AN EMPIRICAL ANALYSIS OF THE DEMAND FOR MONEY IN NIGERIA

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TITLE PAGE

AN EMPIRICAL ANALYSIS OF THE DEMAND FOR MONEY IN NIGERIA

CERTIFICATION

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DEDICATION

To my Mother.

ACKNOWLEDGEMENT

My gratitude to Jehovah the Giver and Protector of life. I am deeply indebted to my lovely mother and my caring uncles. These have sacrificed a lot to see me through M.Sc program.

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ABSTRACT

This study examines the long-run demand for real broad money function and its stability in Nigeria for the period from 1970 to 2012 inclusive. The study employs the Augmented-Dickey Fuller and Phillips-Perron tests for unit root, the Gregory-Hansen (1996a, b) cointegration test to capture endogeneous structural breaks in the cointegrating vectors of Nigerian long-run money demand function, cumulative sum of recursive residuals (CUSUM) and cumulative sum of recursive residuals squares (CUSUMSQ) tests for structural stability proposed by Brown, Durbin and Evans (1975). In estimating the canonical specification models, extended specifications are also presented. The results of the cointegration test suggest that demand for real broad money went through a regime shift in 2005. The results further confirm that there exists a long-run relationship amongst real broad money demand, real income, real domestic interest rate, real exchange rate, rate of inflation and foreign interest rate. However, the result of CUSUMSQ shows that the demand for money function is stable, but has undergone some temporary periods of instability. Hence, the apex bank in Nigeria should target the broad money (M2) aggregate to achieve macroeconomic objectives.

Keywords: Demand, Money, Cointegration, Stability, Structural.

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

Conventionally, a good understanding of the stability and determinants of the demand for real money balances forms the core in the conduct of monetary policy as it enables a policy-driven change in monetary aggregates to have predictable influences on output, interest rate, and ultimately price (Sriram, 1999; Nachega, 2011; Halicioglu and Ugur, 2005). Hence, a stable money demand function serves as a stabilization policy which depends on the ability of central bank to adjust money supply to its demand in order to prevent monetary disturbances from inhibiting real output. It is argued that the relationship between money supply on one hand and prices, income, and balance of payment on the other is determined by the demand for money, and such relationship plays an important role in macroeconomic theory. Several important factors have influenced and shaped the evolution of empirical research on the demand for money. First, there is evolving nature of theories on the demand for money. Second, the growing arsenal of econometric techniques that has permitted more sophisticated investigation of dynamics, functional forms, and expectations. Third, and most importantly, research has been spared by the apparent breakdown of existing empirical models in the face of newly emerging data (Tahir, 1995).

Thus, faced with the objective of maintaining price stability, the Central Bank of Nigeria (CBN) strives to promote and maintain monetary stability through efficient management of debt and exchange rate stability. In essence, appropriate demand and supply management policies by the CBN necessary for economic development requires money to be stable and functional (Nwafor, Nwakanma, Nkansah and Thompson, 2007). Therefore, considerable effort has been made in the empirical literature – for both industrialized and developing countries – to determine the factors that affect long-run demand for money and assess the stability of the relationship between these factors and various monetary aggregates (Nachega, 2001). In sum, with the presence of structural changes in the economy such as the structural adjustment programme (SAP) of 1986, political instability, political crises, the global economic and financial crisis which started in 2008 and innovations in the financial sector, it remains imperative to question whether monetary targeting remains relevant in the conduct of monetary policy.

1.2 Monetary Policy Management Framework in Nigeria

The main objective of monetary policy in Nigeria is price stability. Inflation is a monetary phenomenon which the apex bank uses monetary policy instruments to manage. Hence, the target on money supply growth as a method of targeting inflation. As a result, inflationary pressures continue to moderate partly in response to the tight monetary policy and base effect (CBN, 2013).

1.2.1 Price and Monetary Developments

In 2012, inflation moderated but remained a double digit. The year-on-year headline inflation declined from 12.9% in June to 12.0% in December. The decline was attributed to the stability in the supply of petroleum products, following the partial removal of the subsidy on premium motor spirit (PMS) in January and the tight monetary policy stance. In 2013, the year-on-year headline inflation declined from 9.0% in May to 8.4% in June. Also, core inflation declined significantly to 5.5% in June, from 6.2% in May and 6.9% in April, respectively. Notwithstanding the moderation in headline inflation, there are benign risks on the horizon, including the possibility of accelerated fiscal releases in the later part of the year and the effects of the upward review in electricity tariffs. The six-month inflation outlook indicates that inflation would remain within single digit territory due to base effect and tight monetary policy. However, the current state of government finances is likely to generate increased borrowing (CBN, 2013).

On the other hand, the growth of money supply remained modest in the second half of 2012 relative to the benchmark for 2012. By end-June 2012, broad money supply grew by 12.2%, compared to 1.4% recorded at the end of the preceding half year. The development reflected the respective growth rates of 20.9% and 4.8% in net foreign assets and domestic assets of the banking system. In 2013 broad money (M2) grew by 0.71% as at end-June 2013 over the level at end-December 2012. When annualized, M2 grew by 1.42%, compared to the growth of 2.70% in the corresponding period of 2012. Thus, M2 growth was also significant below the growth benchmark of 15.20% for 2013 and 7.60% for second quater of 2013. The CBN's monetary policy stance is expected to remain tight in the first half of 2013, given the 12.0% inflation (year-on-year) in 2012 (CBN, 2013).

1.2.2 Historical Evolution of the Current Monetary Policy in Nigeria

The CBN's focus on price stability objective represents a paradigm shift from past practices in which the promotion of rapid and sustainable economic growth and employment were the overriding objectives of monetary policy. Prior to 1986, in order to achieve its objective of sustainable growth and employment, the CBN relied on the use of direct (non-market) monetary policy instruments such as credit ceilings on the Deposit-Money of Banks (DMBs), administered interest and exchange rates, as well as prescription of cash reserves requirements. The most popular instruments of monetary policy were the setting of targets for aggregate credit to the domestic economy and the prescription of low interest rates. With these instruments, the CBN hoped to direct the flow of loanable funds with a view to promoting rapid development through the provision of finance to preferred sectors of the economy (agriculture, manufacturing, and residential housing) (Onafowora and Owoye, 2007).

Notwithstanding the huge oil revenues since 1970's, government has been reckless in spending. A particular military head of state once exclaimed that the problem of Nigeria is not money, but how to spend it. Thus, the government went into spending spree and invited the whole world for the Festival of Arts and Culture (FESTAC) in 1977. As a result, the economy was plunged into a quackmire of twin deficit. The government resorted to borrowing from the CBN, the International Monetary Fund (IMF), and the World Bank to finance the deficits.

The government also adopted austerity measures in 1982. The austerity measures achieved some success by 1985 as inflation fell to a single digit, the external current account moved from deficit to balanced position, and real GDP grew by 9.5%. However, improvements in the fiscal and external positions in 1985 proved transitory and failed to establish a basis for sustained economic growth (Onafowora and Owoye, 2007). However, as a policy option to put the Nigerian economy back on the path of sustainability, the government adopted the IMF sponsored Comprehensive Structural Adjustment Programme (SAP) in July 1986. The SAP involved both structural and sectoral policy reforms. The main strategies of the SAP were the liberalization of the external trade and payment system, the adoption of a market-based exchange rate in 1985 for the domestic currency (Naira), the elimination of price and interest rate controls, as well as reliance on market forces as the major determinant of economic activity. The adoption of SAP marked the start of a regime of financial sector reforms characterized by the free entry and free exit of banks and the use of indirect (market-based) monetary control instruments for implementing monetary policy in Nigeria (Nnanna, 2001).

The developments in the Nigerian economy since 1986, and most importantly, the adoption of M2 as an intermediate target for monetary policy by the CBN pose two central questions: Is the real M2 money demand function stable as an intermediate target? Is the CBN justified in its choice of M2 as a target? The recent developments in monetary systems and the increased openness may have caused the money demand function to be unstable. The monetary implications inherent in these questions cannot be over-emphasized. If the money demand function is unstable and experiences substantial shifts over time, then the income velocity of money will be unpredictable, and the quantity of money may not be a good predictor of economic activity. In other words, the choice of M2 as an intermediate target portends serious economic problem for Nigerian monetary authority if M2's demand function is found to be unstable (Onafowora and Owoye, 2007).

1.3 Statement of the Problem

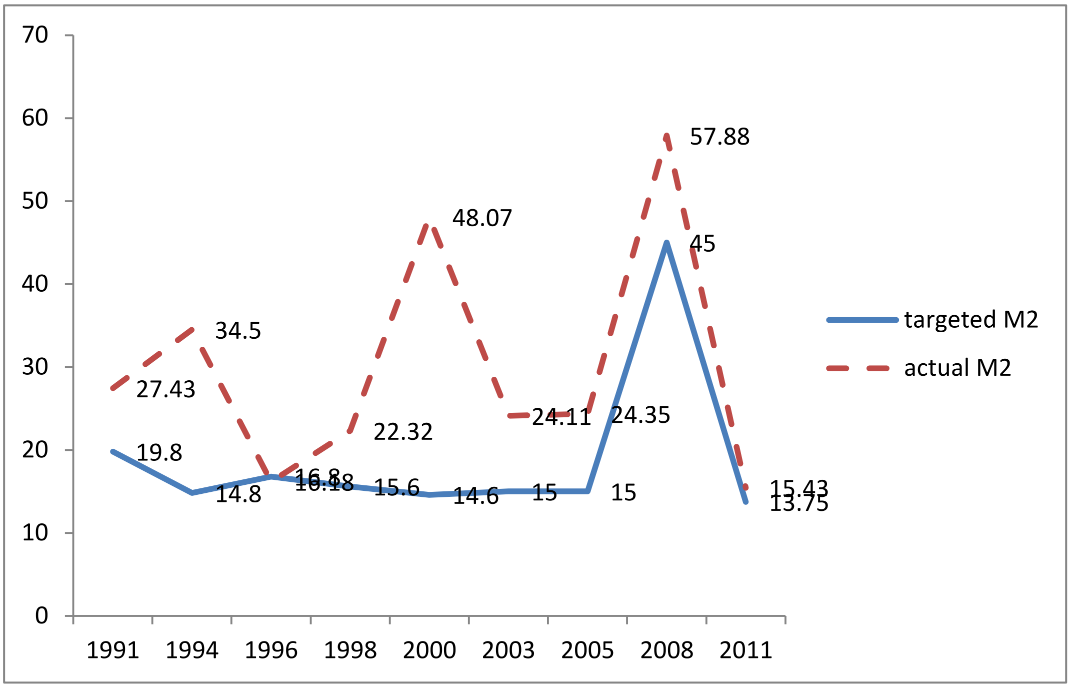
The Central Bank of Nigeria has over the years sought a predictable and stable money demand function. This is due to the fact that a stable money demand function contributes to broader economic growth and rising standard of living. Thus, the re-examination of the question whether demand for money has remained stable during the financial reforms which started in 2005 in Nigeria is imperative. It is often suggested that financial market reforms could lead to an unstable demand for money and changes in money velocity with attendant consequences for monetary policy implementation. In countries where the central bank targets a money aggregate, for instance using reserve money to implement monetary policy, the effectiveness of monetary policy rests on the stability of the monetary transmission mechanism as well as velocity of money. When this relationship is subjected to unexpected shifts, monetary targets lose their transparency and are less able to accurately signal the appropriate stance of monetary policy. This argument has been used as a reason for moving to inflation targeting, which does not rely on the stability of money demand, but instead uses a broad range of information to assess the monetary policy stance (Dagher and Kovanen, 2011).

The velocity of money has been fluctuating in Nigeria. For instance, it was 5.4 in 1970, 2.5 in 1986, 4.6 in 1989, 4.6 in 2006, 2.6 in 2009, and 3.0 in 2011 respectively. This fluctuation in the velocity of money poses big challenge to the Central Bank of Nigeria in its monetary aggregate targeting in particular and monetary policy formulation in general. Again, it can be seen that the velocity of money in 1986 (2.3) and 2009 (2.6) was remarkable. These figures show that there was structural change during the two periods. During the Structural Adjustment Programme in 1986 and the "bailing out" of commercial banks in 2009, lots of money was injected into the economy. This led to a decreased velocity of money and after then increased to 4.6 and 3.0 in 1989 and 2011, respectively. However, some empirical evidence on regime shifts report contradicting results. For example, Kumar, Webber, and Fargher (2010) reported break dates in 1986 and 1992, whereas Chukwu, Agu, and Onah (2010) reported 1994, 1996, and 1997 and Omotor (2011) reported 1981, 1992 and 1994 respectively. Thus, one of the objectives here is to investigate the existence of a long-run broad money demand equilibrium relationship in the presence of structural breaks due to its significance for monetary policy.

If the money demand function is unstable and undergoes substantial instability as Keynes thought, then velocity is unpredictable, and the quantity of money may not be directly linked to aggregate spending, as it is in the modern quantity theory. In recent years, the rapid pace of financial innovations has led to substantial instability of the money demand function and this calls into question whether the theories and empirical analysis are adequate. It also has important implications for the way monetary policy should be conducted, because it casts doubt on the usefulness of the money demand function as a tool to provide guidance to policy makers (Mishkin, 2004). Thus, what is being sought in a stable demand for money function is a set of necessary conditions for money to exert a predictable influence on the economy so that the Central Bank's control of the money supply can be a useful instrument of economic policy (Tahir, 1995).

Therefore, the difference between the actual and targeted broad money (M_2) growth in Nigeria can be illustrated with figure 1 below:

Figure 1: Trending of targeted and actual broad money (M2)



Source: Researcher's Computation with data from CBN

From the above figure, the discrepancy between targeted and actual broad money can be clearly seen. For example, in 1991, 1994, 1996, 1998, 2000, 2003, 2005, 2008, and 2011, the targeted and actual broad money growth were 19.8% and 27.43%, 14.8% and 34.5%, 16.8% and 16.18%, 15.6% and 22.32%, 14.6% and 48.07%, 15% and 24.11%, 15% and 24.35%, 45% and 57.88%, 13.75% and 15.43%, respectively. It is likely this mismatch exerts unpredictable influence on the economy and makes it difficult for the Central Bank of Nigeria to control money supply. Thus, the mismatch between targeted money supply (M2) and actual demand for money (M2) in Nigeria may be responsible to either partial knowledge of what constitutes the determinants of demand for money or the recent innovations in the financial sector. Yet, recent studies conducted on Nigerian economy report stable demand for money. The question is, if the demand for money function is truly stable in Nigeria, why is the CBN unable to predict correctly the demand for broad money? It is because none of the previous studies conducted on Nigerian demand for money used all the relevant potential determinants and a few do not employ the appropriate methodology. This is one of the motivations behind this study.

Hence, this study departs from previous studies due to the inclusion of all the relevant determinants such as yield on foreign real assets proxied by US interest rate and own rate of return and employs the most appropriate methodology for this type of study. Including these variables is predicated on the evaluation of macroeconomic situation and developments in the financial system and due to the fact that Nigeria is an open economy and has a high degree of openness as some studies like Nduka (2013); Nduka, Chukwu, Ugbor and Nwakaire (2013) show.

1.4 Research Questions

The following research questions shall be answered:

1. What are the robust determinants of demand for money?
2. What are the number and timing of endogenously determined regime shifts in the cointegrating equation of the demand for money function?
3. Is the demand for money function stable?

1.5 Objective of the Study

The broad objective is to analyze the demand for money function in Nigeria. The specific objectives are:

1. To investigate the robust determinants of the demand for money.
2. To find the number and timing of the endogenously determined regime shifts in the demand for money function.
3. To examine the stability of the demand for money function.

1.6 Research Hypotheses

The study hypotheses are:

$Ho_{1:}$ There are no robust determinants of the demand for money.

$Ho_{2:}$ There are no significant endogenously determined regime shifts in the demand for money function.

$Ho_{3:}$ The demand for money function is not stable.

1.7 Policy Relevance of the Study

The study would be relevant to the Central Bank of Nigeria (CBN), policy makers and researchers. This is because, if the demand for real money balances has a consistent or stable relationship with its determinants, the changes in money stock would have predictable effects on income and output and the required change in the money stock to restore the equilibrium in the economy. In such a case, the Central Bank of Nigeria (CBN) can bring the desired changes in the economy by using monetary aggregates as a target variable. Thus, if the CBN relies on control of monetary aggregates as policy instruments, it must believe in a known and reliable connection between changes in that aggregate and changes in the arguments of the demand for money function, in order for its policy to have predictable effects. Furthermore, for any Central Bank, the stability issue of the money demand function is one of the most important guiding policy issues that helps decide whether to use monetary targeting strategy or inflation targeting strategy in the monetary policy in bringing the desired changes in the economy. Hence, the focal point for any central bank's policy relies on whether the demand for money function is stable or not.

1.8 Scope of the Study

The models were estimated using annual (1970-2012) series. The choice of the period is informed by the availability of data which were sourced from CBN and IMF. The variables employed are real demand for broad money, real income, domestic real interest rate, real exchange rate, inflation rate and foreign interest rate.

