"MONEY DEMAND BEHAVIOR IN TANZANIA: AN EMPIRICAL INVESTIGATION"

BY

LUBOTOLO KULOLA MISUNGWI

X50/64877/2010

A RESEARCH PAPER SUBMITTED TO THE SCHOOL OF ECONOMICS, UNIVERSITY OF NAIROBI, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE MASTER'S DEGREE IN ECONOMICS.

NOVEMBER 2012

DECLARATION

This research paper is my original work and has not been presented for a degree award in any other University

NAME: LUBOTOLO KULOLA MISUNGWI

SIGNATURE:

DATE: 22 - 11 - 2012

This research paper has been submitted with our approval as university supervisors.

NAME: PROF FRANCIS MWEGA

SIGNATURE:

DATE: 22-11-2012

NAME: MR B.O ONGERI

SIGNATURE:

DATE: 22 - 11 - 2012

DEDICATION

This paper is dedicated to my beloved parents Kulola Misungwi, and Lucy Charles and my sisters Joyce, Stella, Agness, Hellen, Monica, Mhoja, as well as my young brothers Marco, Robert, Charles, Antony, and Moses.

ACKNOWLEDGEMENT

My foremost thanks and gratitude go to the Almighty God for the gift of life, good health guidance and protection which enabled me to successfully navigate through this difficult journey of my academic life. Besides, my appreciation goes to the institutions that nurtured me from nursery up to the university level. Many thanks are also extended to all my teachers including the university lecturers for the knowledge they imparted in me, thus enabling me to successfully cope with the post graduate challenges.

I thank my supervisors: Professor Francis F. Mwega and Mr. B. O. Ongeri who relinquished without complain many times instructing, correcting and commenting on my work.

I also thank my family members for the immense moral and spiritual support. Thanks to my beloved mother Lucy Charles for bearing with my very tight schedules in life. A lot of thanks to the St. Augustine University of Tanzania (SAUT) for the financial and moral support. It is also worthy to extend my appreciation to the country and government of Kenya and my beloved home country and government of Tanzania for having had to run many errands of travels and stay during my period of study.

I thank all my friends especially Sarah Daniel, for her prayers and encouragement and moral support. Above all, I owe a lot to my classmates (M.A Economics 2010) in particular Victor, Grace Jeremiah, and Joseph Mwangi.

Irrespective of the aforementioned recognitions, I take full responsibility for any flaws in the writing of this paper. It is my conviction that it will contribute to the knowledge in the field of monetary policy in Tanzania.

ABSTRACT

Although several studies have been done on the demand for money in Tanzania, there are different and mixed findings as a result of different methodologies adopted and the range of data employed in a particular study. The reliability of the estimation results has therefore been challenged and questioned on whether to apply them in formulating and implementing monetary policy based on results generated by different estimation techniques.

This study attempts to investigate money demand behavior in Tanzania over a period 1996:1-2011:4. The study has used the modern and mostly applied estimation techniques like co-integration. Moreover, due to the application of this reliable technique, the findings thereof have been interpreted as a sign of constancy of parameter estimates of stability of demand for money function in addition to the Chow test, recursive residuals, and the CUSUM and CUSUM SQ tests.

In this study also the Augmented Dickey-Fuller (ADF) unit root tests were used to determine the order of integration of the series. The statistical tests on this basis revealed that all time series data are integrated of order one I(1) except inflation rates and deposit rates series which were integrated of order zero I(0). The Johansen test for co-integration shows that demand for money, real GDP, financial innovation, treasury bill rate, and exchange depreciation rate have long run equilibrium relationship.

There is a positive relationship between demand for real balances and real GDP/income, financial innovations, and exchange depreciation rate in the long-run. And a negative relationship exists between demand for real balances and treasury bill rate. Furthermore the real GDP/income coefficient value of elasticity is slightly below unity and together with the financial innovation, treasury bill rate and exchange depreciation rate are statistically significant in the long-run. The results of the study show that the demand for real money in Tanzania is determined by the treasury bill rate, financial innovations and exchange rate depreciation in the short-run. Finally the results of the study reveal that the demand for real money balances in Tanzania is stable.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

LIST OF TABLES AND FIGURES

ABBREVIATIONS AND ACRONYMS

ATMs	Automated Teller Machines
GDP	Gross Domestic Product
GNP	Gross National Product
CPI	Consumer Price Index
U.S	United States
TZ	Tanzania
IFS	International Finance Statistics
IMF	International Monetary Fund
BOT	Bank of Tanzania
CBT	Central Bank of Tanzania
CBs	Commercial Banks
NBFIs	Non Bank Financial Institutions
WAR	Weighted Average Rate of Exchange
OECD	Organization for Economic Cooperation and Development
MPM	Monetary Policy Management
MT	Monetary Targeting
IT	Inflation Targeting
NBS	National Bureau of Statistics
CC	Currency in Circulation

DD	Demand Deposits
TD	Time Deposits
M1	Narrow definition of monetary aggregate
M2	Broad definition of monetary aggregate
M3	Extended broad monetary aggregate
LDCs	Less Developed Countries
DCs	Developed Countries
FIs	Financial Innovations
OLS	Ordinary Least Squares
U K	United Kingdom

CHAPTER ONE

INTRODUCTION

1:0 Background

The Tanzania economy has a mixed experience in economic performance, divided between the pre-reform and post-reform periods since the attainment of independence in 1961 for Tanganyika and 1963 for Zanzibar and Pemba who later came to unite and form the United Republic of Tanzania

The public or state controls prevailed with little economic success and there were many failures up to mid-1980s and early 1990s (Gerdes 1990, Collier and Gunning 1991). And so like other sectors, the money economy up to the mid-1980s was nationalized after1967 one year after the establishment of the Central Bank (BOT)

The results from this approach were that the exchange rate became frequently overvalued and a two digits high rate of inflation dominated the pre-reform era. And also this period was associated with negative real interest rates on deposits, high lending rates and a narrow financial sector from 1971 up to 1988 as indicated by Lindgren et al (1996).

The objective of economic reforms as endorsed in the Vision 2025 are to achieve high growth rate at 8.0% per annum, stable prices at 5.0% per annum inflation rate, desirable exchange rate and interest rate at lower intermediation margin, among others (Ndulu 1997). And in order to direct the economy towards the achievement of these objectives, decisive economic policies are required that can have a greater positive impact on economic growth

The experience of economic development has inextricably been linked to the monetary economy, because demand for money usually goes up when the economy develops due to gradual monetization of the non-monetized sector. This on the other hand will increase productive activities that are directed to positive returns on domestic financial assets and investments in conjunction with price increases and consequently raise the demand for money

Because of the need to attain sustainable long run economic growth in the country, the monetary policy framework is practically on monetary targeting (MT) biased against inflation targeting (IT). This is elaborated more in view of measures of controlling money supply and credit consistently to money demand, raising the returns on domestic financial assets, and reducing the inflation rate to a moderate rate as prescribed in the monetary policy framework.

Whereas control of money and credit is required to maintain price stability, it is also required for accelerating savings and economic growth. So the aim of using quarterly or annual predictions of velocity, price level, nominal GNP, interest rates, exchange rate, etc is imperative for monetary policy and in the study of money demand, as money demand stability and elasticity determines monetary policy effectiveness.

Between 1990-2000 and 2000-2009, statistics show that the economy's average real GDP growth rate was 4.3% and 7.1% respectively and broad money growth (M2) was 14.3% and 25.7%, respectively. The velocity of money was (GDP/M2) 4.1 and 3.4 on average, real interest rate 7.1% and12.2% and the CPI recorded a 20.9% to 6.5% inflation rate while the official exchange rate was 1320.31 and 1462.88, respectively. The figures tell why we should be interested in the study of money demand behavior, relevant to this is the economy's growth rate reliability in connection to money demand and their implications on monetary policy (World Bank 2011).

Meanwhile previous and recent studies conclude that the level of money demand in Tanzania is rising over time. The liberalization of the financial sector that started in 1991 led both to financial innovation which consequently has spurred much impetus in the demand for money (Siram 2001 and Ndanshau 2004).

It is obvious that some studies oppose the use of monetary aggregates in formulating monetary policy (Drama and Shen 2011). However, conventional macroeconomic theory informs us that the effectiveness of monetary policy based on controlling monetary aggregates is tied on the money demand behavior. The stability of the demand for money in the economy makes forecast of income, and employment as well as price stability from money market reliable.

Money demand also has implications on the budget deficits. For instance, the high growth rate in East Asian economies achieved in the 1980s and 1990s produced a growing demand for money. This in turn allowed for a higher rate of monetary financing that could not fuel inflation as stated by (King and Levine 1993 and Judd 1982)

The monetary policy framework in Tanzania scored considerable success in reducing inflation rate from 30% to 5.3% in the 1990s. This was accompanied by reserves increase, stable exchange rates and fairly stable money demand. This also laid a good foundation to macroeconomic stability since the beginning of 2000s (CBT 2012)

Researchers have devoted their time and energy on the subject of money demand function and elasticity with respect to its determinants. These studies are significant because they determine the effectiveness of monetary policy to influence macroeconomic variables.

With regards to the money market, there two approaches which the economy as a whole can adjust its money balance. One is when the Central Bank stabilizes interest rate and allows the quantity of money to respond to demand. Two, is maintaining a fixed exchange rate which enable money balances to be reduced through foreign sector transactions. Thus no excess supply and excess demand effects and in situations of excess money supply, inflation, and also exchange rate depreciations can be major problem. (Samuelson 1986 and Thorsten-Beck et al. 2000)

The rising inflation, depreciating currency and rising nominal interest rates reduce the long run stock of real money balances. Also lower inflation, appreciating currency and declining nominal interest rates eventually results to higher demand for real balances, positive effects on savings and financial intermediation process and possibly to higher employment and output.

This approach however may be relevant if there should be an application of models integrating policy behavior in different options with the banking system, demand for a broad monetary aggregate and with a bundle of goods and financial market variables (Sims 1996)

As the awareness of the above stated theoretical fact increasing, there is a strong desire for Tanzania economy policy institutions to implement economic policies based on relevant and motivating theoretically supported principles. This is mainly stimulated by the financial sector reform which is moving the economy towards real sector reforms both internally and externally.

1:1 Statement of the Problem

The level of money demand in Tanzanian economy has increased in the last one and a half decade (Nachega 2001, Adam et al 2010) Despite of this increase, little has been done to investigate the money demand behavior in the economy This is a serious oversight especially when considering that policy makers use monetary policy tools to deal with economic issues

The policymakers have been worrying about inflation, exchange rate fluctuations as well as developing a robust capital and money market All these and many others call for an urgent need to identify the role of effective policies in the economy

Moreover, because of the demand for money implications for effectiveness of monetary and exchange rate policies (Gordes 1990, Nyella 1998, Ndanshau 2004 and Adam et al 2010) are among the studies of money demand in Tanzania These studies attempt to address the policy problems of inflation, exchange rate variations, credit and bank rates in Tanzania

Though the studies above shed light on money demand, however, they do not deal with the issue of specific money demand behavior. Also they do not tell the money demand behavior in the context of many financial innovations taking place in the country like foreign accounts and fixed time deposit accounts, etc

The changing money demand behavior with specific reference to stability and elasticity is not sufficiently researched Studies are also quiet on the money demand variation with exchange rate and financial innovations Yet the monetary policy statement by BOT suggest that Monetary Targeting as among the very important tools available to policy makers for controlling inflation, interest rates, exchange rates and promoting economic growth

Economic growth has been on increase continuously for over a decade since 1996 The real interest rate on deposits became positive only up to 2001 and dropped to negative values thereafter, while the ever declining currency value and high inflation rates are prevailing

The structural changes in the financial sector and their effects on money demand behavior still need to be investigated The government is using substantial resources from the financial institutions both commercial banks and non-bank financial institutions to finance its fiscal expenditures Not forgetting the financial innovations driven by foreign currency accounts in dollars, pounds and fixed time deposits have become more massive than prior to 2000s

If money demand behavior is not integrated well in the economy and money, capital, and credit markets in particular, opportunities that would have otherwise been available for individual households, business enterprises and the public sector to stabilize and maintain economic growth might be omitted This would lead to outcomes that are contrary to policy makers expectations, and in the long run may make it difficult to achieve development goals

Therefore this study aimed at making an empirical investigation of money demand behavior and finding out how the structural changes that are taking place (economic growth, interest rates, general price level, exchange rate and financial innovations) had affected the behavior of money demand

1:2 Objectives of Study

The main objective of the study is to investigate the money demand behavior

The specific objectives are

i) To identify the key factors that influence money demand in Tanzania

ii) To examine the relative significance of these factors in money demand behavior

iii) To assess the money demand stability in Tanzania

1:3 Research Questions

This study aimed at answering the following questions

i) Which variables play substantive role in explaining the demand for money in Tanzania?

ii) What is the relative importance of those variables in relation to money demand behavior?

iii) Is the demand for money in Tanzania stable?

1:4 Justification of the Study

The money demand theory has been explored extensively in economic literature particularly in the developing countries era of economic and financial sector reforms. The reasons have been to underscore the applicability of the assumptions and features underlying the money demand function.

Several econometric methods have been discovered also to manage the problems associated with estimation studies being undertaken. These include the spurious results problem in regression estimations, whereby the unit root tests, cointegration tests, and the Vector Autoregressive (VAR) testing are used to yield more reliable results (Watson1994, and Gujarat, 2004).

