REVISITING THE MONEY DEMAND FUNCTION IN SURINAME

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ABSTRACT

The empirical literature on the money demand function pertains mainly to large, closed and advanced economies and developing economies. The empirical findings on the experience of very small open developing economies are therefore limited. This study fills that gap by estimating a money demand function for Suriname and by assessing the stability between real money demand (RM2) and its determinants, namely Monthly Economic Activity Indicator (MEAI), real exchange rate (RER), real lending rate (RLR) and Government expenditure (GE). Two co-integration approaches are applied to analyze the real money demand for the period 2006-2023 on a monthly basis. The results should reveal if the outcome of the previous paper of Gaurisankar & Ong A Kwie-Jurgens (2013) still hold as changes occurred due the a shift in economic fundamentals.

Keywords: money demand function; money growth; Dynamic Ordinary Least Square.

1.0 Introduction

The influence money can have on the economy has been studied both theoretically and empirically by many academics. During the last decade, this subject gained widespread attention, particularly in relation to the determinants of money demand. The macroeconomic importance of the relationship between money demand and its determinants lies, in particular, in selecting the appropriate monetary policy measure in directing the economy. In this regard, the stability of the money demand function is conceived as an important prerequisite for effective money control.

Monetary policy, aimed at managing the supply of money, facilitates in controlling the money demand and thus enables policymakers to achieve price stability (Narayan and Narayan, 2008). Monetarists assume a constant ratio between money growth and the desired growth of production, which enables policymakers to exercise control over price increases (Korteweg & Keesing, 1979). In their view, a stable money demand function implies a stable money multiplier, which in turn enhances the controllability of reserve money and the predictability of money stock.

In various empirical studies, several variables have been considered as determinants of real money demand, such as real GDP, real interest rate and real exchange rate. Structural changes affect the stability of the money demand function (Choi Jung, 2009; Lee and Chien, 2008 and Abbas, 2005). Testing the stability of the money demand function is therefore also a crucial part of the empirics.

Suriname switched in 2016 to a reserve money-targeting (RMT) regime, due to major imbalances in the Surinamese economy making the conventional monetary policy instruments ineffective. Increases of government deficit and reduction in financing from the non-monetary sector resulted in an increase in liquidity creation for the government. Moreover, accommodative monetary policy of the Bank increased liquidity even more. The increased liquidity stock and declined foreign exchange income exerted great pressure on the exchange rate, affecting international reserves. Fluctuations in net credit to general government as the primary cause of fluctuations in base money led to a rise in Broad Money (M2). Hence, the Central Bank of Suriname (the Bank) was forced eventually to adjust its monetary policy, whereby the exchange rate could no longer act as an anchor to manage inflation. In order to support the RMT framework the Bank adapted a flexible exchange rate regime in June 2021. The aim of the RMT framework is to influence base money through open market operations and eventually M2, to achieve price stability. Under this new policy, base money is the new nominal anchor for price stability. In order for the RMT framework to be effective, a stable money demand function is necessary, hence the importance for revisiting the money demand function in Suriname. Worth mentioning is that the implementation of RMT started in June 2021 as the Bank started with open market operation of central bank term deposits.

Many studies on money demand have been conducted mainly on large advanced economies and emerging economies, such as USA, Argentina, China and Canada (Choi Jung, 2009; Hsing, 2008; Lee & Chien, 2008 and Bose & Rahman, 1996). The case of small open economies is relatively unexplored. The sensitivity and therefore difficulty in having monetary control in small open economies because of structural differences and limitations, such as the vulnerability to external shocks and foreign exchange constraint, provides some justification for more empirical research on the money demand function in very small open developing economies. Towards that end, Suriname's economy shows similar characteristics. Estimating the money demand function should provide a unique opportunity for empirical testing. This research makes a second attempt to examine the money demand function and its stability in Suriname during 2006-2023. The model estimation is conducted with Dynamic Ordinary Least Square.

The results of the first assessment of the money demand function in Suriname that covered the period 1981-2010 revealed that in the long-run real broad money growth is positively linked to RGDP growth, while real demand for money responds inversely to real effective exchange rate (RER) changes and real lending rate (RLR) (Gaurisankar & Ong A Kwie-Jurgens, 2013). In the short run, real money demand is influenced by real growth (RGDP growth) and RER changes. Stability tests on the real money demand function seem to suggest that a lack of stability exists in the coefficients. Consequently, implementation of only monetary targeting is not a policy option, while interest rate policy may be ineffective given the statistically insignificant impact on real money demand. Since income elasticity is greater than one and real exchange rate influences real money demand in the short and long run, a combination of income-related fiscal policy measures, exchange rate targeting and money demand management seems to be more effective in Suriname to establish macroeconomic stability.

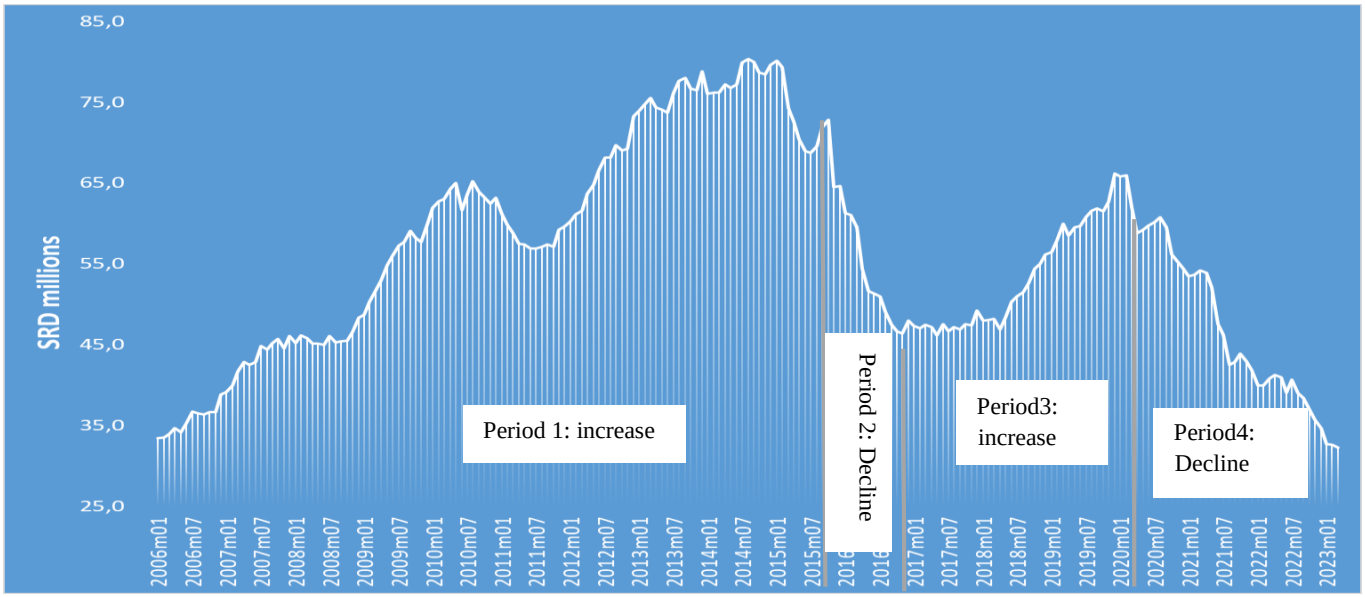
The remainder of the paper is structured as follows. The next section elaborates on the institutional changes with respect to monetary aggregates in Suriname, while in the third section the theories and some results of empirical studies on money demand are briefly highlighted. The fourth section examines the statistical properties of the time series used for empirical testing. Also in the fourth section the money demand model is specified, the methodology is described and the results are presented. Finally, section five summarizes the conclusions and provides policy implications.