CHAPTER TWO
LITERATURE REVIEW

2.1 Conceptual Framework

Conceptually, the quantum of money in the economy and its consistency with the absorptive capacity of the economy underpins the essence of monetary policy (Omanukwue, 2010). The concept of money belongs to the category of things which are not amenable to any single definition. Simply put, money means money supply. It is due to the fact that money performs different functions and what consists of money depends on the mainstay of every economy. Money serves as a medium of exchange, store of values, unit of account, and standard for deferred payment. In the time past, different things have been used as means of payments such as cattle, sheep, furs, leather, fish, tobacco, salt, cowrie, manilla etc. Recently, other financial assets have been used as means of payments. However, money is one of many kinds of financial assets which consumers, government and business firms hold in their asset portfolios. Thus, economists' emphasis on money is because unlike other financial assets, money is the essential ingredient in conducting most economic transactions in the economy.

Additionally, unlike the demand for other commodities, the demand for money is "derived demand". Other commodities used as money cannot effectively perform all the four main functions of money as stated earlier, but can only perform some.

Demand for money

When people say they want more money rather than less, what they generally mean is that they want more income or wealth; they want to be richer and wealthier. However, in macroeconomics, the demand for money has a narrower meaning. It means the portion of wealth that you want to hold in the form of money. The demand for money describes what motivates people to allocate their stock of wealth into non-monetary portion (Baily and Friedman, 1991). The study of the effect of money on the economy is called "*Monetary theory.*" When economists mention supply, the word demand is sure to follow, and the discussion of money is no exception (Mishkin, 2004). Due to the debate on what constitutes money, four approaches to the definition of money have emerged in economic literature. There are the conventional approach, the Chicago approach, the Gurley and Shaw approach, and the Central Bank approach.

Conventional/Traditional Approach

According to this oldest approach, the most important function of money in every society is its ability to perform as a medium of exchange. The proponents of this approach defined money as what money does. Thus, anything that is generally acceptable as a means of exchange is money. According to this approach, money includes only the currency in circulation (C) and the demand deposits (DD) in commercial banks as constituting the supply of money (M). That is, M = C+DD. All other assets can be considered as money if they are first converted into currency or demand deposits with little loss or risk.

Chicago/Monetarist Approach

This approach is associated with Friedman and other monetary theorists of the University of Chicago. Friedman defined money as "a temporary abode of purchasing power". This viewpoint posits that money can act as a temporary abode of purchasing power, if it is kept in the form of cash, demand deposits or any other asset which is close to currency, that is, near-money asset. The Chicago school has adopted a broader definition of money by including in it besides the currency and chequable or demand deposits, the commercial bank time deposits, and fixed interest-bearing deposits placed with the commercial banks. Thus, money (M), according to the monetarist approach includes currency (C), Demand deposits (DD) and time deposits (TD). That is, M = C + DD + TD. They included time deposits due to the following monetarist assumptions: (a) money has been regarded as having highest correlation with national income, (b) money includes all those assets which are perfect substitutes, and thus time deposits are very close substitutes for currency and deposits.

In practice, time deposits are almost as readily available to spending as are demand deposits or currency since most banks make time deposits available to their customers on demand, although they may require a waiting period of some 30 to 60 days.

Gurley and Shaw/Liquidity Approach

According to Gurley and Shaw approach, currency and demand deposits are just two among the claims against financial intermediaries. In this approach, the scope of the constituents of money has been widened to include in money the monetarist definition plus the liabilities of non-banking intermediaries. Thus, money include currency, demand deposits, and commercial bank time depositions, saving bank deposits, credit institutions' shares and bonds etc., all of which are regarded as alternative liquid stores of value by the public. Money (M) includes currency (C), demand deposits (DD), time deposits (TD). Therefore, M = C+DD+SB+S+B etc.

The Central Bank Approach

This approach takes the broadest possible view of money as though it were synonymous with credit funds lent to the borrowers. They identified money with credit due to the central bank's historic position that total credit availability constitutes the key variable for regulating the economy. Thus according to this approach, money (M) includes currency (C), demand deposits (DD), time deposits (TD), credit from non bank financial institutions (NBFI) and credit from unorganized agencies (CUA). M = C + DD + TD + NBFI + CUA.

2.2 Theoretical Literature

In this section on the theories of demand for money, we shall begin with the classical theories refined at the start of the twentieth century by economists such as Fisher, Marshall, and Pigou, then we move on to the Keynesian theories and end it with the post Keynesian theories.

2.2.1 The Classical Approach

The classical approach is divided into two: (i) Quantity theory made famous by Irvin Fisher and (ii) cash balance theory associated with the Cambridge school and pioneered by Marshall and Pigou. These theories are together referred to as the monetarist approach.

Quantity Theory of Money

This was developed in the nineteenth and early twentieth centuries. This is a theory of how nominal value of aggregate income is determined. Because it tells us how much money is held for a given amount of aggregate income. The most important feature of this theory is that it suggests that interest rates have no effect on the demand for money. Fisher wanted to examine the link between total quantity of money M (the money supply) and the total amount of spending on final goods and services produced in the economy P*Y, where p is the price level and Y is aggregate output (income). The concept that provides the link between M and P*Y is called velocity of money, the rate of turnover of money; that is, the average number of times per year that a naira is spent in buying the total amount of goods and services produced in the economy. Velocity = $\frac{P*Y}{M}$. Fisher also formulated the equation of exchange as MV=PY. This equation states that the quantity of money multiplied by the number of times that this money is spent in a given year must be equal to nominal income (the total nominal amount spent on goods and services in that year). Fisher views velocity as being constant in the short-run. Therefore, he transformed the equation of exchange into the quantity theory of money, which states that nominal income is determined solely by movements in the quantity of money. When the quantity of money (m) doubles, MV doubles and so must PY, the value of nominal income.

Because the classical economists including Fisher thought that wages and prices were completely flexible, they believed that the price level of aggregate output Y produced in the economy during normal times would remain at the full-employment level, so Y in the equation of exchange could also be treated as reasonably constant in the short-run. Hence, the quantity theory of money implies that if M doubles, P must also double in the short-run, because V and Y are constant. The quantity theory of money tells us how much is held for given amount of aggregate income, and this makes it a theory of the demand for money. If we divide the equation of exchange (MV = PY) by V we shall then have $M = \frac{1}{v} PY$. This states that when the money market is in equilibrium, the quantity of money M that people hold equals the quantity of money demanded M^d. This also states that demand for money is a fraction of income. It concentrates on the transaction motive of demand for money.

Cambridge Approach (Cash Balance)

The cash balance approach is associated with Pigou (1917), Marshall (1923), and Robertson (1922). The proposition they advance is that money is desired as a store of value and that money is capable of yielding utility. The Cambridge story is fundamentally different from the Fisher. In Fisher, money is desired by agents in some fixed amount solely because it happens to be the medium of exchange. As Fisher noted, money yields no gains to the holder. However, in the Cambridge approach, this is not the case. Money does increase utility in a way; namely, by enabling the divorce of sale and purchase as well as a hedge against uncertainty. The Cambridge lesson is that sale and purchase of commodities are not simultaneous and thus there is a need for a “temporary abode” of purchasing power, i.e., some temporary store of wealth. They allow for money demand to involve a precautionary motive – with money holdings acting as a hedge against uncertain situations. Thus money is demanded for itself. They specify the demand for money as follows: M/P = kY.

where k is constant, M= is money, P is price level and Y is real income

Thus, in the equation above, how much money demanded depends partly on income and partly on other items, notably wealth and interest rates. But the problem is that k is ambiguous and cannot be determined.

2.2.2 Keynesian Approach (Liquidity Preference)

Keynes (1936) abandoned the classical perspective of constant velocity and emphasized on the relevance of interest rates. From the Keynesian viewpoint, the three motives for money are the transactions motive, the precautionary motive and the speculative motive.

Transactions Motive

This arises from the need to hold cash for current personal and business expenditure. The diversity in the timing of inflow and outflow of funds create the need to hold some cash to meet daily expenses till the next cash inflow period.

Hence, the higher the level of income for income of an economic unit, the higher will be the transactions demand for money and vice versa , thus $M_t = f(y)$ where $f>0$ or $LT = kY$, where LT is the transactions demand for money, k is the proportion of income which is kept for transactions purposes and Y is the income. The transaction demand for money is a direct proportional and positive function of the level of income. It is important to note here that while Keynes explicitly recognize that the transactions demand for money (M^d) depends on interest rate, he argued that the influence of interest rate was minor compared to that of income.

Precautionary Motive

Keynes went beyond the classical analysis by recognizing that in addition to holding money to carry out current transactions, people hold money as a cushion against an unexpected need. These needs may be positive or negative. For instance, events such as ill health, accidents and robbery are negative.

Keynes believed that the amount of precautionary money balances people want to hold is determined primarily by the level of transactions that they expect to make in the future and that these transactions are proportional to income. Therefore, he postulated that the demand for precautionary money balances is proportional to income. He recognized that precautionary money demand depends on interest rate, but the influence of interest rate was minor compared with the real income.

Speculative Motive

This need arises from uncertainty about future interest rate. Keynes emphasized risk and the uncertainty of expectations as the reasons behind the negative relationship between the interest rate and the speculation demand for money. Keynes divided the assets that can be used to store wealth into two categories: money and bonds. He then asked the following questions: Why would individuals decide to hold their wealth in the form of money rather than bonds? He answered that question by saying that an individual would want to hold money if its expected return was greater than the expected return from holding bonds. Keynes assumed that the expected return on money was zero because in his time, unlike today, most checkable deposits did not earn interest. For bonds, there are two components of the expected return: the interest payment and the expected rate of capital gains. Keynes assumed that individuals believe that interest rate gravitate to some normal value. If interest rates are below this normal value, individuals expect the interest on bonds to rise in the future and so expect to suffer capital losses on them. As a result, individuals will be more likely to hold their wealth as money rather than bonds and the demand for money will be high. From Keynes reasoning, it is concluded that as interest rates rise, the demand for money falls, and therefore money demand is negatively related to the level of interest rates.

2.2.3 The Post-Keynesian Approach

Baumol (1952) and Tobin (1956) provided the theory that explains why the transactions demand and even the precautionary demand depends on the interest rate.

2.2.3.1 Baumol's Explanation

Baumol called his approach the "inventory – theoretical approach". Baumol applied optimizing techniques in order to find the optimal quantity of transactions balances that an individual should hold. In his analysis, the demand for transactions balance depends on the brokerage costs and the opportunity cost of deposits. The transaction demand is directly proportional to the square root of the quantity of transactions and inversely proportional to square root of the opportunity cost. In other words, if the opportunity cost increases it will be profitable to invest in bonds and the optimal cash balance will decrease.

2.2.3.2 Tobin's Perspective

Tobin called his approach the risk aversion theory of liquidity preference. Tobin stated that the demand for money diminishes as the number of transfers between money and securities increases. According to Tobin, if a worker is paid a salary of ₦90,000 in 30 days, he can deposit all in bonds and then visit the broker to liquidate ₦3,000 worth of bonds until the holding is completely liquidated. The marginal revenue from each transaction with the broker is the extra interest earned by holding more securities and fewer money balances. As the number of transfers increases, the marginal revenue from each transfer diminishes. The marginal cost consists of the brokerage fees, or transaction costs, of transferring securities to money and vice versa. The optimum number of transfers determines the demand for money

2.2.3.3 Friedman's Theory

In 1956, Milton Friedman developed a theory of the demand for money in a famous article, "The Quantity Theory and Money: A Restatement." His theory was closer to Keynes' than Fisher's. He asked the question, "why do people choose to hold money?" He answered the question by only stating that the demand for money must be influenced by the same factors that influence the demand for any asset. He then applied the theory of asset demand to money. Friedman introduced the level of wealth into the demand function for money. He suggested several opportunity cost variables that affect demand for money such as expected rate of inflation. He also used the concept of permanent income as a determinant of demand for money due to the fact that demand for money will not fluctuate much with business cycle movements.

2.3 Empirical Literature

2.3.1 International Evidence

Khan and Ali (1997) examine the existence of a long-run equilibrium relationship between money, income, price, and interest rate in Pakistan. The study employs Engle-Granger cointegration and error correction approach using annual data from 1972 to 1992. The study reports that changes in the financial sector rendered the narrow monetary aggregate unstable and unpredictable in the long-run. On the other hand, the broad monetary aggregate exhibited stable long-run relationship with real income, real interest rate and inflation. The study further shows that the structural changes in the financial sector after 1989 especially interest rate liberalization did not affect the stability of broad monetary aggregate in Pakistan. Meanwhile, in a similar study for Syria, **Samara (n.d)** empirically examines the demand for money function in Syria. The study employs Engle-Granger cointegration, Vector Error Correction Model (VECM), and CUSUM and CUSUMSQ tests for stability. The study uses quarterly data of money demand (M1 and M2), real income, price level, foreign exchange rate, foreign interest rate, and oil prices from $1990Q_1$ to $2009Q_4$. The results show that real money demand (M2 and M1) and their determinants are weakly cointegrated. Moreover, both the stability tests and Error Correction Model show unstable money demand function in Syria. The study concludes that using money supply to control inflation could be fruitless in the Syrian economy.

Sterken (1999) investigates a money demand (M_1) equation for the Ethiopian economy with quarterly data from $1996Q_1$ to $1999Q_4$. This period is characterized by both climatological disasters and political breaks: two changes of the political regime in 1974 and 1991 as well as two serious periods of drought in 1975 and 1985. The study uses real demand for narrow money, real income, shortage and a real alternative yield as the central endogeneous variables in the model. The study employs unrestricted VAR approach. The results show long-run equilibrium condition, relating real per capita money demand, real per capita GNP, shortage and real export price of coffee. The model also shows some instability during the first break between 1974 and 1975. The study concludes that the true endogeneous variables in the model are real income and the real coffe price, while real money holdings and shortage are weak exogeneous variables. In a similar study, **Watson (2001)** studies the demand for money in Jamaica with quarterly data from $1976Q_1$ to $1998Q_4$. The study employs both restricted and unrestricted VAR models and structural cointegration. The variables used are money supply, national income, deposit price level, rate of interest, base money, deposit rate of interest and, interest on loans. The results show that there exists a stable long-run demand for money function in Jamaica over the period studied. The study concludes that the Error Correction form had satisfactory diagnosis while the Persistence Profiles, a useful tool for policy analysis purposes, are not at odds with the predictions of economic theory.

Nachega (2001) applies VAR models analysis to investigate the behaviour of demand for money (M2) in Cameroon from 1963/64 to 1993/94. The cointegrated VAR analysis first describes an open-economy model of money, price, income, and a vector of rates of return, within which three steady state relations are identified: a stable money demand function, an excess aggregate demand relationship, and the uncovered interest rate relation under fixed exchange rates and perfect capital mobility. The results show a short-run stable demand for money in Cameroon over the period studied. Employing similar methodology, **Adam, Kessy, Nyella and O'Connell (2011)** study the demand for money (M_2) function in Tanzania using quarterly data from $1998Q_1$ to $2011Q_4$. The study employs VAR and VEC approach. The variables employed are broad money demand (M2), real GDP, interest rate, inflation rate and rate of nominal exchange rate depreciation. The study reports that disaggregating currency and deposits, currency responds more strongly to expected inflation, and deposits to the interest rate spread vis-à-vis T-bills, than does overall M2. The results show the existence of a stable cointegrating relationship between real money balances and its determinants in Tanzania.

Halicioglu and Ugur (2005) analyze the stability of the narrow money (M_1) demand function in Turkey with annual data of national income, interest rate, and exchange rate for the period of 1950 to 2002. The study employs ARDL approach with the CUSUM and CUSUMSQ for stability tests. The results show that there exists a stable money demand function and suggests that it is possible to use the narrow money aggregate as target of monetary policy in Turkey. Similarly, **Sovannroeun (2008)** estimates the demand for money function in Cambodia with monthly data for the period of 1994:12 to 2006:12. The variables used are demand for money balances proxied by M1, real income, inflation rate, and exchange rate. The study employs ARDL approach of cointegration developed by Pesaran et al. (1996, 2001) and CUSUM and CUSUMSQ tests for stability. The estimated coefficient of error correction term indicates that there is cointegration among variables in money demand function. The results also reveal that the estimated elasticity coefficients of real income and inflation are respectively positive and negative as expected. The exchange rate coefficient is negative which supports currency substitution symptom in Cambodia. The study concludes that the demand for money function is stable during the period covered in Cambodia. In another study, **Dritsakis (2011)** examines the demand for money in Hungary using quarterly data for the period of $1995Q_1$ to $2010Q_1$. The study uses the variables; money demand (M1), real income, inflation rate, and nominal exchange rate. The study employs ARDL cointegrating framework and CUSUM and CUSUMSQ stability tests. The results show that there is unique cointegrated and stable long-run relationship among M1, real income, inflation rate, and nominal exchange rate. Real income elasticity is positive, while the inflation rate elasticity and nominal excahange rate are negative. The CUSUM and CUSUMSQ tests show that narrow money demand function is stable over the period covered in Hungary.

Dagher and Kovanen (2011) investigate the long-run stability of money demand for Ghana with quarterly data for the period of $1990Q_1$ to $2009Q_4$. The study Adopts ARDL approach and bounds test procedure developed by Pesaran et al. (2001) and the CUSUM and CUSUMSQ tests for stability. The variables used are broad money, real income, nominal effective exchange rate, domestic deposit interest rate, the cedi treasury bill interest rate, the US treasury bill interest rate, and the US dollar Libor interest rate. The results show that key determinants of money demand are real income and exchange rate, while other financial variables are found insignificant in the estimation. The study reports a stable long-run money demand function in Ghana. In a similar study, **Baba, Kenneth and Williams (2013)** examine the dynamics of money demand in Ghana with annual data for the period of 1980 to 2010. The study employs Dynamic Ordinary Least Squares (DOLS). The variables used are narrow money demand, GDP as a proxy for income, consumer price index and, nominal exchange rate. The results show that apart from income, inflation and exchange rate elasticities are negative. The study reports a stable money demand function, and concludes that changes in past and current macroeconomic activity significantly affect money demand in Ghana.