Basing on the developing countries financial sector reforms including Tanzania, structural changes have been observed. On real income growth at 7.1%, market interest rates at about 12.2%, exchange rates where currency loosing value overtime, inflation rates increasing now at 13.7% per annum and all these sometimes do pose difficult in the economic management (CBT statistics 2012).

Since these variables are theoretically believed to have influence on money demand function, it is therefore the purpose of this study to investigate the money demand behavior. With focus on its stability, determinants and their elasticities, this is designed to contribute significantly on the study by Adam et al. (2010) as well as the previous studies on the economy using the time series quarterly data of Tanzania.

The selected period for the study is period of increase of formal financial institutions from 30 in 1995 to about 70 in 2011, more than double in 15 years. The period also saw a rapid increase in ATMs, and introduction of M-Pesa, mobile accounts, time deposits and foreign currency accounts. It is also this period of continuous sharp decline of Tanzania currency value against U.S$, between 1996 and 2011 the average depreciation rate is 150%.

CHAPTER TWO

REVIEW OF LITERATURE

2:0 Theoretical Literatures

The most refined money demand models are basically drawn from three schools of thought the Classical School, Keynesian School and the Neo-quantity theorists (monetarists) Primarily, the three theories stem from the fact that the demand for money is subjective in nature, in respect to the influencing variables (Friedman, 1956, 1959)

2:1 The Quantity Theory of Money Demand Model

This basically originates from the identity expression treating money just like any other commodity. In this respect, money demand is determined by income, wealth, price, etc (McCallum, 1988) If we follow the classical assumptions of competitive market economy, relative price and rational behavior of economic agents, we obtain the Fisherian equation of exchange of 1911:

$$MV = PT \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2.1)$$

where "M" denotes the quantity of money in the economy, and V is the velocity of money in circulation assumed to be constant because of full employment P is the general level of price in the economy and T stands for volume of transactions This version implies therefore that money demand is determined by the price level and Income

We can transform the above equation into a quantity theory

$M = PT/V$, where V, is constant, that is the velocity of circulation of money, and is synonymous to money demanded for one unit of transaction, and thus $M = P\ 1/V\ x\ T$, considering that $1/V = K$, inverse of velocity. Given KT is constant, T, constant, implies that an increase in P will increase nominal money balance proportionately Hence obviously the demand for money is a demand for real money balances in the economy Otherwise people will suffer from money illusion (Friedman 1956, Judd and Scadding 1982)

The constancy of velocity gave an implication to the Cambridge theorists like Pigou's 1917, and Marshall's Cambridge approach that money demand is a stable function of nominal output as some measures of transactions, wealth and a set of variables that influence asset yield (MacCallum1988). And as time was elapsing they came up with a new version of money demand where the velocity was also said to be variable

$$Md = kPy \quad \text{where } y = Y/P \qquad (2.2)$$

where k is the inverse of velocity that is 1/V

The basic assumption to Cambridge equation was that wealth is equal to real income and equal to volume of transaction in an economy. Md = kPy and the demand for real money balances depends on real income (y) and the velocity affects the stability of money demand

2:2 The Keynesian Approach to Money Demand

This approach considers money demand as for transaction, precautionary and speculative motives, whose determination depends on the interaction between aggregate demand for and the aggregate supply of money as an asset (Laidler 1977, Barro and Santomero1972 and Meltzer1962).

The interest rate and the real income are the primary determinants of the money demand due to anticipation of price and interest rate changes in the securities market

$$M/p = L(r) + k(y) \qquad (2.3)$$

where L(r) is the speculative demand for money while

K(y) is the transactions and precautionary demand for money

Money demand according to the liquidity preference theory is a function of real income, and interest rate. The model has several strengths over the quantity theory model, especially of its

being closer to the reality of the money demand function. (Keynes 1936, Tobin 1956, Artis and Lewis 1976 and Rothbard 2008)

2:3 Reformulated Approach to Quantity Theory of Money Demand (Monetarist Approach)

The reformulation emphasizes the role of money as an asset and treats the demand for money as part of capital or wealth, the balance sheet or portfolio of assets

It distinguishes demand for money which behaves in more similar way to wealth holders and the demand for money in real terms may be expected to be a function of the following variables according to Friedman (1956), and Artis and Lewis (1976)

$$M/P = f(y: w: r^m: r^b\ r^e: \Pi^e) \qquad (2.4)$$

First, the variable 'w' is the total wealth of an individual person or economy which in practice is less often available for measurement, instead, 'y', that is, the real income or permanent income is commonly used Second, the variables r^m and Π^e forms the expected rates of return on money have been separated into returns on money and the expected inflation rate Third, the variables r^b and r^e are returns on bonds and equities respectively in the economies where these assets form a key role to decision makers

Fourth, the model admits that there are other variables that influence the demand for real balances like utility of money services, and degree of economic stability expected to prevail in the future

For Friedman, when the interest rates rise in the economy the expected rate of return on money held as bank deposits also rises (along with the rise in the expected rate of return on other assets). For the monetarists, the demand for real money balances depends on wealth or permanent income (Friedman1959 and Rothbard 2008)

2:4 An Empirical Literature Review

2:4:1 Money Demand and Determinants

The studies on money demand determinants have been conducted in various countries like Colombia (1982), Singapore (1983), Turkey (1986), Kenya (1992), Venezuela (1980), Peru (2000), and Cameron (2001). These studies show that exchange rate, real income, foreign and domestic interest rates, and expected inflation do have important effects on real money balances The findings also support the hypothesis regardless of the degree of the economy's openness and the integration of the financial sector to the world capital markets

Akhtar (1974) findings in Bangladesh on income, interest rate and expected rate of inflation as determinants of money demand were that permanent income and expected rate of inflation were the primary determinants of money demand.

Theoretical research and empirical analysis in developing countries has shown that the money demand function can become unstable as a result of financial innovations and financial sector reforms (Lungu et al 2012).

Nassar (2005) studied the relationship between money and the price level in Madagascar over 1982-2004, and found the disequilibrium in the money market due to inflation Also there is an existence of a stable long run relationship between broad money demand, domestic price and real income Expectations on inflation can cause prices to rise when the demand for money falls, when the economic agents expect that prices are going to rise in the coming period They will use the money they have now to purchase commodities in the future and run out of money, thus falling money demand and higher inflation can be intensified

Drama and Shen (2011) made a study on the demand for money in Cote d' IVoire over 1980 - 2007 Their study observed that there was a long run equilibrium relationship between money demand and its main determinants, the real income (GDP) and the interest rate

We then note that there are many measures that play a significant role in the money demand function. More importantly is to investigate their empirical validity in the money demand function as indicated earlier if supported by the data which can be used for monetary policy conduct and their effects in the economy be determined. And thus with the numerous structural changes in place, we need to know the most influencing variables.

2:4:2 Money Demand Elasticities

The money demand elasticity issue in monetary economics has been a theoretical and an empirical debate of Latane (1954), Tobin (1958), Friedman (1959), Meltzer (1963), McCallum (1996), Barata et al. (2000), Ventura (2000), and Woon and Oh (2003). And they generally discuss on the money demand elasticities with respect to interest rates, real income, inflation rates, exchange rates and financial innovations in both LDCs and DCs.

While Latane (1954) constructed simple money demand function and observed that the ratio of money to income is a function of the long term interest rate. Friedman, (1959) used the permanent income hypothesis and arrived at the demand function for money which was not interest elastic and the elasticity with respect to permanent income exceeded unity supporting the Hossain (1974) results for Bangladesh.

Meltzer (1963) attempted to relate the demand for money to wealth rather than income and found a substantial interest elasticity of demand for money.

If the demand for money is not interest elastic at all then the option can be to the classical quantity theory with a constant velocity of circulation whose implication is that monetary policy must be very effective because by controlling the quantity of money, the authorities are directly controlling money income, real income and employment, or prices.

Money demand elasticity with respect to financial innovation for U.S ranges from -0.60 to -0.04 while interest rate elasticity ranges from -0.52 to -0.05 for the periods of 1970s and 1980s and

1990s and money demand behavior appeared to be affected negatively by output uncertainty and positively by monetary uncertainty in the studies by McCallum (1996) and Woon and Oh (2003).

In a study of money demand by Prasad (2011), it is observed in India that the income elasticity of money demand is greater than one, and the inflation rate elasticity is -0.07. While Ventura (2000) used an econometric model study of Peru over 1979 – 1991 showed that a 10% change in inflation rate was accompanied by a 1.04% decline in demand for real money balances. The study also suggested that money demand is very sensitive to real income that was greater than unity.

The cointegration test results in Malawi indicates a long run relationship among real money balances, prices, income, exchange rate, treasury bill rate and financial innovations (Lungu et al. 2012). Financial innovations, deepening and the ongoing depreciation or devaluation of currency are now becoming crucial in Tanzania since early 2000s and are affecting the money demand behavior that makes important to look at the elasticity angle.

2:4:3 Money Demand Stability

In the analysis of stability of demand for money and policy implications, it is empirically accepted that the velocity of money is higher when the interest rate is higher. Because people will respond to the high cost of holding money by holding money relative to their income so the ratio GDP/M2 will be higher (Laidler 1977).

The above scholars also argue that if we combine the monetary expansion with the stable demand for money function, it can be used to determine the domestic rate of inflation. And then, the individual economy can determine its own long run rate of inflation.

Friedman (1968) argues that the stability in the demand for money is just a behavioral fact that is proven by making empirical investigation. And if money demand stability exists, it is possible to predict the effects of changes in money supply on total expenditure and income. Output and employment will also rise as a result of rise in expenditure.

The relation of money demand stability and behavior was investigated by the Monetarists and Keynesians using the U S economy since the 1970s The variable has been unstable and unpredictable with increases and declines (Woon and Oh, 2003) Since the 1970s, the U S economic history point out that the financial institutions gained a high speed in innovating credit cards, debit cards, money market accounts, NOW accounts, electronic funds transfers and other forms of payments

The empirical evidence also suggests that stable demand for money functions for the LDCs can be estimated on the same lines as for the DCs as suggested by Adekunle (1968) and Chandavarkar (1977) In this respect, cointegrated demand for money functions used the CUSUM and CUSUM SQUARES called the bound approach (Dagher and Kovanen 2011), while most of the non- cointegrated demand functions have been estimated using the Vector Autoregressive modeling approaches

Akhtar (1974) and Jalal (2000) observed in Bangladesh that both the demands for narrow and broad money are stable functions and neither the log-linear nor the linear functional form has any superiority over the other Ferda and Mehmet (2005) in Turkey, and Samreth (2008) in Cambodia both reveal the existence of long run equilibrium relationship in the estimated money demand function

Other studies like those of Yu and Pei-Tha (2009) found that the income velocity of money in DCs and LDCs is unstable, and the implication is that the use of quantity theory of money to explain the demand for money will not be useful.

Kharadia (1983) and Prasad (2011) also examined the stability of money demand for India using quarterly data from 1996 to 2009 for various monetary aggregates, interest rates, exchange rates, stock prices and GDP The estimated results disclosed the existence of long run and short run relationship among the variables included in the model

Augustine et al (1999), examined stability on 12 developing countries, and Mohsen and Gelan (2009) study on 21 African countries including Tanzania In almost all countries M2 money

demand function was stable The later incorporated the short-run adjustment process in testing for the stability of the long run elasticity estimates, while the former employed M1 and M2 included exchange rate risk, and foreign interest rate in their studies

The above literature show that most of the studies undertaken in various parts of the world reveal a possibility of obtaining stable demand functions in the economy The factors that affect stability are the determinants to be used, the period of time coverage in the sample and other economic as well as non economic forces operating in the economy

2:4:4 Studies of Money Demand in Tanzania

Empirical literature on the demand for money behavior in Tanzania has not been straight forward, instead, it is viewed in the light of the studies of money demand carried out in the 1980s, 1990s, and those of 2000s, but all these studies generally conclude that the stability of money demand has been unpredictably changing

The studies of demand for money in Tanzania include Loxley (1979), Gerdes (1990), Nyella (1998), and Randa (1999) among others These were focusing much on velocity of circulation because the quantity theory of money demand dominated the monetary policy in those times The Chow test for stability in the studies of 1980s displayed a stable money demand function, while the CUSUM and CUSUM sq estimates of 1990s reveal a weakly stable demand function for money (Nyella1998 and Adam et al 2010) respectively

The velocity of currency in circulation in the Ndanshau (2004) study was observed to be trend upward like the 1990s, while the money demand was less stable and few variables had a significant effect on money demand Adam et al (2010) found that real income, expected inflation rate and the treasury bills rate are the most important determinants of money demand while deposit interest rate and the foreign interest rate had weak determining power.

In the study of Nyella (1998) between the periods of 1986-1997, the income elasticity of money demand is 0 58 and for the inflation rate is -0 08 While the finding of Randa (1999) on money demand elasticity with respect to income was 0.9 and with respect to depreciation rate -0.22 in the study of 1974-1996

2:4:5 Overview of Literature Review

From the Cambridge school theory, because of the variability of the velocity of money in circulation, and the Keynesians regard of velocity being increasing with respect to interest rates in the economy then money demand function is said to be unstable, rejecting the classical and monetarist view. For the monetarists it is due to factors like the financial innovations and deepening, currency substitutions and foreign interest rates that affect the money demand stability in the economy.

The monetarists and Keynesians find real income and nominal interest rate being important variables in explaining money demand and regard inflation rate, exchange rate as less significant. Contrary evidence is portrayed by Skrabic and Plazibat (2009) in Croatia, Khatkhate et al (1980) in Venezuela and Prasad (2011) in India, where they find money demand varying with real income, inflation rate uncertainty, interest rate fluctuations and exchange rate volatility.

