DETERMINANTS OF MONEY DEMAND IN KENYA

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DECLARATION

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

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

Signed. …….. Date. ……

Prof. Nelson H. Wawire

Signed. …….. Date. ……

Ms. Susan A. Ayako

DEDICATION

I dedicate this research paper to my beloved Mother, Sofiah for her priceless sacrifice, to my dear wife Winnie and Sons Vitalis and Victor for inspiration.

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I wish also to express my sincere appreciation to my family for the sacrifices they have made to enable me reach this point in life. Above all I would like to thank the almighty God for seeing me through this academic journey and for the gift of life, provision, strength and health.

Finally, I am responsible for any mistakes, errors or opinions in this research paper.

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ABBREVIATIONS AND ACRONYMS

ATM	Automated Teller Machine
CBK	Central Bank of Kenya
GDP	Gross Domestic Product
IMF	International Monetary Fund
KES	Kenya Shillings
KNBS	Kenya National Bureau of Statistics
KV 2030	Kenya Vision 2030
NBFIs	Non-Bank Financial Institutions
SAPs	Structural Adjustment Programs
USD	United States Dollar
WAEMU	West African Economic and Monetary Union

OPERATIONAL DEFINITION OF TERMS

Monetary Policy: The process by which the monetary authority of a country controls the supply of money, through targeting a variety of instruments such as rate of interest for the purpose of promoting economic growth and stability

Financial Innovation: Technological advances which facilitate access to information, trading and means of payment, and to the emergence of new financial instruments and services, new forms of organization and more developed and complete financial markets

Money supply: The total stock of money in the economy at a given time.

Money demand: Desired holding of financial assets in the form of cash or bank deposits

GDP- the total market value of all final goods and services produced in a country in a given year.

Inflation - The overall general upward price movement of goods and services in an economy.

M0 and M1 - Also called narrow money, normally include coins and notes in circulation and other money equivalents that are easily convertible into cash

M2- Includes M1 plus short-term time deposits in banks and 24-hour money market funds.

M3- Includes M2 plus longer-term time deposits and money market funds with more than 24-hour maturity.

ABSTRACT

Understanding the demand for money in an economy is an important prerequisite for formulating and conducting monetary policy. The demand for money is mainly influenced by the levels of prices, interest rates, real national output and the pace of financial innovation.

Kenya has undergone significant changes in the macroeconomic landscape over the years such as financial liberalization, exchange rate regime changes, liberalization of the capital account of the balance of payment and an array of financial innovations and developments. Such changes in the economy may have caused shifts in the parameters of the money demand function over time, making the function unreliable for policy decisions. It is therefore necessary to investigate the money demand function in the country using the latest data and including financial innovation.

Studies in Kenya have not included in the money demand estimations the role of financial innovations witnessed in the country since the financial liberalization of 1980s and 1990s. This study measured and included financial innovations in the money demand function as well as captured the impact of financial liberalization since it used data for pre and post liberalization.

Most of the empirical studies reviewed expressed the money demand functions in real terms and specified the models as log-linear with the estimation relying mainly on error correction models. The contemporary studies acknowledged the role of changing external and internal economic and financial landscape, as well as the achievements in the time series econometric estimation of money demand functions.

Using cointegration and error-correction model, this study sought to examine the relationship between demand for money and levels of prices, interest rates, real national output, exchange rate and the pace of financial innovation in Kenya using data from 1970 to 2012

The short-run and long-run estimation findings show that only GDP, and inflation are significant determinants of real money demand in Kenya. Specifically, the results show that increased GDP and inflation increases the demand for real money balances. This implies that policies aimed at increasing the country's GDP should be pursued. Also since money demand is determined by inflationary factors in Kenya, it supports the use of monetary aggregates M3 to target inflation as a policy tool.

CHAPTER ONE

INTRODUCTION

1.1. Background to the study

Understanding the demand for money in an economy is an important prerequisite for formulating and conducting monetary policy. A change in monetary aggregates influences national output, interest rates and general price levels. These are important variables that affect the production and consumption decisions in an economy. Demand for money is the desired holding of financial assets in the form of cash or bank deposits (Goldfeld & Sichel, 1990). Economic agents are motivated to hold money to facilitate transactions, precautionary and for speculative purposes.