In other studies conducted on Indian economy, **Das and Mandal (2000)** considers M3 money supply and conclude that money demand function is stable in India. The study uses monthly data for the period of April 1981 to March 1998. The variables used are industrial production, short-term interest rates, wholesale prices, share prices, and real effective exchange rates. The results show that there is cointegrating vectors among M3 and the other variables. In contrast, **Inoue and Hamori (2008)** empirically analyze India's money demand function for the period of 1980 to 2007 with both monthly and annual data for the period from 1976 to 2007. The study employs dynamic OLS (DOLS) and carries out cointegration tests. The variables used are real demand for money balances (M1, M2, and M3) as dependent variable, interest rates and output as independent variables. The results show that when money supply is represented by M3, there is no long-run equilibrium, whereas there is long-run equilibrium when money supply is represented by M1 and M2 and the coefficients of interest rate and output are consistent with economic theory, respectively

Hamori (2008) analyzes the demand for money function in 35 Sub-Saharan African countries including Nigeria, for the period of 1980 to 2005 and adopts a non-stationary panel data analysis. The variables used are real money balances (M1); real money balances (M2); real GDP; interest rate, and inflation rate. The empirical results reveal that that there exists a cointegrating relation with respect to money demand in the Sub-Saharan African region over the period studied, regardless of whether M1 or M2 is used as the money supply measure. Thus, money supply (M1 and M2) is a reliable policy variable from the intermediate-target perspective. In a similar study on eleven Euro countries, **Hamori and Hamori (2008)** reveal that the money demand fuction is stable with respect to M3 money demand in Euro aria. The results of the panel estimation indicate that the output coefficient is positively related to M3, while the interest rate is negatively related to M3 in the eleven Euro countries.

Felmingham and Zhang (2000) investigate the long-run demand for broad money in Australia subject to regime shifts with monthly data over the period of 1976(3) to 1998(4). The study employs Gregory Hansen cointegration. It reveals some evidence for the presence of cointegration between broad money, non-money assets, and GDP. The results show a break date in 1991 coinciding with a deep recession and policy induced interest rate reductions in Australia during the period. The income elasticity of demand exceeds one, reacts positively to the interest spread and negatively to inflation.

Lungu, Simwaka, and Chiumia (2012) study the demand for money function in Malawi using monthly data for the period of 1985 to 2010. The variables used are real money balances, prices, income, exchange rate, treasury bill, and financial innovation. The study employs VAR, VEC, and Granger causality approaches. The results show that the model is stable and adequate. It further shows that in the long-run real GDP, inflation, exchange rate, treasury bill rate, and financial depth all have significant impact on the demand for money, while in the short-run, it is financial innovation, exchange rate movements, and lagged money supply that display causality in money demand.

Suliman and Dafaalla (2011) investigate the existence of a stable money demand function in Sudan using annual data for the period of 1960 to 2010. They employ the Johansen Maximum Likelihood procedure using real money balances, real GDP (as a scale variable), the rate of inflation and exchange rate (as opportunity cost of holding money balances variables). All variables are in logarithmic form, except inflation rate. The results reveal that there is a long-run relationship between real money balances and the explanatory variables. The study further shows that money demand function is stable between 1960 and 2010 in Sudan. The study concludes that it is possible to use the narrow money aggregate as target of monetary policy in Sudan. Similarly, **Dahmardeh, Pourshahabi, and Mohmoudinia (2011)** empirically study the long-run relationship between money demand and its determinants in Iran with annual data for the period of 1976 to 2007. The study employs conditional ARDL model with economic uncertainty, money demand, real income, and real interest rate as the variables. The results show that economic uncertainty has a significant negative effect on money demand; real income has a positive and significant effect on money demand, while interest rate has a negative effect on money demand. Moreover, economic uncertainty measured by EGARCH (1,1) model of inflation rate, exchange rate, growth of GDP and terms of trade, has a negative and significant effect on money demand in Iran. The study, therefore reports that there exists a long-run relationship between M_1 and its determinants in Iran.

2.3.2 Nigerian Evidence

Anoruo (2002) investigates the stability of demand for money in Nigeria during the SAP period. Results from Johansen and Juselius (1990) cointegration tests show that real broad money, economic growth, and real discount rate have a long-run relationship. The study employs Hansen (1992) stability test and reports that demand for broad money is stable in Nigeria during the SAP period from $1986Q_2$ to $2000Q_1$.

In another study, **Akinlo (2006)** examines the cointegrating property and stability of M2 money demand in Nigeria. The results reveal that M2 is cointegrated with income, interest rate and exchange rate. Moreover, the results show that income is positively related to demand for money, while interest rate is negatively related to demand for money.

Nwafor et al. (2007) examine the quantity theory of money via Keynesian liquidity preference theory in Nigeria using quarterly data from $1986Q_3$ to $2005Q_4$. The variables used are demand for money (M2), real income, real interest rate, and expected inflation rate. The study employs the ADF unit root and Johansen-Juselius cointegration tests. The results show that demand for money is positively related to real income, real interest rate, and expected inflation rate, respectively in Nigeria. The study therefore concludes that there exists a long-run relationship among aggregate demand for money in accordance with the Keynesian liquidity preference theory. However, the finding is in contrast with **Akinlo (2006), Nwafor et al. (2007), Chukwu, Agu and Onah (2010).** Similarly**, Onafowora and Owoye (2007)** investigate the stability of the demand for money in Nigeria for the period of $1986Q_1$ to $2001Q_4$.The study employs VEC analysis and Johansen Maximum likelihood cointegration approach in order to ascertain whether recent macroeconomic developments such as the implementation of the structural adjustment programme (SAP) in 1986; the liberalization of the exchange rate; changes in monetary policy regimes; and increased integration of the economy with the rest of the world may have caused the real broad money demand function to become structurally unstable. The results show that there exists a long-run relationship between the real broad money aggregate, real income, inflation rate, domestic nominal interest rate, foreign interest rate and expected exchange rate. The CUSUM and CUSUMSQ tests indicate stability of the short-run and long-run parameters of the real money demand function in Nigeria. **Gbadebo (2010)** examines whether financial innovation affects the demand for money in Nigeria for the period from 1970 to 2004. The study employs OLS and Engle-Granger cointegration techniques. The variables used are broad money, nominal interest rate on time deposit, real GDP, nominal rate on treasury bills, dummy variable to capture SAP period, consumer price index and lag of broad money. The results suggest that financial innovations have not significantly affected the demand for money in Nigeria during the period studied.

Omanukwue (2010) investigates the modern quantity theory of money with quarterly time series data from Nigeria for the period of $1990Q_1$ to $2008Q_4$. The study employs Engle-Granger two-stage approach for cointegration to examine the long-run relationship between money, prices, output, interest rate and ratio of demand deposits/time deposits. It employs also the granger causality to examine the causality between money and price. The study establishes the existence of weakening uni-directional causality from money supply to core consumer prices in Nigeria. The study also reports evidence of a long-run relationship between the variables. In all, the results indicate that monetary aggregates still contain significant, albeit weak, information about developments in core prices in Nigeria.

Kumar, Webber and Fargher (2010) investigate the level and stability of money (M_1) demand in Nigeria for the period of 1960 to 2008 with annual data. In addition to estimating the canonical specification, alternative specifications are presented that include additional variables to proxy for the cost of holding money. Results of Gregory-Hansen cointegration tests suggest that the canonical specification is well determined. The money demand relationship went through regime shift in 1986 and 1992 respectively, which slightly improved the scale of economies of money demand. The results further show that there is a cointegrating relationship between narrow money, real income and nominal interest rate after allowing for a structural break. The study concludes that the demand for money was stable in Nigeria between 1960 and 2008 although there is evidence to suggest that it may have declined by a small amount around 1986. Similarly, **Chukwu, Agu and Onah (2010)** examine the evidence in the money demand function in the structural break framework with unknown break point for the period of 1986Q_1 to 2006Q_4 in Nigeria. The variables used are real money demand (M2) as dependent variable, real income, interest rate proxied by interest swap spread, and expected rate of inflation proxied by CPI as independent variables. The study employs the Gregory-Hansen approach for cointegration. The results show that real income and interest rate are positively related to real demand for money, whereas expected rate of inflation is inversely related to money demand. The results further show that there exists structural breaks in the cointegrating vectors of the Nigerian long-run money demand function in 1994, 1996, and 1997. **Omotor (2011)** estimates an endogeneous structural break date of the money demand for Nigeria for the period from 1960 to 2008 with Gregory-Hansen cointegration approach. The variables employed are broad money, real GDP and nominal interest rate. The results suggest that there exists a stable long-run demand for money function in Nigeria during the period reviewed.

Bitrus (2011) examines the demand for money in Nigeria with annual data on both narrow and broad money, income, interest rate, exchange rate, and the stock market for the period of 1985 to 2007. The study employs OLS technique and CUSUM stability test. The results show that money demand function is stable in Nigeria for the sample period and that income is the most significant determinant of the demand for money. It further shows that stock market variables can improve the performance of money demand function in Nigeria. Similarly, **Bassey et al. (2012)** investigate the effect of monetary policy on demand for money in Nigeria with annual data for the period of 1970 to 2007. The study employs OLS multiple regression technique and finds inverse relationship between money, domestic interest rate, expected rate of inflation and exchange rate. **Nduka, Chukwu and Nwakaire (2013)** examine stability of demand for money function in Nigeria for the period of 1986 to 2011. The study uses CUSUM and CUSUMSQ tests for stability and reports that demand for money function is stable during the period reviewed.

2.4 Limitations of Previous Studies and Value added

There have been a number of studies on the demand for money in Nigeria, but most of them have used traditional estimating methods-by applying the partial adjustment model. For instance, Nwafor et al. (2007) omitted both foreign interest rate and exchange rate depreciation. Bassey et al. (2012) excluded income and foreign interest rate. Bitrus (2011) excluded foreign interest rate. Thus, these studies treat Nigeria as a closed economy which is erroneous. While, Onafowora and Owoye (2007) and Kumar et al. (2010) included both nominal interest rate and inflation rate at the same time in their models as independent variables respectively. These two variables are highly correlated due to the fact that nominal interest rate contains inflation. Chukwu, Agu and Onah (2010) and Bassey et. al. (2012) failed to examine whether the demand for money function is stable or not, which should have been the core of their studies. Kumar et. al, (2010) used narrow money (M1), whereas it is broad money (M2) the CBN targets. Again, some of the studies such as Akinlo (2006); Nwafor et al. (2007); Gbadebo (2010); Bitrus (2011); Bassey et. al. (2012); Nduka, Chukwu and Nwakaire (2013) failed to account for structural breaks which is the most appropriate cointegration technique in this type of study, while Omotor (2011) did not estimate all the four models in the Gregory-Hansen (1996a, b) cointegration test. Therefore, this study departs from previous studies by including yield on foreign real assets proxied by US interest rate, and own rate of return. Including these variables is based on the evaluation of macroeconomic situation and developments in the financial system. Furthermore, some studies conducted in Nigeria used expected rate of inflation. This is not correct due to the fact that the expected future rate of inflation is used in computing real interest rate, while the current rate of inflation is the rate at which the price level is actually changing over time (Baily and Friedman, 1991: 300-301).

CHAPTER THREE

METHODOLOGY AND DATA

3.1 Theoretical Framework

The Keynesian theory supposed an easy monetary policy to keep interest rates low in order to stimulate the investment to offset the shortages of demand. Post Keynesian developments showed that, contrary to the Keynesian postulates that transaction demand for money is a function of current income (Dwinvedi, 2008), the transaction demand for money is also a function of interest rate and its elasticity.

Keynes reasoned that people want to hold a certain amount of real money balances (the quantity of money in real terms) – an amount that his three motives indicated would be related to real income (Y) and to interest rates (i). Keynes wrote the following demand for money equation, known as the liquidity preference function, which says that the demand for real money balances M^d/p is a function of (related to) I and y (Mishkin, 2004).

$$\frac{M^d}{P} = f(I, y) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where $f_i < o$, $f_y > 0$

The theory of asset demand (portfolio theories of money) indicates that the demand for money should be a function of the resources available to individuals (their wealth) and the expected returns on other assets relative to the expected return on money to hold a certain amount of real money balances (Mishkin, 2004).

Thus Friedman's model is specified as follows:

$$\left(\frac{M^d}{P}\right) = f(Y_p, r_b - r_m, r_e\text{-}r_m, \pi^e - r_m) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where $F_{yp} > O$, $F_{rb}\text{-}r_m < O$, $F_{re}\text{-}r_m < O$, $F\pi^e - r_m < O$

$\left(\frac{M^d}{P}\right)$ = demand for real money balances

Y_p = permanent income (measure of wealth)

r_b = expected return on bonds

r_m = expected return on money

r_e = expected return on equity

π^e = expected rate of inflation

Equation (2) can be simplified as follows:

M^d/p = f (w, r_s, r_b, π^e)……………………………………… (3)

where r_s = return on securities.

W= wealth

In equation (1), Y is considered as a proxy for wealth, and the nominal interest rate (i) is, I = (r_b+π^e). This means that there is no much difference between equations (1) and (3). The problem with the Friedman's model is the choice of what constitutes money. Hence, the model becomes valid only if and only if it is applied to M_2 (broad money) or M_3 (M_1+M_2).

Where M_1 = narrow money.

Generally, the demand for money function can be specified as follows:

M^d/P = β_0 + β_1 scale variable + β_2 opportunity cost variables………….. (4)

where M^d = demand for money balances

p = price level

M^d/P = real money balances

Scale variable = real income (Y)

Opportunity cost variables = vector of interest rates.

Following the empirical literature on demand for money in developing countries (see Goldfeld 1992, Goldfeld and Sichel, 1990), the long-run demand for money can be specified in the following (natural) logarithm form:

$In\ M_t^d = \alpha_0 + \alpha_1 \text{Iny}_t + \alpha_2 \text{i}_t + \alpha_3\pi_t^e + \varepsilon_t$ ……………………………… (5)

where α_1 (income elasticity) = $\frac{d \ln M_t}{dit}$ < O

α_2 (semi-interest elasticity) = $\frac{d \ln M_t}{di_t}$ < O

α_3 (semi-inflation elasticity) = $\frac{dInM_t}{d\pi_t^e}$ < O

Variables have been defined in previous equations.

3.2 The Model

The study adopted and modified the model originally proposed by Mundell (1963) as follows:

$$\left(\frac{M_2^d}{P}\right) = \beta_o + \beta_1 RYt + \beta_2 R1R_t + \beta_3 R_t^f + \beta_4 RI_t + \beta_5 REX_t + U_t \text{.........(6)}$$

Taking the natural logarithm of the model in order to estimate elasticity and semi-elasticity of the variables, we now specify the mode as follows:

$$In\left(\frac{M_2{}^d}{P}\right)_t = \beta_0 + \beta_1 InRY_t + \beta\ RIR_t + \beta_3 R_t^f + \beta_4 RI + \beta_5 REX_t + U_t \text{..................(7)}$$

where β_0 is the constant term

U_t is the error term

$\beta_1 > 0$, $\beta_2 < 0$, $\beta_3 < 0$, $\beta_4 < 0$, $\beta_5 < 0$ or > 0

$\left(\frac{M_2{}^d}{P}\right)_t$ = real money balances

P = Consumer Price Index

RY = scale variable proxied by Real Gross Domestic Product (RGDP)

RIR = opportunity cost variable proxied by real interest rate.

R^f = foreign interest rate proxied by US interest rate

RI = Inflation Rate

REX = exchange rate depreciation proxied by real exchange rate.

3.2.2 Definition of Model Variables

Scale variable

Either wealth or an income variable can be used. Generally, when wealth data is not available, income variable like Gross National Product (GNP) or Gross Domestic Product (GDP) in real terms can be taken into consideration. In this study, the scale variable RGDP for Nigeria was used for the estimation. This is positively related to real money balance.

Opportunity Cost Variable

An opportunity cost variable in a demand for money function is intended to measure the yield on money against other assets that might be held. Because Nigerian economy is subject to both high price level and high variability in prices, the price level has a considerable impact on the return of financial assets, as risk in saving money will rise and consequently the holding of money will tend to decrease.

Inflation Rate

This generally affects the demand for money negatively as agents prefer to hold real assets as hedges during the periods of rising inflation. It is important to keep the distinction clear between the expected future rate of inflation and the current rate of inflation. The later is the rate at which the price level is actually changing over time. The former is used in computing real interest rate (Bailey and Friedma, 1991: 300-301)

The Foreign Interest Rates

These are expected to exert negative influence on the demand for money as increase in foreign interest rates potentially induces the domestic residents to increase their holdings of foreign assets which will be financed by drawing down domestic money holdings. It is proxied by US interest rate

Expected Foreign Exchange Depreciation

This has a negative relationship with real money balances. An increase in expected depreciation implies that the expected returns from holding foreign money increases, and hence, agents would substitute the domestic currency for foreign currency.

However, since it is proxied by the real exchange rate, it could be positive or negative. A depreciation of domestic currency, value of foreign financial asset held by domestic residents may lead to an increase in the demand for cash balances. The positive coefficient of the exchange rate variable also supports the wealth effect argument in the literature (Arango and Nadiri 1981 and Arinze et al. 1999 in Halicioglu et al. 2005).

