macroeconomic stability, as key to reducing dollarization pressures over the long run. By contrast, interest rate effects, especially monetary policy rate changes, are generally smaller in magnitude, although significant in some specifications.

With regards to real dollarization, similar to nominal dollarization, we find that inflation is positively and significantly associated with movements in the index, suggesting that rising domestic prices erode confidence in the Kwacha and prompt a shift toward foreign currency holdings (Table 5). Similarly, the Treasury Bill interest rate is positively and significantly associated with real dollarization across all models, indicating that higher nominal returns on domestic instruments may not deter dollarization. Instead, they may reflect underlying macroeconomic risks or signal monetary tightening, which depositors interpret as a cue to diversify into foreign currency assets. Real output also consistently exhibits a positive and statistically significant effect on dollarization across all models, consistent with the structural view that dollarization may rise with economic activity due to greater integration with global markets.

Money supply is negatively and significantly associated with real dollarization in all models, implying that greater domestic liquidity reduces the incentive to hold foreign currency. The nominal

exchange rate does not exhibit a robust effect on real dollarization, with coefficients in Models 1 and 2 remaining statistically insignificant. This contrasts with the results for nominal dollarization, suggesting that valuation effects may be less sensitive to exchange rate movements when deposits are adjusted for interest rate differentials and fixed conversion rates. Volatility measures, however, play a more prominent role in explaining real dollarization. Inflation volatility is positively and significantly associated with dollarization in Models 3 and 4, indicating that uncertainty in price levels prompts precautionary shifts toward foreign currency holdings. Exchange rate volatility also shows a positive and statistically significant effect in Models 3 and 4, reinforcing the view that macroeconomic uncertainty, particularly in currency markets, drives real dollarization. External monetary conditions, including the Federal Funds Rate and the monetary policy rate, do not exert significant effects on real dollarization in any model. Likewise, the interest rate gap remains statistically insignificant, suggesting that cross-border interest differentials may be less influential in shaping long-run currency preferences in Zambia.

TABLE 5: LONG RUN DETERMINANTS OF REAL DOLLARIZATION IN ZAMBIA

Dependent Variable : Real Dollarization								
	Model 1		Model 2		Model 3		Model 4	
	Estimate	(t-stat)	Estimate	(t-stat)	Estimate	(t-stat)	Estimate	(t-stat)
Inflation	0.002**	(2.44)	0.002***	(3.33)				
TB Interest Rate	0.002	(1.68)	0.002***	(2.84)	0.003***	(4.76)	0.003***	(4.85)
Output	0.218**	(2.08)	0.224**	(2.75)	0.287***	(3.37)	0.268***	(3.92)
Money Supply	-0.176***	(-6.06)	-0.120***	(-4.59)	-0.136***	(-8.76)	-0.133***	(-10.09)
Exchange Rate	0.055	(1.47)	-0.014	(-0.55)				
Federal Funds Rate	-0.001	(-0.35)			-0.001	(-0.65)		
Monetary Policy Rate	-0.000	(-0.24)			0.000	(0.26)		
Interest Gap			0.001	(0.82)			0.001	(0.48)
Inflation Volatility					0.001**	(2.27)	0.001**	(2.52)
Exchange Rate Volatility					0.462*	(1.97)	0.440**	(2.14)

Notes: Significance levels * 10% ** 5% *** 1%. Model 1 specification: ARDL(2,0,0,0,2,2,1,0); Model 2 specification: ARDL(2,0,0,0,2,2,2); Model 3 specification: ARDL(2,0,1,0,0,1,0,0); Model 4 specification: ARDL(2,0,1,0,0,1,0). The interest gap is calculated as the monetary policy rate minus the federal funds rate.

Real output and exchange rate volatility display relatively large, positive coefficients, while money supply exerts a strong negative effect, mirroring the pattern observed for nominal dollarization. By contrast, the nominal exchange rate, monetary policy rate, and interest rate gap show small and statistically insignificant coefficients, suggesting limited long-run influence on real dollarization under the current model specifications. Overall, the results point to structural factors such as output and money supply and volatility dynamics as the strongest drivers of real dollarization in Zambia. These findings imply that policy should prioritize liquidity provision, inflation control, and exchange rate stability to mitigate dollarization pressures and reinforce the role of the domestic currency in financial intermediation.

6.2 The short-run dynamics of dollarization

The short-run results presented in Tables 6 and 7 offer insight into the immediate drivers of both indices of dollarization in Zambia. Starting with nominal dollarization, across all models, we observe

strong persistence in dollarization behavior, with lagged values of the nominal dollarization index remaining positive and statistically significant. This suggests that past levels of dollarization continue to influence current behavior, reinforcing the notion that dollarization may be self-perpetuating in the short term. Money supply variable is consistently positive and significant across all models, indicating that increases in money supply are associated with higher short-term dollarization, potentially reflecting inflationary expectations or reduced confidence in the domestic currency. Interestingly, the lagged money supply variable is negative and significant in Models 1 and 2, suggesting a correction mechanism whereby previous expansions in liquidity may eventually dampen dollarization pressures. Model 1 includes the Federal Funds Rate, which shows a positive and significant short-run effect on dollarization. This finding supports the view that tighter global financial conditions can lead to increased foreign currency holdings in Zambia, possibly due to capital flow adjustments or shifts in portfolio preferences, as discussed by Kim (2023). The interest gap variable is negative and significant only in its lagged form, implying that a wider gap between domestic and foreign interest rates may reduce dollarization over time, consistent with the stabilizing role of domestic monetary tightening.

