FINANCIAL LIBERALIZATION, MONETARY POLICY AND MONEY DEMAND IN SIERRA LEONE

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Abstract

The study examines the rate at which changes in the financial markets in Sierra Leone have affected money demand behaviour and seeks to draw the implications for monetary policy using annual data for the period 1981 to 2010. Employing the ARDL approach to cointegration, the long-run results show that real GDP, inflation, real exchange rate and foreign interest rate have a significant impact on real money balances in Sierra Leone. The short-run dynamics results also confirm that real GDP, inflation real exchange rate and foreign interest rate have significant impact on real money balances. The Granger causality test results identify uni-directional causality running from real balances to inflation and real effective exchange rate respectively. In spite of the numerous economic and financial reforms undertaken since the 1980s, the results still suggest a stable demand for real money balances in Sierra Leone. Hence, it is suggested that monetary authorities should continue to pursue real money balances as an intermediate target in setting their monetary policy framework.

Keywords: Monetary Policy, Money Demand, ARDL Approach, Real Money Balances

JEL Classification: E41, E52, C52, C85

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INTRODUCTION

Financial activities in the past decade have experienced immense modifications in the World economies; attributed chiefly to full existence of indirect financing in which the development of capital markets has led to increased competition in the banking systems. This has culminated into the emergence of new institutional investors and the growth of transactions using financial derivatives. The drivers of these developments have been financial deregulation, innovations and advancement in technology. Not to mention the fact that financial liberalization plays an important role in economic development by allowing market forces to be determined by the financial markets. These have culminated into changes in the demand for money away from currency and towards other substitutes. This phenomenon has been well documented in the extant literature.

Fry (as cited in Chin-Hong & Lee-Chea, 2010) argues that growth in the financial system engenders the volume and efficiency of investment thereby propelling long-run economic growth. In other words, financial liberalization helps in boosting financial system efficiency and thus enhances the effectiveness and flexibility of monetary policies. Notwithstanding, numerous empirical works have been undertaken both on developed and developing countries to elaborate on periods of missing money to unstable money demand functions. As a result, two major trends have been identified to account for this instability to include financial innovation and currency substitution. Therefore, the motivation of this paper has been anchored on investigating the extent to which current reforms to the financial sector have affected the demand for real money balances in determining monetary policy in Sierra Leone.

McKinnon (1973) and Shaw (1973) argue that financial liberalization can engender economic growth by easing countries from some of their worst distortions. They opine that most of these distortions are the consequent of government’s attempt to use direct instruments of monetary policy rather than indirect instruments. While the financial liberalization paradigm has gained prominence at the theoretical level, empirical testing of its validity is yet to be ascertained. Thus, the causal relationships inferred to the financial liberalization theory have been futile; there is no prior information that would warrant its usefulness in the context of Sub-Saharan African countries (Seck & El Nil, 1993). Current trends in the global financial system pose challenges for the formulation, implementation and conduct of monetary policy in Sierra Leone. The inter-bank market has deepened, interest rates are more flexible and new indirect instruments of monetary control are being developed. Hence, the identification of a stable link among the demand for money, monetary policy and financial liberation gives the empirical impetus that the monetary targeting is an appropriate channel for financial stabilization policy (Ericsson & Sharma, 1996).
However, anecdotal evidence suggests that monetary authorities at the Bank of Sierra Leone pay little attention to identifying the variables that make the money demand stable albeit the Bank of Sierra Leone is adopting a monetary targeting regime. Thus, to achieve the ultimate objective of macroeconomic policy vis-à-vis the stability of domestic currency and prices, income and balance of payments, the Bank has chiefly relied on the control of an intermediate monetary target in broad money aggregate (M2). The extant literature suggest that previous studies in this area ignore the impact of foreign interest rates on real money balances and also the extent to which domestic financial market imperfections have affected the demand for money in Sierra Leone.

Nonetheless, understanding the demand for money in pursuing monetary policy is critical. This is because the analysis of money demand helps authorities to predict the demand for money thereby setting the threshold of monetary growth rate. Thus, the focus of this study is to identify the linkage among money demand, monetary policy and financial liberalization in Sierra Leone using annual data for the period 1981 to 2010. Other studies on Sierra Leone (Kallon, 2009; Bathalomew & Kargbo, 2009) use quarterly data and their analysis fail to examine how monetary policy is related to money demand and financial liberalization in Sierra Leone. Also, previous works on Sierra Leone fail to explore the possibility of causality among real money balances, inflation and real effective exchange rate. This study however, endeavours to establish the relationship between financial liberalization and money demand that translates into monetary policy using annual data. The study also attempts to explore the possibility of causality using the Toda-Yamamoto (1995) approach, following the work of Chin-Hong and Lee-Chea (2010) in Indonesia; Padhan (2011) in India.

The study is divided into five sections. Following the introductory section, section two contains a brief overview of financial liberalization and monetary policy in Sierra Leone. Section three discussed the theoretical and empirical literature, while section four presents the methodology and empirical findings of the study. Section five concludes the major findings of the study and their policy implications.

FINANCIAL LIBERALIZATION AND MONETARY POLICY IN SIERRA LEONE

Sierra Leone like any other Sub-Saharan African Countries has undertaken several reforms in the financial sector following the worsening economic performance and the systemic problems that epitomized the financial sector during the 1980s. Following the introduction of the structural adjustment programme (SAP) in 1986, several reforms have been undertaken to ensure a smooth, competitive and efficient financial sector to engender the development of the economy. These reforms included the adoption of a floating exchange rate, liberalisation of interest rates and trade, elimination of price
controls, removal of some foreign exchange controls and adoption of indirect controls of monetary policy based on market related instruments. It is, however, argued in the literature that financial repression through interest rate ceilings causes low interest rates and thus dampens savings thereby stifling the quantity of investment (Fowowe, 2008).

Nevertheless, these reform measures drastically changed the environment in which monetary policy operates, buttressing the fact that the domestic demand for money cannot be approximately estimated without necessarily taken into consideration the impact of foreign monetary developments vis-à-vis variations in the exchange rates and foreign interest rates. The banking system in Sierra Leone during this period was overburdened with a lot of systemic problems that undermined the soundness of the financial sector in the Country. Political interference, poor supervision, fiscal indiscipline, judicial inadequacies, institutional weaknesses and macroeconomic instability were considered as the major factors that contributed to the systemic crisis in the financial sector in Sierra Leone (Kargbo, 2010). There were also repressive financial system policies during this period in flexible exchange rates, directed credit to key sectors etc. Efforts were therefore taken by authorities to reform the financial sector in the early 1990s to circumvent the setbacks in the 1980s.

The first step toward the reform was the performance of a diagnostic study on the entire banking system; commissioned in 1992 in acknowledgement of problems identified and potential area of vulnerability. Thus, financial sector reforms were undertaken following the completion of the diagnostic study. The major reforms undertaken in the 1990 were the restructuring of the financial institution, liberalisation of interest rate and the foreign exchange market, elimination of directed credit to priority sectors and the strengthening of the supervisory arm of the Bank of Sierra Leone. These reforms transformed the entire financial system in the Country. For instance, the institutional structure became more deepened and diversified. This led to immense developments in the banking sector such as a surge in the entry of subsidiary banks in the Country and expansion of branches by existing and new entrants.