They also add that in many LDCs, the interest rate on deposits and treasury bills are important factors in explaining money demand. Consensus of studies is found with respect to real income though difference is placed on the scale factor.

The inflation rate also is an important factor in explaining money demand, the difference is on the type of expected inflation rate or actual rate to consider. Obviously, monetarists demand for money is interest inelastic and income elastic.

Evidence on the use of money alternative assets is also debatable. Many studies generally referred to bonds as the alternative asset to money (Keynes 1936) when studying the effect of market interest rates on money demand. Despite the controversies in the type of the interest rate for designing and implementing monetary policies that is viable for economic growth and development, it is however generally accepted that equities in many LDCs high interest rate zones are less significant compared to bonds in money demand modelmg.

This study therefore intended to make two areas of contributions. One was to update the Adam et al (2010), Nyella (1998) and Randa (1999) studies, by using the most recent and slightly extensive period and quarterly time series data of money demand. This captures the structural changes of economic reforms in the context of Tanzania economy adding the exchange rate and financial innovations as the current situation suggest they should be given attention in formulating monetary policies.

The rationale for adding depreciation in exchange rate is that foreign exchange is becoming crucial in the economy as one of the portfolio of economic agents, the continuous depreciation is suggested to be forcing individuals to hold money as foreign currency to avoid possible losses that implies to reduce the demand for money.

Second, the behavior of money demand function for Tanzania according to previous studies is not understood in relation to stability. This study was investigating the money demand variability and the determinants because money supply, credit, interest rates, bank rates and exchange rates are important monetary policy instruments.

CHAPTER THREE

METHODOLOGY OF THE STUDY

3.0 Introduction

The concepts and terminologies underlying the money demand literature are of substantial interests in the theory of monetary economics and economic development pertaining to the efficacy of monetary policy And this study was devoted on the money demand behavior by investigating the money demand function, stability and elasticities

3.1 The Conceptual Framework

Consider an economy in which an economic agent, given wealth, chooses to hold assets and spend income on consumption goods, hold interest-bearing assets (financial instruments) and hold money

The earlier quantity theory analyzes the demand for money exclusively for transaction purpose without considering it as an asset competing with other assets The Keynesian liquidity preference came with the argument that the demand for money is an adjustment which an economic agent has to make between money and bonds in the economy (Keynes 1936)

The monetarists considered both views of earlier quantity and Keynesian approaches Following the above reasoning, if we consider the economy of households, firms, the Central Bank and the government, we then develop a model relating money demand behavior

In addition to utility from consumption c (t), utility is also obtained from holding a certain amount m (t) of money given the price level p (t) (Walde, 2011) As the wealth of households and firms a consists of bonds (b) , plus money(m), thus a (t) = b(t) + m (t). Where c_t , and m_t, are consumption and money to be held at time t, the choice is made at the beginning of time period s, and ρ is the time preference rate The household and firms will be regarded to maximize utility subject to the wealth constraint in equation (3.1) as follows,

$$\text{Max } U = U(c_t, m_t) = \int_0^{\infty} e^{\rho t} \left[\ln c(t) + \alpha \ln m(t)/p(t)\right] dt$$

S.t $\dot{a} = i(a - m) + (r^b) - T/L - Pc$ ..... (3.1)

Where T/L is tax payments per representative household from asset returns and is lump sum and the nominal interest rate i (the opportunity cost of holding money) is defined as,

$i = (r^b + \prod^e)/r^m$ ..... (3.2)

r^b is real return on financial assets, and r^m is real return on money which is the deposit interest rate r^d.

Where $\dot{a}$ is the increase in wealth consisting of financial assets in households and firms, plus money, i is the nominal interest rate, and α is the coefficient of the consumption expenditure discounted by the nominal interest rate i, P is the price level and c is consumption chosen The Central Bank chooses money supply M_t hence the money market can equilibrate demand and supply Thus we re-express the nominal interest rate in equation (3.2) as;

$i = (r^b + \prod^e) / r^d$ .....(3.3)

When households choose the amount of money to hold optimally, the money demand can be given from the objective function and budget constraint by;

$M = \alpha Pc/i$ ..... (3.4)

It should be noted also that the total consumption expenditure Pc is the nominal income spent on consumption, which is proportional and proxy to nominal GDP (Y), and the real balances demand can thus be expressed as,

$m = \alpha (y\, r^d / r^b + \prod^e)$..... (3.5)

The general functional form of the demand for real money balance (m) can be written as,

$m = m(y, r^b, \pi^e)$ ..... (3.6)

A specific functional form of the money demand function is the multiplicative form written as,

$m = A\, y^{\beta_1} r^{\beta_2} a\ \Pi e^{\beta_3}$ ..... (3.7)

Where A is a constant, β_I (I = 1, 2, 3) are long-run income, own and cross elasticities of demand for money a and e are interchanged here for simplicity. Transforming equation (3.6) by taking natural logarithms on both sides yields a log-linear equation

$\log m = \log A + \beta_1 \log y + \beta_2 r^d + \beta_3 \Pi^e + \varepsilon$ ..... (3.8)

Assuming money and interest bearing financial instruments are gross substitutes, the demand for money would be expected to depend positively on income(y) and deposit interest (r^d), negatively on expected inflation rate (Π^e) and interest rate on bonds (r^b). The theory underscores that the demand for money function is semi log-linear

3.2 Econometric Modeling Specifications

This follows the methodology outlined and the approach adopted as guidance from other related studies, for example Ericsson (1998) and Adam et al. (2010). However, in addition to interest rates, inflation rate and real income which are suggested by economic theory, other factors that influence the demand for money are included as suggested by the empirical literature review

The money demand function (3.6) is modified by separating the money and financial assets to obtain the following econometric model,

$m = A\,(y, r^d, r^b, \Pi^e)$ ..... (3.9)

The above function is implemented by putting logarithms on m, A and y after transforming the above function into equation and adding a disturbance term (ε) we get,

$\log m = \log A + \beta_1 \log y + \beta_2 r^d + \beta_3 r^b + \beta_4 \Pi^e + \varepsilon$ ..... (3.10)

From the previous literature, other important potential determinants of money demand are introduced into the model (3.10) above to yield money demand equation to be estimated

$$\log (m)_t = \beta o + \beta_1 logy_t + \beta_2 fi_t + \beta_3 r_t^d + \beta_4 r_t^b + \beta_5 \Pi^e_t + \beta_6 dr_t + \varepsilon_t \quad \ldots \quad (3\ 11)$$

Where $\beta_1, \beta_3 > 0$, $\beta_{2 > or < 0}, \beta_4, \beta_5, \beta_6 < 0$, and

$logm_t$ is the logarithm of real balance demand in the economy computed by the central bank as the broad money aggregate (M2/ P) at time t

βo is the intercept of the regression equation

logy is the logarithm of real income

fi is the financial innovation proxied by M3/M2

r^d is the real interest rate on deposits

r^b is the real interest rate on treasury bills

Π^e is the expected rate of inflation

dr is the exchange depreciation rate

ε_t is the residual term

3.3 Definitions of Variables and Data Sources

Dependent variable

The dependent variable in this study is the real money demand in billions TZS which is calculated based on the economy's monetary aggregates divided by the average price. The model for the monetary aggregate reported by the Central Bank of Tanzania uses M2 (M1 plus time and savings deposits plus certificates of deposits plus deposit liabilities of Non-Bank Financial Institutions as the broad measure of money demand.

Explanatory variables

Income series

We followed the traditional proxy of income for GDP at market prices in the model of demand for money, money demand varies positively with real GDP (in billions TZS), with ceteris paribus assumption.

Price series(the inflation rate and CPI).

Inflation is calculated as the annual percentage change in consumer price index in the LDCs context where majority of total expenditure is on consumption. Theoretically, keeping other factors constant, there is a negative relationship between money demand and inflation rate.

Treasury bill rate 91-day:

Is an indicator of the interest rate policy being pursued by the government and a benchmark for the rates charged by commercial banks. Money demand is inversely related to the Treasury bill rate, assuming ceteris paribus.

Deposit interest rates

Nominal Interest rate on deposits is the rate paid by commercial banks or similar banks for demand, time or saving deposits. Other factors being the same, deposit interest rate has a positive effect on money demand

Exchange Depreciation Rate

The nominal exchange rate is the TZ Shilling per U S Dollar, we used the percentage depreciation rate as our variable. An increase in depreciation rate implies a decline in money demand in the economy, ceteris paribus

Financial innovation. Proxied by M3/M2, and is being driven by the prevailing time deposits, foreign currency accounts started since the late 1990s. Theoretically, assuming other factors remaining constant, the increase in financial innovation which increases the extended broad money (M3) increases the ratio that implies a reduction in the broad money demand (M2)

3.4 Data Collection Estimation and Analysis Procedures

The study used secondary time series data obtained from the Central Bank statistical unit, internet sources of international finance statistics and books. These data were from the first quarter 1996 to the fourth quarter 2011 regarding their availability and reliability

The statistical analysis to the data was conducted using statistical techniques for description analysis using Stata software, and E-views. Variables relationships were tested using statistical tests in regression methods (OLS).

The approaches to determine the respective money demand elasticities in our semi log-linear specified long-term demand for real money are interpreted directly from the coefficients of explanatory variables $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5;\beta 6$ provided that the variables are stationary time series.

3.5 Diagnostic Tests

Stationarity. A stationary, I (0) time series is one whose statistical properties such as mean, variance, autocorrelation, autocovariance, etc. are all constant over time. Since time series data tend to be non-stationary due to upward or downward trend, they violate the stationarity conditions and thus OLS regression estimations can produce spurious results and misleading inferences. The estimated coefficients would be biased and inconsistent. A class of test which is Augmented Dickey-Fuller for unit roots was carried out. As non-stationarity was observed then transformation/differencing was required to make the series stationary (Engle and Granger 1987).

Test for Unit Roots

The Augmented Dickey – Fuller (ADF) test was carried out to determine the stationarity of variable and be able to establish the order of integration. Using the following formulation,

$y_t = \alpha_1 y_{t-1} + u_t \; | (0,\sigma^2); y_0 = 0$

The null hypothesis is Ho: $\alpha_1 = 1$ that is the variable or data series contain a unit root and so is non stationary, against the alternative hypothesis that H_A $\alpha_1 < 1$, data series are stationary (Dickey and Pantula 2002). For the Augmented Dickey-Fuller Test the practical approach can be done by using the more general version

$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 t + u_t$, it includes the constant and the trend term and finally we obtain

$\Delta y_t = \psi y_{t-1} + u_t$ So that a test of Ho $\alpha_1 = 1$ is equivalent to a test of Ho $\psi = 0$ (since $\alpha_1 = 1 - \psi$) (Dickey and Pantula 2002)

3.6 Test for Cointegration and the Error Correction Model

Cointegration occurs when two or more time series are stationary, despite of being individually non-stationary. It is important to test whether there is a long run linear combination of them, that is, they exhibit long run equilibrium relationship among them using the Johansen approach.

We need to determine the short run dynamics of the model also, and this short run dynamics can be represented by the Error Correction Mechanism (Engle and Granger 1987)

For the Error Correction Model The residuals obtained from regressing the cointegrated long run relationship between the dependent and independent variables in equation (3.7) can be included in a short-term money demand equation that is to be estimated in first differences as shown below

$$\Delta logmd_t = \alpha_0 + \sum\alpha_{1i}\Delta X_{t-i} + \sum\beta_i\Delta logmd_{t-i} - \psi ec_{t-1}$$

Changes in demand for real balances $\Delta logmd_t$ indicates the direct changes in the explanatory variables ΔX_{t-i} and the changes that reflect the differences apart from the error correction term ec_{t-1}

The prediction is that for the negative coefficient of the estimated ψ, if is statistically significant and less than the adjustment mechanism we say the money demand is stable and the $\Delta logmd_t$ will eventually tend to its long-run value to be estimated in the following equation,

$$\Delta logmd_t = \beta_0 + \beta_1\Delta logmd_{t-i} + \beta_2 logy_t + \beta_3\Delta logy_{t-i} + \beta_4 ri_t + \beta_5\Delta ri_{t-i} + \beta_6 r^d_t + \beta_7\Delta r^d_{t-i} + \beta_8 r^b_t + \beta_9\Delta r^b_{t-i} + \beta_{10} dr_t + \beta_{11}\Delta dr_{t-i} + \varepsilon_t$$

Where i, in the subscripts represent the number of lags to be used in estimating the above short-run model and the non-differenced explanatory variables are the contemporaneous variables In order to ensure that the short-run dynamic effects of the explanatory variables and the error correction term, a number of three lags (3) were selected And each lag representing a period of one quarter

CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.0 Introduction

This chapter presents empirical results and analysis of the relationship between money demand (M) and explanatory variables. The chapter is divided into five sections. Section 4.1 presents the descriptive analysis. Section 4.2 presents the unit root test. Section 4.3 presents the long-run equation and gives the entire discussions of results. The test for cointegration is presented in section 4.4. An estimation of the Short-run Model and the Parsimonious model is presented in Section 4.5 and Section 4.6 presents the results on stability tests of money demand function.

4.1 Descriptive analysis

Before estimating the model the transformation of variables were done. This attempt is basically after checking the nature or trend of the curves per each variable. In this manner, the trends help to choose the appropriate transformation per each variable; however, some of the variables could remain untransformed. For our data, it was only two variables i.e. Money demand "m" and real gdp/ income "y", which were transformed into loganthmic form. Table 4.1 summarizes all the variables before going further to test for the unit root.