TABLE 6: SHORT RUN DETERMINANTS OF NOMINAL DOLLARIZATION

Dependent Variable : Nominal Dollarization								
	Model 1		Model 2		Model 3		Model 4	
	Estimate	(t-stat)	Estimate	(t-stat)	Estimate	(t-stat)	Estimate	(t-stat)
ΔNom. Dollarization(-1)	0.424***	(5.40)	0.446***	(5.01)	0.442***	(3.59)	0.267**	(2.56)
ΔMoney Supply	0.158**	(2.43)	0.145**	(2.11)	0.470***	(5.32)	0.436***	(4.53)
ΔMoney Supply(-1)	-0.232***	(-3.24)	-0.192***	(-2.77)				
ΔFederal Funds Rate	0.024***	(3.38)						
ΔInterest Gap			-0.001	(-0.33)				
ΔInterest Gap(-1)			-0.009**	(-2.30)				
ΔExchange Rate Volatility					-0.845**	(-2.64)		
ΔTB Interest Rate					-0.006**	(-2.11)		
ΔMonetary Policy Rate					0.011**	(2.15)		
Adjustment Coef.	-1.196***	(-9.66)	-1.215***	(-8.33)	-0.752***	(-3.53)	-0.535***	(-3.55)
Constant	1.318	(0.95)	0.369	(0.39)	-3.956**	(-2.68)	-1.960*	(-1.83)
R-squared	0.878		0.862		0.721		0.606	
N	45		45		45		45	

Notes: Significance levels * 10% ** 5% *** 1%. Model 1 specification: ARDL(2,0,0,0,2,0,1,0); Model 2 specification: ARDL(2,0,0,0,2,0,2); Model 3 specification: ARDL(2,0,1,1,0,1,0,1); Model 4 specification: ARDL(2,0,0,0,0,1,0). The interest gap is calculated as the monetary policy rate minus the federal funds rate. Adjustment Coef.=Adjustment Coefficient.

Model 3 introduces short-run volatility measures and reveals a counter-intuitive result: exchange rate volatility is negatively and significantly associated with dollarization. This contrasts with the conventional expectation that uncertainty drives currency substitution. One possible explanation, as proposed by Ize and Yeyati (2006), is that increased volatility raises the cost of managing foreign currency risk, making domestic deposits relatively more attractive in the immediate period. Alternatively, heightened volatility may signal that the foreign currency is overvalued, prompting expectations of a future correction and reducing the incentive to hold dollar-denominated assets (Froot, 2019). We also find that the Treasury Bill interest rate is negatively associated with dollarization, while the monetary policy rate shows a positive effect. These findings suggest that while short-term domestic interest rate hikes may reduce dollarization through improved returns on local assets, monetary policy rate increases may simultaneously signal inflationary concerns or macroeconomic instability, thereby

encouraging foreign currency holdings. This divergence highlights the complexity of interpreting interest rate movements in the short run.

The error correction term, which captures the speed of adjustment back to long-run equilibrium following short-run shocks, is negative and statistically significant with coefficients ranging from –0.535 to –1.196. These values indicate a rapid correction mechanism, though the magnitude suggests potential over-adjustment, implying that the system may oscillate around equilibrium rather than converge smoothly. The R-squared are also relatively high pointing to sufficient explanatory power across the models. Overall, the short-run results underscore the importance of liquidity conditions, interest rate signaling, and external financial pressures in shaping dollarization behavior in Zambia. While some findings, such as the negative effect of exchange rate volatility, challenge conventional expectations, they offer valuable insights into the nuanced and context-specific nature of currency substitution in the short term. These results reinforce the need for careful calibration of monetary policy and exchange rate management to mitigate dollarization pressures and support confidence in the domestic currency.

The short-run determinants of real dollarization are presented in Table 7. Across all four specifications, lagged values of real dollarization are positive and highly significant, indicating strong persistence in dollarization behavior for this index as well. This suggests that economic agents tend to maintain foreign currency holdings over time, reflecting inertia or structural reliance on foreign-denominated assets within the financial sector. Short-run changes in money supply have a positive and significant effect on real dollarization in Models 3 and 4, while lagged money supply exerts a negative and significant influence in Models 1 and 2. This duality implies that while immediate liquidity expansion may encourage dollarization—possibly due to inflationary expectations—past monetary tightening appears to reduce dollarization over time.

TABLE 7: SHORT RUN DETERMINANTS OF REAL DOLLARIZATION

Dependent Variable : Real Dollarization								
	Model 1		Model 2		Model 3		Model 4	
	Estimate	(t-stat)	Estimate	(t-stat)	Estimate	(t-stat)	Estimate	(t-stat)
ΔReal Dollarization(-1)	0.331***	(3.57)	0.311***	(3.41)	0.448***	(4.45)	0.446***	(4.53)
ΔMoney Supply	0.062	(0.88)	0.061	(0.87)	0.236***	(4.36)	0.235***	(4.43)
ΔMoney Supply(-1)	-0.232***	(-3.37)	-0.252***	(-3.55)				
ΔExchange Rate	0.064	(1.60)	0.059	(1.41)				
ΔExchange Rate(-1)	0.115***	(3.46)	0.167***	(4.41)				
ΔFederal Funds Rate	0.020***	(3.57)						
ΔInterest Gap			0.000	(0.02)				
ΔInterest Gap(-1)			-0.010***	(-3.25)				
ΔExchange Rate Volatility					-0.388**	(-2.36)	-0.373**	(-2.43)
Adjustment Coef.	-1.040***	(-6.92)	-1.091***	(-7.07)	-1.100***	(-5.67)	-1.100***	(-5.82)
Constant	0.995	(0.90)	0.032	(0.05)	-0.432	(-0.63)	-0.264	(-0.48)
R-squared	0.735		0.734		0.624		0.622	
N	45		45		45		45	

Notes: Significance levels * 10% ** 5% *** 1%. Model 1 specification: ARDL(2,0,0,0,2,2,1,0); Model 2 specification: ARDL(2,0,0,0,2,2,2); Model 3 specification: ARDL(2,0,1,0,0,1,0,0); Model 4 specification: ARDL(2,0,1,0,0,1,0). The interest gap is calculated as the monetary policy rate minus the federal funds rate. Adjustment Coef.=Adjustment Coefficient.