Moreover, the entry into the market by another ten new banks from the sub-region during the mid-2000s brought in a lot of financial innovations in the country. For example, the introduction of electronic based products such as internet banking, short message services (SMS) banking and other innovative electronic based services to facilitate online banking transactions and enquiries. This process has been catalysed by the partnership between some banks and mobile telecommunications companies. Now we have Mobile Network Operator (MNO) services in the Country. Figure 1 shows trends in some macroeconomic indicators in Sierra Leone. Inflationary experiences in Sierra Leone during the 1970s and 80s were as a result of the pass through of World inflation. It can be observed from the graph that inflation reached its highest level in Sierra Leone in 1987 hitting 178.7% before dwindling to 110.9% in 1990. There were
further reductions in the 1990s compared to the 1980s where inflation was on the high. During the 2000s, inflation was moderate especially in the first half were inflation was single digit until 2004 when it reached double digit hitting 14.2% before falling to 12.1% in 2005 and a further reduction to 9.5% in 2006 and 11.7% in 2007.

As can be seen from Figure 1, annual headline inflation exhibited high volatility during the 1980s occasioned by both internal and external shocks. Also, the high prices of imports following the oil shocks of the 1970s were suspected to have led to imported inflation in Sierra Leone in the 1980s on account of the degree of openness of the economy.

**Figure 1: Trends in Macroeconomic Indicators**

The monetization of fiscal deficits also contributed to the high inflation witnessed during this period. The 1970s witnessed deterioration in the macroeconomic conditions which exacerbated in the 1980s. In the 1980s, real GDP growth averaged 1.6% with growth rates of -1.4%, 2.7% and -2.4% realised during the periods 1983, 1985 and 1986 respectively. Growth in real GDP further dropped significantly to an average of -4.5% per year between 1990 and 2000. However, there was a surge in the economy throughout the 2000s. For instance, real GDP grew by 5.4% in 2001, 6.3% in 2002, 6.5% in 2003, 6.4% in 2007 and 5.6% 2008. The decrease in inflation in the early 2000s was attributed to expectations that rekindled business and consumer confidence after...
the end of the civil war in 2002. Between 2000 and 2006 as stated above, inflation for most part was in single digit throughout; except for the periods 2004 and 2005 were we had double digit inflation. A key challenge of the Bank’s monetary policy is to bring inflation again to single digit as an expressed desire to meet one of the convergence criteria of the WAMZ countries. However, between 2007 and 2011, inflation has stubbornly remained in double digits rising from 11.7% in 2007 to 14% in 2008 and 17.1% in 2010.

**Monetary policy in Sierra Leone**

Since 1964, monetary policy has been conducted by the Bank of Sierra Leone (BSL) with market-based instruments. The main objectives have been primarily geared towards the attainment of price stability, curtailing inflationary pressures and rebuilding foreign reserves. The BSL is to meet these objectives by managing the growth of its net domestic assets. These objectives are complemented by maintaining a higher reserve-requirement ratio and using interest rates more effectively. The BSL Act 2011 also gives the Bank the prerogative to formulate, adopt and execute monetary policy. These functions have been assigned to the Monetary Policy Technical Committee (MPTC) within the BSL, under the auspices of the Bank Governor. The main objective set by this committee is the maintenance of low inflation, high sustainable economic growth and price stability.

Prior to 1992, direct instruments such as reserve requirements, special deposits requirements, selective credit control and moral suasion were the main channels through which the Bank achieved its monetary policy objectives. The growth of money and credit were therefore sought to be limited by the Central Bank through direct constraint on the growth of commercial banks’ balance sheets. This implies that interest rates on government securities were determined by the monetary authorities. In terms of reserve requirements, commercial banks were urged to hold a minimum of 40 percent of their total deposits liabilities as reserve asset with the BSL. Moral suasion was considered as a vibrant monetary policy instrument at that time because the Central Bank’s Governor was able to convince the Managing Directors (MDs) of commercial banks to cooperate with the objectives and policies of the Bank. This was done through periodic meetings between the MDs with the Governor of the Central Bank.

Within the framework of the Structural Adjustment Programme (SAP), the implementation of monetary reforms took place with the aim of curtailing inflation and revamping the reserve position through tight monetary controls. This necessitated the replacement of administrative system of controls on interest rates and exchange rate with a system of indirect controls that were based on market related instruments. Thus, the BSL established a tender system in January 1992 with the aim of selling ordinary Treasury Bills to the commercial banks. An effective market-determined Treasury Bills
auction was therefore replaced with a system of setting rates for these Treasury Bills. By August 1992, the hitherto segmented markets in Treasury Bills (Bank and Non-Bank) were amalgamated and this led to the adoption of the open market operations in primary markets. Following this development a Treasury Bearer Bonds scheme was introduced in the following year (August 1993) that has a twelve month government-borrowing instruments targeting mainly the non-bank public. The Treasury Bearer Bonds scheme was first issued on August 12 at an interest rate of 33 percent.

On February 28 1994, the BSL introduced a Clearing House System for commercial banks to trade Treasury Bills in a secondary market. This comprises all the sales and purchases of Treasury Bills before maturity. These reform measures laid the foundation for the vigorous use of open market operations as the key instrument of the conduct of monetary policy in the BSL since 1992. At present, the primary instrument of monetary policy is open market operations which are centred on the primary market for government securities. Reserve requirement is also used as a monetary policy instrument. Because the BSL does not have independent bills, reserve and liquidity ratios are used as prudential measures. There are also very little activities in the secondary market as a result of the small size of the financial market and the high liquidity of commercial banks.

Monetary policy is conducted within the conduit of monetary targeting regime. Reserve money has been identified as the operational target which is used for day-to-day or week-to-week policy to achieve the final goals. Broad money has also been identified as the intermediate target which hinges on the Central Bank’s ultimate policy goals and the operational target. The IMF requires the Central Bank to target the reserve money on a quarterly basis that is consistent with that on inflation and economic growth. Hence, the schematic framework of monetary policy in Sierra Leone is illustrated below.

Policy Instrument → Operational Target → Intermediate Target → Ultimate Target

(OMO) (Reserve Money) (Money Supply) (Inflation)

From the above, it is evident that the key monetary policy instruments in Sierra Leone are open market operation and reserve requirement. The operational and intermediate targets are reserve money and broad money respectively. Hence, the ultimate policy objectives of the Bank of Sierra Leone are price stability and sustained economic growth. Figure 2 shows trends in some monetary aggregates. The graph indicates that broad money growth during the late 1990s was on the rise hitting 37.8%. The increase was as a result of a decrease in external budgetary support leading to the financing of the budget deficit by borrowing from the domestic banking system. This was contrary
to the early 2000s where foreign sources and private sector funds were used to finance the budget deficit thereby resulting to a huge reduction in broad money growth of 12%. During this period, the exchange rate of the Leone to the United States Dollar on average depreciated by 15.4% while it appreciated by 5.4% in 2001 as a result of the introduction of the weekly foreign exchange auction by the Bank of Sierra Leone in the year 2000.