2.0 Institutional Changes and Money Supply Developments

From 1968-2010 the Central Bank of Suriname used the monetary aggregate M2, initially consisting of cash held by the public, demand deposits, all short-term liabilities held by the public at banking institutions and gold certificates, for monetary policy and analytical purposes. In 2011, the Bank redefined money by including foreign currency deposits of residents at all depository corporations and abandoning the distinction between short-term and long-term liabilities of the private sector in its monetary aggregates.

Figure 1 presents the development of broad money in real terms (RM2), in which three periods have been distinguished, namely a period with a strong increase, a steep decline and an acceleration of RM2. Since RM2 is the outcome of nominal M2 adjusted using the Consumer Price Index (CPI), these distinct periods also reflect the developments of the general price level in the economy. In the first and third distinct periods, the annual average increase of CPI was 50 per cent and 70 per cent, respectively. In the second and fourth period, however, CPI increased by 133 and 348 per cent on an annual average basis. Therefore, real money declined as inflation worsened.

Figure 1: Real Broad Money (RM2)



Source: Authors' calculations

The first period can be categorized as low inflation, growth, stable exchange rate, favored international commodity[1] prices. In 2008 the black exchange rate market started again en Suriname devalued its currency in 2011 to 1 SRD/USD 3.35 from 1 SRD/USD 2.80. However, the international reserves reached USD 1 milliard in 2012. Monetary policy remained focused on conservation exchange rate stability and achieving low inflation.

In 2015 (second period), the Surinamese economy was struggling. General economic activity contracted by 3.4%. The export value of the oil, gold and bauxite sectors showed a strong drop, while total import value remained virtually the same. This contributed to a sharp increase in the deficit on the current account of the balance of payments. The international reserves continued to decline and as a result, the import coverage of goods and services fell sharply below the standard of 3 months and reached 1.5 months. The unfavorable development in the export sector affected public finances negatively. The decline in export earnings caused a sharp decline in government revenues. Because income-increasing and expenditure-reducing measures failed to materialize, the government's financing deficit continued to widen. This subsequently resulted in increased debt and higher debt ratios. The reduced inflow of foreign currency from gold exports also caused a foreign currency shortage leading to increased exchange rate pressure, which prompted the Bank to intervene on the foreign currency market. However, the currency interventions and exchange rate adjustment were not adequate to balance the economy. The sharp fall in the international oil price since 2014 and the decline in foreign exchange earnings and government revenues continued in 2016.

The first two periods within the third period were more or less stable with low inflation. The last part of the period however faced a deterioration in the current account balance due to the export sector. The government deficit remained a source of concern. Total balance registered a deficit of 18.6% of GDP. In a small developing country, without a good money and capital market, a deficit of this size is unsustainable and its continuation will eventually create major imbalances in the economy. The deficit widened further as the Covid-19 pandemic hit the country in 2020. Various implemented covid-19 measures such as lockdowns, closure of borders, social distancing measures affected growth negatively. In addition, inflation spiked at 60.8% driven mostly by exchange rate pressure, and increase of international goods and services prices.

Since May 2020 (fourth period) Suriname's inflation rose, caused by domestic and international factors. While fighting with various swings of COVID-19, the country was trapped in an economic crisis since 2018. Declining exports and contraction in reserves pushed the country in a balance of payments crisis. Moreover, large fiscal deficit due to unbridled expenses and high external borrowing made matters worse. The deficit financed through the domestic banking system, led to a large exposure of the banking sector to the government. In addition, the deficit financed with foreign loans put great pressure on the repayment capacity of the Surinamese economy. Failure to address this worrying state of public finances was a source of macroeconomic disruption.

[1] Suriname is an commodity exporting country

While drawing on an agreement with the International Monetary Fund (IMF), Suriname venture into a number of macroeconomic policy reforms, as well as shifting from a fixed to a floating exchange rate regime. Streamlining its monetary policy toolkit and trying to reduce its fiscal deficit, with cuts in electricity and fuel subsidies. Implementation of this policy made the country ended up with high inflation rates reaching double digits. One of the adjustments in the monetary toolkit beside the shift to another exchange rate regime was the change of the monetary anchor from exchange rate to monetary targeting. The monetary variable is base money as this is the variable central banks can control. The choice of the monetary targeting regime was due to the underdeveloped and shallow money and capital market.

The Surinamese dollar devalued by 216% between September 2020 and June 2021 as the monetary framework slowly moved to a freely floating exchange rate. The public debt-to-GDP ratio spiked and the high exchange rate pass-through took hold of inflation resulting in rates over 60% in august 2021 affecting most of Suriname's key macroeconomic indicators. The international economic development also affected the Surinamese economy. The conflict between Russia and Ukraine exerted upward pressure on international energy and food prices, and inflation in Suriname continued to accelerate. The Russian war stoked the inflation and most countries experienced symptoms of rising prices since 2021. Fuel prices, measured by world oil prices, and international food prices rose throughout 2021, affecting mostly small open economies depending on imports. Smaller economies that has less diversified economies and rely more on imports are more susceptible to inflationary pressures arising from higher import prices. In addition, food and fuel—both of which experienced enormous high levels of price increases since the beginning of the war in Ukraine—account for a large share in the consumption basket in these economies.