Table 4.1 Descriptive Statistics of the Variables

Variable	Mean	sd	Min.	Max.	skewness	kurtosis
LOGM	9 4443	0 4917	8 5748	10 2726	0 0146	1 9855
LOGY	14 6585	0 4392614	13 9574	15 51963	1 996854	0 4946771
FI	1 5450	0 5283	0 34	2 61	0 4274	3 0278
RD	4 1964	2 3949	2 2	10 9	1 3615	3 5377
RB	9.5736	4.0479	2.5	16.3	1 3615	3 5377
INF	8 9469	4.1165	4.1	21.8	1.3335	4.7002
DR	2 6531	2 6927	-7.6	7.8	-0 7313	4 8943

Notes: Author (2012) LOGY=log of real gdp/income, LOGM=log of money demand, INF=inflation, FI=financial innovation, RD=real deposit interest rate, RB=real interest rate on treasury bills, DR=depreciation rate

Table 4 1 shows the descriptive statistics of all variables, in particular the mean, standard deviation, minimum, maximum values, skewness and kurtosis As mention earlier, the analysis used the information ranging from 1996 to 2011 According to the nature of data, we found that the loganithm of real income and money demand had average values around 14 66 and 9.44 respectively. On the other side, inflation rate and real interest rate on treasury bills had on average the rate of 8 9 percent and 9.6 percent respectively The lowest average rate was 1 5 percent and 2 7 percent for financial innovation and depreciation rate respectively

Also, inflation and real interest rate on treasury bills have the highest standard deviation values indicating that, they are most volatile variables However, the less volatile variables were "LOGY", "LOGM" and financial innovation since they have lowest standard deviation Again inflation peaks the highest rate out of all the maximum values, of 22% The logarithm of both real GDP and money demand were ranging between 13 to 15, with more or less similar deviation

Except depreciation rate, the rest are positively skewed (i.e., right skewed distribution), this means most values are concentrated on the left of the mean, with extreme values to the right. Again few variables are more than 3 value of kurtosis, this indicates that their distributions are sharper than a normal distribution, with values concentrated around the mean and thicker tails It also means, there is high probability of extreme values

In order to test for linear relationship between the explanatory variables, a correlation matrix is an important indicator It is also helpful in determining the strength of the variables in the model, deciding which variables to drop from the equation Table 4 2 shows the correlation matrix of the variables

The table shows that except deposit rate, treasury bills rate, and inflation rate, there is a positive correlation of dependent variable and real GDP/income, financial innovation and the depreciation rate Real GDP/income, financial innovation, and deposit rate are highly correlated to demand for real balances hence indicating that there is a problem of multicollinearity

Table 4.2 Correlation matrix

```
correlate logmd logy fi rd rb inf dr
(obs=64)
```

	logmd	logy	fi	rd	rb	inf	dr
logmd	1.0000						
logy	0.6462	1.0000					
fi	0.6010	0.5578	1.0000				
rd	-0.5496	-0.6563	-0.4187	1.0000			
rb	-0.1951	-0.0337	0.1331	0.4993	1.0000		
inf	-0.2059	-0.0241	0.1554	0.6328	0.7771	1.0000	
dr	0.2894	0.2882	0.0693	-0.1833	-0.0479	0.0155	1.0000

Source: Author (2012) as obtained from Stata output

4.2 Unit Root Test

There was a need to test for stationary or unit root for all the variables used in the analysis. This was done by employing the most common test namely Augmented Dickey Fuller (ADF) test. Given the fact that, the ADF test uses a certain number of lag(s), the first attempt was to choose the appropriate number of lags to use. It is known in literature that, too many lags could increase the error in the forecasts too few could leave out relevant information. Experience, knowledge and theory are usually the best way to determine the number of lags needed. There are, however, information criterion procedures to help come up with a proper number. Three commonly used are: Schwarz's Bayesian information criterion (SBIC), the Akaike's information criterion (AIC), and the Hannan and Quinn information criterion (HQIC). All these are reported by the command 'varsoc' in STATA.

Table 4.3: Selection of lags

Selection-order criteria

```
Selection-order criteria
  Sample:  11 - 64                        Number of obs      =        54
 |lag |    LL      LR      df    p      FPE       AIC      HQIC      SBIC
 |  0 |  112.46                        .00118   -3.90593  -3.80649  -3.6481
 |  1 |  137.254  49.587    1  0.000  .000489*  -4.78717* -4.67353* -4.4925*
 |  2 |  137.314   .1208    1  0.728   .000507  -4.75237  -4.62452  -4.42087
 |  3 |  137.365   .1031    1  0.748   .000526  -4.71724  -4.57519  -4.34891
 |  4 |  137.381  .03009    1  0.862   .000546  -4.68076  -4.52451   -4.2756
 |  5 |  140.524  6.2879*   1  0.012   .000505  -4.76017  -4.58971  -4.31817
 |  6 |  140.563  .07705    1  0.781   .000525  -4.72456  -4.53989  -4.24573
 |  7 |  140.604   .0823    1  0.774   .000545  -4.68904  -4.49017  -4.17338
 |  8 |  140.893  .57842    1  0.447   .000561  -4.66272  -4.44964  -4.11022
 |  9 |  141.771  1.7562    1  0.185   .000566   -4.6582  -4.43092  -4.06887
 | 10 |  143.23   2.9168    1  0.088   .000558  -4.67518  -4.43369  -4.04902
   Endogenous:  logmd
    Exogenous:  logy fi rd rb inf dr  _cons
```

Source: Author(2012) As obtained from Stata Output

When all three criteria agree, the selection is clear, but what happens when getting conflicting results? In the context of VAR models, AIC tends to be more accurate with monthly data, HQIC works better for quarterly data on samples over 120 and SBIC works fine with any sample size for quarterly data (on VEC models)[1] In this study, we have quarterly data with 60 observations, SBIC suggest a lag of 1 (which is also suggested by HQIC) As a result, the ADF test used lag one to test for unit root and the results for ADF test are presented in Table 4.5

The ADF results suggest that all variables have unit root after first differencing except only two variables (INF and RD) were stationary at level Procedure wise, the variables which are not stationary should be differenced and test their stationarity again Upon testing for unit root on

[1] Ivanov, V and Kilian, L. 2001 'A Practitioner's Guide to Lag-Order Selection for Vector Autoregressions' CEPR Discussion Paper no 2685 London, Centre for Economic Policy

differenced variables, we found all the differenced variables were finally stationary (see Table 4.5).

Table 4.4: Unit Root for the Variables

	At levels		First difference	
Variable	**ADF test statistic**	**p-value**	**ADF test statistic**	**p-value**
LOGM	-0.652	0.8587	-5.709***	0.0000
LOGY	-0.402	0.9098	-5.771***	0.0000
FI	-1.822	0.3697	-7.232***	0.0000
RD	-3.059***	0.028		
RB	-2.326	0.1637	-7.051***	0.0000
INF	-3.900***	0.0020		
DR	-2.840	0.7734	-7.535***	0.0000

Notes: Author (2012)
(i) Asterisk *, ** and *** indicates significance at the 1%, 5% and 10% significance levels respectively
(ii) The ones with *** are stationary, otherwise they were differenced and tested again, until they become stationary

4.3 Long-run estimation Results

This estimation uses the variables which are non-stationary in levels that is integrated of order one I (I). It is simply by running an Ordinary Least Squares (OLS), whereby the dependent variable is "LOGMD" against the rest of the variables (the non-stationary explanatory variables)

Table 4.5: Long-run estimation results

Dependent Variable: LOGMD				**No. of obs.=64** **F(6, 57) =366.38** **Prob > F = 0.0000** **R-squared= 0.9813**
Variable	**Coefficient**	**Std. Error**	**t-statistic**	**P>|t|**
LOGY	0.943627	0.2645	3.56812***	0.0005
FI	0.092899	0.021372	4.34672***	0.0001
RB	-0.697179	0.213307	-3.268431***	0.0018
DR	1.163128	0.325300	3.575559***	0.0007
_cons	-1.499141	0.4039152	-3.71	0.0005

Notes: Source: Computed by Author (2012)
(i) The *, ** and *** indicates significance at the 1%, 5% and 10% significance levels respectively

The long run estimation results above can be transformed into an equation form. In this manner, the equation can be written as follows:

ASSIGN @ALL F

LOGMD = 0.943624493 1*LOGY + 0.092899322951*FI - 0.6971793734*RB + 1.163128097*DR

The results above have all explanatory variables significant in explaining the variation in money demand in the long-run, which is real income, financial innovations, treasury bill rate, and the exchange depreciation rate at 1% level of significance. The influence or effect of real incomes on money demand is positive. The explanatory power of the estimation is high (i.e., the R-square is 98%). This indicates that about 98 percent of total variation in money demand is explained by variations of the explanatory variables in the model.

Discussions on Empirical Results on Determinants Elasticity

Money demand elasticity from econometric point of view can be analyzed from the model employed in this study estimation of the long-run equation [3.11] in Chapter 3. This is because the empirical long-run relationship between money demand and their respective determinants are simply interpreted as rates of change.

Elasticity of money demand with respect to real income [GDP] is 0.94 and is significant. As real GDP increase by 1 percentage it results to 0.94 percentage increases in the amount of money demand keeping other factors constant. Again this value is slightly below unity [1]. Monetarist argument is that the elasticity of money demand with respect to output is above unity for effectiveness of monetary policy. The similar results were obtained in the study by Randa (1999), while differed slightly with 0.58 results of Nyella (1998).

The demand for real balances is less sensitive to financial innovation whose elasticity measure is 0.0928 and is significant. The 1 percentage increase in financial innovation increases the demand for real balances by 0.09%. This could be interpreted as, in the long-run even though foreign currency accounts increases, there is a high preference to holding real balances in the economy. Nevertheless, financial innovation has received a wide scope of variable representations and the findings are remarkably varied across studies.

For the treasury bills rate of interest, money demand coefficient in Tanzania is -0.697 and is significant. The empirical results on money demand against interest rates coefficient is slightly below -0.05 and -0.5 corresponding to the Keynesian and the Monetarist theoretical estimate that the interest rate in the developing countries is higher in absolute value than the interest rates in the developed countries.

The demand for real balances also is highly sensitive to exchange depreciation rates. The elasticity value is 1.1631 and has a positive sign. The result of Randa (1999) is -0.22 significant

contrasts in these two empirical findings This shows that as the exchange rate rise by 1 percentage it results to 1 1631 percentage increase in the quantity of money demanded This can be further inferred that the Tanzania shilling depreciation increases the demand for Money as foreign currency [U S Dollar] deposit liabilities increase in value in units of domestic [Tanzanian shilling]

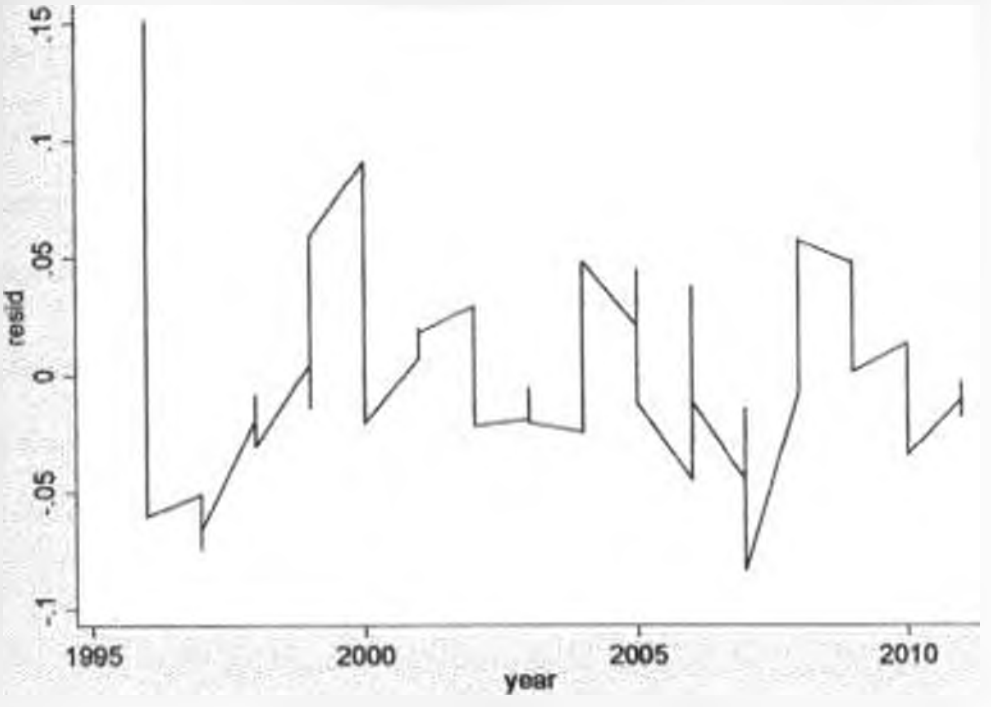
4.4 Cointegration Test

The cointegration test was carried out to analyze the presence of long-run relationship between variables The entire task of testing for cointegration involves several steps first is to run an OLS regression using only the non-stationary variables, meaning at level The results for this estimation are presented in Table 4 5 above

The long-run static regression estimation will only help in getting or predicting the residuals for analysis It is commonly known that, the cointegration test relies on testing the stationarity of residuals In this case, the residuals were predicted and tested for unit root using ADF test The variables will be termed to be cointegrated if and only if the residuals are stationary

This study attempted to produce a graph of the predicted residuals against time or quarterly years In one way or another, this could suggest whether the residuals are stationary or not before running the ADF test Looking at the graph below, it suggests that the residuals are not stationary since they are not moving around zero over time

Figure 4.1. Predicted residuals over time



Whether the graph has right suggestion, the ADF test was applied on the predicted residuals The results of this test are presented in Table 4.5 and the hypothesis for the test was:

Ho series are not cointegrated [residuals are non-stationary]

H1 series are cointegrated [residuals are stationary]

Table 4.6: Cointegration Test for Long-Run Static Residuals

Augmented Dickey-Fuller test for unit root			Number of obs.=62
Variable	**ADF statistic**	**P-value**	**Order of integration**

Lagged residuals	-4.473***	0.0002	I(0)

Notes: (i) Asterisk *, ** and *** indicates significance at the 1%, 5% and 10% significance levels respectively

Table 4.6 shows the ADF test statistic is statistically significant, because the test statistic lies in the rejection region. This implies that there is a long-run statistical relationship among variables included in the system, since the lagged residuals generated from OLS equation above are stationary.