**Figure 2: Trends in Monetary Indicators**

[Graph showing trends in exchange rate, TBR, and GRM2 from 1980 to 2008]

*Source: BSL and WDI*

Broad money also grew by 20.1% in 2004. This was however less than growth rates in 2002 and 2003 of 29.6% and 21.9% respectively. Large inflow from budgetary support coupled with a reduction in government expenditure was suspected to be responsible for this growth. Treasury Bills rate were also high during this period hitting 47.5% in 1990, 50% in 1991 and 78% in 1992 respectively. These were the periods were inflation was high. Since then the Treasury bills rates have been on the decrease as a result of a persistent decrease in inflation.

**LITERATURE REVIEW**

**Theoretical literature review**

The extant literature suggests that the demand for money plays a crucial role in macroeconomic policy analysis, particularly in designing appropriate monetary policy. As a result, a handful of theoretical and empirical research have been undertaken World-wide to analyse the determinants and stability of money demand. In essence, a
stable money demand as conjectured, underpins the formulation of effective and efficient monetary policy (Sekine, 1998). For instance, the structure and responsiveness of the demand for money in the private sector have been considered a key driver in countries’ responses to changes in macroeconomic policy. These changing trends have been anchored on the financial liberalization process in Sub-Saharan Africa (SSA). It has generally been argued in the literature that financial liberalization increases the elasticity of substitution between money and other domestic financial assets thereby creating instability in the money demand (Randa, 1999).

Ang (as cited in Kargbo, 2010) maintained that most developing countries especially those in SSA adopted macroeconomic policies during the 1980s that followed the Keynesian proposition. In other words, the Keynesian approach to economic growth was based on policy of low interest rate to propel investment and hence growth in the economy. Thus, the money demand function is critical in ascertaining whether the central bank should target money or other monetary variables and what policy measures to be adopted. Not to mention the fact that a stable demand function for money necessitates policy makers to target monetary aggregate consistent with price stability. Keynes’ famous 1936 book on The General Theory of Employment, Interest and Money, developed a theory of money demand which he referred to as the liquidity preference theory. The developments in the liquidity preference theory, however, came under intense attack by various scholars regarding the rationale for a speculative demand for money and have thus contributed to the existing theoretical literature by differentiating between transactions demand (Baumol, 1952; Tobin, 1956) and the speculative motive (Tobin, 1956; Friedman, 1956). Hence the demand for money has been regarded as the demand for real balances and is described as a function of scale variable that measures economic activity and a set of opportunity cost variables. These variables are deemed to reflect forgone earnings in case agents decide not to hold assets which are alternatives to money. The variables are measured by income, wealth or expenditure, the own rate of return on money and the opportunity cost of holding money chiefly the domestic interest rate and the expected rate of inflation.

In their money demand models (Baumol, 1952 and Tobin, 1956) revealed that money balances held for transactions purposes are sensitive to the level of interest rates. Further, as interest rates increase, the amount of cash held for transaction purposes declines, which in turn means that velocity increases as interest rates. Tobin (1956) assumed that most people are risk averse and the return on money is zero. Bonds can have substantial fluctuations in price and their returns can be pretty risky and sometimes negative. Friedman (1956) in his famous article The Quantity Theory of Money, a restatement, analysis of demand for money is closed to Keynes’ and Cambridge economist. He argued that the demand for money is influenced by the same factors that influence the demand for any asset.
Empirical literature review

The theoretical literature underpinned the nexus among financial liberalization; monetary policy and money demand that suits the African context and thus gives an insight into the empirical literature. However, some studies (WAMA, 2012; Bathalomew & Kargbo, 2009; Kargbo, 2010, Kallon, 2009, 1992) in Sierra Leone have endeavoured to reveal how key macroeconomic variables of money demand functions without necessarily concentrating on their stability. For instance, Rutayisire (2010) estimates the function of the demand for money in the short and long term in the Rwandan economy using annual data for the period 1980 to 2005. Using the maximum likelihood method by Johansen (1988) and Johansen and Juselius (1990), the study reveals a stable function and a stable demand for money in both the long-run and short-run. The short-run results show that the rate of adjusting cash in hand to its long-run equilibrium level is relatively low, which is an indication of the persistence of monetary disequilibrium in the economy.

Kallon (2009) using the same methodology by Rutayisire (2010) investigates the demand for money in Sierra Leone using annual data on real money balances, consumer price index, exchange rate, real GDP and US Treasury bill rates as proxy for foreign interest rate for the period 1964 to 2005. Employing the Johansen methodology to cointegration, he finds that the estimated income elasticity of long-run money demand in Sierra Leone is not significantly different from unity with a numerical value of 1.5194 suggesting there are no economies of scale in money-holding in Sierra Leone. The Johansen approach was also adopted by Sriram (2009) in examining the long-run demand for real broad money in The Gambia using quarterly data from 1998 to 2007 and evaluates the factors that adjust in response to temporary disequilibrium. Exploring the Johansen-Juselius (1990) multivariate cointegration approach to examine the presence of cointegration relationship between real broad money and its determinants, the results find an unstable long-run relationship and were attributable to the changing velocity of M2, political and weather-related shocks as well as the lack of good quality data.

Randa (1999) estimates both long-run and short-run money demand function for Tanzania using Quarterly data for the period 1976 to 1996 on real money balances, real income, inflation rate and expected currency depreciation. Employing the Johansen’s (1988) maximum likelihood approach to cointegration, the results find a stable long-run equilibrium money demand function suggesting that even if instability of the money demand would have been engendered by economic liberalization and relaxation as conjectured, the result of such instability would not be sufficient to restrain the estimation of long-run demand for money.
Omotor and Omotor (2011) estimate structural breaks, demand for money and monetary policy in Nigeria using annual data from 1960 to 2008. To achieve the empirical results, the study addresses three key questions on the money demand function. The first question aims at identifying the endogenous determinant of structural break date in the cointegrating equation of the money demand function of Nigeria. The second question was on the stability of the money demand function for Nigeria over the study period and the third question was whether the Central Bank of Nigeria (CBN) uses the monetary policy effectively to achieve its objectives. To address the first question, they employ the Gregory-Hansen (1996) cointegration approach and found the endogenous break date as 1994. Because during this year, the country had numerous policy shifts such as the liberalization and deregulation policy during the regime of the late General Sani Abacha. The second question was addressed by plotting the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) and found that there was no sign of instability in the money demand function suggesting that the demand for money was stable. The final question was addressed by using three sub periods to examine the effectiveness of monetary policy in Nigeria and found that the CBN uses its monetary policy effectively.