In March 2020, the rate of inflation in Suriname increased to 17.6% coming from a one-digit rate of 6.9% in February 2020, which is an increase of 10.7 percentage point, reaching 60.8% at the end of 2020. It then fell gradually over the first five months of 2021, to a low of 43.6% in May 2021, but went up again. Inflation increased almost 16 percentage points in August 2021, reaching a climax of 74.4% in August 2021, derived from a 113.2% increase in the housing and utilities sub index following a cut in fuel subsidy. In January 2022, year-on-year inflation stood at 61.5%, falling to 55.1% by June, ending at 54.6% in December 2022. Overall, broad money in real terms declined in this period, which mainly reflected high inflation relative to previous periods.

3.0 Literature Review

3.1 Theoretical Literature

Money demand theories, which are at the center of macroeconomic policy, have been subject of debate among several economic schools of thought and are derived from a spectrum of hypotheses. The theoretical foundations are well established in the economic literature with great consensus that real cash balances (Lungu et al., 2012) in the first place determine the demand for money. According to

Telyukova (2008), three dominant views can be distinguished, namely the classical, the Keynesian and the post Keynesian view.

The classical school approaches the theory on money from the quantity theory of money, which is based on the equation of exchange. This equation expresses the relationship between the nominal supply of money (M) and the total nominal expenditure on final goods and services produced in an economy (PY), indicating Prices (P) multiplied by Real Output (Y). The variable linking M and PY is the velocity of money (V). The pioneer of this view within the classical school is Irving Fisher, who suggested that institutions in the economy determine the velocity of money by affecting the way in which economic agents conduct transactions (Mishkin, 2009).

However, the great depression shed some light on economists' view on the rigidity of money velocity because of the sharp fall of money velocity during severe economic contractions. The data available at that time showed that velocity was not constant, which started the search for other factors affecting the money demand (Mishkin, 2009). The Cambridge School of Economics attempted to augment the classical theory by allowing flexibility to the decisions of individuals to hold money. According to their concept the level of people's wealth is also viewed as a determinant of money demand and, therefore, individuals have two reasons to hold money, namely for transactions' purposes and for enhancing their wealth (Keynes, 1936). This motive enables individuals to reserve a part of their income as a store of wealth, which allows velocity of money to fluctuate in the short run. However, the decision to reserve money for wealth purposes depends on the gains and expected returns on other assets that also function as stores of wealth (Mishkin, 2009).

Keynes highlighted in his liquidity preference theory the significance of interest rate as determinant of the money demand function. In his view, the interest rate is a compensation for the renouncing of liquidity and thereby rejecting the argument of the classical school that the velocity of money is constant. He postulated three motives for holding money, namely the transaction, precautionary and speculative motive. The first two proportionally depend on income (Sahadudheen, 2012). This means that as income increases more money will be reserved for transaction and precautionary measures, which reflects the medium of exchange function of money. Thus, there exists a positive correlation between money demand and income. On the other hand, speculative demand for money has been found to have a negative relation with interest rate. To facilitate the analysis of the latter, Keynes used the assets' theory, indicating that if the expected return of holding bonds is greater than the return on holding money, individuals will hold bonds as a store of wealth rather than money (Mankiw, 2010).

Another economist analyzing the money demand function was Milton Friedman, who generally relied on assets demand determinants, which is almost in conformity with Keynes analysis. In his post-Keynesian view, money is considered as a type of asset implying its demand must also be influenced by the same factors affecting the demand of any other assets. Hence, he arranged bonds, equity and goods as types of assets to form his wealth concept. The assessment of an individual to hold an asset rather than money depends on the expected return of the asset with respect to that of money. However, since the incentive to hold money does not change very much, the impact of interest on the demand for money is, according to Friedman's theory, very poor.

The theoretical discussions reveal different approaches to money demand, yet they still share common variables as determinants. Generally, they draw up a relationship between the quantity of or the demand for money and income or output and interest rate, whether in nominal or real terms.

3.2 Empirical Literature

The exploration of empirical studies on money demand was mostly focused on the selected macroeconomic variables included in the money demand function, the applied empirical methodology and the country-specific conditions that have been taken into account.

Several monetary aggregates have been used as the dependent variable, representing the demand for money. In some, less developed countries (LDCs) narrow money (M1) has been employed as the dependent variable, while other researchers used a broader definition of money (M2 and M3). The choice was mostly based on the monetary aggregate that was manageable by the monetary authorities and had a stable relationship with the selected real variables. Evidence gathered by several authors suggests that the money demand function should have scaled explanatory variables, such as real income, expenditure or wealth and alternative assets (Bitrus 2011; Yu & Gan 2009; Bahmani-Oskooee 2005 & Marashdeh 1997).

Some of the empirical studies also highlighted the inclusion of the exchange rate in the money demand function, particularly in developing countries. The impact of internal and external shocks usually takes place through the exchange rate in these economies. The argument is that real exchange rate changes can generate a substitution and a wealth effect on money demand, especially in open economies with a flexible exchange rate and a high degree of capital mobility. The proposition is that expectation of a deterioration of the local currency will result in an increase of foreign currency holdings at the expense of domestic currency holdings (substitution effect) or a higher return on foreign currency assets following the lower interest rate on domestic assets (wealth effect).

With the bound testing approach to co-integration, Bahmani and Bahmani-Oskooee (2005) demonstrated that indeed the exchange rate and interest rate hypothesis matter in Iran. Their study suggested that the money demand function should be augmented with the exchange rate volatility. In Malaysia, the estimated money demand function also indicated currency substitution (Marashdeh 1997). They used the Chow tests and the demand function turned out to be stable (Marashdeh 1997).

Studies have also provided evidence that underdeveloped economies suffer from a lack of well-developed financial and capital markets, which diminish the alternatives of the public for holding money (Lungu et al., 2012). According to Lungu underdeveloped financial and capital markets could affect the stability of the money demand function. Rutayisire (2008) used the Johansen co-integration procedure and they concluded that the currency substitution effect and the positive relationship with income do exist in Rwanda.

Bashier and Dohlan (2011) examined the money demand function and its stability for Jordan over the period 1975-1990. They recalled earlier studies, which assessed the demand for money in Jordan and presented mixed results. The Cumulative Sum (CUSUM) and Cumulative Sum of Squares

(CUSUMSQ) test provided evidence of a stable money demand function. The empirical results showed that real money balances had a positive relationship with real income and a negative relationship with interest rate and exchange rate. This was in line with the money demand theory.