Different measures of money supply exist and they include M0, M1, M2, M3 and M4. These classifications depend on countries, either because of institutional framework or arbitrary specifications. The Central Bank of Kenya (CBK) defines M1 as including coins and notes circulating in the economy and other money equivalents easily convertible into cash. M2 includes M1 and short time deposits in banks and 24 hour money market funds. M3 consists of M2 and includes longer-term time deposits and money market funds with more than 24 – hour maturity. M1 is also referred as narrow money while broad money describes M2 and M3.

Money serves as a medium of exchange, as a store of value and as a unit of account. Money underpins all sectors of the economy and ensures operation of economies.

In an economy, the aggregate demand for money is a result of money demanded by households, firms and government, each with distinct money demand function. Money provides liquidity by facilitating transactions and can earn interest. Demand for money results from the trade-off between the liquidity advantage of holding money and the interest advantage of holding other assets (Handa, 2009)

The demand for money is mainly influenced by the level of prices, the level of interest rates, and the level of real national output (real GDP) and the pace of financial innovation (Mankiw, 2008; Barro, 1997). The demand for money has direct relationship with the general price levels. Generally, nominal demand for money has direct relationship with nominal output (such as gross domestic product), and an inverse relationship with interest rate. The liquidity preference and money supply curve (LM) provides the combinations of interest rates and output levels for equilibrium in the money market (Handa, 2009).

The European Central Bank describes financial innovation as the 'technological advances which facilitate access to information, trading and means of payment, and to the emergence of new financial instruments and services, new forms of organization and more developed and complete financial markets.' Arrau et al. (1991) found out that financial innovation has inverse relationship with the demand for money balances.

1.2. Monetary Policy Framework in Kenya

The colonization of Kenya brought about centralized and formal governance, which included a formal monetary system.

This ushered in the era of monetary policy management occasioned by the need to control money supply and regulation of the quantity of money in the economy towards the goal of determining national output, inflation and balance of payments.

The Central Bank of Kenya was established in 1966 following the dissolution of the East African Currency Board. The main mandate of the Central Bank was formulation and implementation of monetary policy directed to achieving and maintaining stability in the general level of prices. Pursuance of this mandate is based on the presumption that money matters, that the behavior of monetary aggregates has major bearing on the performance of the economy (Kinyua, 2001). The Central Bank was formed with the mandate of developing and maintaining a sound monetary system in the country, as well as maintaining a desirable level of foreign exchange. To achieve these objectives, the CBK's preferred monetary policy strategies included controls on interest rate, credit expansion and money supply growth (Kinyua, 2001).

An analysis of the evolution of the monetary policy in independence Kenya (Kinyua, 2001; Killick & Mwega, 1990) indicated that the period after independence was characterized by stable macroeconomic environment. The decade of 1970 was however characterized by unstable macroeconomic situations emanating mainly from balance of payment deficits and inflation pressures, occasioned by the collapse of the Bretton Woods system of fixed exchange rates in 1971and the 1973 oil crisis. For instance, inflation rose to double digits in 1973 and remained so well into the 1980s.

Mwega (1990) explained that the 1980s saw the country's economy affected by external and exogenous shocks emanating from changes in import and export prices, adverse weather conditions, Bretton Woods's structural adjustment programs (SAPs) and increasing external debt. This period was characterized by controls on interest rates, fixed exchange rates and prices.

In the 1990s, the implementation of the SAPs continued which among other things provided framework for liberalized trade (unlike the post-colonial import substitution) as well as market determination of the exchange rate (Gertz, 2008). This period was also characterized by elimination of price controls, privatization of state-owned business entities and financial sector reforms, especially of the non-bank financial institutions (Gertz, 2008). The country also witnessed macroeconomic disturbances in the run up to the general elections of 1992 when the inflation shot up to about 50 per cent. The decade also saw the tightening of external budgeting and subsequently fiscal control measures (Ndung'u, 1999).