Consistent with the findings for nominal dollarization, exchange rate volatility is negatively and significantly associated with dollarization in Models 3 and 4, suggesting that heightened uncertainty

in the exchange rate discourages foreign currency usage. This may reflect risk aversion or reduced confidence in the stability of foreign-denominated transactions. Conversely, lagged nominal exchange rate levels are positively and significantly associated with dollarization in Models 1 and 2, indicating that past depreciation episodes increase reliance on foreign currency. The federal funds rate has a positive and significant short-run effect in Model 1 while the interest gap has a negative and significant lagged effect in Model 2 as was the case for nominal dollarization.

Notably, the results do not support a significant role for inflation or economic growth in the short run, contrary to prior expectations. The absence of inflation variables in the estimated models limits direct inference, while the hypothesized positive effect of economic growth on dollarization is not captured in the current specifications. However, the findings remain broadly consistent with the literature, including Tweneboah et al. (2019), who argues that in import-dependent economies, output expansion may increase demand for foreign currency due to greater trade and financial integration.

The contrasting effects of exchange rate and inflation rate volatility underscore the importance of relative risk perceptions. As discussed in Rennhack and Nozaki (2006) and Ize and Yeyati (2006), residents may compare the variance of inflation to that of the exchange rate when deciding their currency holdings. If inflation volatility is perceived to be lower than exchange rate volatility, agents may prefer the domestic currency, thereby moderating real dollarization. However, this theoretical scenario may be difficult to achieve in Zambia, where exchange rate pass-through to prices is high, particularly during depreciation episodes (Zgambo and Chileshe, 2014). This is consistent with evidence from highly dollarized economies, where elevated exchange rate pass-through to prices is commonly observed (Reinhart et al., 2003). We also find that the adjustment coefficients are large and negative across all models, confirming robust error correction dynamics and a strong tendency for real dollarization to revert to its long-run equilibrium.

In summary, our findings indicate that while several variables exert statistically significant effects on dollarization, output, money supply, and exchange rate volatility emerge as the dominant drivers of both nominal and real dollarization in the long run. In the short run, both dollarization indices exhibit persistence, and money supply and exchange rate volatility remain the key determinants, whereas monetary policy rate effects are largely insignificant, except for a modest positive impact on nominal dollarization. These results imply that policies aimed at stabilizing output and exchange rate fluctuations, together with prudent money supply management, are likely to be more effective in curbing deposit dollarization and could enhance the effectiveness of monetary policy rate measures, whose direct impact appears limited over the study period.

We also find evidence of asymmetric effects of exchange rate volatility on dollarization, suggesting that different mechanisms operate over different horizons. In the short run, increased exchange rate volatility is associated with lower nominal and real dollarization. Although this appears to contradict standard theoretical priors, it is consistent with the minimum variance portfolio framework, which predicts that conditional on a given level of inflation volatility, the optimal share of foreign currency assets may decline as exchange rate variance rises, due to the reduced hedging effectiveness and increased riskiness of foreign currency positions (Ize and Yeyati, 2003, 1998). In this context, heightened volatility raises the uncertainty associated with foreign currency returns, thereby discour-

aging short-term exposure. This may also reflect higher risk-management costs, liquidity constraints, and precautionary behavior that lead economic agents to temporarily re-balance toward domestic currency assets. In contrast, the long-run estimates are positive and statistically significant, in line with theoretical expectations. This suggests that persistent exchange rate volatility ultimately increases dollarization, likely because it serves as a signal of macroeconomic instability and weak policy credibility. Over longer horizons, such conditions strengthen incentives for structural hedging and portfolio diversification into foreign currency assets (Guidotti and Rodriguez, 1992; Palley, 2003). Our findings are consistent with existing empirical evidence. For instance, Uroševic and Rajkovic (2016), using panel data for the Czech Republic, Hungary, Poland, Romania, and Serbia, find that exchange rate volatility exerts a negative effect on dollarization in the short run. They attribute this to the increased relative riskiness of foreign currency deposits, which induces temporary portfolio reallocation during periods of heightened uncertainty. Similarly, Catão and Terrones (2000) argue that higher devaluation risk can reduce deposit dollarization in the short term, depending on initial conditions. They document episodes such as Argentina and Mexico in 1995, and several emerging markets during the 1998–1999 financial turbulence where the share of foreign currency liabilities in banking systems declined sharply amid heightened uncertainty and funding pressures. At the same time, longer-term evidence points in the opposite direction. For example, Civcir (2005) finds that sustained exchange rate volatility in Turkey is associated with higher dollarization over time. Taken together, these findings highlight that the relationship between exchange rate volatility and dollarization is inherently dynamic and context dependent. As emphasized by Catão and Terrones (2000), the impact of devaluation risk on dollarization depends critically on structural features such as credit market conditions, banking sector frictions, and the nature of macroeconomic shocks, rather than solely on the level or volatility of macroeconomic variables.