Narayan and Narayan (2008) proved with Fiji's time series that beside the stability test also structural breaks should be considered when estimating the money demand function. They used the bound test, which can be applied irrespective of whether or not the underlying variables are non-stationary. They pointed out that because previous studies on the demand of Fiji did consider structural breaks the unit root null hypothesis was rejected. He emphasized that structural breaks in the data diminishes the power to reject a unit root, when the alternative hypothesis is true and the break is therefore disregarded.

The money demand function has also been studied in some small open Caribbean economies. Jackman (2010) employed an ARDL model using quarterly data from 19822010 for the Barbadian economy. He found evidence that in Barbados economic uncertainty also pertains to the explanatory variables of the money demand function of which the relation with the dependent variable could be both negative and positive. He argued that economic agents constantly make portfolio decisions in a macro economically uncertain environment, thereby affecting the degree of money held. Beside economic uncertainty, the coefficients of interest rate on T-bills and real income also tend to have a great impact on money demand. Of particular note is that the few studies that have included uncertainty in their model yielded mixed results, indicating that the impact is different from country to country.

Atkins (2005) and Canova (2006) also estimated a money demand function for Jamaica using annual data in an ARDL and a VAR/VECM framework respectively. Both studies found evidence of co-integrating relationships, in which the interest rate turned out to be insignificant. This was attributed to the limited development of the financial sector and the instability of the interest rate. The two financial crises in Jamaica were also considered in the studies, but their impact on the demand for money was negligible. The money demand was stable.

A study conducted by Watson (2003) utilized a VAR/VECM framework for the money demand in Trinidad and Tobago. The results indicated a non-stable money demand function and movements away from equilibrium. In the model, the levels of foreign prices and oil prices were included and they appeared highly significant. This outcome confirmed the openness and the oil-dependence of the Trinidad economy. Noteworthy is that the error distribution violated normality, which implies that predictable properties are lacking and probabilities cannot be made. Based on the results, he argued that the monetary authorities have little control in achieving final macroeconomic objectives. Instead, he suggested that an exchange rate policy might be more effective because of the pass-through effect of oil prices on exchange rate through the international reserves.

Sánchez-Fung (2004) estimated a money demand function using monthly data during 1991-2003 in an error correction framework for the Dominican Republic. The results displayed movements back to equilibrium prior to the 1990s, while they vanished thereafter. All the explanatory variables had a significant impact on real money (see table1). A co-integration relationship existed in the model and

the results were in conformity with theory, in the sense that the explanatory variables had the expected sign.

The research of Egoumé-Bossogo (2000) concentrated on the money demand in Guyana and revealed co-integration among the variables. He used monthly data and the results revealed income elasticity close to one and a negative correlation of the interest rate on the alternative assets and positive correlation of the local interest rate. However, movements in the net deposit rate and real income affect money demand in the long run. Table 1 summarizes the outcome of selected empirical studies on the money demand function.

Table 1: Selected Empirical Evidence on Money Demand

Reference	Period	Country	Methodology	Determinants	Results
Marashdeh. 1997	1980.1-1994.10 (monthly)	Malaysia	VAR	Nominal GDP, Nominal ER Expected inflation and Deposit rate	Variables cointegrated; money demand stable
Bahmani et al., 2005	1979-2007 (annual)	Iran	Bounds test	Real GDP, RER, Inflation and ER volatility	Long-run relationship and short-run dynamics
Hossain, 2007	1970-2005 (annual)	Indonesia	Simple linear regression model	Real GDP, Nominal interest rate and Inflation	Determinants significant, except interest rate; money demand stable
Nair et al., 2008	1970-2004 (annual)	Malaysia	UECM & Bounds test	Real GDP, RER, Real interest rate and CPI	Variables cointegrated with real money demand; money demand stable
Narayan et al., 2008	1971-2002 (annual)	Fiji	OLS/Bounds test	Real GDP and Nominal interest rate	No long-run relationship; money demand unstable
Moghaddam et al., 2008	1970-1998 (annual)	Gambia	IS-LM-BB model	Real GDP, RER, nominal interest rate and CPI	Variables cointegrated with real money demand
Ozturk et al., 2008	1994-2005 (annual)	10 Transition countries	Feasible GLS panel model	Real GDP, RER and Inflation	Determinants significant in explaining money demand
Lungu et al., 2012	1985-2010 (annual)	Malawi	VECM	Real GDP, Nominal ER, Tbills interest rate and Financial depth	Variables significant; money demand stable
Jackman M, 2010	1982(1)-2010(1) (quaterly)	Barbados	ARDL	Real GDP, Nominal interest rate,Economic uncertainty	Economic uncertainty is significant
Atkins F, 2005	1962-2002 (annual)	Jamaica	VAR/VECM	Real GDP,Inflation,Interest rate and real exchange rate	Stable money demand, but not all variables were significant
Canova L, 2006	1962-1997 (annual)	Jamaica	ARDL	Real GDP and Interest rate	Stable function byt different result in the long and short run
Watson P, 2003	1971-1999 (quaterly)	Trinidad & Tobago	VAR/VECM	Domestic prie level, GDP,Exchange rate, Interest rate, Foreign price level & Real oil price	Stable function

Sánchez-Fung J , 2004	1991.8 - 2003.82 (monthly)	Dominican Republic	Error correction mechanism	RGDP, Lending rate & US loan rate	Co-integration exists
Egoumé-Bossogo P, 2000	1990.1-1999.9 (monthly)	Guyana	VAR/VECM	RGDP, Inflation, Net deposit rate, Local TB rate,US TB rate & Nom exchange rate	Stable money demand and the variables had the expected signs

Source: Authors

4.0 Empirical Model

4.1 Data Analysis

The choice of determinants for the money demand function in Suriname is primarily based on variables considered in the theoretical debates, variables employed in empirical studies of developing countries and the paper of Gaurisankar & Ong A Kwie-Jurgens (2013). The estimation of the money demand function is in real terms, because high price developments may affect nominal variables leading to biased or distorted results.

Real broad money (RM2) serve as proxies for real money demand. The estimated model should reveal the significance of the explanatory variables in order to determine their impact on the dependent variable. To get the real values CPI deflates the nominal monetary aggregates. MEAI (Monthly economic Activity Index) is a proxy for real income. This short-term indicator provides insight of the direction of economic activity in our country. The openness and small size of the Surinamese economy justifies the inclusion of real exchange rate (RER) together with real average lending rate (RLR) as proxies for the opportunity costs of holding money. In highly dollarized economies, such as Suriname, the exchange rate influences decisions on holding local money or foreign money (currency substitution) and it covers financial innovation of the economy. The interest rate is important for deciding on two types of return, namely one for holding money and the other one for holding alternative financial assets. Government expenditure (GE) is added to the model, as it is a source of money creation.