Adams, Maturu, Ndung'u and O'Connell (2010) contended that the monetary policy regime changes in the 1990s laid the foundations for the decade of solid economic performance lasting until 2007. In this period, the economy grew from around 2 per cent annually in the late 1990s to around 7 per cent annually in 2007. Inflation was also under control.

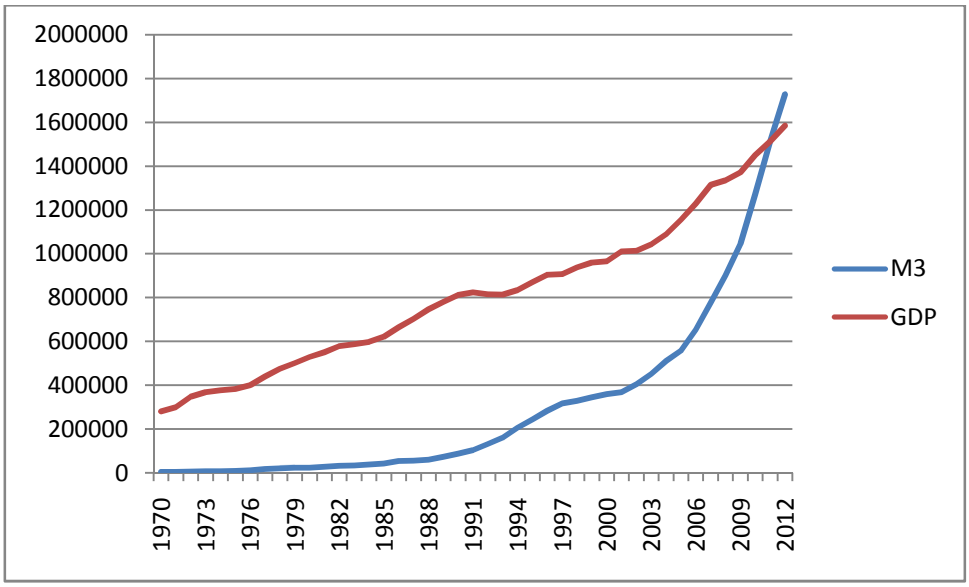

Figure 1.1: Performance of Real GDP and Real Money Balances (1970-2012)

Source of data: Central Bank of Kenya complemented with World Bank Development indicators.

Figure 1.1.shows a steady growth of real money balances in Kenya since 1970 to 2011. The same steady growth is observed in the growth of real gross domestic product at current prices in the country. The two variables move in the same direction, accentuated by periods of apparent breaks like in 1973/1974, 1984/1985, 1991-1992-1993. These apparent structural breaks could be explained by the oil shocks in 1973/1974, the serious drought of 1984/1985. The major macroeconomic turmoil of the early 1990s is captured in the breaks of 1991-1992-1993 period. There is an apparent spike in the real money balances and the real gross domestic product in 2008.