3.3 Estimation Procedure

To capture the study objectives, the Ordinary Least Squares (OLS) was used in estimating equation (7). The parameters are expected to possess the BLUE (Best Linear Unbiased

Estimators) property. The model was subjected to economic theoretical criterion as well as statistical and econometric criteria. The study was adopted the Gregory-Hanson (1996a & b) cointegration approach to estimate equations (9, 10, 11, and 12) and CUSUM and CUSUMSQ tests for stability proposed by Brown, Durbin, and Evans (1975) to estimate equation (13).

3.3.1 Lag Length Selection

The appropriate lag length was selected using Schwarz Bayesian criterion (SBC).

3.3.2 Unit Root Test

Regressing a time series variable on another time series variable(s), one might obtain a high R^2 even though there is no meaningful relationship between the variables. This situation shows the problem of spurious or nonsense regression (Gujarati, 2007). To assess the time series properties, we employed the ADF (Augmented Dickey-Fuller) and Phillips-Perron tests. The ADF test is specified as follows:

$$\Delta R_t = \beta_0 + \beta_1 R_{t-1} + \sum_{l=1}^{k} biR_{t-1} + \varepsilon_t \quad . \quad . \quad . \quad . \quad . \quad . \quad (8)$$

R_t = a vector of all variables of the model

β_1 and bi = 28arameters of the model

ε_t = white noise, Δ = change, $\sum_{l=1}^{k}$ = sum

3.3.3 Cointegration Test with Structural Breaks

The Gregory and Hansen (G- H) (1996 a, b) technique employed by Chukwu, Agu and Onah (2010); Kumar, Webber and Fargher (2010) and Omotor (2011) is the only time series based structural change test that estimates cointegration vectors and considers break dates. This gives it important advantages over other techniques if the purpose is to examine the change in slope parameters that are due to the impact of structural breaks. The null hypothesis of no cointegration with structural breaks is tested against the alternative of cointegration. Four models are proposed by Gregory and Hansen that are based on alternative assumptions about structural break: (i) level shift (ii) level shift with trend (iii) regime shift where both the intercept and slope coefficients change and (iv) regime shift where intercept trend and slope coefficients change Kumar, Webber and Fargher (2010). We apply equation (7) to these four approaches as follows:

GH-1: Level shift

$InRDM_t = a_1 + a_2\sigma_{tk} + b_1 In(RY_t) + b_2 RIR_t + b_3 R_t^f + b_4 RI_t + b_5 REX_t + \varepsilon_t$ ……………………………………………………..(9)

GH-2: Level shift (includes trend)

$$InRDM_t = a_1 + a_2\sigma_{tk} + \alpha_1 t + b_1 In(RY_t) + b_2 RIR_t + b_3 R_t^f + b_4 RI_t + b_5 REX_t + \varepsilon_t \ldots\ldots\ldots(10)$$

GH-3 Regime shit (Intercept and slope coefficients change)

$$\ln RDM_t = a_1 + a_2\sigma_{tk} + \propto_1 t + b_1 In(RY_t) + b_{11} In(RY_t)\sigma_{tk} + b_2 RIR_t + b_{22} RIR_t\sigma_{tk} + b_3 R_t^f + b_{33} R_t^f\sigma_{tk} + b_4 RI_t + b_{44} RI_t + b_5 REX_t + b_{55} REX_t\sigma_{tk} + \varepsilon_t \ldots\ldots\ldots(11)$$

GH-4: Regime shift (intercept, trend and slope coefficients change)

$$\text{InRDM}_t = a_1 + a_2 \acute{o}_{\tau\kappa} + \alpha_1 t + \alpha_{2t}\sigma_{tk} + b_1 \ln(RY_t) + b_{11}\ln(RY_t)\sigma_{tk} + b_2 RIR_t + b_{22} RIR\sigma_{tk} + b_3 R_t^f + b_{33} R_t^f\sigma_{tk} + b_4 RI_t + b_{44} RI_t\sigma_{tk} + b_5 REX_t + b_{55} REX_t\sigma_{tk} + \varepsilon_t \ldots\ldots\ldots(12)$$

where σ is the shift in the slope, intercept or trend coefficient. The break dates are attained by estimating the cointegration equations for all possible break dates and break date is selected where the absolute value of the ADF test statistic is at its maximum (Kumar et al. 2010).

3.3.4 Structural Stability Test

Testing for structural breaks implies that the process underlying the data is stable up to a known transition point, where it makes a discrete change to a new, but later stable structure. structure. For the test of stability, cumulative sum of recursive residuals (CUSUM) and cumulative sum of recursive residuals squares (CUSUMSQ) tests as proposed by Brown, Durbin, and Evans (1975) was employed. The technique is appropriate for time series data and is recommended for use if one is uncertain about when a structural change might have taken place. The null hypothesis is that the coefficient vector ß is the same every period.

The CUSUM test is based on the cumulated sum of the residuals:

$$W_t = \sum_{r=k+1}^{r=t} w/\ \sigma \text{ ,}\ldots\ldots(13)$$

where $\sigma^2 = (T-K-1)^{-1} \sum_{r=k+1}^{T} (w_r-w)^2$ and $w = (T-K)^{-1} \sum_{r=k+1}^{T} W_t$.

3.4 Model Justification

There is no consensus that the log-linear version is most appropriate functional form (Zarembka, 1968 and Sriram, 2001). We chose to log M_2 and the scale variable (Y) in equation (7) and allow other variables to be in level form. Thus, estimates of the coefficient for the scale variable (Y) directly provides the measure of income elasticity, and those of interest rate, expected rate of inflation, exchange rate depreciation, and foreign interest rate show semi-elasticities. The Gregory and Hansen (GH) (199a, b) test for structural break is chosen over Chow test because of the advantages the former has over the latter. First, it does not require a priori knowledge of structural break dates, whereas the Chow test requires that the break date is known before estimation. Second, GH test shows the exact dates that structural break occurred. Finally, the Chow test tells us only if the two regressions are different, without telling us whether the difference is on account of the intercepts, or the slopes, or both; it also assumes that error variances in the regressions must be the same, whereas these are accounted for in the GH test.

3.5 Data

The study employed annual data from Central Bank of Nigeria (CBN) statistical bulletin of various years and International Monetary Fund (IMF).

3.6 Econometric Software for Analyses

Eviews 6.0 and RATS econometric packages were used for the analyses.

CHAPTER FOUR
EMPIRICAL RESULTS

4.1 Unit Root Tests Results

To examine the time series characteristics of the model variables, the Augumented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests were conducted. The results of the ADF and PP unit root tests are presented in table 1.

Table 1: ADF and PP Unit Root Tests, 1970-2012

Variable	Lag	ADF	PP	Order of integration
RDM	[9,6]	0.977 (-2.933)	1.147 (-2.933)	
ΔRDM	[9,5]	-4.486* (-2.935)	-4.328* (-2.935)	I(1)
RY	[9,2]	2.461 (-2.937)	-5.545* (-2.933)	
ΔRY	[9, -]	-8.12* (-2.937)		I(1)
RIR	[9,4]	-3.402* (-2.933)	-3.315* (-2.933)	I(0)
REX	[9,3]	-2.647 (-2.933)	-2.583 (-2.933)	
ΔREX	[9,14]	-7.536* (-2.935)	-11.347* (-2.935)	I(1)
RI	[9,4]	-3.279* (-2.933)	-3.171* (-2.933)	I(0)
RF	[9,4]	-1.944 (-2.933)	-1.947 (-2.933)	
ΔRF	[9,8]	-5.512* (-2.935)	-5.683* (-2.935)	I(1)

Notes: Lag is the lag lengths for ADF and PP tests respectively. For both ADF and PP, the 5% critical values are given below the test statistics in parentheses. Asterisk (*) shows no unit root at 5% critical value. ADF and PP tests were conducted in Eviews 6.0.

The null hypothesis of non-stationarity of each variable was tested against the alternative hypothesis of stationarity. The ADF and PP results suggest that the null hypothesis cannot be rejected for most variables in their level form at the 5% level with the exception of real interest rate and rate of inflation. Also, the nulls that their first differences have unit roots are also rejected. Similar result for rate of inflation was reported by Kumar, Webber and Fargher (2010). However, it is worthy to note that the PP test suggests that the real income is stationary at level, while the ADF test indicates that it is stationary after first difference.

4.2 Cointegration Test Results (with Structural Breaks)

To capture objective two, the Gregory-Hansen (1996a & b) cointegration technigue was conducted on the demand for money function in Nigeria assuming canonical form and extended version of the model in line with Kumar, Webber and Fargher (2010). The results of the GH test are reported in table 2.

Table 2: Cointegration test with structural breaks (1970-2012)

Specification / GH Model	Break Date	GH Test Statistics	5% Critical Value	Existence of Cointegration
$LnRDM_t = \Psi_0 + \Psi_1 lnRY_t + \Psi_2 RIR_t + \varepsilon_t$ (1)				
GH-1	2006	-7.736	-5.280	Yes
GH-2	2006	-7.558	-5.570	Yes
GH-3	2005	-8.627	-6.000	Yes
GH-4	2006	-8.718	-6.320	Yes
$LnRDM_t = LnRDM_t = \Psi_0 + \Psi_1 lnRY_t + \Psi_2 RIR_t + \Psi_3 REX + \varepsilon_t$ (2)				
GH-1	2006	-7.766	-5.560	Yes
GH-2	2006	-7.903	-5.830	Yes
GH-3	2005	-9.945	-6.410	Yes
GH-4	2005	-8.298	-6.840	Yes
$LnRDM_t = LnRDM_t = \Psi_0 + \Psi_1 lnRY_t + \Psi_2 RIR_t + \Psi_3 REX + \Psi_4 RI_t + \varepsilon_t$ (3)				
GH-1	2006	-7.907	-5.23	Yes
GH-2	2006	-7.774	-5.29	Yes
GH-3	2005	-9.897	-4.92	Yes
GH-4	2005	-8.673	-4.50	Yes
$LnRDM_t = LnRDM_t = \Psi_0 + \Psi_1 lnRY_t + \Psi_2 RIR_t + \Psi_3 REX + \Psi_4 RI_t + \Psi_4 Rf_t + \varepsilon_t$ (4)				
GH-1	2006	-7.745	-5.29	Yes
GH-2	2006	-7.796	-5.73	Yes
GH-3	2003	-9.807	4.69	Yes
GH-4	1999	-6.005	-5.03	Yes

Note: Test was estimated using RATS software.

The null hypothesis of no cointegration is rejected for all the four canonical specifications. The endogenously determined break dates are 2005 and 2006 for specifications 1, 2 and 3 corresponding to G-H models 1 to 4, while the break dates for specification (4) are 1999, 2003 and 2006.

In all, the endogenously determined break dates resulting from all the GH models estimated are 1999, 2003, 2005 and 2006. The empirical results suggest that there exists a long-run relationship amongst real demand for money, real income, real interest rate, real exchange rate, inflation rate and foreign interest rate in Nigeria within the period under review. These break date periods as revealed by the test are periods of policy changes by the Central Bank of Nigeria.

Table 3: Cointegrating Equations

	Specification (1) [2005 & 2006]	Specification (2) [2005]	Specification (3) [2005]	Specification (4) [2003]
Intercept	111.066 (0.666)	-557.589 (-1.122)	-401.745 (-0.734)	498.368 (0.399)
Dum x intercept	886005.918 (19.3004)*	-3691613.748 (-10.914)*	-254539.14 (-5.85)*	2001466.26 (1.371)
Trend	6.436 (0.869)	54.248 (1.902)**	71.266 (1.899)**	123.169 (2.291)*
Dum x Trend	51339.764 (25.189)*	359160.263 (18.505)*	451530.81 (15.134)*	494650.660 (7.882)*
RY_t	0.000024 (0.329)	0.000184 (1.0019)	0.000184 (0.995)	0.000369 (1.429)
Dum x RY_t	0.1915 (9.545)*	1.218 (9.743)*	1.166 (7.93)*	1.482 (4.917)*
RIR_t	-1.285 (-0.257)	-26.434 (-1.617)*	-60.262 (-1.188)	-129.844 (-1.773)*
Dum x RIR_t	-10250.468 (-7.432)*	-175010.028 (-15.732)*	381809.76 (-9.465)*	-521460.61 (-6.098)*
REX_t	-	-10.389 (-2.147)*	-10.267 (-2.106)*	-15.804 (-2.183)*
Dum x REX_t	-	-68780.148 (-20.88)*	-65050.267 (-16.77)	-63470.38.38 (-7.507)*
RI_t	-	-	-33.069 (-0.705)	-91.577 (-1.32)
Dum x RI_t	-	-	-209519.600 (-5.617)*	-367779.04 (-4.546)*
Rf_t	-	-	-	-102.453 (-1.069)
Dum x Rf_t	-	-	-	-411454.38 (-3.679)*

Source: Author's calculation.

Notes: Absolute t-ratios are in parentheses. 5% and 10% significance levels are indicated with * and ** respectively. The years relevant for the dummy variable are indicated in the column header in parentheses [ ]. For instance, Dum 2005 means that the dummy is unity after that year.

The estimates of all canonical specifications have the expected signs. However, specification (2) suggests that models GH-1 and GH-2 are the most appropriate models since all the estimated coefficients, but real income are statistically significant. In sum, the empirical findings support canonical specification (2). Therefore, we argue that the real money demand function has undergone some regime shifts in the intercept, trend and slope coefficients within the period.

4.3 General linear Regression Model

To capture objective one, multiple regression technique was employed.

Table 4: The Model

(Dependent Variable – (lnRDM))

Variable	**Coefficient**	**S.E**	**t-statistic**	**Prob.**
C	2.590	0.702	3.690	0.0007
Ln(RY)	0.389	0.064	6.064	0.0000
RIR	-0.044	0.015	-2.985	0.0051
REX	0.0063	0.0014	4.393	0.0001
RI	-0.069	0.014	-4.885	0.0000
Rf	-0.067	0.024	-2.836	0.0074

R^2 = 0.909 F = 60.141DW = 1.397

Source: Author's calculation using E-Views 6.0

4.3.1 Economic Criteria

The signs of all the variables in table 4 are in line with economic theory postulates. The results show a positive and statistically significant relationship between demand for real money and income. This suggests that as real income increases, people would have the tendency to hold more money. The coefficient (0.389) of the real income variable indicates that the long-run income elasticity for real broad money is less than unity. All else held constant, if real income increases by one percent, real demand for money will increase by about 0.39 per cent. This is in line with Keynes' transaction and precautionary theories of money demand. This result is consistent previous Nigerian studies such as Nduka, Chukwu and Nwakaire (2013); Btrus (2011) and Nwafor et al. (2007).

The domestic interest rate (opportunity cost variable), real exchange rate (currency substitution variable), rate of inflation (assets substitution variable) and foreign interest rate (capital mobility variable) entered the long-run money demand model in equation (1) with different signs. The coefficient of the domestic real interest rate is negatively related to real demand for money but is statistically significant. This suggests that, if real interest rate increases by one per cent, the real demand for money will decrease by about 0.04 per cent. This suggests that, the higher the rate of return on alternative assest, the lower the demand for money. The coefficient of real exchange rate is positively related to real demand for money and statistically significant. This suggests that as real exchange rate increases by one unit, real demand for money increases by about 0.006 per cent. This implies that the real exchange rate increase results to increased returns from holding foreign money. There is a negative but statistically significant relationship between rate of inflation and real money demand. If rate of inflation increases by one percent, all else held constant, real demand for money decreases by 0.07 per cent. This is likely to be explained by the fact that agents prefer to hold real assets as hedges during periods of rising inflation. The coefficients of domestic real interest rate and expected rate of inflation follow Friedman's quantity theory of money. These findings validate previous Nigerian studies such as Nduka, Chukwu and Nwakaire (2013) and Bassey et al. (2012). The coefficient of foreign interest rate is negative but significantly related to real demand for money. This suggests that foreign interest rate increase by one per cent, leads to 0.07 per cent decrease in real money demand. This finding supports the portfolio balance theory of capital mobility for Nigeria. These findings suggest that all the model variables (real income, interest rate, foreign interest rate, real exchange rate and inflation rate) are robust determinants of real demand for money in Nigeria. This is due to the fact that their test statistics are all significant.

4.3.2 Statistical Criteria

The t – test result: The t – test shows the significance of each variable in the model.

H_o: β = 0 (Parameter estimated is statistically insignificant)

H_1: β≠ 0 (Parameter estimated is statistically significant)

Decision Rule:

Reject H_o if $|t_{cal}| > |t_{tab}|$

Accept otherwise.

A = 5 % with (n – k)df

i.e. 0.05 (43 – 6)df

= 0.05 (37)df

$|t_{tab}|$ = 2.042.

From the empirical results, real income, domestic real interest rate, real exchange rate, rate of inflation and foreign interest rate are statistically significant at 5 % level of significance. Their t – statistic (6.07, -2.98, 4.39, -4.89 and -2.84) > t_{tab} (2.042).

The F – test: This measures the overall significance of the model.