Chin-Hong and Lee-Chea (2010) investigate the significance of Divisia monetary aggregates in Indonesia for the period 1981Q1-2005Q4 using the money demand function following the works of Heung (1998) and Narayan (2007) which assume that the demand for money depends on a measure of real income both domestic and foreign interest rates and real effective exchange. Employing the Johansen-Juselius multivariate cointegration test, the results reveal a positive and significant relation among real money balances, real GDP and foreign interest rates. However, domestic interest rate and exchange rate exhibited negative but significant impact on real money balances. The Granger causality test results based on the vector error correction mechanism reveal that Simple-sum M1 cannot capture the financial liberalization impact especially in situations where there is no nexus among foreign interest rate and other money demand determinants. Given this condition, they recommended that Bank of Indonesia may explore the possibility of employing monetary aggregate targeting by using Divisia money as the policy variable alongside the traditional simple sum monetary aggregates.

Blevins, Vagassky and Wong (1999) examine the effects of financial liberalization on the money demand function in Peru and their implications for monetary policy using quarterly data for the period 1979:I-1997:II. They aim to investigate how recent structural reforms to the financial sector affect the Peruvian demand for real money balances and monetary policy. They also attempt to investigate whether by liberalizing the financial sector the central bank pursue price stability by using monetary aggregates as intermediate targets. They find out that since 1991, the development of the financial
system has created a more robust atmosphere for competition in the Peruvian economy thereby lowering transaction costs as well as enabling economic agents to quickly adjust their current money holdings.

The above studies used the Johansen methodology where the variables have to be integrated of the same order before establishing cointegrating relationship. Other studies including the current study used a more robust approach to cointegration in ARDL because of the numerous advantages it has over the traditional Johansen approach. In particular, Bathalomew and Kargbo (2009) using a modified money demand model examine the impact of foreign monetary developments on the demand for real broad money balances in Sierra Leone using quarterly data for the period 1983Q1 to 2008Q4. Adopting the ARDL methodology to estimate the long-run and short-run dynamics, their results suggest the existence of a cointegrating relationship between real broad money balances and its determinants. The results further confirm the negative and statistically significant coefficient of the lagged error term in the short-run dynamic model. The policy implication of their study is that, the liquidity requirements should be widened to incorporate foreign currency deposits held at the commercial banks to ensure perfect control over money supply.

Kargbo (2010) tested the McKinnon’s Complementarity Hypothesis in examining the relationship between financial liberalization and savings mobilization in Sierra Leone using annual data on per capita real money balances, per capita real GDP and growth rate of per capita real GDP, ratio of domestic savings to real GDP, real deposit rate and inflation rate, terms of trade, foreign aid as a percentage of GDP and a dummy variable to capture financial liberalization for the period 1977 to 2008. Employing the ARDL approach to cointegration to evaluate the efficacy of financial liberalization in Sierra Leone, the result of the financial liberalization dummy posited a positive and statistically significant effect implying that reforming the financial sector has positive impact on domestic saving and the rate of capital formation.

Akinlo (2006) explores the Autoregressive Distributed Lag model to investigate the stability of money demand in Nigeria using quarterly data obtained from IMF’s international financial statistics over the period 1970:1 to 2002:2. He uses real money balances (M2), real income, interest and exchange rates. The objectives of the study were to throw light on the cointegrating properties of M2, income, interest and exchange rates; and to determine the stability of M2 money demand function for Nigeria. The results were in conformity with Omotor and Omotor (2011).

WAMA (2012) investigates the determinants of the money demand functions in the countries of ECOWAS including The Gambia, Ghana, Guinea, Nigeria, Liberia and Sierra Leone and test its stability using quarterly data from 2000 to 2010. Exploring the autoregressive distributed lag model to test the money demand functions for
cointegration both in the long-run and short-run, the results reveal a long-run relationship between money demand and its determinants in Sierra Leone and The Gambia but not the other countries. The money demand functions in the countries were stable over the study period except Guinea and Liberia.

In conclusion, the empirical literature reveals that less work has been done on Sierra Leone in this area. The few that have been done used both annual and quarterly data and employed the Johansen approach while others used the ARDL approach to cointegration. However, all the studies on Sierra Leone seem to examine the relationship among real balances and its determinants without exploring the possibility of causality among real money balances and some monetary variables for monetary policy purposes. Therefore, the current study endeavours to explore this possibility using the T-Y approach.

**METHODOLOGY AND EMPIRICAL RESULTS**

**Model Specification**

The existing literature reveals that in economic theories of money demand, two key factors determine money vis-à-vis an inventory to smooth variations between income and expenditure patterns and as various assets in a portfolio. Hence, the general specification of the long-run money demand model that has been adopted in most emerging economies takes the following functional representation:

\[
\left( \frac{M}{P} \right)_t = f(Y, r)
\]

Where \( \frac{M}{P} \) is demand for real balances that denotes function of a chosen scale variable Y and the opportunity cost variable r. M is the chosen monetary aggregate in nominal terms and P is the price level.

Following Bathalomew and Kargbo (2009), Akinlo (2006), Kallon (2009), Omotor and Omotor (2011), the study augments equation (1) with other variables that are assumed to influence the relationship among real balances, financial liberation and monetary policy is given by equation (2).

\[
\left( \frac{M}{P} \right)_t = f(Y, TBR, F, INF, EXC).
\]
Where $F$ denotes foreign interest rate, $R$ is inflation rate and $EXC$ is real effective exchange rate. $Y$ and $r$ are defined as before. Transforming equation (2) into log linear form in order to reduce the errors and variances, the following empirical model is formulated and is denoted by equations (3).

$$L(M - P)_t = \alpha_0 + \alpha_1 LY_t + \alpha_2 TBR_t + \alpha_3 F_t + \alpha_4 INF_t + \alpha_5 LEXC_t + \epsilon_t$$

(3)

Assuming $L(M-P) = LRM2$, $LY = LRGDP$, equation (3) can be rewritten as follows:

$$LRM2_t = \alpha_0 + \alpha_1 T + \alpha_2 LRGDP_t + \alpha_3 TBR_t + \alpha_4 F_t + \alpha_5 INF_t + \alpha_6 LEXC_t + \lambda_1 FD + \lambda_2 W + \epsilon_t.$$  

(4)

Where $LRM2$ is natural log of real broad money balances ($M2$), $LRGDP$ is natural log of real gross domestic product (GDP), $TBR$ is Treasury bills rates, $F$ is foreign interest rate, and $INF$ is inflation rate and $LEXC$ natural log of real effective exchange rate. The dummy variable $W$ takes the value one (1) during periods of the civil unrest (1991-2002) and zero (0) otherwise. Financial sector liberalization and development is calculated as a dummy for financial liberalization with one (1) during the period of liberalization (1986, 1989-2008) and zero (0) otherwise. $T$ is time trend and is included in the model to capture the effects of the steady financial innovation that occurred during the periods of financial liberalization. The study uses annual data on all the variables for the period 1981 to 2010 obtained from the Bank of Sierra Leone (BSL) and World Development Indicators (WDI).