Furthermore Table 4.7 below examines the test for cointegration using the Johansen approach and observe that the null hypothesis of no cointegration among variables in the model is rejected at 5% and 1% significant level. According to the statistically significant of the log likelihood ratio the statistic value of 648.9 is larger than the Z critical value at 5% and 1%. The observation is that there exists a long-run equilibrium relationship of the variables in the model, all the integrated of order one variables are cointegrated.

Table 4.7: Johansen Test for Cointegration

The Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

LOGMD	LOGY	FI	RB	DR	C
1.000000	-0.645817	-0.491497	0.285831	-1.659488	-3.961558
	(0.05958)	(0.07820)	(0.15965)	(0.13820)	
Log likelihood	648.9518				

Note: Numbers inside the brackets are the standard errors.

Source: Computed from E-views (2012)

The first cointegrating equation as shown in table 4 7 above reveals that the standard errors given in the parenthesis do not differ substantially With the RB and DR slightly higher than the standard errors of LOGY and FI This shows that there are some degrees of instability but not substantial

Moreover the standard errors indicate that there is high degree of certainty in predicting the coefficient of each respective variable in the model Both variables in the equation have the expected signs Hence, this study concludes that the series are cointegrated given the above unit root test on residuals

4.5 The Short-run Model and the Error Correction Mechanism

This study estimated the coefficients of the model using the short-run model and the Error Correction Mechanism (ECM). The Error Correction Term as indicated in Table 4.8 is -0.21 and is statistically significant, hence suggesting that the deviations from equilibrium are corrected at about 21% per quarter Thus the stationary short-run equation for the current values of explanatory variables is shown (see Table 4 8) below

And in order to ensure that the short-run dynamic effects of the explanatory variables and the error correction term, a number of three lags (3) were selected And each lag representing a period of one quarter.

Table 4.8 The Short-run Model Estimation

The general model

Dependent Variable: DLOGMD
Method: Least Squares
Date: 11/21/12 Time: 15:01
Sample(adjusted): 1996:1 2011:4
Included observations: 60 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.058327	0.029532	1.975672	0.0546
DLOGMD_1	-0.132960	0.048080	-2.765265	0.052
DLOGMD_2	0.049701	0.145484	0.341622	0.7345
DLOGMD_3	0.168133	0.152249	1.104329	0.2762
DLOGY	-0.137408	0.230794	-0.595577	0.6548
DLOGY_1	-0.073800	0.291430	-0.253233	0.8014
DLOGY_2	-0.141454	0.246260	-0.574409	0.5690
DLOGY_3	-0.426901	0.247324	-1.726075	0.1922
DFI	-0.007633	0.006706	-1.138326	0.2619
DFI_1	-0.011273	0.008669	-1.388635	0.2538
DFI_2	0.004941	0.004944	0.999499	0.3237
DFI_3	0.001700	0.004810	0.353400	0.7267
DRD	0.002310	0.001382	-1.670709	0.1328
DRD_1	0.000474	0.001440	-0.328798	0.7441
DRD_2	0.001199	0.001388	0.863898	0.3929
DRD_3	0.003468	0.001402	-2.473701	0.0178
DRB	0.088369	0.126408	0.699080	0.4887
DRB_1	-0.280919	0.148316	-1.894057	0.0657
DRB_2	-0.095882	0.147730	-0.649035	0.5201
DRB_3	-0.116063	0.130146	-0.907156	0.3699
DINF	0.068237	0.086254	0.791536	0.2923
DINF_1	0.023746	0.064185	0.370585	0.0865
DINF_2	-0.062472	0.026489	2.358412	0.0522
DINF_3	0.002379	0.032659	0.072256	0.3861
DDR	-0.217923	0.058617	3.718137	0.0025
DDR_1	0.058145	0.047238	1.230947	0.1136
DDR_2	0.032688	0.038493	0.849053	0.2874
DDR_3	0.003492	0.009414	0.370885	0.4842
LAGRESID	-0.211739	0.078649	-2.692208	0.0469

R-squared	0.413290	Mean dependent var	0.025005
Adjusted R-squared	0.109313	S.D. dependent var	0.019259
S.E. of regression	0.018432	Akaike info criterion	-5.385646
Sum squared resid	0.009242	Schwarz criterion	-4.781425
Log likelihood	152.1704	F-statistic	4.237579
Durbin-Watson stat	1.947122	Prob(F-statistic)	0.077283

According to the Table 4.8 above, the significance of the error correction term is an indication that misspecification of the dynamic relationship of the model is the result of ignoring the long-run equilibrium relationship of the variables. The empirical results in the short-run reveals that the short-run factors that determine the changes in the demand for money in Tanzania are the deposit rate (DRD_3), exchange depreciation rate (DDR) and inflation rate (DINF_2).

The estimates of coefficients are the dynamic effects of the adjustment of short-run money demand to the long-run steady state. The dynamic effects tend to produce an error correction term of -0.21. When the lags of dependent variable itself are added in the lags of explanatory variables, the coefficients of the differenced and lagged three times explanatory variables are the dynamic effects on the short-run money demand when adjusting towards its long-run equilibrium.

From these results above, we observe two significant results. One is that all variables that are cointegrated are significant determinants of money demand in Tanzania. Second the real income/GDP, and financial innovations do not significantly determine short-run money demand, however, their effects in the long-run reveal that they determine changes in the money demand through themselves and also through the short-term determinants. Therefore suitable and relevant policy analysis can be undertaken by varying the processes that drives these variables.

4.7 The Parsimonious model

The Parsimonious model was thereafter estimated which includes the Error Correction Term after sequentially removing the non-significant variables in the general short-run model.

Table 4.9 below presents the full information of the estimates where the core variables, their coefficients together with their t-ratios are included. C is the constant and DLOGMD is the dependent variable.

Table 4.9: The Parsimonious Estimate

Parsimonious model

Dependent Variable DLOGMD
Method Least Squares
Date 11/22/12 Time 09 36
Sample(adjusted) 1996 1 2011 4
Included observations 61 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.058520	0.010595	5.521694	0.0410
DLOGMD_1	0.024281	0.007976	3.044065	0.0373
DRB_1	-0.316507	0.089234	-3.547452	0.0283
DINF_2	-0.372621	0.087423	4.262268	0.0066
DDR	-0.168362	0.074631	-2.255924	0.0495
LAGRESID	-0.158842	0.060913	-2.607554	0.0345
R-squared	0.381452	Mean dependent var		0.049355
Adjusted R-squared	0.258244	S.D. dependent var		0.044459
S.E. of regression	0.039271	Akaike info criterion		-7.883561
Sum squared resid	0.037826	Schwarz criterion		-6.464692
Log likelihood	77.56068	F-statistic		12.53402
Durbin-Watson stat	1.910870	Prob(F-statistic)		0.063980

According to the Table 4.9 above, the R- Square 0.38 indicates that the model explains 38% variations in demand for real balances in the short-run by the explanatory variables and the error correction term.

The short-run money demand of one lag has a negative effect on short-run money demand and is statistically significant at 5% and 10%. This could be interpreted that the past value of the dependent variable will reduce the value of DLOGMD by a magnitude of 0.024.

The relationship of short-run inflation rate and demand for real balances is negative in the short-run and is statistically significant at 1%, 5%, and 10% with a feedback effect of 0.3726 after two periods. The interpretation for this result is that economic agents respond to rising inflation in the short-run by purchasing goods rather than holding money balances which are losing value.

The short-run treasury bill rate has a negative effect on short-run money demand and is statistically significant at 5% and 10% with a feedback effect after one period. Being an opportunity cost of holding money, the 1% increase of treasury bill rate in the short-run coefficient measures the trade-off of about -0.28% in holding real balances in the short-run if other factors remains constant.

The current short-run exchange depreciation rate is negatively related to the demand for real money balances in a short-run and is statistically significant at 5% with a feedback effect of 0.168. This can be interpreted that economic agents respond to currency depreciation by holding foreign currency in the short-run, this is a substitution effect prevailing in the economy.

Comparing the results of the short-run general and parsimonious models, the error correction mechanism parameter (ECT) -0.21 in the general model and is -0.159 in a parsimonious model. Both have the expected signs and are statistically significant.

The low magnitudes for the ECTs show that the adjustment toward equilibrium is slow. The Error Correction models in Tables 4.8 and 4.9 also give various statistical information which are satisfactory.

For the Specific parsimonious model (see Table 4.9), the p-value of obtaining F value is greater than zero (0.06 and 12.53) respectively. Therefore the null hypothesis that the explanatory variables together with the lagged error correction term do not determine money demand in the short-run is rejected. Durbin Watson statistic is 1.9, therefore we fail to reject the null hypothesis of no autocorrelation at 1%, 5%, and 10% level. The (ECT) also passed most of the other diagnostic tests including serial correlation, functional form and the heteroskedasticity tests as shown in the Appendix III.

4.8 Empirical Results on Money Demand Function Stability

The approaches to stability tests used are the Chow types test and the recursive residuals test Where the procedures performed for the Chow test were to divide the sample into two groups, the first group consisted the period between 1996Q1-2003Q4, and the second group covered the period between 2004Q1-2011Q4. Their residuals were together with the residuals in the general sample 1996Q1-2011Q4 used to generate the F-statistic and the Log likelihood ratio.

The 2004 1 was the first observation period. The test re-estimated the equation for the period 1996.1 to 2003.4 and 2004 1 to 2011.4. The result in the first group was used to predict errors for the remaining quarters and the following results were obtained

Table 4.9: The Chow-types test results

Chow Breakpoint Test: 2004 1			
F-statistic	1.081003	Probability	0.403833
Log likelihood ratio	18.46383	Probability	0.102316

Chow Forecast Test: Forecast from 2004 1 to 2011:4			
F-statistic	1.335310	Probability	0.220182
Log likelihood ratio	59.30650	Probability	0.422336

The tests were carried out to see whether the parameters of the sub-samples would be more favorable than the combined sample, the results show that the F-statistic and the Log likelihood ratios fail to reject the null hypothesis of no structural change in the sample period Hence the parameters of the general sample reveal stability and therefore the money demand function in Tanzania is stable

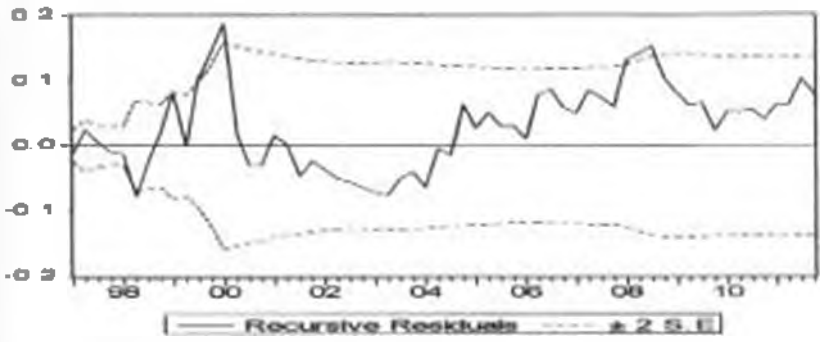
Recursive Residuals tests

Another test for parameter stability commonly used is the recursive residuals The purpose was to test whether the value of the dependent variable at specific time have resulted from the fitted

model for the all data ranging to 2011.4. The errors obtained are compared with standard deviation from the whole sample

From the equation test in the sample period it was observed that the money demand function have instability behavior in 1998 and 2009 years The fact that the general curve of the recursive residuals did not go outside the plus and minus two standard error bounds as shown in the figure 4.2 below indicates that money demand function in Tanzania is stable

Fig 4.5 Recursive Residuals test results



Furthermore, the general stability of money demand function in Tanzania is supported by other tests like the CUSUM and CUSUM sq tests In the CUSUM test and CUSUM SQ the plots of the curves did not go outside the 5% significance range except in 2009 which is a similar instability displayed in the recursive residuals test In general all the tests reveal that money demand function in Tanzania is stable

Fig 4.3 CUSUM test

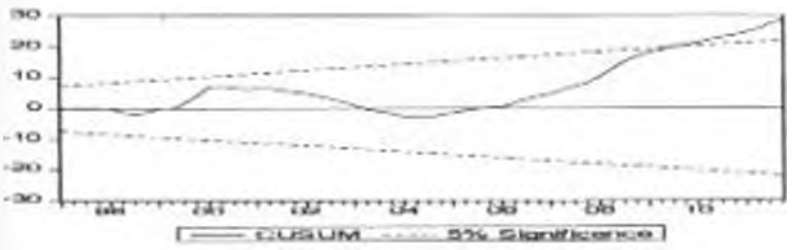
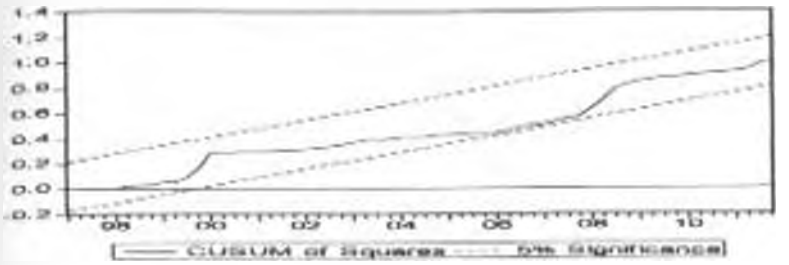


Fig 4.4 CUSUM SQ test



CHAPTER FIVE

CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1 Conclusions

The study set out to investigate the demand for real money balances in Tanzania over the period 1996.1-2011.4. The study was motivated by the inconclusive findings of the previous studies on money demand determinants, elasticities and stability which has been identified as the major challenge to monetary policy makers in the country (Adam et al. 2010).