6.3 Monetary Policy Options and Deposit Dollarization - Monetary Policy Rate versus Exchange Rate

We now examine the response of dollarization to monetary policy variables. Impulse response functions, modeled as local projection functions, are used to trace the effects of shocks to the monetary policy rate and the exchange rate on both real and nominal dollarization. Our regression analysis revealed stronger effects, measured by statistical significance and coefficient size, of exchange rate movements on dollarization than those from the monetary policy rate changes and in this section, we compare the long term impact of changes in these two factors on foreign currency deposit usage. The analysis period is undertaken for a period of 16 quarters, or four years, to capture long-term adjustments and equilibrium shifts.

Starting with interest rate effects, from Figure 3, the impulse response analysis show that a positive shock to the monetary policy rate has broadly similar short-run effects on both nominal and real dollarization, though the magnitude and timing differ slightly. For nominal dollarization, the initial three periods exhibit statistically significant declines, indicating that tighter monetary policy immediately reduces foreign currency deposit holdings, with the effect peaking in the second period. This contraction is followed by a temporary rebound between periods four and eight, with some positive

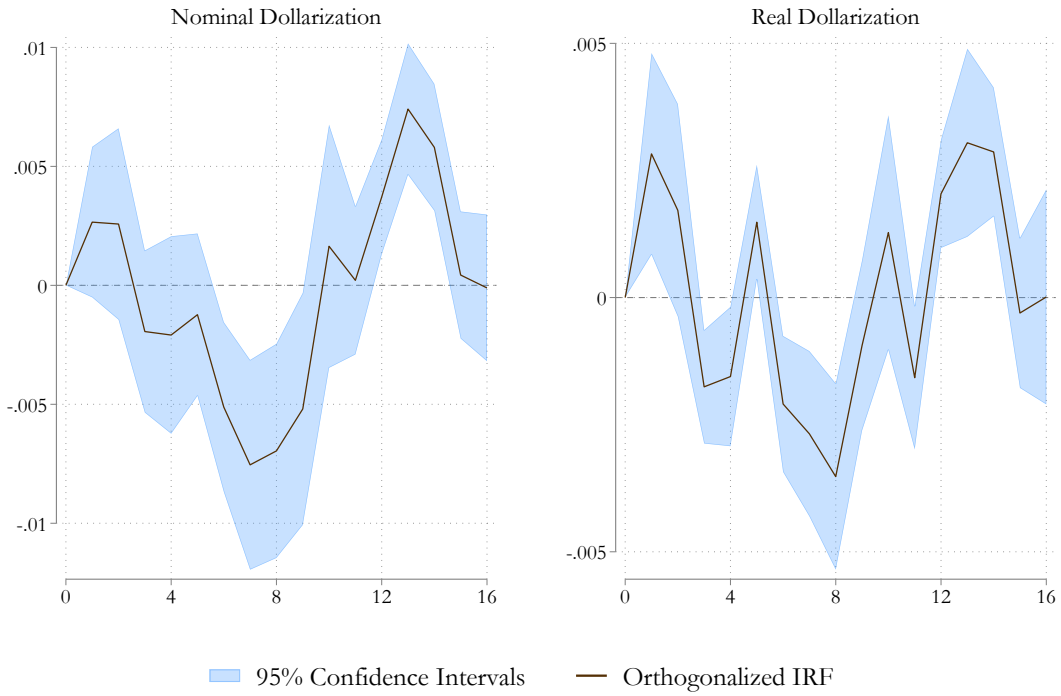
FIGURE 3: EFFECTS OF MONETARY POLICY RATE INNOVATIONS ON NOMINAL AND REAL DOLLARIZATION

Notes: The figure shows the impulse response functions nominal and real dollarization when there is a change in the monetary policy rate

and significant coefficients, before negative effects re-emerge in later periods, suggesting delayed portfolio adjustments. Real dollarization displays a comparable pattern though the effects are largely insignificant: early negative responses are followed by a short-lived increase in periods six to nine, and renewed negative adjustments at the latter periods. Collectively, these dynamics indicate that monetary policy rate shocks produce an immediate but transient dampening effect on both nominal dollarization, followed by partial reversals and longer-term portfolio re-balancing. This highlights the non-linear relationship and mixed long-term interest rate effects which may be influenced by changes in economic expectations held by agents, exchange rate dynamics or policy shifts. The findings are consistent with the literature on monetary policy and dollarization, which suggest that policy credibility and inflation expectations may play key roles in determining the extent of dollarization (Alesina and Barro, 2001; Rennhack and Nozaki, 2006).

When we examine the implication of an exchange rate shock, we find that a positive shock to the nominal exchange rate affects nominal and real dollarization differently in both magnitude and timing (Figure 4). For real dollarization, the initial response is positive but only marginally significant in the second period, followed by a sequence of significant negative responses, indicating that a depreciation of the domestic currency initially induces a reduction in real foreign currency deposits. This pattern alternates in later periods, with significant positive responses during the latter period, suggesting delayed portfolio adjustments and potential re-balancing over the medium term. This could also reflect in part the long-term responses of the agent to hedge against currency weaknesses by moving to foreign currency assets. In essence, persistent depreciation can lower trust in the local cur-

FIGURE 4: EFFECTS OF NOMINAL EXCHANGE RATE INNOVATIONS ON NOMINAL AND REAL DOLLARIZATION



Notes: The figure shows the impulse response functions nominal and real dollarization when there is a change in the monetary policy rate

rency and reinforce dollarization, aligning with research showing that dollarization is highly reactive to exchange rate shocks (Craig and Waller, 2004; Kim, 2019; Yinusa, 2008). In contrast, nominal dollarization exhibits more pronounced negative responses in the early to middle periods (between the third and ninth quarters after the shock), with the largest contraction occurring around the seventh quarter, indicating a stronger and more immediate sensitivity of nominal deposits to exchange rate fluctuations. Positive and significant responses reappear in later periods, consistent with gradual reallocation or compensation effects. Overall, these dynamics suggest that nominal exchange rate shocks exert a stronger and more immediate effect on nominal dollarization than on real dollarization, while real dollarization responds with somewhat delayed and alternating adjustments, reflecting differences in how currency composition and inflation-adjusted holdings react to exchange rate movements.