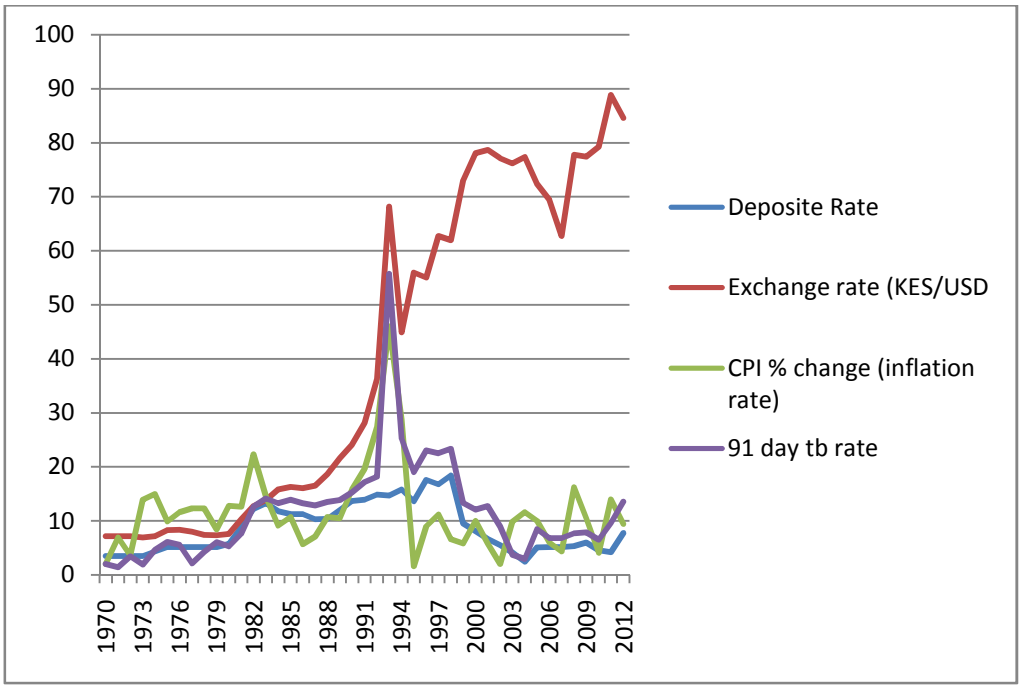

Figure 1.2: Performance of Selected Macro-Economic Variables (1970-2012)

Source of data: Central Bank of Kenya complemented with World Bank Development indicators.

Figure 1.2 shows the performance of exchange rate (KES to the USD), percentage change in the consumer price index which indicates the inflation rate over the years, the deposit rate paid for demand deposits for corporate customers, all savings and time deposits in the country. Also provided is the performance of the 91-day Treasury bill rate which represents the return on assets alternative to money, as the benchmark interest rate used. The movement of these variables is in line with the general macroeconomic conditions in the country indicating periods of macroeconomic instability and general inability to rein in on key variables.

The general consensus point to the fact that the monetary policy framework adopted has persistently failed to achieve the inflation targets and other

policy objectives (Adams, Maturu, Ndung'u & O'Connell, 2010). More specifically, the contemporary challenges involve choosing the optimal policy instrument to achieve the desired monetary objectives such as fixing the exchange rate to a reference currency, inflation targeting and fixing monetary aggregates.

The choice of the policy strategy to adopt is based upon a clear understanding of the demand for money in an economy. Macroeconomic stability is an important prerequisite for the achievement of Kenya's long term economic goals. The long term growth plan, identified in the Kenya Vision 2030 highlights the importance of effective monetary policy, specifically hitting the inflation targets as well as having a predictable exchange rate (Republic of Kenya, 2007).

1.3. Statement of the Problem

Knowledge of the demand for money in an economy is important for the formulation and conduct of monetary policy in terms of predicting the influence on output, interest rates and prices (Sriram, 2001). Kilick and Mwega (1990) postulate that the behavior of monetary aggregates affects inflation and balance of payments position of an economy. Governments pursue monetary policy in order to attain and maintain low inflation, minimize time-inconsistencies in targeting inflation, and to smoothen payment and financial systems in an economy (Adams, Maturu, Ndung'u and O'Connell; 2010).

Kenya has undergone significant changes in the macroeconomic landscape over the years such as financial liberalization, exchange rate regime changes, liberalization of the capital account of the balance of payment and an array of financial innovations and developments (Sichei & Kamau, 2012;

Adam, Maturu, Ndung'u & O'Connell, 2010). Such changes in the economy may have caused shifts in the parameters of the money demand function over time, making the function unstable (Randa, 1999). Therefore, unstable money demand function is consequently ineffective towards the conduct of monetary policy framework in the country and therefore needs re-examination. The annual inflation target of 5 per cent, under the current macroeconomic framework has been consistently missed and Adams, Maturu, Ndung'u & O'Connell, (2010) contended that there has been an upsurge in inflation in the last half of the 2000s that is not attributable to external factors such as drought or oil price increases.

The subject of the demand for money has received considerable attention in Kenya. These studies stretch back to the 1980s including Pathak (1981), Darrat (1985), and Kanga (1985) as reviewed by Sichei & Kamau (2012). Other studies include Kilick and Mwega (1990), Mwega, (1990); Ndele, (1991). Sichei and Kamau (2012) concluded that before Adams (1992), 'the work on demand for money turned out disparate findings regarding the determinants and stability of the demand for money' and that 'Adams (1992) attributed the differences in reported results to differences in sample size, composition of explanatory variables and the appropriate specification of the dynamic adjustment in the demand for money.' The post 1992 studies include Ndung'u (1994) and Kisinguh, Korir and Maana (2004). These studies however do not reflect the significant changes in the country's macroeconomic landscape over the years. Sichei and Kamau (2012) estimated the demand for money functions using data from 1997 to 2011.