Hypothesis:

H_o: $\beta_o = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ (the model is statistically insignificant)

H_1: $\beta_o \neq \beta_1 \neq \beta 2 \neq \beta 3 \neq \beta_4 \neq \beta_5 \neq 0$ (the model is statistically significant)

β = 5 % with ${}^{k-1}/_{n-k}{}^{df}$

$\Rightarrow$ 0.05 with ${}^{5}/_{37}$ df

Decision Rule:

Reject H_o if |f – cal| > |f-tab|

Accept if otherwise

f – cal = 60.14083

f – tab = 2.53

Since f–cal > f–tab, we reject H_o and conclude that the model is statistically significant.

The Coefficient of Determination, R^2:

R^2 which is equal to 0.909 explains the total variation in the dependent variable (RDM) caused by the variations in all the explanatory variables. This suggests that explanatory variables explain about 91 % of the total variation in real money demand.

4.3.3 Econometric Criteria

4.3.3.1 Autocorrelation

The Durbin-Watson (DW) test statistic was employed to check for serial correlation in the model. From empirical results, DW = 1.4; n = 43; k=5 (excluding the intercept) and from the DW table; d_L =1.230 and d_U = 1.786 at 0.05 level.

Hypothesis:

H_o: No positive autocorrelation

H_o: No negative autocorrelation

H_1: There is autocorrelation

Decision Rule

Since $d_L < 1.4 < d_U$, there is inconclusive evidence regarding the presence or absence of positive first order-order serial correlation.

4.3.3.2 Heteroscedasticity Test

Table 5: White's Heteroscedasticity test

Dependent Variable: $RESID^2$

Variable	Coefficient	T-statistic
Constant	-18.401	-0.970
Log(RY)	1.944	1.154
$(Log(RY))^2$	-0.033	-0.880
RIR	-0.024	-0.066
RIR^2	8.38	0.006
REX	-0.149	-2.404
REX^2	8.55	1.811
RI	0.189	0.398
RI^2	0.001	0.384
Rf	0.803	0.609
Rf^2	0.024	1.589

F-stat. = 11.231 Prob. = 0.0000; Obs*R^2 = 40.974 Prob.Chi-Square (27) = 0.0414.

Source: Author's computation with E-Views 6.0

Hypothesis:

H_o: There is heteroscedasticity

H_1: There is homoscedasticity

α = 5% with (k-1)df

Decision Rule

Reject H_o if Obs*R^2 > χ^2_{df}

Accept if otherwise.

From the Chi-Square table $\chi^2_{(9)}$df = 16.9190

Since Obs*R^2 (40.974) > $\chi^2_{(9)}$df (16.9190), we reject H_0 and conclude that the model is homoscedastic.

4.3.3.3 Functional Form Specification Test

Table 6: Ramsey Reset Specification Test

Variable	F-statistics	F-tabulated	Assessment
Fitted^2	50.55448	2.53	Well specified

Source: Author's computation

Hypothesis:

H_o: $\beta_i = 0$ (the model is wrongly specified)

H_1: $\beta i \neq 0$ (the model is correctly specified)

At $\alpha = 5\%$ level.

Decision Rule

Reject H_o if F-stat. > F-tab. (k-1/n-k)df.

Accept if otherwise

where k = number of parameters; n = number of observation

F_{tab} = (6-1/43-6) = (5, 37) = 2.53

Since F-stat. (50.55) > F-tab. (2.53) at 5% level, we reject H_o and conclude that the model is correctly specified.

4.4 Structural Stability Test

Figure 2: Plot of Cumulative Sum of Recursive Residuals (CUSUM)

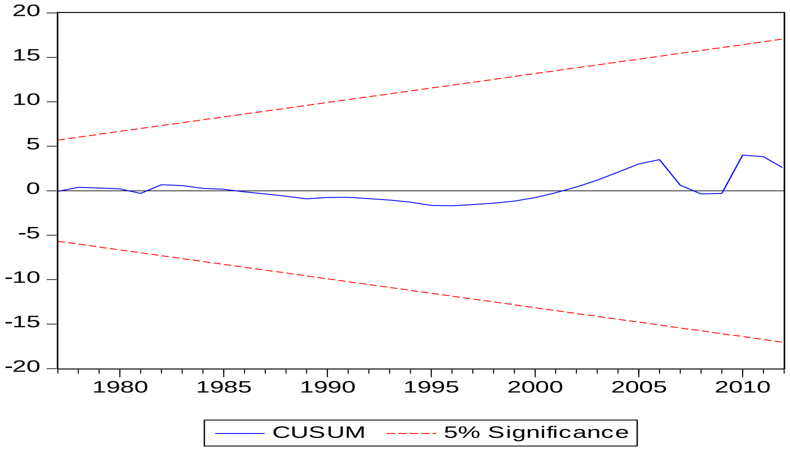
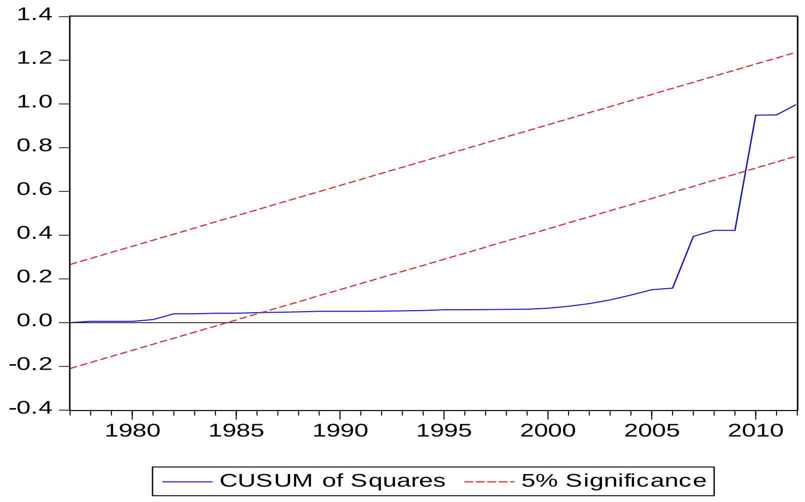


Figure 3: Plot of Cumulative Sum of Recursive Residuals Squares (CUSUMSQ)



Figures 2 and 3 are the graphs of CUSUM and CUSUMSQ respectively. Econometric theory suggests it is important that the CUSUM and CUSUMSQ statistics lie within the 5% critical bound. As depicted by figure 2, the estimated long-run parameters of the real broad money demand function are stable. This is due to the fact that the plots of CUSUM lie completely within the 5% critical lines. However, in figure 3, real broad money demand function deviated from the 5% critical lines between 1986 and 2008 and returned to the line for CUSUMSQ. These findings revealed the superiority of CUSUMSQ over CUSUM. This is due to the fact that the CUSUM test suggests that the money demand has always been stable in Nigeria, whereas the CUSUMSQ suggests that it has undergone instability. Almost all the previous studies conducted on Nigerian economy employed only CUSUM test and therefore concluded that money demand function has always been stable. Thus, this necessitated the application of the CUSUMSQ test in this study. The result of the CUSUMSQ test corresponds with the periods of structural changes in the economy. For example, during the Structural Adjustment Programme (SAP) in 1986, all the sectors of the Nigerian economy witnessed structural changes as a result of huge injection of money. Additionally, in 2005, the apex bank came up with the policy of recapitalization that compelled banks to have a capital base of at least twenty five billion naira. These structural changes overlapped with the periods of global financial crisis that hit the Nigerian economy in 2008. Following the global financial crisis, the CBN bailed banks out by injecting huge money into them.

CHAPTER FIVE

CONCLUSION AND POLICY IMPLICATIONS

5.1 Conclusion

The study was carried out to empirically address three research questions on the demand for money function in Nigeria for the period from 1970 to 2012 inclusive. The motivation and justification behind the study were driven by recent changes in the financial sector of the economy due to global financial crisis and economic meltdown which led to massive bail-out of deposit money banks (DMBs) by the apex bank as well as the timely establishment of the Asset Management Corporation of Nigeria (AMCON) in July, 2010 to efficiently resolve the non-performing loan assets of banks including related matters. This is in addition to the shift to a medium term perspective monetary policy that targets inflation. Hence, the study broadly aims to further test for the stability of money demand function in Nigeria.

After testing for the time series properties of model variables, two specifications for cointegration with structural breaks were investigated namely, the canonical and extended forms through augmentation of real exchange rate and rate of inflation to capture the cost of holding money. The empirical findings suggest that the canonical specification performed better. This finding validates Kumar, Webber and Fargher (2010). Furthermore, the results suggest that there is cointegrating relationship amongst real demand for broad money, real income, domestic real interest rate, real exchange rate, inflation rate and foreign interest rate after accounting for structural breaks in the underlying relationship. Also, the study finds that models GH-1 and GH-2 in specification (2) with regime shift (intercept, slope coefficients and trend changes) corresponding to break date 2005 are preferred models. The endogenously determined break dates are 1999, 2003, 2005 and 2006.

The signs of all the variables are theory consistent. The empirical results show a positive and statistically significant relationship between demand for real money and real income. The domestic real interest rate, the inflation rate and foreign interest rate are negative, but statistically related to real money demand respectively. The real exchange rate is positive, but significantly related to real money demand. The results of the CUSUM and CUSUMSQ tests suggest that Nigerian money demand function is stable within the period under review, but experienced instability between 1986 and 2008. It is likely that this explains why the Central Bank of Nigeria has been unable to match money supply with money demand.

5.2 Policy Implications

It is worth noting that the periods of the endogenously determined structural breaks namely 1999, 2003, 2005 and 2006 are within the periods of deviation from stable demand for money function (1986 through 2008). These periods correspond to the era of injection of huge currency into the economy by the apex bank especially in 2008. The policy implication of the findings is that the Central Bank of Nigeria should target broad money aggregates for effective monetary policy.

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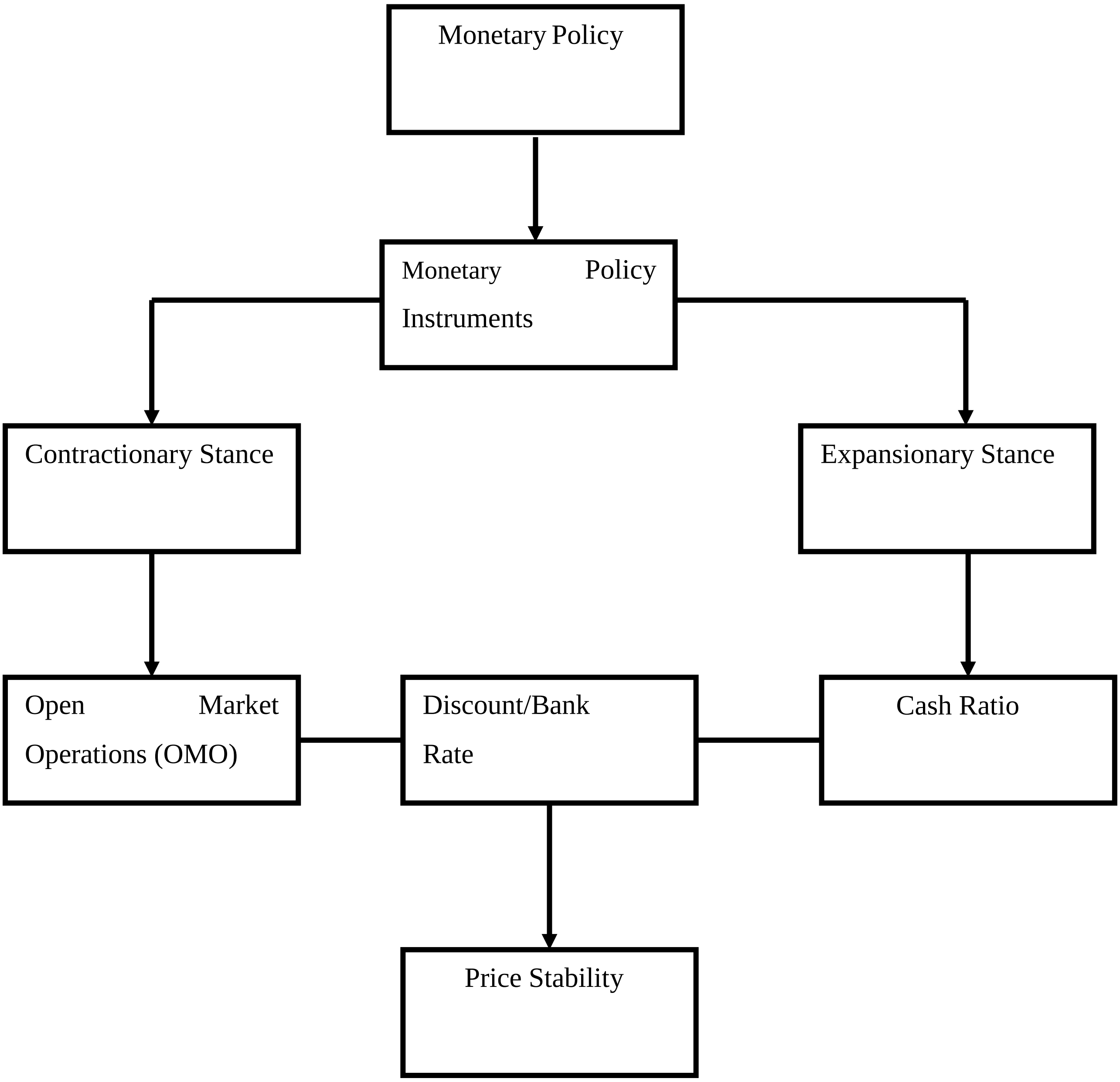
Glossary

Figure 4**: Monetary Policy Transmission**



Source: Author's conception

Monetary Policy: This is the use by the government or central bank of interest rates or controls on the money supply to influence the economy. Monetary policy works through the effects of the cost and availability of loans on real activity, and through this on inflation, and on international capital movements and thus on the exchange rate.

Contractionary Stance: Simply put, contractionary monetary policy contracts (decreases) the supply of a country's currency.

Expansionary Stance: Expansionary monetary policy is simply a policy which expands (increases) the supply of money.

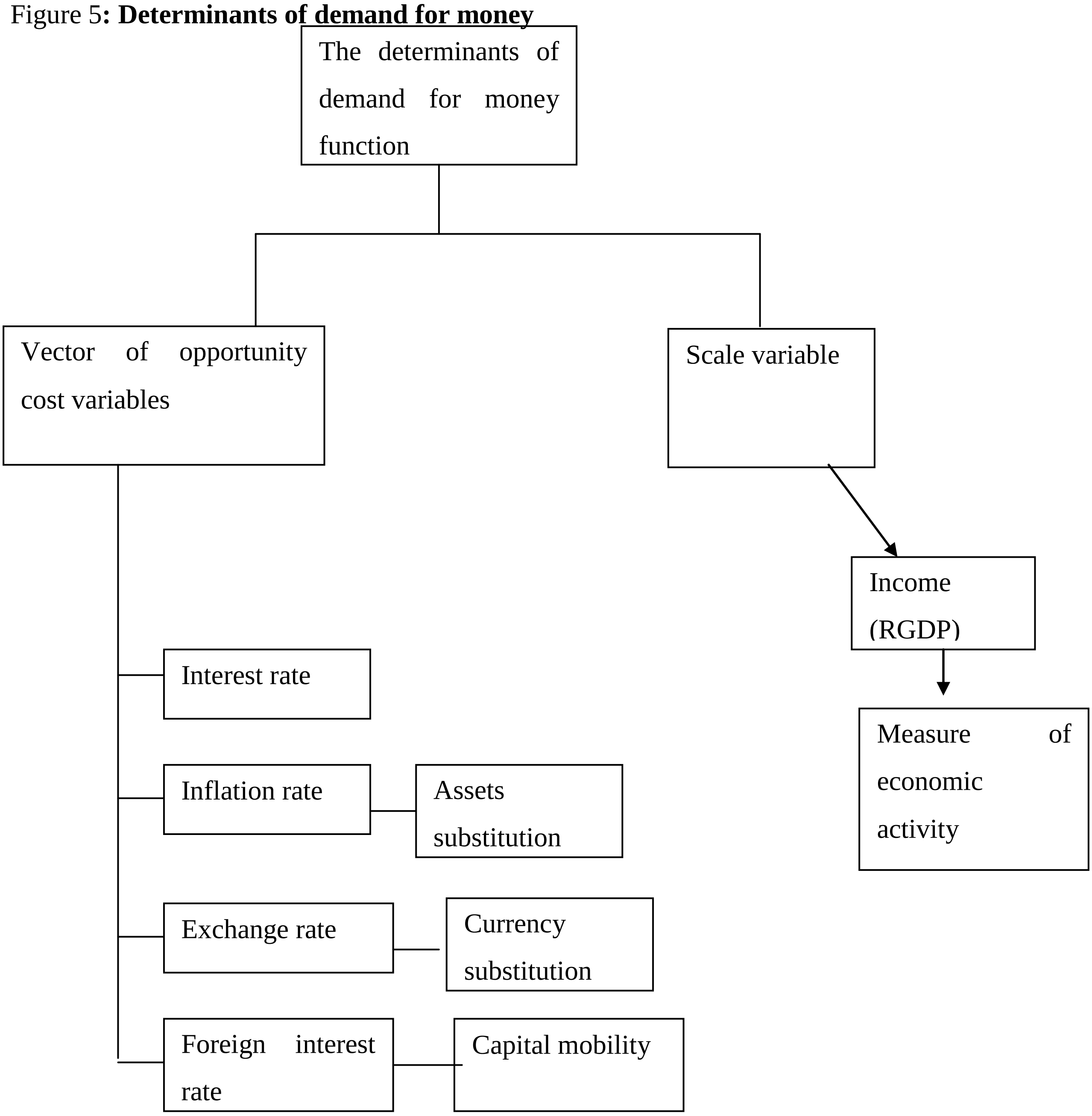
Open Market Operations (OMO): This is the purchase or sale of securities by the central bank as a means of changing interest rates and the money supply.