Summarizing the responses of the two dollarization indices to monetary policy rate and exchange rate shocks, the impulse response analysis indicates that monetary policy rate shocks produce immediate, statistically significant reductions in both nominal and real dollarization, with the strongest short-run effect observed in nominal deposits, followed by temporary reversals and longer-term portfolio adjustments. In contrast, nominal exchange rate shocks exert a more pronounced and immediate impact on nominal dollarization, while real dollarization responds more gradually, with alternating adjustments over time. From a monetary policy perspective, monetary policy rate shocks are most effective for short-run stabilization of dollarization, particularly nominal deposits, whereas exchange rate stabilization plays a critical complementary role, shaping real dollarization over longer horizons. Together, these tools can enhance confidence in the domestic currency and support broader

de-dollarization efforts.

A key conceptual issue flowing from our findings is how effective would monetary policy be in a partially dollarized economy, particularly under an inflation targeting framework, as adopted by Zambia in 2012. Given the exchange rate pass through to prices in a dollarized economy, the potential to reduce dollarization through inflation stability alone may be constrained, echoing the caution raised by Ize and Yeyati (2003) regarding limits of monetary policy in highly open and volatile economies. This is supported by some empirical evidence from studies of monetary transmission in partially dollarized economies under inflation targeting such as Peru and Uruguay shows that the interest rate channel tends to be weaker relative to the exchange rate channel (Ormaechea and Fernandez, 2011). Further empirical work from Zambia and other emerging economies from Zgambo (2018) suggests that the exchange rate channel often dominates monetary transmission in dollarized environments, and that high currency substitution and a large share of foreign currency loans amplify liquidity and solvency risks, reducing the effectiveness of both monetary and fiscal policy on real macroeconomic outcomes (Pepić et al., 2015).

Nonetheless, Leiderman et al. (2006) argue that even in highly dollarized economies, although dollarization may alter the monetary transmission mechanism, an inflation-targeting regime can still operate effectively provided it is suitably adapted. They further contend that, over time, inflation targeting may itself induce changes in behavioral parameters that enhance the economy's responsiveness to policy signals, and that the framework can be calibrated to account for the specific constraints and vulnerabilities associated with dollarization. Evidence from Peru supports this view. As Armas and Grippa (2005) document, the central bank's inflation-targeting strategy was accompanied by policies aimed at reducing financial dollarization such as requiring prices to be quoted in domestic currency, fostering the internalization of dollarization-related risks by economic agents, and maintaining sufficiently high international reserves to mitigate potential contingent-liability crises. Reinhart et al. (2003) also find limited empirical support for the view that dollarization impedes the effectiveness of monetary policy or that it alters or adds complexity to the monetary transmission process though they do find that the exchange rate pass through to prices is higher. Monetary policy implementation in dollarized economies also diverges from that of non-dollarized inflation-targeting countries, particularly with respect to the core forecasting model employed and the policy tools used to manage financial-dollarization risks (Armas and Grippa, 2005). Taken together, this evidence suggests that inflation targeting is viable in dollarized economies, although the interest-rate channel may be relatively weak especially for variables such as deposit dollarization and the exchange rate pass through to prices higher. This is consistent with our findings that the monetary policy rate plays a relatively weaker role as a determinant of deposit dollarization and has less impact on the evolution of the dollarization indices when compared to exchange rate movements. Thus, while policy signals may be dampened by currency substitution and extensive foreign-currency lending, an appropriately augmented inflation-targeting framework remains a feasible and effective approach for anchoring inflation expectations and stabilizing prices in dollarized settings.

7 Conclusion

In this paper, we construct two indices of dollarization for Zambia. These are nominal dollarization which captures exchange rate-driven changes in foreign currency deposits relative to money supply and real dollarization which removes exchange rate effects to focus on structural and behavioral factors. We identify several consistent patterns and important divergences when we look at the short run and long run determinants of nominal and real dollarization. Both indices exhibit strong persistence, with lagged values remaining positive and statistically significant across all models, underscoring the self-reinforcing nature of dollarization behavior in Zambia. Sustained growth might encourage financial and trade linkages with dollarized economies, increasing both real and nominal dollarization while the nominal exchange rate has positive effects on nominal dollarization. The money supply variable shows a dual effect: while contemporaneous increases in liquidity are positively associated with both nominal and real dollarization, likely reflecting inflationary expectations or reduced confidence in the domestic currency, lagged money supply exerts a negative and significant influence, suggesting a corrective mechanism whereby prior expansions eventually dampen dollarization pressures. This dynamic highlights the nuanced role of liquidity conditions in shaping currency substitution. In the short run, exchange rate volatility is negatively and significantly associated with dollarization in both frameworks, challenging conventional expectations that uncertainty drives foreign currency holdings. Instead, heightened volatility may increase the cost of managing foreign exchange risk or signal overvaluation of the foreign currency, thereby reducing its attractiveness.