In sum, the following are the a priori expected signs of the respective coefficients of equation (4): 

$$\alpha_2 > 0, \alpha_3 < 0, \alpha_4 < 0, \alpha_5 < 0, \alpha_6 > 0, or, \alpha_6 < 0$$

**Estimation techniques**

Since we intend to find out the long-run relationship among real money balances, real GDP, inflation, foreign interest rate, real exchange rate and Treasury bills rate, the appropriate technique to be used is error correction modelling and cointegration analysis. To perform this task, we need to first establish the degree of integration of each variable in the model. This is however predicated on which unit root test used. To resolve this problem, Pesaran and Pesaran (1999) and Pesaran et al. (2001) introduced another approach to cointegration known as the Autoregressive Distributed Lag (ARDL) approach otherwise known as the bounds testing approach to cointegration. This approach to cointegration has some econometric advantages over the Engle and Granger (1987) and maximum likelihood-based approach proposed by Johansen and

First, the existence of a long-run relationship is tested without knowing in advance the order of the series, i.e. whether they are purely I(0) or purely I(1). Second, it incorporates sufficient number of lags to capture the data generating process (DGP) general to specific modeling framework. Third, it solves the problem of endogeneity found among macroeconomic variables. Fourth, it has superior small sample properties. An ARDL representation of equation (4) is formulated as follows:

\[
\Delta LRM_{2_t} = \alpha_0 + \alpha_1 T + \sum_{i=1}^{p} \alpha_{2i} \Delta LRM_{2_{t-i}} + \sum_{i=1}^{p} \alpha_{3i} \Delta LRGDP_{t-i} + \sum_{i=1}^{p} \alpha_{4i} \Delta TBR_{t-i} + \\
\sum_{i=1}^{p} \alpha_{5i} \Delta F_{t-i} + \sum_{i=1}^{p} \alpha_{6i} \Delta INF_{t-i} + \sum_{i=1}^{p} \alpha_{7i} \Delta LEXC_{t-i} + \delta_1 LRM_{2_{t-1}} + \delta_2 LRGDP_{t-1} + \delta_3 TBR_{t-1} + \\
\delta_4 F_{t-1} + \delta_5 INF_{t-1} + \delta_6 LEXC_{t-1} + \gamma_1 W + \gamma_2 FD + \nu_t
\]  

(5)

Where \( \Delta \) is the first difference operator; the parameters \( \alpha_{ij} \) are the short-run parameters and \( \delta_{ij} \) are the long-run multipliers respectively in equation (5). All the variables are defined as before. The ARDL model testing procedure begins with the bounds test. Equation (5) is estimated by the OLS method. The F-test or Wald test is used to test for the presence of long-run relationship among the variables in equations (5). Here, we test the joint null hypothesis that there is long-run relationship among the variables against the alternative hypothesis that there is no long-run relationship. Successfully rejecting the null hypothesis confirms the existence of a long-run relationship. Pesaran et al. (1996a) have tabulated the appropriate critical values for different numbers of regressors (k). The critical values are given in two extreme cases. One set assuming that the variables are I(1) or I(0). Here, the null hypothesis can be rejected when calculated F-statistic is higher than the upper bound value and we can fail to reject the null hypothesis when the F-statistic falls below the lower critical bound value. The result can however be inconclusive when the calculated F-statistic falls within the lower and upper critical bound values.

\[
H_0 : \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = 0 \\
H_1 : \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq 0
\]

The ARDL procedure involves two stages. First, we estimate equation (4) by imposing two lags on each first differenced variable and calculate the F-statistic. The second
stage is to estimate the error correction model denoted by equation (5). Here, we keep the lagged level of the variables and by relying upon the Swartz Bayesian (SBC) or Akaike Information (AIC) Criteria we select an appropriate lag length on each of the first differenced variables. In this study, we select the model based on the SBC since it uses the smallest possible lag length which makes it the parsimonious model. The AIC however chooses the maximum relevant lag length.

Once the selected long-run ARDL model is estimated, the study then moves on to estimate the short-run dynamic elasticities of the variables within the framework of the error correction representation of the ARDL model as shown below:

\[
\Delta LRM_2 = \alpha_0 + \alpha_1 T + \sum_{i=1}^{p} \alpha_{2i} \Delta LRGDP_{t-i} + \sum_{i=0}^{p} \alpha_{3i} \Delta TBR_{t-i} + \sum_{i=0}^{p} \alpha_{4i} \Delta F_{t-i} + \sum_{i=0}^{p} \alpha_{5i} \Delta IN_{t-i} \\
+ \sum_{i=0}^{p} \alpha_{6i} \Delta EXC_{t-i} + \lambda_1 W + \lambda_2 FD + \psi ECM_{t-1} + \mu_t \quad \text{---} \quad \text{---} \quad \text{---} \quad \text{---} \quad \text{---} \quad (6)
\]

Where \( \psi \) is the speed of adjustment parameter and \( ECM_{t-1} \) is the residual obtained from equations (4) which is the cointegration residual lagged one period.

The reliability of the goodness of fit of the model is also determined by conducting the diagnostic and stability tests of the model. The diagnostic test takes care of heteroscedasticity; autocorrelation, normality and the functional form that are linked with the model selected. The diagnostic test statistics of the selected ARDL model can then be examined from the short-run estimates at this stage of the estimation procedure. The test for parameter stability can also be performed at this stage by plotting the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) to know whether the coefficients of the estimated model are stable over the study period.

**Granger Causality Tests**

Toda and Yamamoto (1995) maintained that WALD hypothesis test which can be performed by including an extra lag to vector autoregressive model within the framework of the maximum cointegration relationship of the series will have a chi-square \( (X^2) \) distribution. Toda and Yamamoto (1995) proposed a Modified Wald test (MWALD) in testing for causality among macroeconomic variables. They argue that the MWALD test resolves the problems that are associated with the traditional Granger causality test by ignoring any possibility of a non-stationary or cointegration between series when testing for causality. The test also fits a VAR model in the level forms of the variables and thus minimizes the risks that are inherent in the faulty identification
of the order of integration of the series. The Toda-Yamamoto Granger causality test is employed in this study by estimating the following bivariate vector autoregressive (VAR) system using the seemingly unrelated regression (SUR) technique.

$$LRM_{2t} = \beta_0 + \sum_{i=1}^{k} \beta_{1i} LRM_{2t-i} + \sum_{j=k+1}^{d_{\text{max}}} \beta_{2j} LRM_{2t-j} + \sum_{i=1}^{k} \phi_{1i} LEXC_{t-i} + \sum_{j=k+1}^{d_{\text{max}}} \phi_{2j} LEXC_{t-j} + \eta_1 \quad -(7)$$

$$LEXC_t = \theta_0 + \sum_{i=1}^{k} \theta_{1i} LEXC_{t-i} + \sum_{j=k+1}^{d_{\text{max}}} \theta_{2j} LEXC_{t-j} + \sum_{i=1}^{k} \gamma_{1i} LRM_{2t-i} + \sum_{j=k+1}^{d_{\text{max}}} \gamma_{2j} LRM_{2t-j} + \eta_2 \quad -(8)$$

Where \( LRM_2 \) and \( LEXC \) are defined as before, \( k \) is the optimal lag order; \( d_{\text{max}} \) is the maximum cointegration level of the variables entered into model and \( \eta_1, \eta_2 \) are error terms that are assumed to be white noise. Each variable is regressed on each other variable lagged from one to the \( k + d_{\text{max}} \) lags in the SUR system and the restriction that the lagged variables of interest are equal to zero is tested. The following hypotheses are tested:

LEXC does not Granger Cause LRM2 that is if \( H_0 : \phi_{li} = 0 \) or \( H_1 : \phi_{li} \neq 0 \) against the alternative that LRM2 does not Granger Cause LEXC that is if \( H_0 : \gamma_{li} = 0 \) or \( H_1 : \gamma_{li} \neq 0 \)

**Unit Root Tests Results**

Although the bounds test approach to cointegration does not necessitate the pretesting of variables for unit roots, it is however imperative to perform this test to verify that the variables are not integrated of an order higher than one. The aim is to extricate the results from spurious regression. The order of integration of the variables was tested using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. The Schwarz-Bayesian Criterion (SBC) and Akaike Information Criterion were used to determine the optimal number of lags included in the test. Hence, Table 1 reports results of the unit root tests with intercept and trend both at levels and 1\(^{st}\) differences.
Table 1: Unit Root Tests for order of integration

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF</th>
<th>PP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>1st Difference</td>
</tr>
<tr>
<td>F</td>
<td>-5.56 (1)***</td>
<td>-</td>
</tr>
<tr>
<td>INF</td>
<td>-3.83 (0)**</td>
<td>-</td>
</tr>
<tr>
<td>LEXC</td>
<td>-1.93 (0)</td>
<td>-4.07 (0)***</td>
</tr>
<tr>
<td>LRGDP</td>
<td>-0.55 (0)</td>
<td>-4.84 (1)***</td>
</tr>
<tr>
<td>LRM2</td>
<td>-0.62 (0)</td>
<td>-5.99 (0)***</td>
</tr>
<tr>
<td>TBR</td>
<td>-2.62 (0)</td>
<td>-5.66 (4)***</td>
</tr>
</tbody>
</table>

Notes: ***,** (*) denotes significance at 1%, 5% and 10% respectively. The values in bracket for the ADF are the lag length and those for the PP are the band width.

Table 1 shows that the ADF and PP statistics for the levels of all the variables except inflation (INF) do not exceed the critical values (in absolute terms) implying that the variables are non-stationary at levels except inflation which is stationary at level. However, when first differences are taken on each of the variables, the ADF and PP statistics are higher than their respective critical values (in absolute terms) implying stationary after first differences. The study concludes that (real GDP, real money balances, Treasury bills rate, foreign interest rate and real effective exchange rate) are each integrated of order one or I(1) while (inflation) is integrated of order zero or I(0) according to the ADF statistics. However, the PP test result of foreign interest rate contradicts the ADF because while the ADF says it is integrated of order zero, the PP says it is integrated of order one. But since the PP test is a superior and confirmatory test to the ADF, the study considers foreign interest rate to be integrated of order one.

Cointegration Analysis

Since the focus of this study is to examine the effects of financial liberalization on money demand, it is imperative that we test for the existence of a long-run equilibrium relationship among these variables within the framework of the bounds testing approach to cointegration. Table 3 reports the bounds test results where real money balances is used as the dependent variable.
Table 2 shows that when real M2 is used as the dependent variable, the calculated F-statistic (7.6614) is greater than the upper critical bound (6.370) found in Narayan (2004). Thus, the null hypothesis of no cointegrating relation among real money balances and its explanatory variables cannot be rejected. This warrants the estimation of the long-run coefficients.

**Table 2: Bounds Test Results**

<table>
<thead>
<tr>
<th>Dependent Variable with lag 2</th>
<th>F-Statistic</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRM2</td>
<td>7.6614</td>
<td>Cointegration</td>
</tr>
<tr>
<td>F</td>
<td>2.517</td>
<td>No Cointegration</td>
</tr>
<tr>
<td>LRGDP</td>
<td>0.905</td>
<td>No Cointegration</td>
</tr>
<tr>
<td>INF</td>
<td>8.024</td>
<td>Cointegration</td>
</tr>
<tr>
<td>LEXC</td>
<td>38.611</td>
<td>Cointegration</td>
</tr>
<tr>
<td>TBR</td>
<td>52.922</td>
<td>Cointegration</td>
</tr>
</tbody>
</table>

Source: Computed by Author using Microfit Version 4.1. Note: k is number of regressors in equation 4. Critical values are obtained from Appendix A4 Narayan (2004:29).

**Static Long-run Coefficients based on SBC-ARDL (1, 2, 2, 1, 2, 2)**

Having established cointegrating relationship among real money balances and its explanatory variables, the study then proceeds to estimate the long-run coefficients. Table 3 reports estimates of long-run coefficients. Table 3 reveals that the coefficient of real income has the expected positive sign and significant at the 10 percent level. This coefficient indicates that a 1 percent increase in real GDP increases the demand for real money balances by 0.85 percent. The positive effect of real GDP on real money balances supports the transactions demand behind money holding and is in conformity with Bathalomew and Kargbo (2009), Kallon (2009) on Sierra Leone and Khan and Sajjid (2005).

Also, inflation has a negative effect on real money balances as expected in the long-run. In particular, the result shows that a 1 percent increase in inflation decreases demand for real money balances by 0.0089 percent in the long-run suggesting that the investment effect of inflation on money demand is less than that of the hedging effect. This implies that Sierra Leonean agents prefer to substitute real assets for money balances. This negative effect is in line with studies by Bathalomew and Kargbo (2009), Akinlo (2006) but contradicts the findings by Kallon (2009) who found a positive effect of inflation on real money balances in Sierra Leone.
Real effective exchange rate exerts a positive effect on real money balances. This indicates that in the long-run, a 1 percent increase in real effective exchange rate, on average, increases the demand for real money balances by 0.77 percent. The positive coefficient is in conformity with the wealth enhancing effect given that M2 is normally defined in terms of investment. As a result of money illusion, wealth holders in the case of Sierra Leone assess their asset portfolios based on the quantum of liquid cash available in their portfolios. Hence, depreciation in the exchange rate increases the external value of the domestic currency in foreign assets. Thus, wealth holders who perceive this as an increase in their wealth tend to repatriate a portion of their foreign assets to domestic assets, including M2 in a bid to maintaining a fixed share of their wealth that are invested in domestic currency. The positive coefficient is in conformity

Table 3: Estimates of Long-run Coefficients based on SBC-ARDL (1, 2, 2, 1, 2, 2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRGDP</td>
<td>0.85070</td>
<td>0.42063</td>
<td>2.0224*</td>
</tr>
<tr>
<td>INF</td>
<td>-0.0089337</td>
<td>0.0029642</td>
<td>-3.0139**</td>
</tr>
<tr>
<td>TBR</td>
<td>0.0044179</td>
<td>0.0054121</td>
<td>0.81630</td>
</tr>
<tr>
<td>LEXC</td>
<td>0.77130</td>
<td>0.38218</td>
<td>2.0181*</td>
</tr>
<tr>
<td>F</td>
<td>0.10293</td>
<td>0.043425</td>
<td>2.3702**</td>
</tr>
<tr>
<td>FD</td>
<td>0.073616</td>
<td>0.41980</td>
<td>0.17536</td>
</tr>
<tr>
<td>W</td>
<td>-0.60701</td>
<td>0.19002</td>
<td>-3.1945**</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>-5.7475</td>
<td>5.2769</td>
<td>-1.0892</td>
</tr>
<tr>
<td>TREND</td>
<td>0.061759</td>
<td>0.015781</td>
<td>3.9135***</td>
</tr>
</tbody>
</table>