The Cointegration test, Chow-types tests, recursive residuals tests and the CUSUM tests indicate that the conclusions based on the estimated coefficients are efficient. The unit root tests show that most of the variables have unit roots and they attain stationarity after first differencing thus are integrated of order one, I (1), except for inflation rates and deposit rates were integrated of order zero, I (0).

A strong support is found for the monetarists' argument that the monetary policy is effective in influencing economic variables basing on the long-run results. The real GDP/income, financial innovations, treasury bill rate and the exchange depreciation rate have significant effects on the demand for money (see Table 4.5).

The results of the study reveal that real GDP/ income influences demand for money positively and significantly. The results do suggest further that, the slightly lower than unity value of the coefficient confirms the efficacy of monetary policy (Friedman 1956). Since the elasticity value is close to one, and though is an indicator of a normal good feature of money in the economy, still individuals would prefer to hold money balances as a store of value.

Thus pursuing economic growth policies is an important strategy for increasing the efficiency of monetary policy in Tanzania, hence policy makers must pay attention to income variables and ways of increasing income.

The treasury bills rate has negatively and significantly influenced demand for money in Tanzania in the long-run and short-run. It therefore appears to play a strong role in reducing the level of demand for money in Tanzania. In regard to this observation therefore it would be clearly wise to recommend that the driving forces behind the rising interest rate on treasury bills must be reduced in Tanzania.

In the short-run, changes in money demand is determined by financial innovation, treasury bills rate, inflation rate, exchange depreciation rates and the lagged demand for money, where the central focus on monetary policies can be based. Therefore suitable and relevant policy analysis can be undertaken by varying the processes that drives these variables.

5.2 Policy Recommendations

The study findings have important implications for policy formulation. Understanding the key determinants of money demand, elasticity and stability is an important for monetary policy formulation in Tanzania since there are many determinants in the monetary theory that have different applicability in different countries.

For the fact that real income, financial innovation, treasury bill rates, inflation rates and the exchange depreciation rates have a significant effect on money demand, this does therefore implies that a controlled growth of money supply and financial liberalization are important for economic growth and development in Tanzania. In the short run interest rate policies, price stability and policies to stabilize the demand for money should not be ignored due to the fact the money demand function portrays parameter stability.

There is a need to prioritize key sectors that drive the country's economic growth and hence make sure that money supply is directed to such carefully selected and monitored development projects and programmes which would lead to increase in economic growth and development

Since the results have indicated that growth in real GDP/income has influenced demand for money positively and significantly in Tanzania, the government should implement and focus on policies directed towards improvement in people's income and creation of employment opportunities in Tanzania

There is also need to investigate the influence of deposit interest rate and treasury bills rate on savings and investments exists in Tanzania. Whereby raising interest rate on savings would be considered as an instrument for savings and investment while reducing the treasury bills rate would only work when the government reduces the financing of its budget using the funds that would be used for private sector investment purposes

The government should increase the establishment of capital market and other measures that would improve the performance of the financial sector to ensure that for effectiveness of monetary policies many policy instruments are available to policy makers

5.3 Limitations of the study

One of the limitations of this study has been to obtain reliable data Since data especially time series are usually volatile and incomplete, thus it was necessary to collect from different sources Secondly, the effects of the financial liberalization and the resulting financial deepening during the last one and half a decade were not directly taken into account in the study modeling. This is mainly due to various factors like data and the relevant variable to measure and capture them in this study model This is among the shortfalls in modeling money demand within the cointegration-ECM framework adopted in this study However, this limitation remains an opportunity call for future research

Adam Christopher S., Pantaleo J., Kasey Johnson Nyella and Stephene O'connell A (2010): 'The Demand for Money in Tanzania',[Online] Available at: http://eprints.lse.ac.uk/36393/(Accessed 2nd June 2012).

Adekunle J O. (1968): 'The Demand for money Evidence from Developed and Less Developed Economies.' IMF Staff Papers. Vol 15, No 2,pp 251-265

Akhtar, Hossain (1974) A Quarterly Short run Money Demand model for Bangladesh The Bangladesh Development Studies [e-journal] 16(3)pp 1-30, Available through http //www jstor org/stable/40795325 (accessed 4th, August2012)

Artis, M J and Lewis, M K. (1976). 'The demand for Money in the U K 1963-73 ' Manchester School, vol44, pp 147-81

Augustine C , Arize, John Malindretos, and Steven S., Shwiff. (1999). Structural breaks: Cointegration, and speed of adjustment: Evidence from 12 LDCs money demand International Review of Economics and Finance 8(4) pp 399-420

Barata J M, Lemo P A and Varuz P E (2000) Demand for Money and Elasticity CIEF Lisbon Portugal

Barro Robbert J., and Antony Santomero M (1972) 'Household Money Holdings and The Demand Deposits Rate '- Journal of money, Credit and Banking vol, 4,No 2 pp397-413 Ohio State University Press

Central Bank of Tanzania (CBT) Statistics (2012). Quarterly Economic Bulletins, BOT Dar es Salaam

Chandavarkar A.G. (1977) 'Monetization of developing Economies ' IMF Staff Papers, No24,pp 665 - 721

Collier, Paul and Jan Willem Gunning (1991): "Money Creation and Financial liberalization in a Socialist Banking System: Tanzania 1983-88 " World Development 19(5), 533-538

Dagher J and Kovanen A. (2011): A bounds Testing Approach on the Stability of Money Demand in Ghana IMF Working Paper African Department

Dickey, D. A. and Pantula,S.G. (2002). "Determining the Order of Differencing in AR processes" Journal of Business Economics Statistics, 20. 18-24

Drama Bodi G.H., and Yao Shen (2011): 'The Demand for Money', Evidence from the cointegration Test ' vol 3, No. 1 (2011).

Engle , R.F. and Granger C.W.J. (1987): "Cointegration and Error Correction: Representation, Estimation, Testing," Econometrica 55,pp 251-276

Ferda Halicioglu, Mehmet Ugur. (2005): Stability of Demand for Money in a Developing OECD country The Case of Turkey. [Online] Available at: <http://129.3.20.41/eps/Mac/papers/0508/ pdf. (Accessed on 04 Aug 2012)

Friedman Milton (1959): "The Demand for Money. Some theoretical and Empirical Results "Journal of Political Economy,.LXVII, No 4,327-51.

Friedman Milton (1956): 'The Quantity Theory of Money A Restatement' Studies in the Quantity Theory of Money.' Chicago: University of Chicago Press

Gerdes William (1990) "The Demand for Money in Socialist Tanzania" Atlantic Economic Journal 18(3).

Ghatak S (1981): "Monetary Economics in Developing countries" The Macmillan Press Ltd

Gujarat Damodar (2004). Basic Econometrics, 4th ed McGraw-Hill Companies

Ivanov, V. and Kilian, L. (2001): 'A Practitioner's Guide to Lag-Order Selection for Vector Autoregressions' CEPR Discussion Paper no. 2685. London, Centre for Economic Policy

Jalal Siddiki U (2000). Demand for Money in Bangladesh: A Cointegration Analysis. Kingston University U K, 32(15) pp 1977-84

Judd John P. and Scadding John L. (1982): "The search for a stable Money Demand Function" A survey of post- 1973) Journal of Economics Literature, vol; XX pp 993-1023.

Keynes John M (1936): 'The General Theory of Employment, Interest and Money '' Palgrave Macmillan 2007 ed

Khasadia,C. (1983). 'The behavior of currency Demand Deposits Ratio in India, its Effects on money supply and implication for monetary policy ' The India Economic Journal,vol.31 ,pp89-106.

Khatkhate, D R , V G , Galbis and Villanueva D P (1980): 'A Money Multiplier Model for a Developing Economy ' The Venezuela case Costa Jr and DR Khatkhate (eds) Money and Monetary Policy in LDCs. A Survey of Issues and Evidence Pergamon Press, New York, pp 335-45

King R.G and Levine R. (1993): "Finance Entrepreneurship and Growth, Theory and Evidence ''Journal of Monetary Economics, vol, 35, pp 513-42.

Koffie Nassar, (2005): "Money Demand and Inflation in Madagascar ''IMF working papers

Laidler, D. (1977), 'The Demand for Money Theories and Evidence,' Harper and Row Publishers,New York

Latane H A (1954): 'Cash Balance and the interest rate A Pragmatic Approach ' Review of Economics and statistics, XXXVI, No 4, Nov 1954,456 - 60, 'Income, velocity and interest rate 'A pragmatic Approach ,Review of Economics and statistics, XLII,No 4, 445-9

Lindgren Carl-Johan, Gillian Garcia and Mathew Saal I (1996). 'Bank Soundness and Macroeconomic policy.' IMF Washington DC.

Loxley J. (1979): "The Behavior of Tanzania money supply and the use of monetary Indicators " Papers on the Political Economy of Tanzania

Lungu M, Kisu Simwaka, Austin Chiumia, Arnold Palamuleni, and Wytone J. (2012): "Money Demand Function for Malawi - Implications for Monetary PolicyConduct "Banks and Bank Systems, vol7, 1.

McCallum Bennett (1988) "Robustness Properties of a Monetary Rule " Carnegie Rochester conference series for Public Policy29, Autumn, 173-203

Meltzer, Allan H. (1963): 'The demand for Money' The evidence from the time series ' Journal of Political Economy, LXXI, No.3 June 1963, 219-46.

Mohsen Bahman-Oskooee, Abera Gelan (2009): "How stable is the Demand for money in African Countries?" Journal of Economic Studies, vol.36,3, pp.216 – 235.

Nachega J. (2001). "A cointegration Analysis of Broad money Demand in Cameroon " IMF Working paper WP/01/26.

Ndanshau M (2004). "The Currency Ratio in Tanzania An Econometric Analysis" African Development Review vol 16, No 2, pp 269-286 Nairobi

Ndulu Benno J (1997) "The Challenging Path of Transition to a Low Inflation Economy in Tanzania " The Second Gilman Rutihinda Memorial Lecture (BOT).

Neil Ericsson R. (1998): "Empirical Modeling of Money Demand " Empirical Economics 23, 295-315.

Nyella Johnson (1998). "The Demand for Money in Tanzania "Dar es Salaam Bank of Tanzania

Prasad U R (2011): Determinants of Demand for Money in India- An Empirical Analysis

Randa John (1999) "Economic Reform and the Stability of the Demand for Money in Tanzania " Journal of African Economies 8(3). 307-344

Ribik Jack (1971) "Monetary Economics controversies in Theory and Practice " Random House Inc, New York.

Rothbard Murray N. (2008): The Mystery of Banking 2nd ed. Ludwing Von Mises Institute Alabama.

Samreth Sovannroeun. (2008): 'Estimating Money Demand Function inCambodia (Online) Available at. <http://mpra ub uni-muenchen de/16274/ (access on 6 August 2012).

Samuelson P. (1966): Collected scientific papers The Reflections on Central Banking. The National Banking Review pp1361- 1377

Sims Christopher A (1996): 'What Does Monetary Policy Do"? The Brookings Institutions Papers on Economic Activity vol1,No2 pp 1-78

Siram, Subramanian. (2001) "A Survey of Recent Empirical Money Demand Studies "IMF Staff Papers 47(3): 334-65.

Skrabic B and Plazibat N T. (2009) Evidence of the Long-run Equilibrium between Money Demand Determinants in Croatia World academy of Science, Engineering and technology Croatia

Thorsten – Beck, Ross Levine, Norman Loayza (2000) 'Finance and the source of Growth ' World Bank Research Journal of Financial Economics 58 261-300 pp

Tobin J (1956): "The Interest-Elasticity of Transaction Demand for Cash " Review of Economics and Statistics XXXVIII, No 3, 241 – 7.

Ventura J P (2000): "Money Demand and Inflation An Econometric Study Peru [Available at www.clevelandfed.org/Research/commentary/2000/1200.pdf] (accessed on 15th May 2012)

Walde Klaus (2011): 'Applied Intertemporal Optimization'[e-book]Mainz University Gutenberg Press Available through Waelde library website http://www.waelde.com (Accessed on 10th July 2012).

Watson M (1994). Vector Autoregressions and Cointegration," in Hand book of Econometrics, Volume IV R F Engle and D McFadden (eds.) Elsevier Science Ltd , Amsterdam

Woon Gyu Choi and Seongwan Oh (2003) 'Money Demand Function with output uncertainty, Monetary uncertainty, and Financial Innovations' Journal of Money, Credit and Banking Ohio State University Press, vol 35, No,5 pp 685-709

World Bank (2011): World Development Indicators Available online at data worldbank org Washington DC.