Discount/Bank Rate: It is minimum rate at which the central bank discounts or re-discounts bills.

Cash Ratio: This is the part of commercial banks liabilities (deposits) required to be kept by the central bank in order for the former to meet customers' demand.

Price Stability: This implies avoiding both prolonged inflation and deflation. Price stability contributes to achieving high levels of economic activity and employment in the economy.

Figure 5**: Determinants of demand for money**



Source: Author's Conception

Scale variable: Either wealth or an income variable can be used. Generally when wealth data is not available, income variable like Gross National Product (GNP) or Real Gross Domestic Product (RGDP) can be used.

Opportunity Cost Variable: An opportunity cost variable in a demand for money function is intended to measure the yield on money against other assets that might be held.

Inflation Rate: This generally affects the demand for money negatively as agents prefer to hold real assets as hedges during the periods of rising inflation.

The Foreign Interest Rates: These are expected to exert negative influence on the demand for money as increase in foreign interest rates potentially induces the domestic residents to increase their holdings of foreign assets which will be financed by drawing down domestic money holdings.

Expected Foreign Exchange Depreciation: This has either a negative or positive relationship with real money balances.

Appendix

Literature Reviewed

Study	Country	Sample	Methodology	Variables	Findings
Baba, Kenneth and William (2013)	Ghana	1980-2010	DOLS	M1,GDP, CPI, Nominal exchange rate.	Stable demand for money function
Inoue and Hamori (2008)	India	1976-2007	DOLS	M1,M2.M3,interest rate, output	Long-run equilibrium when money demand is M1 & M2, No long-run equilibrium when it is M3
Watson (2001)	Jamaica	$1976Q_1$-$1998Q_4$	VAR and VECM	Money supply, NI, deposit price level, interest rate, base money, deposit rate of interest, interest on loan	Stable long-run equilibrium
Sterken (1999)	Ethiopia	$1996Q_1$-$1999Q_4$	Unrestricted VAR model approach	Real M1, real income, shortage and real export coffee price	Break in 1974-1975, long-run equilibrium
Samara (n.d)	Syria	1996-1999	Unrestricted VAR	M1, real per capita GNP, shortage and real export price of coffee yield	Long-run equilibrium
Lungu, Simwaka, and Chiumia (2012)	Malawi	Monthly data: 1985-2010	VAR, VEC, Granger Causality	Real money balances, Price, income, exchange rate, treasury bill, financial innovation	Stable demand for money function
Halicioglu and Ugur (2005)	Turkey	1950-2002	ARDL modeling to cointegration, CUSUM & CUSUMSQ stability tests	Real M1, interest rate, national income, exchange rate	Stable demand for money function

Adam, Kessy, Nyella, and O'Connell (2011)	Tanzania	$1998Q_1$-$2011Q_4$	VAR model & VEC approach	M2, real GDP, interest rate, inflation rate, nominal exchange rate depreciation	Stable cointegrating relationship
Dahmardeh, Pourshahabi, and Mahmoudinia (2011)	Iran	1976-2007	ARDL, EGARCH (1,1)	M1, economic uncertainty, real income, real interest rate exchange rate, inflation rate, growth of GDP, terms of trade.	Long-run relationship between M1 and its determinants
Suliman and Dafaalla (2011)	Sudan	1960-2010	Johansen ML procedure	Real money balances, real GDP, rate of inflation, exchange rate.	Stable demand for money function
Dritsakis (2011)	Hungary	$1995Q_1$-$2010Q_1$	ARDL, CUSUM,CUSUMSQ	M1, real income, inflation rate, nominal exchange rate.	Stable demand for money function
Omanukwe (2010)	Nigeria	$1990Q_1$-$2008Q_4$	Engle-Granger two stage approach	Money demand, price, output, interest rate ratio of demand deposits/time deposits	Weakening uni-directional causality from money supply to consumer price, long-run relationship between the variables
Nwafor, Nwakanma, Nkansah, and Thompson (2007)	Nigeria	$1986Q_3$-$2005Q_4$	ADF for unit root, Johansen-Juselius cointegration	M2, real income, real interest rate, expected rate of inflation	Long-run relationship among aggregate demand for money.
Bassey, Bessong, and Effiong (2012)	Nigeria	1970-2007	OLS	Money demand, domestic interest rate, inflation rate, exchange rate	Inverse relationship between money demand and its determinants
Sovannroeun (2008)	Cambodia	Monthly data: 1994:12-2006:12	ARDL modeling to cointegration, CUSUM & CUSUMSQ test for	M1, real income, inflation rate, exchange rate	stable demand for money function

			stability		
Hamori (2008)	Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Congo Rep., Cote'Ivoire, Equitorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Niger, Nigeria, Rwanda, Senegal, Seychelles, Sierra-Leone, South Africa, Swaziland, Togo, Uganda, Zambia, Zimbabwe.	1980-2005	Non-stationary panel data analysis	M1 & M2, real GDP, interest rate, inflation rate.	Cointegration relation with respect to money demand regardless of whether M1 or M2
Akinlo (2006)	Nigeria	$1970Q_1$-$2002Q_4$	ARDL modeling to cointegration	M2, income, interest rate, exchange rate	Stable demand for money function
Dagher and Kovanen (2011)	Ghana	$1990Q_1$-$2009Q_4$	ARDL modeling to cointegration, CUSUM, CUSUMSQ for stability	M2, real income, nominal exchange rate, domestic deposit interest rate, US dollar Libor interest rate.	Stable long-run demand for money function
Nachega (2001)	Cameroon	1963/64-1993/94	VAR model analysis	Money demand, income, vector of rates of return	Short-run demand for money function
Bitrus (2011)	Nigeria	1985-2007	OLS, CUSUM stability test	M1, income, interest rate, exchange rate, stock market	Stable demand for money function

Khan and Ali (1997)	Pakistan	1972-1992	Engle-Granger cointegration	M1 & M2, income, price, interest rate	Unstable demand for money (M1) function, stable function for M2
Kumar, Kumar, Webber and Fargher (2010)	Nigeria	1960-2008	Gregory-Hansen (1996a & b) cointegration	M1, real income, nominal interest rate,	Break dates in 1986 & 1992, stable demand for money function
Chukwu, Agu, and Onah (2010)	Nigeria	$1986Q_1$-$1997Q_4$	Gregory-Hansen (1996a & b) cointegration	Real M2, real income, interest rate, expected rate of inflation	Break dates in 1994, 1996, & 1997.
Felmingham and Zhang (2000)	Australia	Monthly data: 1976(3)-1998(4)	Gregory-Hanson (1996a & b) cointegration	M2, non-money assets, GDP	Break in 1991
Anoruo (2002)	Nigeria	$1986Q_2$-$2000Q_1$	Johansen and Joselius (1990) cointegration, Hansen (1992)	M2, economic growth, real discount rate.	Stable demand for money function
Das and Mandal (2000)	India	Monthly data: 1981:4-1998:3		M3, industrial production, short-term interest rates, wholesale price, share price, real exchange rate	Stable demand for money function
Hamori and Hamori (2008)	11 European Countries		Panel estimation	M3, output, interest rate	Stable demand for money function
Onafowora and Owoye (2007)	Nigeria	$1986Q_1$-$2001Q_4$	VEC Analysis and Johansen ML, CUSUM & CUSUMSQ stability tests	Real M2, real income, inflation rate, domestic nominal interest rate, exchange rate, foreign interest rate	Stable demand for money function
Suliman and Dafaalla (2011)	Sudan	1960-2010	Johansen Maximum Likelihood	Real money balances, real GDP, the rate of inflation, exchange rate	Stable demand for money function
Nduka, Chukwu and	Nigeria	1986-2011	OLS, CUSUM and CUSUMSQ stability	Real M2, real interest rate, GDP, exchange rate depreciation,	Stable Demand for money function

Nwakaire (2013)			tests	inflation rate	
Gbadebo (2010)	Nigeria	1970-2004	OLS, Engle-Granger	M2, nominal interest rate on time deposit, RGDP, nominal rate on treasury bills, dummy variable to capture SAP period, consumer price index and lag of broad money.	
Omotor (2011)	Nigeria	1960-2008	Gregory-Hansen Cointegration (1996b), CUSUM and CUSUMSQ stability test.	M2, RGDP, nominal interst rate	Stable Demand for Money

Source:Autho

YEAR	RDM	RIR	RF	RI	REX	RY
1970	90.57407	-6.8	7.9	13.8	0.1	4219
1971	83.344	-9	5.7	16	0.22	41715.5
1972	94.17829	3.8	5.2	3.2	0.2	4892.8
1973	111.9485	1.6	8	5.4	0.2	5310
1974	152.7468	-6.4	10.8	13.4	0.1	15919.7
1975	204.8889	-27.9	7.9	33.9	0.24	271720
1976	230.668	-15.2	6.8	21.2	0.28	29146.5
1977	266.8412	-9.4	6.8	15.4	0.32	31520.3
1978	219.8667	-9.6	9.1	16.6	0.32	29212.4
1979	265.574	-4.3	12.7	11.8	0.32	29948
1980	356.974	-2.4	15.3	9.9	0.28	31546.8
1981	315.6582	-13.15	18.9	20.9	0.34	205222.1
1982	328.3775	2.55	14.9	7.7	0.38	199685.3
1983	307.4978	-13.2	10.8	23.2	0.49	185598.1
1984	243.9457	-27.1	12	39.6	0.7	183563
1985	262.776	3.75	9.9	5.5	0.83	201036.3
1986	259.8653	5.1	8.3	5.4	1.94	205971.4
1987	289.7367	7.3	8.2	10.2	4.11	204806.5
1988	250.8107	-21.8	9.3	38.3	6.95	219875.6
1989	172.5523	-14.1	10.9	40.9	16.26	236729.6
1990	234.1832	18	10	7.5	18.03	267550
1991	264.4297	7.01	8.5	13	24.04	265379.1
1992	269.8276	-14.7	6.3	44.5	58.1	271365.5
1993	263.9702	-38.88	6	57.2	114.7	274833.3
1994	226.0904	-36	7.1	57	174.4	275450.6
1995	156.226	-52.62	8.8	72.8	293.1	281407.4
1996	140.3789	-9.56	8.3	29.3	19.07426	293745.4
1997	150.0878	5.04	8.4	8.5	19.2189	302022.5
1998	166.9115	8.29	8.4	10	19.87715	310890.1
1999	208.4029	14.72	5.2	6.6	53.7556	312183.5
2000	288.5613	11.08	9.2	6.9	58.24839	329178.7
2001	308.3105	-0.61	6.9	18.9	70.58229	356994.3
2002	326.6274	11.95	4.7	12.9	85.13346	433203.5
2003	361.3842	6.71	4.1	14	106.6806	477533
2004	358.157	4.18	4.3	15	126.6871	527576
2005	378.0144	0.05	6.2	17.9	143.7826	561931.4
2006	499.7645	8.69	8	8.55	148.3301	595821.6
2007	6373.021	10.3775	8.1	6.56	155.7536	634251.1
2008	8976.533	0.075431	5.1	15.06	93.64	672202.6
2009	8334.92	5.060833	3.3	13.93	98.77	718977.3
2010	8481.435	5.78562	4.2	11.8	92.31	7763322
2011	7907.441	5.717556	3.75	10.3	89.91408	834161.8

2012	10255.31	4.79	3.98	12	87.3225	888893

Source: CBN statistical Bulletin of various years and IMF

UNIT ROOT TEST AT LEVELS

Null Hypothesis: **RDM** has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

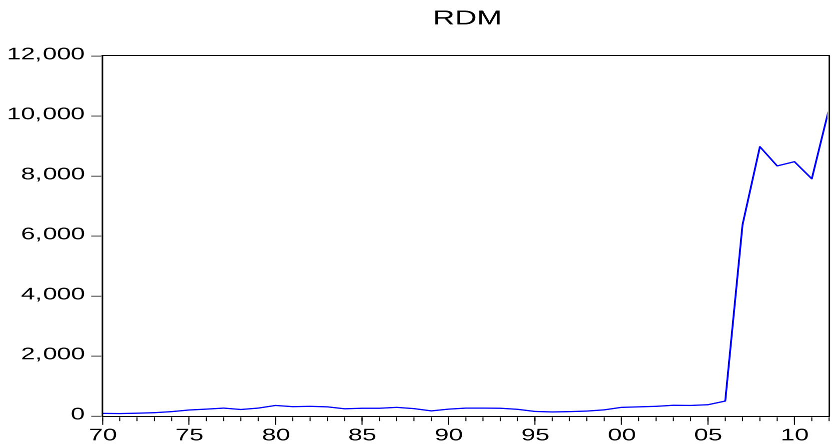
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.977478	0.9956
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RDM)
Method: Least Squares
Date: 04/01/14 Time: 12:07
Sample (adjusted): 1971 2012

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RDM(-1)	0.062458	0.063897	0.977478	0.3342
C	168.8766	178.4738	0.946226	0.3497

R-squared	0.023329	Mean dependent var	242.0175
Adjusted R-squared	-0.001087	S.D. dependent var	1049.509
S.E. of regression	1050.079	Akaike info criterion	16.79757
Sum squared resid	44106659	Schwarz criterion	16.88031
Log likelihood	-350.7489	Hannan-Quinn criter.	16.82790
F-statistic	0.955464	Durbin-Watson stat	1.539558
Prob(F-statistic)	0.334207		



Null Hypothesis: **RDM** has a unit root
Exogenous: Constant
Bandwidth: 6 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		1.146750	0.9973
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

Residual variance (no correction)	1050159.
HAC corrected variance (Bartlett kernel)	956416.1

Phillips-Perron Test Equation
Dependent Variable: D(RDM)
Method: Least Squares
Date: 04/01/14 Time: 12:11
Sample (adjusted): 1971 2012
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RDM(-1)	0.062458	0.063897	0.977478	0.3342
C	168.8766	178.4738	0.946226	0.3497

R-squared	0.023329	Mean dependent var	242.0175
Adjusted R-squared	-0.001087	S.D. dependent var	1049.509
S.E. of regression	1050.079	Akaike info criterion	16.79757
Sum squared resid	44106659	Schwarz criterion	16.88031
Log likelihood	-350.7489	Hannan-Quinn criter.	16.82790
F-statistic	0.955464	Durbin-Watson stat	1.539558
Prob(F-statistic)	0.334207		

Null Hypothesis: **RY** has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic based on SIC, MAXLAG=9)

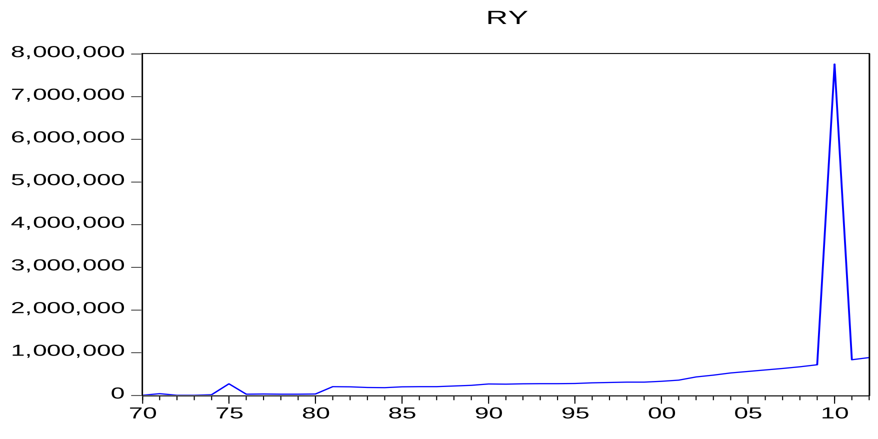
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.469819	1.0000
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RY)
Method: Least Squares
Date: 04/01/14 Time: 12:12
Sample (adjusted): 1973 2012
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RY(-1)	2.542320	1.029355	2.469819	0.0184
D(RY(-1))	-3.698405	1.103233	-3.352333	0.0019
D(RY(-2))	-3.872431	1.181647	-3.277146	0.0023
C	-364352.4	300630.9	-1.211959	0.2334

R-squared	0.571400	Mean dependent var	22100.01
Adjusted R-squared	0.535684	S.D. dependent var	1583531.
S.E. of regression	1079030.	Akaike info criterion	30.71566
Sum squared resid	4.19E+13	Schwarz criterion	30.88455
Log likelihood	-610.3133	Hannan-Quinn criter.	30.77673
F-statistic	15.99815	Durbin-Watson stat	2.056067
Prob(F-statistic)	0.000001		



Null Hypothesis: **RY** has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.545358	0.0000
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

Residual variance (no correction)	1.32E+12
HAC corrected variance (Bartlett kernel)	1.38E+12

Phillips-Perron Test Equation
Dependent Variable: D(RY)
Method: Least Squares
Date: 04/01/14 Time: 12:13
Sample (adjusted): 1971 2012
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RY(-1)	-0.865302	0.156626	-5.524630	0.0000
C	414521.1	195169.3	2.123905	0.0399