Our initial analysis, which integrates the long and short run determinants of deposit dollarization, finds that the monetary policy rate effects are generally modest but effective, especially for nominal dollarization, while exchange rate effects are strong. Impulse response analysis complements this view by showing that monetary policy rate shocks can generate immediate reductions in both nominal and real dollarization, particularly in the short run, whereas exchange rate shocks primarily affect nominal deposits and induce more delayed, less predictable responses in real dollarization. Taken together, these findings suggest that monetary policy can achieve the most effective stabilization of dollarization through a combination of structural and macro-financial measures aimed at reducing exchange rate volatility while monetary policy rate adjustments serve as a useful short-run tool to reinforce these broader measures. Overall, the findings highlight the role of volatility and structural factors such as output growth and liquidity conditions in shaping depositor behavior. For Zambia, these findings suggest that sustained efforts to reduce uncertainty and strengthen domestic monetary credibility are essential to reversing the trend of real dollarization.

From a policy perspective, various lessons can be drawn. The finding that the exchange rate and its volatility play a prominent role in explains dollarization is a source of concern as persistent exchange-rate uncertainty may cause firms to diversify sources of production internationally to protect against exchange-rate movements that can adversely affect their expenses and competitive edge as discussed by Palley (2003). Further, in an open economy without capital mobility restrictions, in additional to trade considerations, equilibrium in the exchange markets will also reflect asset portfolio considerations and decisions to hold wealth across different national financial markets. This means that an asset market dimension is introduced to the foreign exchange markets which may be highly

problematic in the implementation of monetary policy. In particular, currency markets will take on the character of asset markets. As such, they may be volatile and subject to speculative tendencies. This opens the way for asset market volatility to impact exchange rates and the domestic economy vis-a-vis inflation and output. Thus, policy makers should carefully consider that flexible exchange rates when combined with unrestricted capital mobility can increase the volatility in the financial markets and in turn, increase dollarization levels (Palley, 2003). The consistent impact of the monetary policy rate on both nominal and real dollarization in the impulse response analysis further implies that the levels of both indices can be moderated by using appropriate monetary policy actions.

There are numerous potential areas for expansion to this study. We used the nominal exchange rate as a possible determinant of dollarization and identified strong effects. It may be useful to examine whether real exchange rates have differing implications for dollarization in Zambia even in the face of theoretical evidence that they should be aligned. The study can also be expanded to incorporate how labor market dynamics and advancements made to the payment system landscape which has increased the definition of money, namely mobile money, relate to dollarization. An examination of the nexus between dollarization and poverty/ inequality in Zambia may also be of interest.

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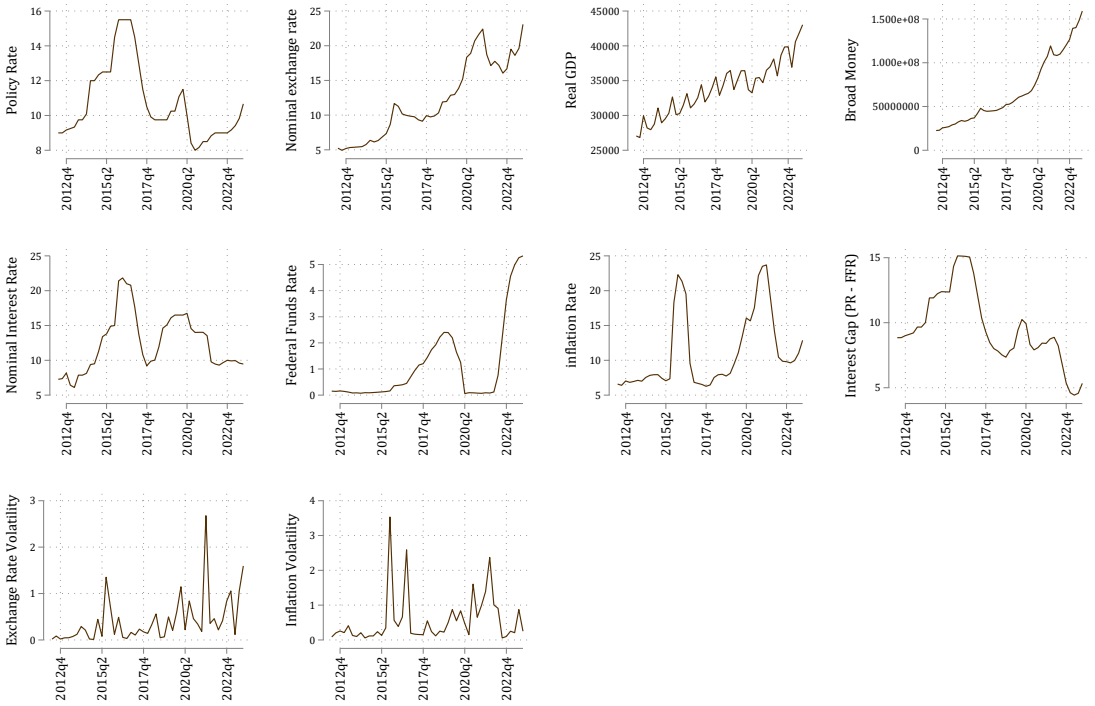
Appendix