Yu Han and Gan Pei-Tha (2009): An Empirical Analysis of the Money Demand Function in ASEAN-5, International Research Journal of Finance anf Economics ISSN 1450-2887 Issue 33 (2009) [Available at http://www Eurojournals com/finance htm] (Accessed on 12th June 2012)

APPENDIX1 DATA USED IN ANALYSIS

year	md	y	fl	rd	rb	inf	dr
1996	686031	1152468	1.34	0.109	0.156	0.218	0.009
1996	704914	1276268	1.55	0.104	0.154	0.215	0.027
1996	712684	1382347	1.75	0.101	0.152	0.202	0.016
1996	749424	1394569	1.69	0.092	0.15	0.173	0.005
1997	742875	1418976	1.05	0.087	0.153	0.167	0.029
1997	752643	1426739	1.09	0.082	0.147	0.145	0.012
1997	765872	1433260	1.17	0.074	0.149	0.128	0.035
1997	774823	1447830	1.18	0.071	0.146	0.119	0.002
1998	783751	1448962	1.21	0.025	0.148	0.115	-0.005
1998	794282	1448999	1.21	0.077	0.163	0.105	0.008
1998	797893	1466873	1.22	0.036	0.16	0.107	0.059
1998	800364	1489696	1.24	0.073	0.153	0.092	0.021
1999	826844	1496217	1.26	0.083	0.092	0.088	0.024
1999	846853	1525668	1.26	0.044	0.062	0.074	0.061
1999	852228	1548969	1.28	0.074	0.126	0.081	0.005
1999	867751	1569754	1.29	0.071	0.152	0.069	-0.007
2000	883646	1593620	1.33	0.032	0.143	0.067	0.048
2000	870622	1628944	1.35	0.071	0.073	0.064	0.007
2000	896827	1652610	1.33	0.062	0.062	0.063	0.035
2000	917842	1678117	1.38	0.049	0.049	0.061	0.029
2001	932668	1726685	1.39	0.043	0.044	0.059	0.031
2001	945576	1749253	1.43	0.042	0.042	0.058	0.023
2001	954862	1768232	1.44	0.04	0.044	0.055	0.025
2001	966635	1789236	1.45	0.038	0.037	0.053	-0.019
2002	987468	1802365	1.46	0.033	0.035	0.051	0.023
2002	992898	1872343	1.33	0.032	0.041	0.049	0.031
2002	1027841	1901769	1.36	0.028	0.025	0.042	0.025
2002	1159375	1947001	1.39	0.027	0.044	0.045	0.027
2003	1251894	1962402	1.64	0.025	0.058	0.043	0.028
2003	1342986	1983644	1.38	0.025	0.061	0.041	0.017
2003	1421829	2015868	1.41	0.024	0.073	0.045	-0.002
2003	1351294	2071783	1.44	0.025	0.076	0.048	-0.018
2004	1382682	2096879	1.37	0.024	0.073	0.05	0.041
2004	1369876	2101125	1.38	0.024	0.077	0.052	-0.001
2004	1373944	2189772	2.41	0.023	0.081	0.055	0.012

2004	1439206	2240507	1.66	0.026	0.078	0.057	-0.076
2005	1450964	2296848	2.37	0.026	0.051	0.059	0.008
2005	1440987	2302477	1.39	0.026	0.056	0.058	0.024
2005	1565867	2401792	1.38	0.027	0.064	0.053	0.049
2005	1679463	2431984	1.42	0.028	0.069	0.054	0.036
2006	1746476	2576790	2.61	0.022	0.072	0.061	0.069
2006	1839682	2602290	1.53	0.026	0.076	0.068	0.024
2006	1931586	2623578	1.46	0.039	0.079	0.075	0.018
2006	1866789	2810467	1.47	0.025	0.077	0.075	0.028
2007	1876821	2984217	1.49	0.03	0.0715	0.082	0.039
2007	1920896	3101335	1.48	0.035	0.0709	0.089	0.043
2007	1993107	3236893	1.48	0.026	0.0698	0.085	0.045
2007	2009261	3423912	1.45	0.036	0.0642	0.086	0.047
2008	2166889	3488925	1.53	0.029	0.0721	0.089	0.055
2008	2018943	3508935	1.56	0.037	0.0746	0.094	0.057
2008	2236246	3624424	1.59	0.027	0.0839	0.095	0.061
2008	2331236	3739702	1.64	0.031	0.092	0.096	0.072
2009	2376677	3866724	1.78	0.0261	0.11	0.098	0.078
2009	2401789	3989260	1.96	0.027	0.12	0.11	0.071
2009	2499187	4136290	2.12	0.0266	0.12	0.102	0.065
2009	2526186	4274199	2.29	0.0283	0.123	0.104	0.061
2010	2629826	4392497	2.33	0.0288	0.133	0.106	0.042
2010	2766287	4564516	2.36	0.0282	0.129	0.108	0.045
2010	2862155	4762268	2.39	0.0257	0.13	0.11	0.038
2010	2912349	4983964	2.41	0.0241	0.125	0.116	0.032
2011	2989775	5146573	2.54	0.0266	0.128	0.123	0.026
2011	3129198	5274842	2.55	0.0239	0.137	0.125	0.012
2011	3266784	5361221	2.57	0.0234	0.119	0.127	-0.015
2011	3293377	5496547	2.61	0.026	0.126	0.128	-0.019

APPENDIX II Stata software estimations

SUMMARY OF DESCRIPTIVE STATISTICS

```
summarize logmd logy fi rd rb inf dr
```

Variable	Obs	Mean	Std. Dev.	Min	Max
logmd	64	9.44427	.4916937	8.57475	10.27258
logy	64	14.65685	.4392614	13.95742	15.51963
fi	64	1.623125	.4425786	1.05	2.61
rd	64	.0418859	.0239925	.022	.109
rb	64	.0956562	.0404614	.025	.163
inf	64	.0895625	.0412949	.041	.218
dr	64	.0265313	.0269267	.076	.078

```
. summarize logmd logy fi rd rb inf dr, detail
```

logmd

Percentiles		Smallest		
1%	13.57475	13.57475		
5%	13.65231	13.59849		
10%	13.74923	13.6081	Obs	64
25%	14.09794	13.65231	Sum of Wgt.	64
50%	14.38475		Mean	14.44427
		Largest	Std. Dev.	.4916937
75%	14.85592	15.224		
90%	15.1416	15.23359	Variance	.2417627
95%	15.224	15.26637	Skewness	.0145501
99%	15.27258	15.27258	Kurtosis	1.98545

logy

Percentiles		Smallest		
1%	13.95742	13.95742		
5%	14.1481	14.05945		
10%	14.17546	14.13929	Obs	64
25%	14.27397	14.1481	Sum of Wgt.	64
50%	14.54994		Mean	14.65685
		Largest	Std. Dev.	.4392614
75%	15.0557	15.45384		
90%	15.33382	15.47846	Variance	.1929506
95%	15.45384	15.4947	Skewness	.4946771
99%	15.51963	15.51963	Kurtosis	1.996854

fi

	Percentiles	Smallest		
1%	1.05	1.05		
5%	1.18	1.09		
10%	1.22	1.17	Obs	64
25%	1.345	1.18	Sum of Wgt.	64
50%	1.45		Mean	1.623125
		Largest	Std. Dev.	.4425786
75%	1.72	2.55		
90%	2.41	2.57	Variance	.1958758
95%	2.55	2.61	Skewness	1.129869
99%	2.61	2.61	Kurtosis	2.900497

rd

	Percentiles	Smallest		
1%	.022	.022		
5%	.0239	.023		
10%	.024	.0234	Obs	64
25%	.026	.0239	Sum of Wgt.	64
50%	.0289		Mean	.0418859
		Largest	Std. Dev.	.0239925
75%	.0465	.092		
90%	.082	.101	Variance	.0005756
95%	.092	.104	Skewness	1.361013
99%	.109	.109	Kurtosis	3.532447

rb

	Percentiles	Smallest		
1%	.025	.025		
5%	.041	.035		
10%	.044	.037	Obs	64
25%	.0641	.041	Sum of Wgt.	64
50%	.0785		Mean	.0956562
		Largest	Std. Dev.	.0404614
75%	.1315	.154		
90%	.152	.156	Variance	.0016371
95%	.154	.16	Skewness	.1822943
99%	.163	.163	Kurtosis	1.635274

inf

	Percentiles	Smallest		
1%	.041	.041		
5%	.045	.042		
10%	.049	.043	Obs	64
25%	.0575	.045	Sum of Wgt.	64

```
50%        .0835                       Mean           .0895625
                       Largest         Std. Dev.      .0412949
75%         .109          .173
90%         .128          .202         Variance       .0017053
95%         .173          .215         Skewness       1.310129
99%         .218          .218         Kurtosis       4.638719

                              dr
-------------------------------------------------------------
      Percentiles      Smallest
 1%        -.076         -.076
 5%        -.018         -.019
10%        -.005         -.019         Obs                  64
25%        .0105         -.018         Sum of Wgt.          64

50%         .027                       Mean           .0265313
                       Largest         Std. Dev.      .0269267
75%         .044          .069
90%         .061          .071         Variance       .000725
95%         .069          .072         Skewness      -.7313305
99%         .078          .078         Kurtosis       4.89427
```

UNIT ROOT TESTING RESULTS AT LEVEL

```
. dfuller logmd,

Augmented Dickey-Fuller test for unit root        Number of obs   =        62

                              ---------- Interpolated Dickey-Fuller ---------
                 Test         1% Critical       5% Critical     10% Critical
               Statistic           Value             Value           Value
------------------------------------------------------------------------------
 Z(t)            -0.652           -3.563            -2.920          -2.595
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.8587


. dfuller logy,

Augmented Dickey-Fuller test for unit root        Number of obs   =        62

                              ---------- Interpolated Dickey-Fuller ---------
                 Test         1% Critical       5% Critical     10% Critical
```

	Statistic	Value	Value	Value
Z(t)	1.823	-3.563	-2.920	-2.595

MacKinnon approximate p-value for Z(t) = 0.9984

. dfuller fi,

Augmented Dickey-Fuller test for unit root Number of obs =
62

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		---------- Interpolated Dickey-Fuller ---------		
Z(t)	-1.124	-3.563	-2.920	-2.595

MacKinnon approximate p-value for Z(t) = 0.7054

. dfuller rd,

Augmented Dickey-Fuller test for unit root Number of obs = 62

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		---------- Interpolated Dickey-Fuller ---------		
Z(t)	-3.059	-3.563	-2.920	-2.595

MacKinnon approximate p-value for Z(t) = 0.018

. dfuller rb,

Augmented Dickey-Fuller test for unit root Number of obs = 62

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		---------- Interpolated Dickey-Fuller ---------		
Z(t)	-2.325	-3.563	-2.920	-2.595

MacKinnon approximate p-value for Z(t) = 0.1641
. dfuller inf, lags(1)

```
Augmented Dickey-Fuller test for unit root        Number of obs   =        62

                                 ---------- Interpolated Dickey-Fuller ---------
                 Test            1% Critical       5% Critical      10% Critical
               Statistic              Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -3.900            -3.563            -2.920           -2.595
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0020


. dfuller dr,

Augmented Dickey-Fuller test for unit root        Number of obs   =        62

                                 ---------- Interpolated Dickey-Fuller ---------
-
                 Test            1% Critical       5% Critical      10% Critical
               Statistic              Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -2.840            -3.563            -2.920           -2.595
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0528
```