R-squared	0.432797	Mean dependent var	21063.67
Adjusted R-squared	0.418617	S.D. dependent var	1544455.
S.E. of regression	1177623.	Akaike info criterion	30.84234
Sum squared resid	5.55E+13	Schwarz criterion	30.92509
Log likelihood	-645.6892	Hannan-Quinn criter.	30.87267
F-statistic	30.52153	Durbin-Watson stat	2.032853
Prob(F-statistic)	0.000002		

Null Hypothesis: **RIR** has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

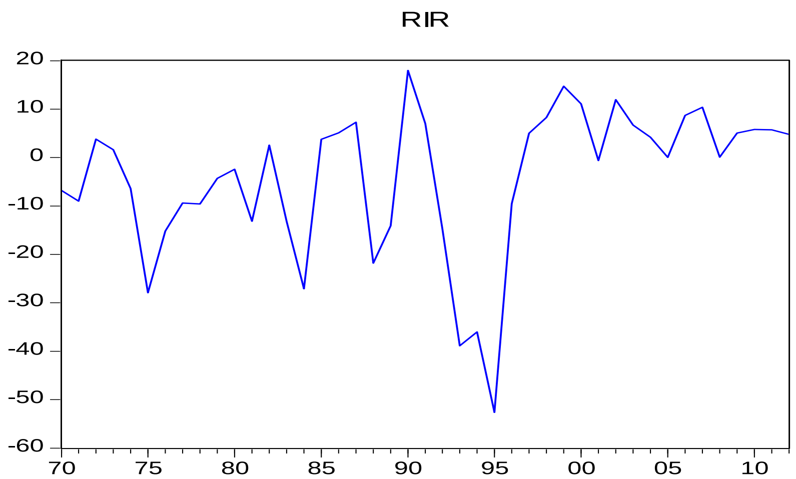
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.401580	0.0165
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RIR)
Method: Least Squares
Date: 04/01/14 Time: 12:14
Sample (adjusted): 1971 2012
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RIR(-1)	-0.452660	0.133074	-3.401580	0.0015
C	-1.727426	2.096679	-0.823887	0.4149

R-squared	0.224366	Mean dependent var	0.275952
Adjusted R-squared	0.204976	S.D. dependent var	14.62577
S.E. of regression	13.04094	Akaike info criterion	8.020512
Sum squared resid	6802.646	Schwarz criterion	8.103259
Log likelihood	-166.4308	Hannan-Quinn criter.	8.050842
F-statistic	11.57074	Durbin-Watson stat	1.785168
Prob(F-statistic)	0.001532		



Null Hypothesis: **RIR** has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.314907	0.0204
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

Residual variance (no correction)	161.9678
HAC corrected variance (Bartlett kernel)	148.3840

Phillips-Perron Test Equation
Dependent Variable: D(RIR)
Method: Least Squares
Date: 04/01/14 Time: 12:16
Sample (adjusted): 1971 2012
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RIR(-1)	-0.452660	0.133074	-3.401580	0.0015
C	-1.727426	2.096679	-0.823887	0.4149

R-squared	0.224366	Mean dependent var	0.275952
Adjusted R-squared	0.204976	S.D. dependent var	14.62577
S.E. of regression	13.04094	Akaike info criterion	8.020512
Sum squared resid	6802.646	Schwarz criterion	8.103259
Log likelihood	-166.4308	Hannan-Quinn criter.	8.050842
F-statistic	11.57074	Durbin-Watson stat	1.785168
Prob(F-statistic)	0.001532		

Null Hypothesis: **REX** has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

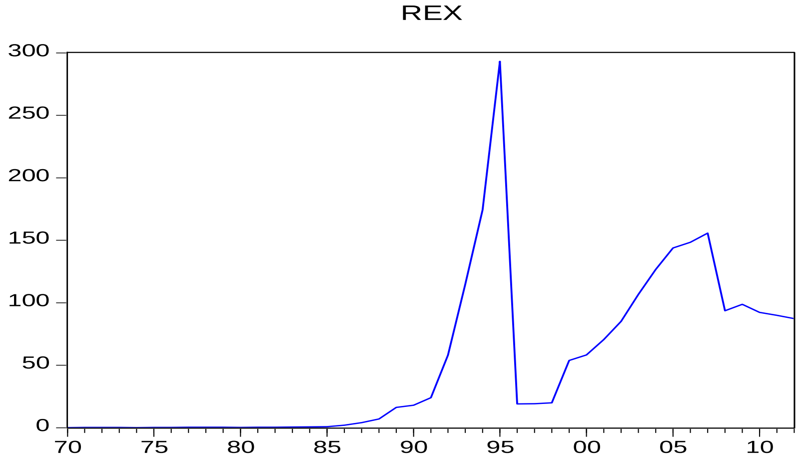
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.646858	0.0919
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REX)
Method: Least Squares
Date: 04/01/14 Time: 12:17
Sample (adjusted): 1971 2012
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REX(-1)	-0.294473	0.111254	-2.646858	0.0116
C	16.79130	9.136036	1.837920	0.0735

R-squared	0.149042	Mean dependent var	2.076726
Adjusted R-squared	0.127768	S.D. dependent var	50.30878
S.E. of regression	46.98505	Akaike info criterion	10.58398
Sum squared resid	88303.80	Schwarz criterion	10.66673
Log likelihood	-220.2637	Hannan-Quinn criter.	10.61431
F-statistic	7.005860	Durbin-Watson stat	2.068179
Prob(F-statistic)	0.011563		



Null Hypothesis: **REX** has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.582740	0.1045
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

Residual variance (no correction)	2102.471
HAC corrected variance (Bartlett kernel)	1962.991

Phillips-Perron Test Equation
Dependent Variable: D(REX)
Method: Least Squares
Date: 04/01/14 Time: 12:18
Sample (adjusted): 1971 2012
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REX(-1)	-0.294473	0.111254	-2.646858	0.0116
C	16.79130	9.136036	1.837920	0.0735

R-squared	0.149042	Mean dependent var	2.076726
Adjusted R-squared	0.127768	S.D. dependent var	50.30878
S.E. of regression	46.98505	Akaike info criterion	10.58398
Sum squared resid	88303.80	Schwarz criterion	10.66673
Log likelihood	-220.2637	Hannan-Quinn criter.	10.61431
F-statistic	7.005860	Durbin-Watson stat	2.068179
Prob(F-statistic)	0.011563		

Null Hypothesis: **RI** has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

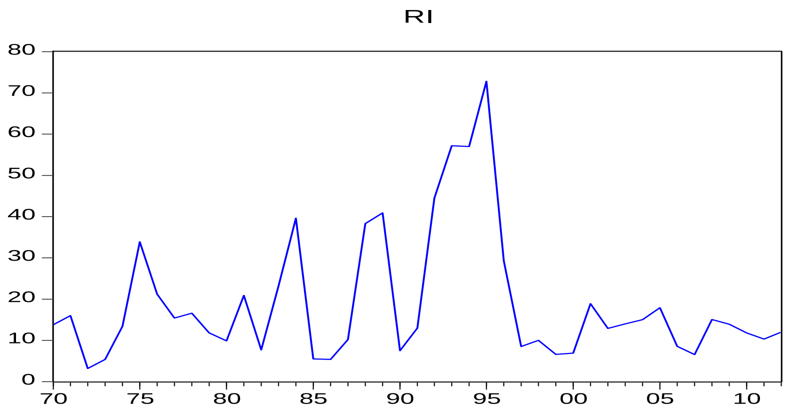
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.278654	0.0223
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RI)
Method: Least Squares
Date: 04/01/14 Time: 12:19
Sample (adjusted): 1971 2012
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RI(-1)	-0.424725	0.129542	-3.278654	0.0022
C	8.153323	3.230230	2.524069	0.0157

R-squared	0.211816	Mean dependent var	-0.042857
Adjusted R-squared	0.192111	S.D. dependent var	14.75029
S.E. of regression	13.25795	Akaike info criterion	8.053520
Sum squared resid	7030.932	Schwarz criterion	8.136266
Log likelihood	-167.1239	Hannan-Quinn criter.	8.083850
F-statistic	10.74957	Durbin-Watson stat	1.713273
Prob(F-statistic)	0.002164		



Null Hypothesis: **RI** has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.179659	0.0283
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

Residual variance (no correction)	167.4031
HAC corrected variance (Bartlett kernel)	151.2293

Phillips-Perron Test Equation
Dependent Variable: D(RI)
Method: Least Squares
Date: 04/01/14 Time: 12:21
Sample (adjusted): 1971 2012
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RI(-1)	-0.424725	0.129542	-3.278654	0.0022
C	8.153323	3.230230	2.524069	0.0157

R-squared	0.211816	Mean dependent var	-0.042857
Adjusted R-squared	0.192111	S.D. dependent var	14.75029
S.E. of regression	13.25795	Akaike info criterion	8.053520
Sum squared resid	7030.932	Schwarz criterion	8.136266
Log likelihood	-167.1239	Hannan-Quinn criter.	8.083850
F-statistic	10.74957	Durbin-Watson stat	1.713273
Prob(F-statistic)	0.002164		

Null Hypothesis: **RF** has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

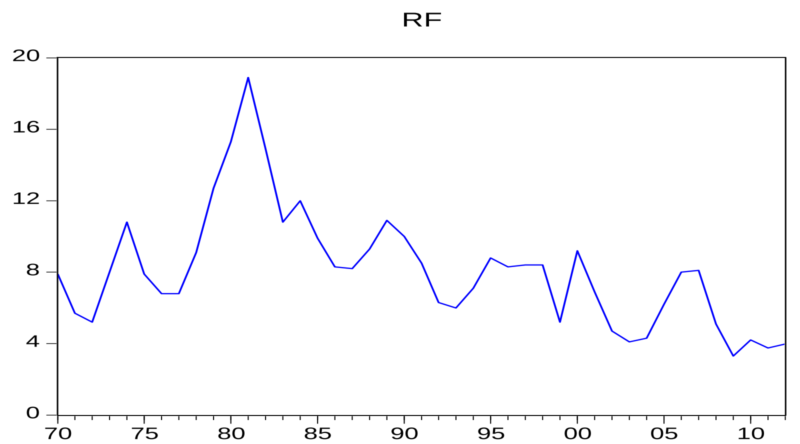
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.943632	0.3099
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 04/01/14 Time: 12:22
Sample (adjusted): 1971 2012
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-0.190712	0.098121	-1.943632	0.0590
C	1.469822	0.863682	1.701810	0.0966

R-squared	0.086293	Mean dependent var	-0.093333
Adjusted R-squared	0.063450	S.D. dependent var	2.108517
S.E. of regression	2.040528	Akaike info criterion	4.310742
Sum squared resid	166.5501	Schwarz criterion	4.393488
Log likelihood	-88.52558	Hannan-Quinn criter.	4.341071
F-statistic	3.777706	Durbin-Watson stat	1.542058
Prob(F-statistic)	0.058999		



Null Hypothesis: **RF** has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.947178	0.3083
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

Residual variance (no correction)	3.965479
HAC corrected variance (Bartlett kernel)	3.979024

Phillips-Perron Test Equation
Dependent Variable: D(RF)
Method: Least Squares
Date: 04/01/14 Time: 12:23
Sample (adjusted): 1971 2012
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RF(-1)	-0.190712	0.098121	-1.943632	0.0590
C	1.469822	0.863682	1.701810	0.0966

R-squared	0.086293	Mean dependent var	-0.093333
Adjusted R-squared	0.063450	S.D. dependent var	2.108517
S.E. of regression	2.040528	Akaike info criterion	4.310742
Sum squared resid	166.5501	Schwarz criterion	4.393488
Log likelihood	-88.52558	Hannan-Quinn criter.	4.341071
F-statistic	3.777706	Durbin-Watson stat	1.542058
Prob(F-statistic)	0.058999		

UNIT ROOT TEST AT FIRST ORDER DIFFERENCE

Null Hypothesis: **D(RDM)** has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

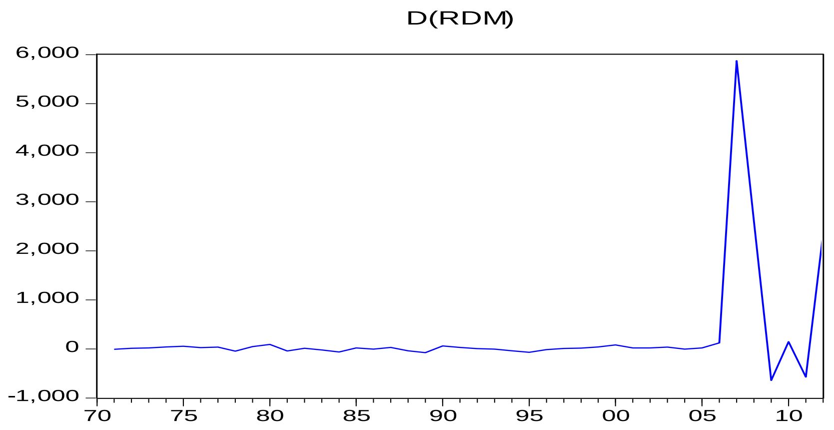
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.486148	0.0009
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RDM,2)
Method: Least Squares
Date: 04/01/14 Time: 12:25
Sample (adjusted): 1972 2012
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RDM(-1))	-0.732049	0.163180	-4.486148	0.0001
C	197.0104	165.3696	1.191334	0.2407

R-squared	0.340386	Mean dependent var	57.44143
Adjusted R-squared	0.323473	S.D. dependent var	1264.388
S.E. of regression	1039.974	Akaike info criterion	16.77933
Sum squared resid	42180331	Schwarz criterion	16.86292
Log likelihood	-341.9763	Hannan-Quinn criter.	16.80977
F-statistic	20.12553	Durbin-Watson stat	1.777316
Prob(F-statistic)	0.000062		



Null Hypothesis: **D(RDM)** has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.328203	0.0014
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

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

Residual variance (no correction)	1028789.
HAC corrected variance (Bartlett kernel)	867288.6

Phillips-Perron Test Equation
Dependent Variable: **D(RDM,2)**
Method: Least Squares
Date: 04/01/14 Time: 12:27
Sample (adjusted): 1972 2012
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RDM(-1))	-0.732049	0.163180	-4.486148	0.0001
C	197.0104	165.3696	1.191334	0.2407

R-squared	0.340386	Mean dependent var	57.44143
Adjusted R-squared	0.323473	S.D. dependent var	1264.388
S.E. of regression	1039.974	Akaike info criterion	16.77933
Sum squared resid	42180331	Schwarz criterion	16.86292
Log likelihood	-341.9763	Hannan-Quinn criter.	16.80977
F-statistic	20.12553	Durbin-Watson stat	1.777316
Prob(F-statistic)	0.000062		

Null Hypothesis: **D(RY)** has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=9)

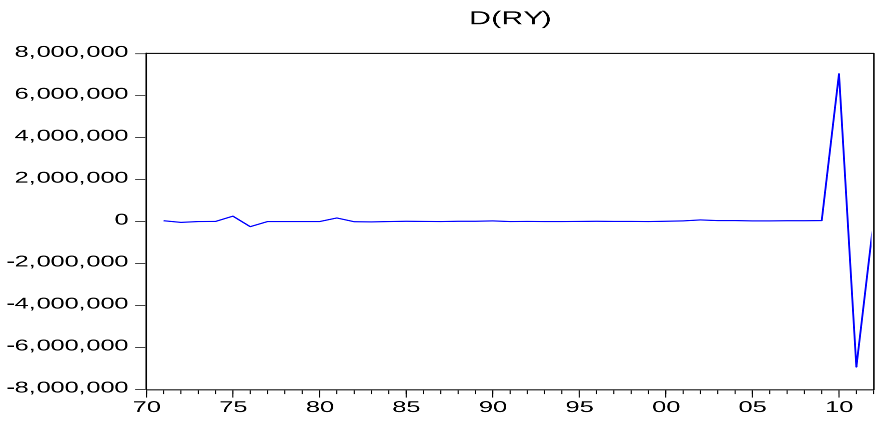
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.118591	0.0000
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RY,2)
Method: Least Squares
Date: 04/01/14 Time: 12:27
Sample (adjusted): 1973 2012
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RY(-1))	-3.005484	0.370198	-8.118591	0.0000
D(RY(-1),2)	1.004986	0.234632	4.283239	0.0001
C	236865.8	188182.2	1.258704	0.2160

R-squared	0.832955	Mean dependent var	2288.847
Adjusted R-squared	0.823926	S.D. dependent var	2742999.
S.E. of regression	1150996.	Akaike info criterion	30.82219
Sum squared resid	4.90E+13	Schwarz criterion	30.94886
Log likelihood	-613.4438	Hannan-Quinn criter.	30.86799
F-statistic	92.24863	Durbin-Watson stat	1.997750
Prob(F-statistic)	0.000000		



Null Hypothesis: **D(RY**) has a unit root
Exogenous: Constant
Bandwidth: 40 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-40.20975	0.0001
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

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

Residual variance (no correction)	1.79E+12
HAC corrected variance (Bartlett kernel)	7.37E+10

Phillips-Perron Test Equation
Dependent Variable: **D(RY,2)**
Method: Least Squares
Date: 04/01/14 Time: 12:29
Sample (adjusted): 1972 2012
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RY(-1))	-1.500252	0.138653	-10.82022	0.0000
C	30789.22	214159.7	0.143768	0.8864