The statistical properties of the variables will be examined by using the Hodrick-Prescott filter to extract the trend and cyclical component of the time series. Moreover, a summary of descriptive statistics is presented mainly to test the time series on normal distribution.

Figure 2: RM2 with a Hodrick-Prescott Filtered Trend and Cycle Line

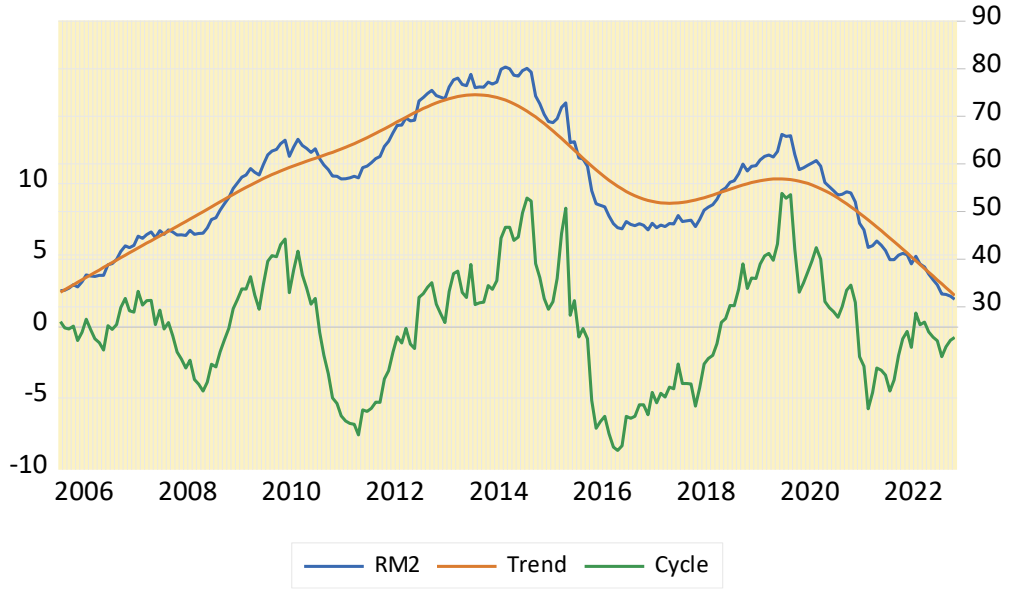


Figure 2 shows the development of RM2 during 2006-2023M6, in which the actual series are decomposed into the trend and cyclical components. The trend component is displayed as the more smoothed line (red line). The aggregate had some large swing under the long-term trend line during 2011M1-2012M10 and 2016M3-2018M10, which was followed by a large upward swing above the trend line. After 2023M3, the cyclical variations were less volatile. The economic background of these developments is explained in Section 2.

Figure 3: MEAI annual growth rate

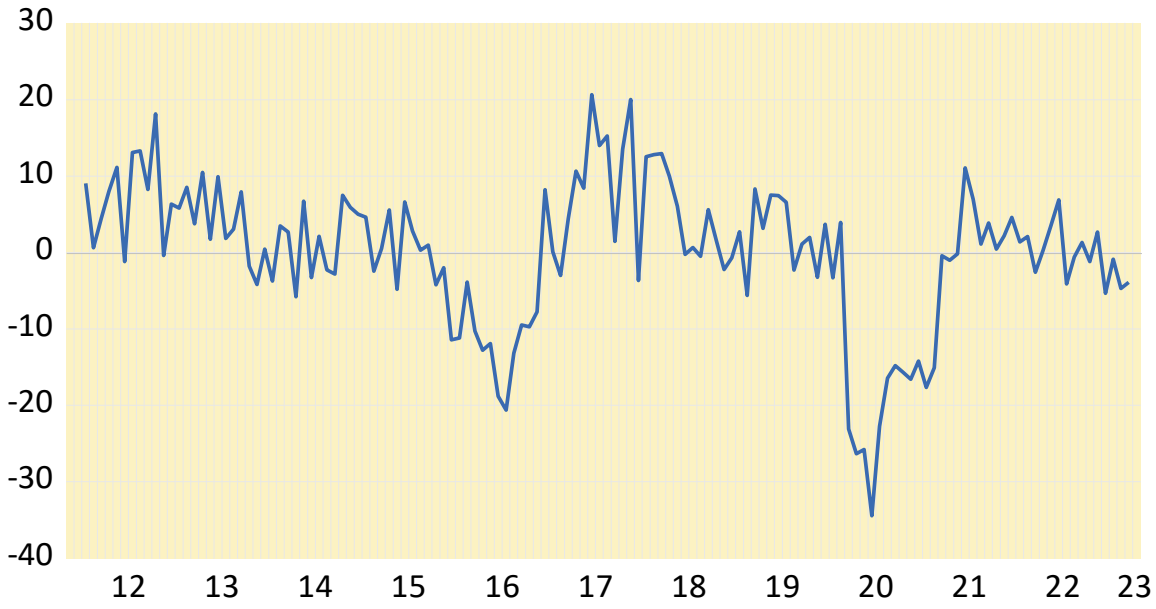
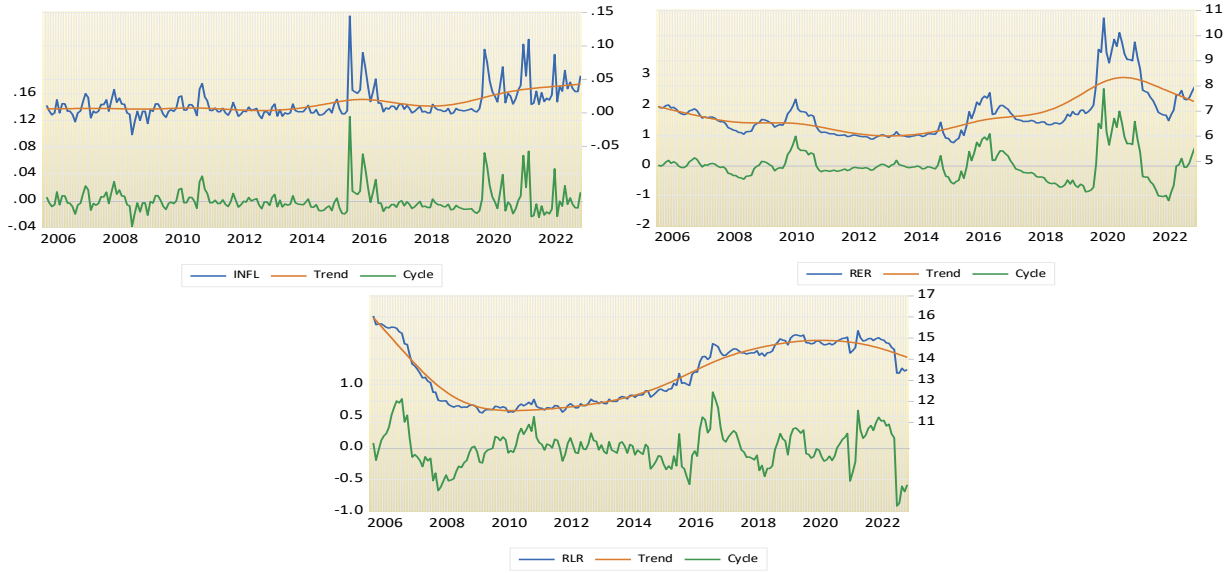