Diagnostic Tests

<table>
<thead>
<tr>
<th>Test Statistics</th>
<th>L M Version</th>
<th>F Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Correlation</td>
<td>CHSQ(1)=2.6340(0.105)</td>
<td>F(1,7)=0.75671(0.413)</td>
</tr>
<tr>
<td>Functional Form</td>
<td>CHSQ(1)=2.6907(0.101)</td>
<td>F(1,7)=0.77480(0.408)</td>
</tr>
<tr>
<td>Normality</td>
<td>CHSQ(2)=0.26674(0.875)</td>
<td>N/A</td>
</tr>
<tr>
<td>Heteroscedasticity</td>
<td>CHSQ(1)=1.7670(0.184)</td>
<td>F(1,25)=1.7507(0.198)</td>
</tr>
</tbody>
</table>

*Source: Estimated by Author using Microfit Version 4.1. Note: ***, ** and * denote the 1, 5 and 10 percent significance levels respectively.*
with study by Khan and Sajjid (2005) but contradicts the findings by Bathalomew and Kargbo (2009) that found a negative relationship between exchange rate and real money balances in Sierra Leone and attributed it to the existence of currency substitution.

Foreign interest rate poses a positive and significant effect on real money balances at the 5 percent significant level. The coefficient suggests that a 1 percent increase in foreign interest rate increases real money balances by 0.10 percent in the long-run suggesting that dollar and Leone denominated assets are substitutes in the portfolios of economic agents in Sierra Leone. The positive coefficient is in conformity with study by Kallon (2009) on Sierra Leone but contradicts Khan and Sajjid (2005) and Bathalomew and Kargbo (2009). Khan and Sajjid (2005) found a relatively small negative effect of foreign interest rate on real money balances while Bathalomew and Kargbo (2009) found no effect of foreign interest rate on real money balances in the long-run. Treasury bills rate are however positive and not significant.

Since all the variables except inflation were stationary with trend and intercept, the study deemed it fit to include time trend in the model and the results show a positive and significant coefficient of time trend at the 1 percent level suggesting that there has been an upward movement in the holdings of real money balances especially following periods of financial liberalization. The dummy variable for war also has a negative and significant effect on real money balances and is significant at the 5 percent level suggesting that the insecurity of the war years exacerbated the demand for liquidity. However, Treasury bills rate and financial liberalization dummy are not significant in the long-run which is in conformity with Bathalomew and Kargbo (2009). The insignificant coefficient of interest rate in Sierra Leone in the long-run is in conformity with Rutayisire (2010) in Rwanda.

**Short-run Dynamic Coefficients based on SBC-ARDL (1, 2, 2, 1, 2, 2)**

The presence of a cointegrating relationship among real money balances and its explanatory variables necessitates the estimation of a short-run dynamic model of the ARDL. Table 4 reports results of the short-run dynamic coefficients. Table 4 reveals that coefficient of the lagged error correction term is negative and statistically significant at the 1 percent level as expected. The coefficient suggests that about 54 percent of the disequilibrium caused by previous years’ shock converges back to long-run equilibrium in the current year. The Table also reveals that inflation has the expected negative sign as in the long-run while real GDP also exerted a positive and statistically significant impact on real money balances but lagged one period. This result supports Bathalomew and Kargbo (2009). The coefficient of exchange rate is negative and not significant in the current period but however negative and significant
at the 10 percent level lagged one period which is in support of the currency substitution phenomenon.

Table 4: Short-run Dynamic Coefficients based on SBC-ARDL (1, 2, 2, 1, 2, 2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLRGDP</td>
<td>0.15106</td>
<td>0.26419</td>
<td>0.57178</td>
</tr>
<tr>
<td>DLRGDP1</td>
<td>0.67512</td>
<td>0.21901</td>
<td>3.0826***</td>
</tr>
<tr>
<td>DINF</td>
<td>-0.0052543</td>
<td>0.8595E-3</td>
<td>-6.1134***</td>
</tr>
<tr>
<td>DTBR</td>
<td>-0.4118E-3</td>
<td>0.0019713</td>
<td>-0.20888</td>
</tr>
<tr>
<td>DLEXC</td>
<td>-0.21642</td>
<td>0.15493</td>
<td>-1.3969</td>
</tr>
<tr>
<td>DLEXC1</td>
<td>-0.41155</td>
<td>0.20629</td>
<td>-1.9950*</td>
</tr>
<tr>
<td>DF</td>
<td>0.013330</td>
<td>0.018038</td>
<td>0.73897</td>
</tr>
<tr>
<td>DF1</td>
<td>-0.035518</td>
<td>0.016133</td>
<td>-2.2016**</td>
</tr>
<tr>
<td>FD</td>
<td>0.039951</td>
<td>0.22035</td>
<td>0.18130</td>
</tr>
<tr>
<td>W</td>
<td>-0.32942</td>
<td>0.088151</td>
<td>-3.7370***</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>-3.1191</td>
<td>2.9754</td>
<td>-1.0483</td>
</tr>
<tr>
<td>TREND</td>
<td>0.033516</td>
<td>0.010963</td>
<td>3.0571***</td>
</tr>
<tr>
<td>ECM(-1)</td>
<td>-0.54269</td>
<td>0.16894</td>
<td>-3.2122***</td>
</tr>
</tbody>
</table>

R-Squared 0.96275 R-Bar-Squared 0.87894
S.E. Regression 0.065954 F-Stat. F(13,13) 15.9059(0.0000)
Mean of Dep. Var. 0.0011975 S.D. of Dep. Var. 0.18956
R.S. of Squares 0.034799 Equation Loglikeliho. 51.5176
AIC 32.5176 SBC 20.2071
DW-Statistic 2.4073

Source: Estimated by Author using Microfit Version 4.1. Note: ***, ** and * denote the 1, 5 and 10 percent significance levels respectively.

Moreover, the coefficient of foreign interest rate, in the short-run exerted a negative effect on real money balances and significant at the 5 percent level. This result is in
line with findings by Khan and Sajjid (2005) and Bathalomew and Kargbo (2009). Treasury bills rate however have expected negative sign in the short-run but not significant. The negative but not significant effect contradicts findings by Bathalomew and Kargbo (2009), Kallon (2009) and Khan and Sajjid (2005).

**Granger causality test results**

The study employed the AIC, SBC and Log Likelihood (LL) information criteria to ascertain and choose the optimal lag length of the VAR (k). Table 5 reports the test statistics and choice criteria for selecting the order of the VAR model. The Table shows that the AIC chooses lag 3 (-51.893) while the SBC chooses lag 1 (-82.115). The adjusted LR statistics which are adjusted for the small samples fails to accept the zero lag. Hence, the model chooses the maximised SBC lag order.