R-squared	0.750124	Mean dependent var	420.3578
Adjusted R-squared	0.743717	S.D. dependent var	2708521.
S.E. of regression	1371174.	Akaike info criterion	31.14778
Sum squared resid	7.33E+13	Schwarz criterion	31.23137
Log likelihood	-636.5295	Hannan-Quinn criter.	31.17822
F-statistic	117.0773	Durbin-Watson stat	2.168215
Prob(F-statistic)	0.000000		

Null Hypothesis: **D(REX)** has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

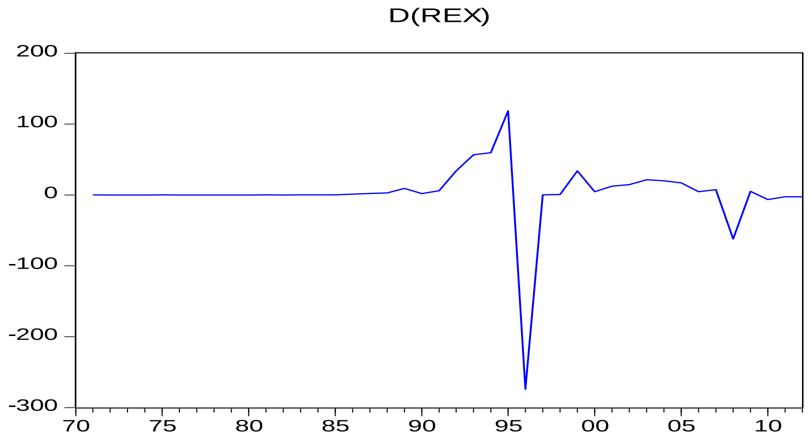
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.536183	0.0000
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REX,2)
Method: Least Squares
Date: 04/01/14 Time: 12:30
Sample (adjusted): 1972 2012
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(REX(-1))	-1.185842	0.157353	-7.536183	0.0000
C	2.531554	7.922893	0.319524	0.7510

R-squared	0.592877	Mean dependent var	-0.066136
Adjusted R-squared	0.582438	S.D. dependent var	78.43386
S.E. of regression	50.68324	Akaike info criterion	10.73662
Sum squared resid	100182.8	Schwarz criterion	10.82021
Log likelihood	-218.1007	Hannan-Quinn criter.	10.76706
F-statistic	56.79405	Durbin-Watson stat	2.034149
Prob(F-statistic)	0.000000		



Null Hypothesis: **D(REX)** has a unit root
Exogenous: Constant
Bandwidth: 14 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-11.34675	0.0000
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

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

Residual variance (no correction)	2443.483
HAC corrected variance (Bartlett kernel)	474.7186

Phillips-Perron Test Equation
Dependent Variable: D(REX,2)
Method: Least Squares
Date: 04/01/14 Time: 12:32
Sample (adjusted): 1972 2012
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(REX(-1))	-1.185842	0.157353	-7.536183	0.0000
C	2.531554	7.922893	0.319524	0.7510

R-squared	0.592877	Mean dependent var	-0.066136
Adjusted R-squared	0.582438	S.D. dependent var	78.43386
S.E. of regression	50.68324	Akaike info criterion	10.73662
Sum squared resid	100182.8	Schwarz criterion	10.82021
Log likelihood	-218.1007	Hannan-Quinn criter.	10.76706
F-statistic	56.79405	Durbin-Watson stat	2.034149
Prob(F-statistic)	0.000000		

Null Hypothesis: **D(RF)** has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

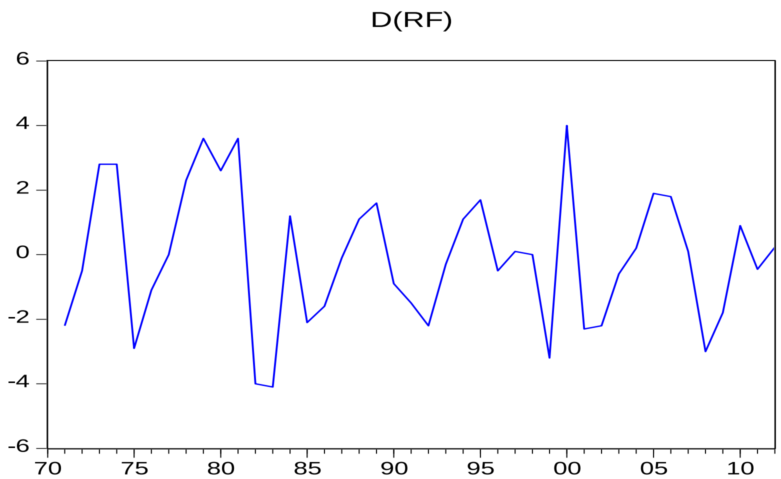
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.511734	0.0000
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RF,2)
Method: Least Squares
Date: 04/01/14 Time: 12:32
Sample (adjusted): 1972 2012
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RF(-1))	-0.863385	0.156645	-5.511734	0.0000
C	-0.028123	0.330572	-0.085074	0.9326

R-squared	0.437872	Mean dependent var	0.059268
Adjusted R-squared	0.423458	S.D. dependent var	2.784470
S.E. of regression	2.114257	Akaike info criterion	4.382835
Sum squared resid	174.3333	Schwarz criterion	4.466424
Log likelihood	-87.84811	Hannan-Quinn criter.	4.413273
F-statistic	30.37921	Durbin-Watson stat	1.934844
Prob(F-statistic)	0.000002		



Null Hypothesis: **D(RF)** has a unit root
Exogenous: Constant
Bandwidth: 8 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.682928	0.0000
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

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

Residual variance (no correction)	4.252031
HAC corrected variance (Bartlett kernel)	1.828352

Phillips-Perron Test Equation
Dependent Variable: D(RF,2)
Method: Least Squares
Date: 04/01/14 Time: 12:34
Sample (adjusted): 1972 2012
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RF(-1))	-0.863385	0.156645	-5.511734	0.0000
C	-0.028123	0.330572	-0.085074	0.9326

R-squared	0.437872	Mean dependent var	0.059268
Adjusted R-squared	0.423458	S.D. dependent var	2.784470
S.E. of regression	2.114257	Akaike info criterion	4.382835
Sum squared resid	174.3333	Schwarz criterion	4.466424
Log likelihood	-87.84811	Hannan-Quinn criter.	4.413273
F-statistic	30.37921	Durbin-Watson stat	1.934844
Prob(F-statistic)	0.000002		

GREGORY-HANSEN COINTEGRATION TEST WITH STRUCTURAL BREAKS

CALENDAR(A) 1970:1
@GREGORYHANSEN(METHOD=BIC,BREAK=INTERCEPT)
RDM Constant RY RIR
Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR
Break in Intercept. No Trend
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -7.736
Achieved At 2006:01
1% Critical Value -5.770

5% Critical Value -5.280

@GREGORYHANSEN(DET=TREND,METHOD=BIC,BREAK=INTERCEPT)
RDM Constant RY RIR
Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR
Break in Intercept. Trend Included
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -7.558
Achieved At 2006:01
1% Critical Value -6.050
5% Critical Value -5.570

@GREGORYHANSEN(METHOD=BIC,BREAK=ALL)
RDM Constant RY RIR
Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR
Full Structural Break. No Trend
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -8.627
Achieved At 2005:01
1% Critical Value -6.510
5% Critical Value -6.000

@GREGORYHANSEN(DET=TREND,METHOD=BIC,BREAK=ALL)
RDM Constant RY RIR
Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR
Full Structural Break. Trend Included
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -8.718
Achieved At 2006:01
1% Critical Value -6.890
5% Critical Value -6.320

@GREGORYHANSEN(METHOD=BIC,BREAK=INTERCEPT)
RDM Constant RY RIR REX
Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR REX
Break in Intercept. No Trend
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -7.766
Achieved At 2006:01
1% Critical Value -6.050
5% Critical Value -5.560

@GREGORYHANSEN(DET=TREND,METHOD=BIC,BREAK=INTERCEPT)
RDM Constant RY RIR REX

Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR REX
Break in Intercept. Trend Included
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -7.903
Achieved At 2006:01
1% Critical Value -6.360
5% Critical Value -5.830

@GREGORYHANSEN(METHOD=BIC,BREAK=ALL)
RDM Constant RY RIR REX
Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR REX
Full Structural Break. No Trend
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -9.945
Achieved At 2005:01
1% Critical Value -6.920
5% Critical Value -6.410

@GREGORYHANSEN(DET=TREND,METHOD=BIC,BREAK=ALL)
RDM Constant RY RIR REX
Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR REX
Full Structural Break. Trend Included
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -8.298
Achieved At 2005:01
1% Critical Value -7.310
5% Critical Value -6.840

@GREGORYHANSEN(METHOD=BIC,BREAK=INTERCEPT)
RDM Constant RY RIR REX RI
Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR REX RI
Break in Intercept. No Trend
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -7.907
Achieved At 2006:01
1% Critical Value -5.16
5% Critical Value -4.92

@GREGORYHANSEN(DET=TREND,METHOD=BIC,BREAK=INTERCEPT)
RDM Constant RY RIR REX RI
Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR REX RI
Break in Intercept. Trend Included
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -7.774
Achieved At 2006:01

1% Critical Value -5.51
5% Critical Value -5.29

@GREGORYHANSEN(METHOD=BIC,BREAK=ALL)
RDM Constant RY RIR REX RI
Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR REX RI
Full Structural Break. No Trend
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -9.897
Achieved At 2005:01
1% Critical Value -5.73
5% Critical Value -5.23

@GREGORYHANSEN(DET=TREND,METHOD=BIC,BREAK=ALL)
RDM Constant RY RIR REX RI
Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR REX RI
Full Structural Break. Trend Included
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -8.673
Achieved At 2005:01
1% Critical Value -5.51
5% Critical Value -5.29

@GREGORYHANSEN(METHOD=BIC,BREAK=INTERCEPT)
RDM Constant RY RIR REX RI RF
Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR REX RI RF
Break in Intercept. No Trend
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -7.745
Achieved At 2006:01
1% Critical Value -5.16
5% Critical Value -4.92

@GREGORYHANSEN(DET=TREND,METHOD=BIC,BREAK=INTERCEPT)
RDM Constant RY RIR REX RI RF
Gregory-Hansen Cointegration Test
Variables
RDM Constant RY RIR REX RI RF
Break in Intercept. Trend Included
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -7.796
Achieved At 2006:01
1% Critical Value -5.51
5% Critical Value -5.29

@GREGORYHANSEN(METHOD=BIC,BREAK=ALL)
RDM Constant RY RIR REX RI RF
Gregory-Hansen Cointegration Test
Variables

RDM Constant RY RIR REX RI RF
Full Structural Break. No Trend
With 0 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -9.807
Achieved At 2003:01
1% Critical Value -5.73
5% Critical Value -5.29

@GREGORYHANSEN(DET=TREND,METHOD=BIC,BREAK=ALL)
RDM Constant RY RIR REX RI RF
Gregory-Hansen Cointegration Test
Variables
Constant RY RIR REX RI RF
Full Structural Break. Trend Included
With 2 lags chosen from 2 by BIC/SBC
Minimum T-Statistic -6.005
Achieved At 1999:01
1% Critical Value -5.51
5% Critical Value -5.29

THE MODEL

LINEAR REGRESSION RESULT

Dependent Variable: **LOG(RDM)**
Method: Least Squares
Date: 04/01/14 Time: 13:14
Sample: 1970 2012
Included observations: 43

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.590591	0.702010	3.690250	0.0007
LOG(RY)	0.389297	0.064157	6.067909	0.0000
RIR	-0.043969	0.014731	-2.984821	0.0051
REX	0.006340	0.001443	4.392594	0.0001
RI	-0.069814	0.014290	-4.885407	0.0000
RF	-0.066878	0.023581	-2.836152	0.0074

R-squared	0.909284	Mean dependent var	5.930649
Adjusted R-squared	0.894165	S.D. dependent var	1.320651
S.E. of regression	0.429638	Akaike info criterion	1.296151
Sum squared resid	6.645188	Schwarz criterion	1.582858
Log likelihood	-20.86725	Hannan-Quinn criter.	1.401880
F-statistic	60.14083	Durbin-Watson stat	1.396787
Prob(F-statistic)	0.000000		

WHITE HETEROSCEDASTICITY

Heteroskedasticity Test: White

F-statistic	11.23072	Prob. F(27,15)	0.0000
Obs*R-squared	40.97316	Prob. Chi-Square(27)	0.0414
Scaled explained SS	88.40250	Prob. Chi-Square(27)	0.0000

Dependent Variable: RESID^2
Method: Least Squares

Sample: 1970 2012
Included observations: 43

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-18.40169	18.96086	-0.970509	0.3472
LOG(RY)	1.943923	1.684048	1.154316	0.2664
(LOG(RY))^2	-0.033029	0.037498	-0.880814	0.3923
(LOG(RY))*RIR	-0.008234	0.031046	-0.265224	0.7944
(LOG(RY))*REX	0.011274	0.005105	2.208481	0.0432

(LOG(RY))*RI	-0.019570	0.033558	-0.583167	0.5684
(LOG(RY))*RF	-0.099894	0.080643	-1.238718	0.2345
(LOG(RY))*SER01	0.000239	0.000392	0.607971	0.5523
RIR	-0.024070	0.366815	-0.065619	0.9485
RIR^2	8.38E-06	0.001402	0.005977	0.9953
RIR*REX	-0.000258	0.000535	-0.481780	0.6369
RIR*RI	0.001700	0.003446	0.493215	0.6290
RIR*RF	0.014582	0.009306	1.567041	0.1380
RIR*SER01	-3.94E-05	2.99E-05	-1.318150	0.2072
REX	-0.149995	0.062391	-2.404121	0.0296
REX^2	8.55E-05	4.72E-05	1.810681	0.0903
REX*RI	-0.000307	0.000598	-0.513440	0.6151
REX*RF	-0.000556	0.001439	-0.386384	0.7046
REX*SER01	8.46E-06	4.39E-06	1.927590	0.0731
RI	0.189311	0.475487	0.398140	0.6961
RI^2	0.001053	0.002739	0.384478	0.7060
RI*RF	0.012692	0.013693	0.926891	0.3687
RI*SER01	-2.46E-05	4.09E-05	-0.601000	0.5568
RF	0.803456	1.317767	0.609711	0.5512
RF^2	0.023769	0.014955	1.589382	0.1328
RF*SER01	-6.29E-05	7.03E-05	-0.894172	0.3854
SER01	-0.003427	0.005682	-0.603038	0.5555
SER01^2	2.46E-08	3.65E-08	0.675377	0.5097

R-squared	0.952864	Mean dependent var	0.154539
Adjusted R-squared	0.868020	S.D. dependent var	0.387982
S.E. of regression	0.140950	Akaike info criterion	-0.831641
Sum squared resid	0.298005	Schwarz criterion	0.315187
Log likelihood	45.88029	Hannan-Quinn criter.	-0.408727
F-statistic	11.23072	Durbin-Watson stat	1.804304
Prob(F-statistic)	0.000007		

SPECIFICATION TEST

Ramsey RESET Test:

F-statistic	0.277578	Prob. F(1,35)	0.6016
Log likelihood ratio	0.339679	Prob. Chi-Square(1)	0.5600

Test Equation:
Dependent Variable: LOG(RDM)
Method: Least Squares
Date: 04/01/14 Time: 13:43
Sample: 1970 2012
Included observations: 43

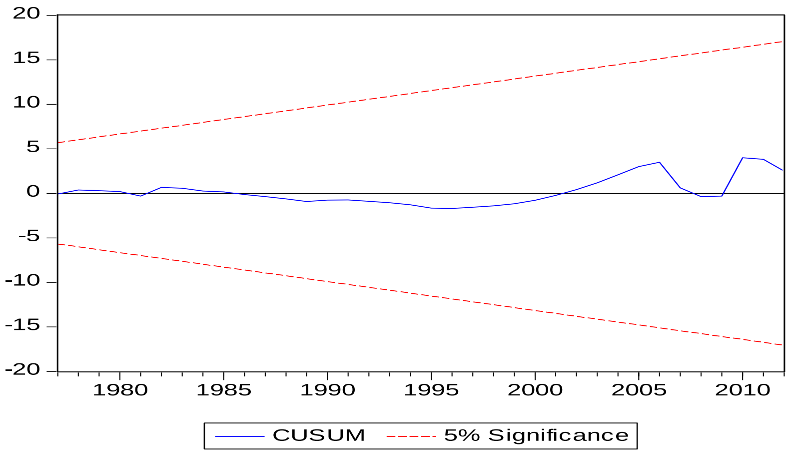
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.340688	0.853168	2.743524	0.0095
LOG(RY)	0.113611	0.527265	0.215472	0.8306
RIR	-0.008548	0.068858	-0.124144	0.9019
REX	0.000615	0.010964	0.056116	0.9556
RI	-0.011629	0.111377	-0.104415	0.9174

RF	0.004642	0.137824	0.033684	0.9733
SER01	7.67E-06	0.000683	0.011226	0.9911
FITTED^2	0.063535	0.120593	0.526856	0.6016

R-squared	0.909998	Mean dependent var	5.930649
Adjusted R-squared	0.891998	S.D. dependent var	1.320651
S.E. of regression	0.434015	Akaike info criterion	1.334763
Sum squared resid	6.592901	Schwarz criterion	1.662429
Log likelihood	-20.69742	Hannan-Quinn criter.	1.455596
F-statistic	50.55448	Durbin-Watson stat	1.307492
Prob(F-statistic)	0.000000		

STRUCTURAL STABILITY TEST

CUSUM TEST



CUSUM SQ TEST