FIGURE A1: VARIABLE TRENDS

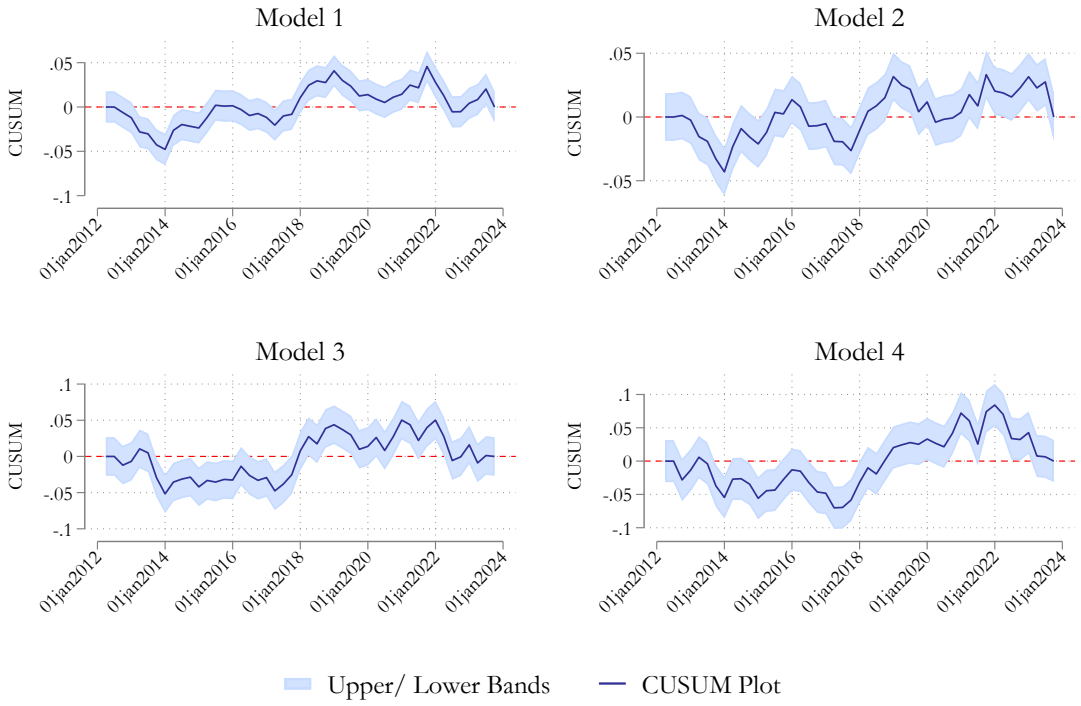


Notes: The figure shows the trends in the main variables

TABLE A1: DATA SOURCE AND TRANSFORMATIONS

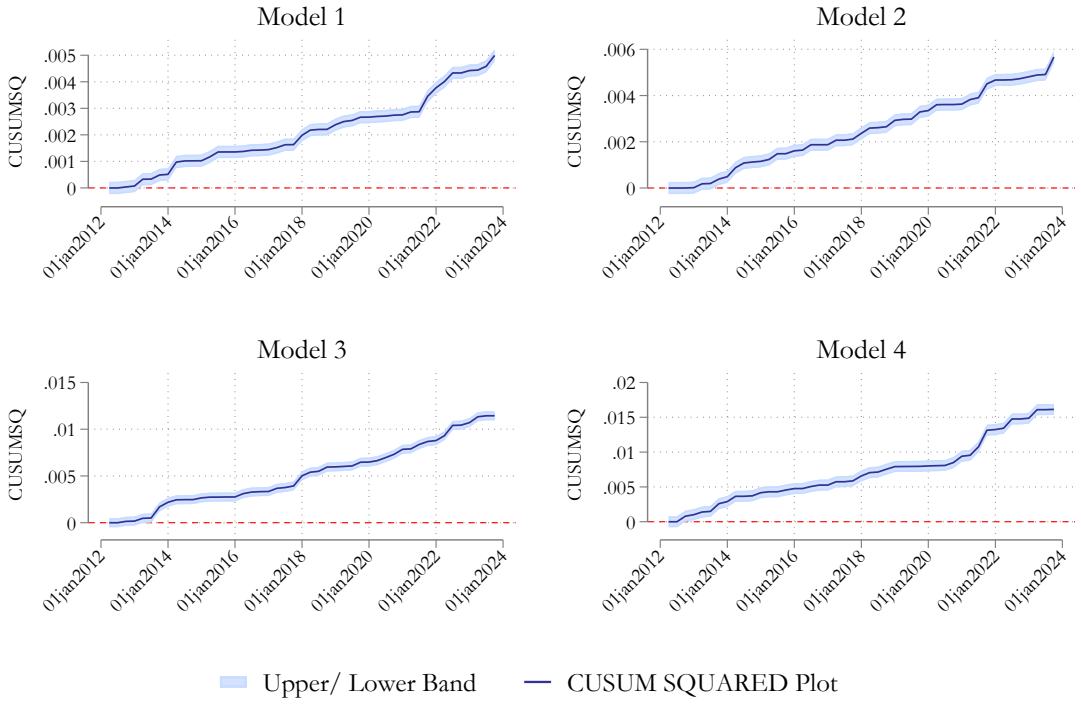
Variable	Transformation	Source
Foreign Currency Deposits	None	Bank of Zambia
Currency in Circulation	None	Federal Reserve Bank
Exchange Rate	Log of the nominal exchange rate	Bank of Zambia
Federal Funds Rate	Log of the FFR	Federal Reserve Bank
Gross Domestic Output	Log of GDP	Zambia Statistics Agency
Inflation	Year-on-Year CPI Growth Rate	Bank of Zambia
Interest Rate	91 day Treasury Bill Interest Rate	Bank of Zambia
Money Supply	Log of broad money (M3)	Bank of Zambia
Monetary Policy Rate	None	Bank of Zambia