Figure 3 displays the annual growth rate of MEAI. The economy contracted by 3.4% in 2015 which was the result of reduced economic activity in various industries, in which the exchange rate also played a role. In addition, declining world market prices, closure of the bauxite company in Suriname and decline in activity in the gold sector also contributed to the decline. Due to relatively low international raw material prices, the mining sector in Suriname underwent unfavorable developments in 2015. These low prices were partly due to the continued slowdown in economic activity in developing countries and emerging economies. In particular, slow growth in China has been a major stagnant growth factor. The contraction continued in 2016, partly due to the reduction in purchasing power from 2016, which also had an impact on imports, followed by the aftermath effects of the closure of the bauxite company.

The second decline, a contraction of 15.9, is partly due to the negative effects of the pandemic, followed by increased pressure on the foreign exchange market rate as a result of increase in money supply mainly due to government deficits financing through the banking system and reduced supply of foreign exchange due to the low tourists influx. Economic contraction is still evident as the global economy is still under the influence of, among other things, the negative effects resulting from the geopolitical tensions resulting from the Russian-Ukrainian war and the "lockdown" measures in China as a result of a new wave of Covid-19 infections. These factors lead to disruptions in manufacturing sectors, which maintain high energy, food prices and other goods in international commodity markets. Rate hikes by central banks worldwide to combat high inflation have fueled recession fears in major economies.

Figure 4: Inflation, RER and RLR with a Hodrick-Prescott Filtered Trend and Cycle Line



The trend-cycle decomposition of inflation in the first graph in figure 4 depicts high inflation in 2016 caused by devaluation of the Surinamese dollar together with cost-push factors such as increases of utilities tariffs. In addition, the election behavior also played its part. May 2020 Suriname's inflation rose again, caused by domestic and international factors (see section 2).

RER, second graph, reveals the deviation of the US-dollar exchange rate from its trend, particularly since 2018 downwards and since 2020 upwards. These deviations primarily reflect the overvaluation and undervaluation of the Surinamese currency on the parallel market. Since the methodology of RER is based on inflation difference between Suriname and the USA, the price effects of the large devaluations in Suriname are also displayed in the cyclical component.

In the period 2014-2018, an amount of approximately SRD 3.0 billion in liquidity was created for the government. This liquidity expansion remained in the economy and contributed to considerable pressure on the exchange rate. In 2018, our country went through a very unfavorable development whereby the Netherlands Government seized foreign money shipment [2] of Euro 19.5 million executed by the Bank on behalf of the commercial banks. This resulted in shortage of cash US dollars on the foreign exchange market, which put pressure on the exchange rate. The confiscation of the Euros had also disrupted the foreign exchange build-up and strengthened the undesirable currency trade. The upward deviation of the RER from its trend from 2020 was due to, among other, unbridled money creation by the government, foreign currency shortage and so on.

High inflation in 2015-2016 resulted in negative real interest rates, which recovered in 2017. Due to decrease in inflation, the real credit interest rate, which had been negative since the 4th quarter of 2015, turned positive again towards the end of 2017, which was maintained in 2018. After more than a year of positive real interest rates, real interest rates turned negative again in 2020, mainly due to high inflation

4.2 Methodology

The process of testing for unit roots precedes the model estimation. The aim for performing unit root tests is to verify whether the variables, which are to be included in the model, are stationary. The importance of stationary, i.e. the mean and variance are transitory and do not deviate over time, derives from the fact that the results of the variables are statistically

[2] The seizure of a cash euro shipment by the judicial authorities in the Netherlands, on suspicion of money laundering. The banking institutions obtained the euro cash for a significant part of the exchange offices, but since the seizure by the Dutch judicial authorities, they have started to reorganize euro purchases at the exchange offices. Both demand and sales decreased as a result.
On the foreign exchange market, the public in general, and exchange offices in particular, were further confronted with adjusted handling costs for euro transactions with the banks, which are partly the result of their tightened AML/CFT (Anti Money Laundering/Combating the Financing of Terrorism) compliance measures. This combination of circumstances has led to a significant drop in price quotes for this currency.

reliable and they are not biased. Moreover, the result of the regression will not lead to spurious regression and consequently will produce genuine correlation between the variables of interest. Two widely used statistical procedures are employed, namely the Augmented Dickey-Fuller (ADF) test statistic (1981) and the Phillips-Perron (PP) test statistic (1988), to trace the presence of unit root in the data and to establish the order of integration of the variables. The null hypothesis of the ADF and PP tests state that the data series have a unit root. It is worth mentioning that these tests have their constraints, namely:

- The difficulty in rejecting the null hypothesis, because the unit root tests have low power to differentiate between a unit root process and a borderline stationary process (Brooks, 2008);
- These unit root tests are very sensitive to trend breaks or regime shifts often resulting in non-rejection of the unit root null hypothesis (Ghosh, 2000).

For ease of interpretation of estimated coefficients, the variables will be transformed in a logarithmic form. It allows for the interpretation of the parameters as elasticity. All other variables are stationary when first differencing them. Therefore, RLR, MEAI and the logarithmic values of RM2, RER and GE will be included in the regression model. Both tests reveal that these variables are integrated of the order one.