UNIT ROOT TESTING AT FIRST DIFFERENCING

```
. dfuller dlogmd, lags(1)

Augmented Dickey-Fuller test for unit root        Number of obs   =        61

                                 ---------- Interpolated Dickey-Fuller ---------
                 Test            1% Critical       5% Critical      10% Critical
               Statistic              Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -5.709            -3.565            -2.921           -2.596
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

. dfuller dlogy, lags(1)

Augmented Dickey-Fuller test for unit root        Number of obs   =        61
```

```
                                      ---------- Interpolated Dickey-Fuller ---------
                 Test                 1% Critical          5% Critical          10% Critical
               Statistic                 Value                Value                Value
------------------------------------------------------------------------------------------
 Z(t)            -5.771                  -3.565               -2.921               -2.596
------------------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

. dfuller dfa, lags(1)

Augmented Dickey-Fuller test for unit root                  Number of obs   =        61

                                      ---------- Interpolated Dickey-Fuller ---------
                 Test                 1% Critical          5% Critical          10% Critical
               Statistic                 Value                Value                Value
------------------------------------------------------------------------------------------
 Z(t)            -7.232                  -3.565               -2.921               -2.596
------------------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

. dfuller drb, lags(1)

Augmented Dickey-Fuller test for unit root                  Number of obs   =        61

                                      ---------- Interpolated Dickey-Fuller ---------
                 Test                 1% Critical          5% Critical          10%
Critical
               Statistic                 Value                Value                Value
------------------------------------------------------------------------------------------
 Z(t)            -7.051                  -3.565               -2.921               -
2.596
------------------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000


. dfuller ddr, lags(1)

Augmented Dickey-Fuller test for unit root                  Number of obs   =        61

                                      ---------- Interpolated Dickey-Fuller ---------
                 Test                 1% Critical          5% Critical          10% Critical
               Statistic                 Value                Value                Value
------------------------------------------------------------------------------------------
 Z(t)            -7.535                  -3.565               -2.921               -2.596
------------------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

Source: Stata Output

LONG-RUN STATIC REGRESSION RESULTS .

Dependent Variable: LOGMD
Method: Least Squares
Date: 11/16/12 Time: 03:38
Sample: 1996:1 2011:4
Included observations: 64

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGY	0.943627	0.002645	356.8128	0.0000
FI	0.092899	0.021372	4.346720	0.0001
RB	-0.697179	0.213307	-3.268431	0.0018
DR	1.163128	0.325300	3.575559	0.0007

R-squared	0.981305	Mean dependent var	14.44427
Adjusted R-squared	0.980370	S.D. dependent var	0.491694
S.E. of regression	0.068690	Akaike info criterion	-2.452162
Sum squared resid	0.284747	Schwarz criterion	-2.317232
Log likelihood	82.46918	F-statistic	1049.797
Durbin-Watson stat	0.898034	Prob(F-statistic)	0.000000

COINTEGRATION TEST

Date: 11/17/12 Time: 01:23
Sample: 1996:1 2011:4
Included observations: 61
Test assumption: Linear deterministic trend in the data
Series: LOGMD LOGY FI RB DR
Lags interval: 1 to 2

Likelihood	5 Percent	1 Percent	Hypothesized

Eigenvalue	Ratio	Critical Value	Critical Value	No of CE(s)
0.469508	78.66992	68.52	76.07	None **
0.264793	39.99898	47.21	54.46	At most 1
0.233338	21.23521	29.68	35.65	At most 2
0.069830	5.026948	15.41	20.04	At most 3
0.009971	0.611270	3.76	6.65	At most 4

*("") denotes rejection of the hypothesis at 5%(1%) significance level
L.R test indicates 1 cointegrating equation(s) at 5% significance level

Unnormalized Cointegrating Coefficients

LOGMD	LOGY	FI	RB	DR
-1.441445	0.930910	0.708466	-3.294900	5.274948
1.974344	-2.343336	0.197177	0.656536	-5.446468
-0.451389	0.812423	-0.132688	-1.370166	-6.071016
1.403396	-1.577511	0.088959	-2.023362	1.893802
0.778340	-0.617398	0.111631	2.183505	2.238656

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

LOGMD	LOGY	FI	RB	DR	C
1.000000	-0.645817	-0.491497	0.285831	-1.659486	-3.961558
	(0.05958)	(0.07820)	(0.15965)	(0.133620)	
Log likelihood	648.9518				

Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)

LOGMD	LOGY	FI	RB	DR	C
1.000000	0.000000	-1.197340	4.617246	-4.734740	-12.82766
		(0.12275)	(1.05061)	(2.59320)	
0.000000	1.000000	-1.092946	3.610024	-1.664951	-13.72851

		(0.12587)	(1.07730)	(2.65909)	
Log likelihood	658.3642				

Normalized Cointegrating Coefficients: 3 Cointegrating Equation(s)

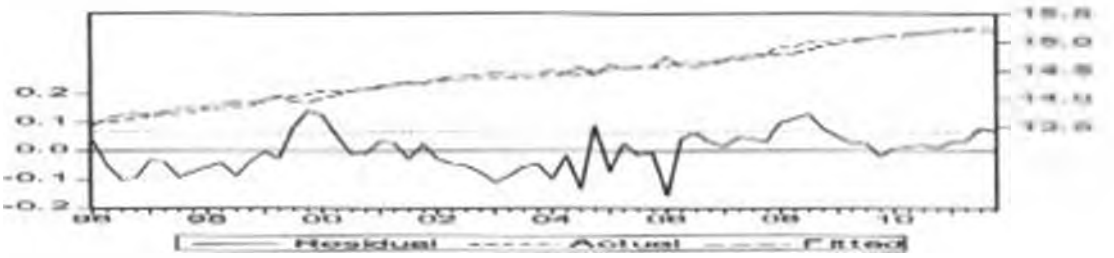
LOGMD	LOGY	FI	RB	DR	C
1.000000	0.000000	0.000000	-7.763832	-42.98845	-12.55047
			(8.75051)	(24.0193)	
0.000000	1.000000	0.000000	-7.691567	-36.58338	-13.47548
			(7.88957)	(21.6561)	
0.000000	0.000000	1.000000	-10.34049	-31.94692	0.231511
			(7.60698)	(20.8804)	
Log likelihood	663.7853				

Normalized Cointegrating Coefficients: 4 Cointegrating Equation(s)

LOGMD	LOGY	FI	RB	DR	C
1.000000	0.000000	0.000000	0.000000	-67.37628	-12.60204
				(65.3718)	
0.000000	1.000000	0.000000	0.000000	-60.74619	-13.52657
				(61.0668)	
0.000000	0.000000	1.000000	0.000000	-64.43323	0.162824
				(71.2470)	
0.000000	0.000000	0.000000	1.000000	-3.141468	-0.006842
				(4.88329)	
Log likelihood	666.8369				

E-views output

UNIT ROOT TESTING FOR LAG RESIDUAL



E-views output

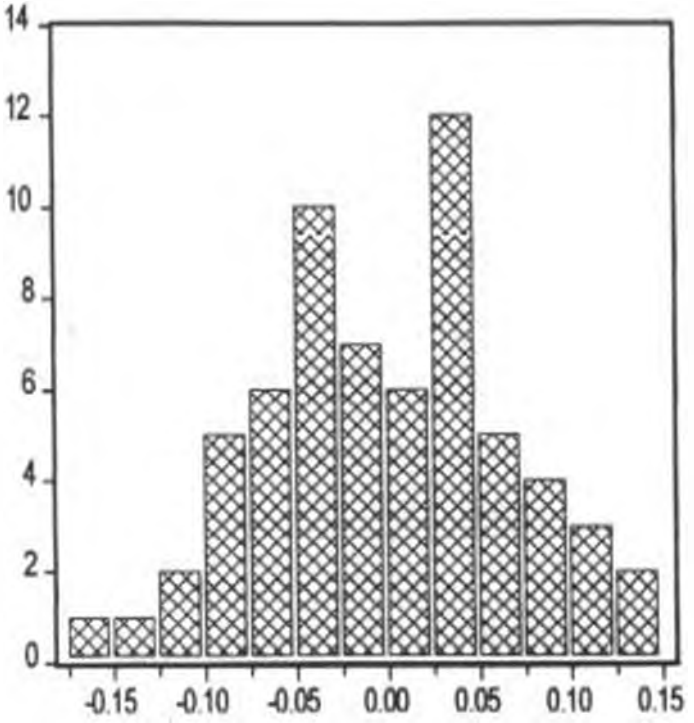
```
. dfuller lagresid, lags(1)

Augmented Dickey-Fuller test for unit root         Number of obs   =        62

                                 ---------- Interpolated Dickey-Fuller ---------
                 Test         1% Critical       5% Critical      10%
Critical
              Statistic           Value              Value             Value
------------------------------------------------------------------------------
 Z(t)            -4.473           -3.563             -2.920            -2.595
------------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.0002
```

APPENDIX III

DIAGNOSTIC TESTS OF ECM AND STABILITY TESTS

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	37.06818	Probability	0.295377
Obs*R-squared	24.69850	Probability	0.176291

White Heteroskedasticity Test			
F-statistic	3.894765	Probability	0.1060745
Obs*R-squared	23.14488	Probability	0.3629183



Series: Residuals	
Sample 1996 1 2011:4	
Observations 64	
Mean	-0.000695
Median	0.002682
Maximum	0.142353
Minimum	-0.155856
Std. Dev.	0.057226
Skewness	-0.008797
Kurtosis	2.480209
Jarque-Bera	0.721313
Probability	0.697219

The Short-run Equation Estimation

The general short-run model

Dependent Variable: DLOGMD
Method: Least Squares
Date: 11/21/12 Time: 15:01
Sample(adjusted): 1996:1 2011:4
Included observations: 60 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.035642	0.013952	2.554672	0.0146
DLOGMD_1	0.144960	0.139510	1.039085	0.3052
DLOGMD_2	0.049701	0.145484	0.341622	0.7345
DLOGMD_3	0.168133	0.152249	1.104329	0.2762
DLOGY	-0.173607	0.291494	-0.595577	0.5549
DLOGY_1	-0.073800	0.291430	-0.253233	0.8014
DLOGY_2	-0.141454	0.246260	-0.574409	0.5690
DLOGY_3	0.426901	0.247324	1.726075	0.0922
DFI	-0.007633	0.006706	-1.138326	0.2619
DFI_1	-0.011273	0.005669	-1.988635	0.0538
DFI_2	0.004941	0.004944	0.999499	0.3237
DFI_3	0.001700	0.004810	0.353400	0.7257
DRD	-0.002310	0.001382	-1.670709	0.1028
DRD_1	-0.000474	0.001440	-0.328798	0.7441
DRD_2	0.001199	0.001388	0.863898	0.3929
DRD_3	-0.003468	0.001402	-2.473701	0.0178
DRB	0.068369	0.126408	0.899080	0.4687
DRB_1	-0.280919	0.148316	-1.894057	0.0657
DRB_2	-0.095882	0.147730	-0.649035	0.5201
DRB_3	-0.118063	0.130146	-0.907156	0.3699
DINF	0.068237	0.086254	0.791536	0.2923
DINF_1	0.023746	0.064185	0.370585	0.0865
DINF_2	-0.006247	0.056489	0.110638	0.1922
DINF_3	0.002379	0.032859	0.072256	0.3861
DDR	-0.217923	0.058617	3.718137	0.0025
DDR_1	0.058145	0.047238	1.230947	0.1136
DDR_2	0.032688	0.038493	0.849053	0.2874
DDR_3	0.003492	0.009414	0.370885	0.4842
ECT_1	-0.218617	0.070565	-3.098104	0.0036

R-squared	0.388250	Mean dependent var	0.027005
Adjusted R-squared	0.074633	S.D. dependent var	0.021259
S.E. of regression	0.020451	Akaike info criterion	-4.672346
Sum squared resid	0.016312	Schwarz criterion	-3.939325
Log likelihood	161.1704	F-statistic	1.237579
Durbin-Watson stat	2.447122	Prob(F-statistic)	0.277283

Source: E-views Output

Specific parsimonious model Specific parsimonious model

Dependent Variable: DLOGMD
Method: Least Squares
Date: 11/22/12 Time: 09:36
Sample(adjusted): 1996:1 2011:4
Included observations: 61 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.056520	0.010595	5.521694	0.0410
DLOGMD_1	0.024281	0.007876	3.044065	0.0373
DRB_1	-0.316507	0.089234	-3.547452	0.0283
DINF_2	-0.372621	0.087423	4.262268	0.0066
DDR	-0.168362	0.074631	-2.255924	0.0495
LAGRESID	-0.156842	0.060913	-2.607554	0.0345
R-squared	0.381452	Mean dependent var		0.049355
Adjusted R-squared	0.258244	S.D. dependent var		0.044459
S.E. of regression	0.038271	Akaike info criterion		-7.883561
Sum squared resid	0.037826	Schwarz criterion		-6.464692
Log likelihood	77.56068	F-statistic		12.53402
Durbin-Watson stat	1.910870	Prob(F-statistic)		0.003980

Table 4.10: The Chow-types test results

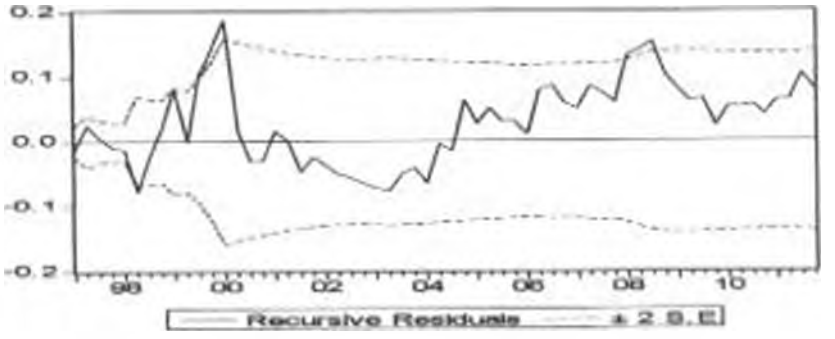
Chow Breakpoint Test: 2004 1

F-statistic	1.081003	Probability	0.403833
Log likelihood ratio	18.46383	Probability	0.102318

Chow Forecast Test: Forecast from 2004 1 to 2011.4

F-statistic	1.335310	Probability	0.220182
Log likelihood ratio	59.30650	Probability	0.422336

Fig 4.5 Recursive Residuals test results



Ramsey RESET test results

Ramsey RESET Test:

F-statistic	0.776793	Probability	0.513105
Log likelihood ratio	3.029392	Probability	0.387116

Test Equation
Dependent Variable: DLOGMD

Fig 4.3 CUSUM test

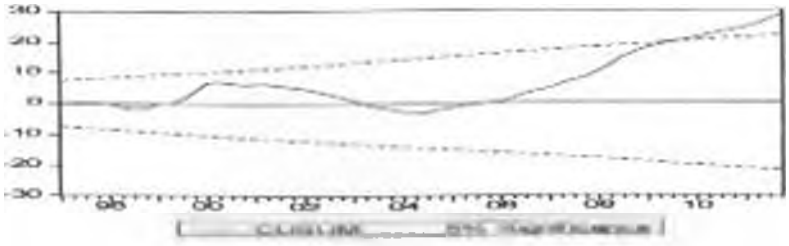


Fig 4.4 CUSUM SQ test