FIGURE A2: NOMINAL DOLLARIZATION INDEX - CUSUM PLOTS



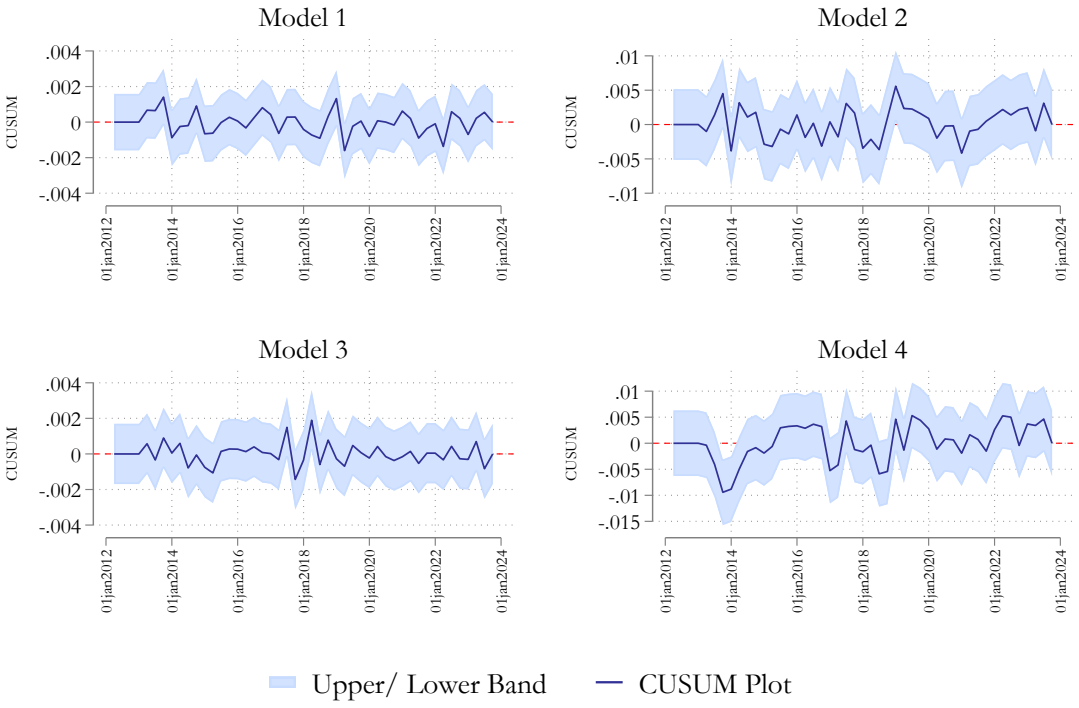
Notes: The figure shows the CUSUM plot for the models with nominal dollarization as the dependent variable and with 90 % confidence bands.

FIGURE A3: NOMINAL DOLLARIZATION INDEX - CUSUM SQ PLOTS



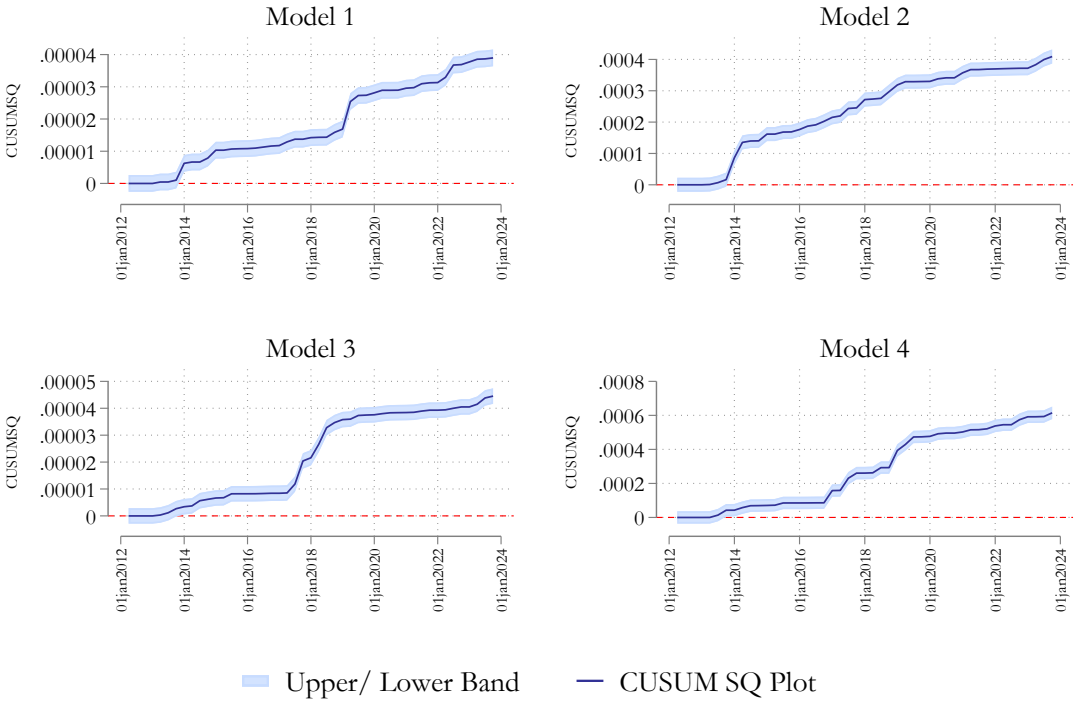
Notes: The figure shows the CUSUM SQ plot for the models with nominal dollarization as the dependent variable and with 90 % confidence bands.

FIGURE A4: REAL DOLLARIZATION INDEX - CUSUM PLOTS



Notes: The figure shows the CUSUM plot for the models with real dollarization as the dependent variable and with 90 % confidence bands.

FIGURE A5: REAL DOLLARIZATION INDEX - CUSUM SQ PLOTS



Notes: The figure shows the CUSUM plot for the models with real dollarization as the dependent variable and with 90 % confidence bands.