**Table 5: Test Statistics and Choice Criteria for Selecting the Order of the VAR Model**

<table>
<thead>
<tr>
<th>Order</th>
<th>LL</th>
<th>AIC</th>
<th>SBC</th>
<th>Adjusted LR test</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0.107</td>
<td>-51.893</td>
<td>-84.604</td>
<td>$X^2 (16)=18.33(0.305)$</td>
</tr>
<tr>
<td>2</td>
<td>-29.817</td>
<td>-65.817</td>
<td>-88.463</td>
<td>$X^2 (32)=39.043(0.183)$</td>
</tr>
<tr>
<td>1</td>
<td>-49.534</td>
<td>-69.534</td>
<td>-82.115</td>
<td>$X^2 (48)=52.693(0.297)$</td>
</tr>
<tr>
<td>0</td>
<td>-135.425</td>
<td>-139.425</td>
<td>-141.941</td>
<td>$X^2 (64)=112.156(0.000)***$</td>
</tr>
</tbody>
</table>

Source: Estimated by Author using Microfit Version 4.1. Note: (.)*** Significant at 1% level. AIC= Akaike Information Criterion, SBC= Schwarz Bayesian Criterion and LL= Log Likelihood

Having selected the optimal lag length of the VAR model, the study went further to ascertain whether there is any causality among the variables using the Toda-Yamamoto approach to Granger causality. Table 6 reports the T-Y Granger causality test results. A Modified Wald test was conducted to establish whether the coefficients of the lagged variables in the Granger causality equations are significantly different from zero.

The results show that the null hypotheses of LRM2 Granger causing INF and LEXC were not rejected in both cases against the alternative hypotheses. Hence, the study found Uni-directional causality among LRM2, INF and LEXC respectively whereas no evidence of causality was found among LRM2 and the other explanatory variables suggesting that real money balances drive inflation and exchange rate respectively. These results are in line with study by Padhan (2011) in India but contradict study by Chin-Hong and Lee-Chea (2010) in Indonesia who found bi-directional causality between money demand and income
Table 6: Toda-Yamamoto Granger Causality Test Results

<table>
<thead>
<tr>
<th>VAR(k + d_{max}) = 2</th>
<th>Modified Wald Statistics</th>
<th>Direction of causality</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRM2 does not Granger cause LRGDP</td>
<td>1.8822 (0.170) 1.0979 (0.295)</td>
<td>No causality</td>
</tr>
<tr>
<td>LRGDP Granger causes LRM2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRM2 does not Granger cause INF</td>
<td>3.4740 (0.062)* 0.12151 (0.727)</td>
<td>Uni-directional causality</td>
</tr>
<tr>
<td>INF Granger causes LRM2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRM2 does not Granger cause TBR</td>
<td>0.37251 (0.542) 0.2721 (0.132)</td>
<td>No causality</td>
</tr>
<tr>
<td>TBR Granger causes LRM2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRM2 does not Granger cause LEXC</td>
<td>3.0833 (0.079)* 0.00953 (0.922)</td>
<td>Uni-directional causality</td>
</tr>
<tr>
<td>LEXC Granger causes LRM2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LRM2 does not Granger cause F</td>
<td>0.11232 (0.738) 1.5994 (0.206)</td>
<td>No causality</td>
</tr>
<tr>
<td>F Granger causes LRM2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Estimated by Author using Microfit Version 4.1. Note: * denotes significance at the 10 percent level while values in parentheses are the probability (P-values).

Diagnostic and parameter stability tests

Hansen (1992) warned that estimated parameters of a time series data may vary over time. As a result, it is imperative that we conduct parameter stability tests since model misspecification may arise as a result of unstable parameters. Hence, Pesaran and Pesaran (1997) advise that we always employ the CUSUM and CUSUMSQ tests. These tests were proposed by Brown, Durbin and Evans, (1975). Figures 3 and 4 report plots of the CUSUM and CUSUMSQ graphs. The graphs indicate the absence of any instability of the coefficients since the plots of these graphs are confined within the 5 percent critical bounds of parameter stability.
CONCLUSION AND RECOMMENDATIONS

The study empirically examined the extent that changes in the financial markets have affected money demand behaviour in Sierra Leone and sought to draw the implications for monetary policy for the period 1981 to 2010. Using the ARDL approach to cointegration, the results show that in both the long-run and short-run, real GDP and inflation had positive and negative effects on real money balances respectively. This suggests that real income and the opportunity cost of holding (inflation) are the two vital components of domestic money holding in Sierra Leone.

Additionally, foreign interest rate has a positive and significant impact on real money balances in the long-run albeit its response is very moderate. Real exchange rate also
has a positive and significant impact on real money balances in the long-run but a negative impact in the short-run. The trend has a positive and significant effect on real money balances whereas the financial liberalization dummy is positive but not significant in both the long-run and short-run. The war dummy is however negative and significant in both the long-run and short-run. The results also reveal that the demand for real money balances is still stable in spite of the various financial reforms carried out since the 1980s.

The Granger causality test results identify a Uni-directional causality running from real balances to inflation and real effective exchange rate respectively. The magnitude of the estimated coefficient of the ECM suggests that the lagged excess money will reduce holding of money by 54 percent in each year. Finally, the results showcased that the model passes both the diagnostic and parameter stability tests indicating the absence of any instability in the model since the plots of the CUSUM and CUSUMSQ lie within the 5 percent critical bound. The implications for policy are that, monetary authorities may put emphasis on the broad definition of money for monetary control given that it is considered as an appropriate intermediate target in setting monetary policy framework in Sierra Leone.

And, considering the transmission mechanisms of monetary policy to aggregate demand, the insignificant coefficient of the financial liberalisation dummy suggests that the process of financial reform may alter the way liquidity constraints function in the economy. In other words, financial liberalisation appears to reduce the extent to which credit availability deters spending decisions, and hence the authorities’ capability to use this hitherto powerful channel of influence. Thus, liquidity requirements should be expanded to capture other deposits held at commercial banks. Also, authorities should ensure financial liberalization is accompanied by the kind of fiscal discipline that allows credit to flow to the private sector. Moreover, during the process of financial liberalization, tensions are sometimes put on the real effective exchange rate especially when it continuously appreciates thereby leading to decreases in domestic prices. To circumvent this problem, Sierra Leonean authorities must also take into account the stability of the real effective exchange rate.

However, it is worthy to know that this paper fails to derive a financial liberalization index using the Principal Component Analysis (PCA) to obtain an index which measures the various liberalization processes during the review period owing to dearth of data on some of the major indicators of moves towards liberalization but rather used it as a dummy with 1 during periods of liberalization and 0 otherwise following works of Bartholomew and Kargbo (2009) and Kargbo (2010) on Sierra Leone respectively. Hence, any future research in this area should explore the possibility of deriving some indexes using the PCA given that it is argued in the literature that the PCA reduces the dimension of a data and also extracts the main relations from it.
REFERENCES