After estimation of the unit roots test co-integration statistics should be examined to determine the unique co-integration relation between the variables. There are many tests of co-integration (Watson, 1994), but in this research the Johansen co-integration testing procedure is employed. This is a two-stage testing procedure, in which the first co-integration step is conducted without imposing any information about the co-integrating vector (Ibid, 1994). The null hypothesis in this test states that there is no co-integration. If co-integration is identified, then a second stage test is employed to see whether the co-integrating vector takes on the value predicted by economic theory (Ibid, 1994). After confirmation of co-integration one should proceed with choosing the appropriate model. As all the variables are I (1), models such as the ordinary least square (OLS) and restricted VAR with level variables are excluded. This indicates that dynamic econometric models should be utilized.

However, though the effects of changes in variables are not always simultaneous, the modeling of the dynamic nature of the relationship should be considered. Another point that should be looked at is the sample size, because of the degrees of freedom problems. The number of data point in this research is 121. The Stock and Watson (1993) dynamic ordinary least squares (DOLS) is an improvement of the Engle-Granger method by taking endogeneity of the regressors into account. In the presence of endogenous variables this method still gives unbiased and asymptotical efficient estimates, which is done through the inclusion of leads of the first difference of the I(1) variables. It also corrects for autocorrelation by including lags of the first difference of the I(1) variables. Based upon the abovementioned advantages of the DOLS model, this model is employed to estimate the real money demand function. The long-run equation used in this research is:

$$LRM2_t = \beta 0 + \beta 1\, MEAI_t + \beta 2\, LRER_t + \beta 3\, RLR_t + \beta 4\, GE_t \epsilon_t \qquad \text{(I)}$$

Where:

LRM2 = log of real broad money as proxy for real money demand;
LMEAI = log of MEAI growth as proxy for real income;
LRER = log of real exchange rate as proxy for opportunity cost for holding money;
RLR = real lending rate as proxy for opportunity cost for holding money.
RGE = real government expenditure.

The long run equation is estimated by inclusion of the leads and lags of the difference of I (1) regressors. Based on the data the appropriate leads/lags are selected. According to Gujarati (2003), a rule of thumb for determination of the lead/lag length is to calculate one-third to one-quarter the length of the data points. The equation is reduced and only the significant regressors remain. Subsequently, the residuals derived from this estimation are subject to unit root testing in order to confirm co-integration. If unit root is rejected, which indicates a co-integration relationship, the second step is to estimate the short-run dynamics of which the error correction mechanism (ECM) is part.

In ECMs the error correction term (ECT) is required to be negative and statistically significant (Butts, 2009). A negative ECT indicates a movement towards long-run equilibrium relationship, while a positive ECT implies movements away from long-run equilibrium. The stability of the coefficients can be tested by the Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) test, which test the stability of the model within a 5 percent-significance band. The Chow test for breakpoints also provides information on the stability of a model.

4.3 Model Specification and Results

The real money demand function is estimated using the Dynamic OLS. The Johansen co-integration test is employed and at least two co-integrating relationship between the variables exists. The long run and short-run behaviour of the model is estimated by applying the HAC (Newey-West) approach in order to obtain valid standard errors. The general form of the DOLS can be formulated as follows:

$$Y_t = \beta_0 + \vec{\beta}\mathrm{X} + \sum_{\mathrm{i}=-\mathrm{q}}^{\mathrm{n}} \overrightarrow{\theta_i}\, \Delta X_{t-i} + \varepsilon_t \quad (2)$$

Where:

Y_t = Dependent variable
$\vec{\beta}$ =Vector of long-run coefficients
X = Matrix of explanatory variables
n = Lag length
q = Lead length
$\overrightarrow{\theta_i}$ = The short-run coefficients
ε_t = A random error term

Equation (2) represents the real money demand function. Money demand theory prescribes a positive relationship between (log) real money and real income implying that as output/income rises the demand for money increases. However, there are some debates on the selection of the scale variable. Some empirical studies on money demand in developing countries have concentrated on a scale variable using industrial production (Sriram, 1999) or consumption expenditure or wealth or have even employed a more comprehensive measure of transaction. The underlying idea is that not all transactions have a similar degree of money dependence. Nevertheless, there is no evidence of deviated behavior of the money demand when one of the latter scale variables is employed.

With regard to the other determinants, namely real exchange rate and real lending rate, money demand theory assumes a negative relationship, which implies that if the domestic currency depreciates, or interest rate increases demand for money declines. The log of exchange rate captures the degree of currency substitution in the economy. Between the dependent and government expenditure a positive link exits indicating that government expenditure increases money. Two optimal lead/lag lengths were determined and a Johansen co-integration test is used.

The long-run equation is estimated by including two leads and one lag of I (1) regressors. The long-run model is reduced using a general-to-specific reduction method. The results of the reduced model in presented in equation 3. Based on the residual diagnostic tests the model behaved well (see table 4).

$$LRM2_t = \underset{4.95***}{1.77} \cdot LMEAI_t - \underset{-5.80***}{0.66} \cdot LRER_t - \underset{-7.11***}{0.15} \cdot RLR_t + \underset{4.75***}{0.01} \cdot GE_t - \underset{-4.00***}{5.78} \qquad (3)$$

The t-statistics are in italic numbers, while *, ** and *** denote variables at 10 percent, 5 percent and 1 percent level of significance respectively.

Table 4: Model Specifications & Residual Test

Model Specifications		*Residual test*	*P-value*
R-Squared	0.877	Normality test	0.878
Adjusted R-Squared	0.805	Serial correlation (χ^2)	0.673
F-statistics	12.32[c]	Heteroskedasticity (χ^2)	0.791
D-W:	1.707		

Source: Author using Eviews 11

As indicated in table 5 the error term of the long-run real money demand function, with LRM2 as proxy, is stationary at all significance levels, which suggests that a co-integrating relationship exists between these real money demand variables and their determinants.

Table 5: AFD Unit Root Test

	t-statistic	critical values		
		1%	5%	10%
sw-residuals	-4.28	-3.48	-2.88	-2.58

Source: Authors using Eviews 11

The quantity theory of money assumes an income elasticity of unity, but the long-run equation in the case of Suriname reveals an income elasticity of greater than one, which was also the case in the previous paper. The result suggests that a 1 percent-rise of real economic growth increases real demand for broad money by about 1.77 percent. Compared with the first paper the coefficient of this indicator dropped, but the positive relation still holds. The currency substitution effect, which is indicated by the exchange rate elasticity, shows that a 1 percent-increase in real exchange rate lowers the real demand for broad money by 0.66 percent in the long- run. In addition, a 1 percent-increase of the real lending rate causes real money demand to decline by 0.15 percent. The coefficient of the interest rate indicator increased compared to in the previous paper, indicating small movements of the functioning of the interest rate transmission mechanism are achieved through the implementation of the open market operations carried out by the central bank. As mentioned earlier the central bank carries out open market operations (OMOs) with the aim of achieving the inflation objective that the Bank pursued through its monetary policy. The OMOs involve issuing of central bank term deposits (TDs) through an auction platform at variable interest rates and fixed volumes as an instrument to mop up excess liquidity to achieve the annual inflation objective set every year. Commercial banks can invest in these TDs ranging from one day, one week, one month, three months and six months.

In June 2022, the central bank introduced Central Bank Certificates (CBCs) for the "Wholesale" segment, which is for institutional investors, and later in the year, the retail segment, which is for the households. For the "wholesale" segment the terms were 1 month, 3 months and 6 months respectively and for the "retail" segment the terms were 3, 6 and 9 months. In June 2022, the CBCs were able to mop up an amount of SRD 100 million in the economy. The execution of these operations has made an important contribution in reducing excess liquidity. However, the shallowness and underdevelopment of the domestic financial markets still exits. The Surinamese public lacks alternatives to hold money. The market for government papers is shallow and not accessible for the general public.

A short-run model is then estimated, whereby the model changes in difference of the dependent variable on differences in the explanatory variables including leads/lags. This model also went through the residual diagnostics. In the short-run model, a stability dummy is included based on the structural adjustments that took place in the monetary policy of the central bank namely the amendment of the exchange rate regime and the introduction of the different kinds of CBCs.

The model was then reduced and the coefficient of the error correction term is significant and negative, which indicates that short-run deviations move back to the long-run equilibrium relationship. The regression model (see table 6) explains 78 percent variation in real broad money demand.

The general- to- specific model is expressed as follows:

$$\Delta LRM2_t = 0.17 \cdot \Delta LMEAI_{t-3} - 0.76 \cdot \Delta LRER_{t-1} + 0.28 \cdot \Delta LGE_{t-1} - 0.36EC_{t-1} \quad (3)$$

*13.8*** -26.80*** 23.48****

The t-statistics are in italic numbers, while *, ** and *** denote variables at 10 percent, 5 percent and 1 percent level of significance respectively.

Table 6: Model Specifications & Residual Test

Model Specifications		*Residual Test*	*P-value*
R-Squared	0.78	Normality test	0.44
Adjusted R-Squared	0.74	Serial correlation (χ^2)	0.68
D-W:	1.95	Heteroskedasticity (χ^2)	0.87

Source: Authors using Eviews 7.0

In the short-run, economic growth index of three periods and real depreciation of the local currency and government expenditure of one period before can induce deviations from the long-run equilibrium relationship. The error correction coefficient states that, in response to a shock to the system, real growth of broad money would decline in order to correct 36 percent of the deviation from long run equilibrium each year. The speed of adjustment to a shock in the system would last about two years, with real money demand adjusting to restore long-run equilibrium (results previous paper see annex).

5.0 Conclusions and Policy Implications

The revisiting of the real money demand function in this paper is done for the sample period 2006-2023 by applying a DOLS estimation procedure. The estimation used real broad money as proxy for money demand. Ultimately, the model indicated long-run equilibrium relationship and short-run dynamics, which links real demand for broad money with real gross domestic product, real exchange rate, real lending rate and real government expenditure.

Based on the required statistical properties for regression models, the DOLS model behaved well. The estimation procedures provided the expected positive relationship between real broad money demand and real income and government expenditure and the expected negative relationship between real broad money demand and real exchange rate and interest rate in the long- run. In addition, the desired negative and significant error correction term, which indicates an adjustment back to long- run equilibrium relationship, was detected.

The long-run equation reveals an income elasticity greater than one, implying a multiplier effect of 1.77 percent for every one-percentage point growth of real output. The exchange rate elasticity indicates that in the long - run the demand for real broad money declines by 0.66 percent, if a real depreciation of the domestic currency takes place. This decline may be attributable to the currency substitution behavior of the public when the value of the domestic currency deteriorates. The impact of a change in the real lending rate is still a bit low, given the coefficient of 0.15, but the coefficient is higher than in de first paper. The underdevelopment of domestic financial markets may explain the limited interest rate sensitivity in the economy. Nevertheless, the operation of the CBCs have stimulated the interest transmission channel, which should be continued.

The short-run dynamics in the real money demand function are induced by real economic growth, real exchange rate changes and government expenditure. In case of a shock to the system, the error correction term indicates that real growth of broad money would decline in order to correct 36 percent of the deviation from long run equilibrium each year.

The empirical findings suggest that broad money is the most appropriate monetary aggregate for policy analysis. The high-income elasticity suggests that income-related policy measures may prove to be more effective to influence the real demand for money. The estimated real money demand function confirms again the presence of currency substitution in Suriname. As the domestic currency depreciates, people are more inclined to switch to the US dollar as it offers protection in time of crises. The limited options of investment products also pushes the population to hold more US dollars. However, the public's holding of too many US dollars complicates the bank's monetary policy and puts additional pressure on the exchange rate, which is often difficult to keep stable as an importing country. In addition, it requires the bank to have high international reserves to be able to defend the dollar.

Furthermore, the small impact of real lending rate suggests that the financial market is not ready for interest rate policy implementation, but TD’s operations instigated the interest rate channel mechanism and should continue. In order to strengthen and develop the financial market the commercial banks and central bank should think of other investment instruments such as repo’s and T-bills and even the establishment of brokers.

For a good policy mix, both the Central Bank and government should work together, to reach the ultimate goal as the government expenditure coefficient suggested a large impact on money demand. Therefore, prudent fiscal and monetary policy must be carried out jointly to deliver macroeconomic stability.

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Annex (results previous paper)

Equation 1: Long-run results

$$LRM2_t = 2.19LRGDP_t - 0.17LRER_t - 0.01RLR_t - 11.63$$
$$\textit{7.26***} \qquad \textit{-6.61***} \qquad \textit{-2.99***} \qquad \textit{-4.50***}$$

Equation 2: General to specific results after structural break adjustment

$$\Delta LRM2_t = 2.80\ \Delta LRGDP_t - 0.18\Delta LRER_{t-1} - 0.24\Delta EC_{t-1}$$
$$\textit{6.31***} \qquad \textit{-5.22***} \qquad \textit{-3.48***}$$

The t-statistics are in italic letters, while *, ** and *** denote variables on at 10 per cent, 5 per cent and 1 per cent level of significance respectively.