While Sichei and Kamau (2012) acknowledged that financial innovations and developments may have impacted on the monetary aggregates and the

stability of money demand in Kenya, the study did not include a variable to measure financial innovations and developments. Therefore, using only the most recent data may miss the role of financial innovations in determining demand for money in Kenya. This study will introduce a variable to represent financial innovations in the model as well as using a longer period of data from 1970 to 2011.

1.4. Objectives of the Study

The general objective of this study was to examine the determinants of demand for money in Kenya. The specific objectives were to examine how;

i. Prices determine demand for money in Kenya
ii. Interest rates determine demand for money in Kenya
iii. Levels of real national output determine demand for money in Kenya
iv. The pace of financial innovation determine demand for money in Kenya
v. Suggest policy implications based on the findings of this study

1.5. Research Questions

The study sought to answer the following questions;

i. How do price levels determine demand for money in Kenya?
ii. What is the relationship between interest rates and the demand for money balances in Kenya?
iii. How does the real national output levels influence demand for money in Kenya?
iv. How is the pace of financial innovation related to the demand for money in Kenya?
v. What policy implications can be inferred from this study towards conduct of monetary policy in Kenya?

1.6. Significance of the Study

Understanding the determinants of money demand in Kenya will inform the monetary policy framework in the country which is especially important given that five years since the implementation of the Kenya Vision 2030, various monetary policy targets have been consistently missed. These include inflation, exchange rate, GDP growth rate and investment and savings. Findings of such a study provide the framework for the implementation of the macroeconomic framework for the realization of Kenya Vision 2030, especially on the targets of economic growth, monetary policy, exchange rate policy and investment and savings (Republic of Kenya, 2007).

Additionally, findings of this study will contribute to the literature on the evolution and dynamism in the monetary framework in Kenya. This contribution is useful for the current and future research.

1.7. Scope and Organization of the Study

This study was limited to establishing the determinants of money demand in Kenya. The study used annual observations of the period between 1970 and 2012. The choice of this period is motivated by availability of reliable and comprehensive data and to meet the minimum sample requirement for a time series data n=30.The rest of the study is organized as follows; chapter two provides a review of theoretical and empirical literature. Chapter three provides the methodological framework of the study in terms of study design, theoretical framework; model specification, postulation of the hypotheses, data and its time series properties. Chapter four presents the empirical results and their interpretation whereas chapter five gives the summary, conclusions and policy implications

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This chapter presents the review of both theoretical and empirical literature on the determinants of money demand.

2.2. Theoretical Literature

The evolution of money demand theories since the classical period to the present is presented.

2.2.1. Quantity Theory of Money Demand

The functions of money provided the framework for classical economists to conceptualize formulation of money demand theories, as was the case of Leon Walras who expressed the role of money demand as part of explaining economic equilibrium (Schumpeter, 1954, as cited by Sriram, 1999).During this period, the quantity theory of money started forming as expressed by Fisher (1911) in the equation of exchange. Pigou (1917) further developed the theory by introducing the supply-side dynamics in the context that some portions of money was not used for transactions but rather held for convenience and security.

The equation of exchange relates the quantity of money in circulation to the volume of transactions and the price level of articles traded in a given period through a proportionality factor called the transactions velocity of circulation (Fisher, 1911). In this case, money does not have intrinsic value but it is held only to facilitate transactions. Pigou (1917) advanced the cash balance approach which emphasized individual choice rather than market

equilibrium, holding money as a store of value rather than the medium of exchange as in Fisher's case and incorporating the role of wealth and the interest rate in determining the demand for money.

The cash balance approach provides a more satisfactory description of monetary equilibrium within the classical model as it focuses on public's demand for money as well as highlighting the role of money as a store of value and that its movement as depending on the desirability of holding cash (Sriram, 1999).

2.2.2. Liquidity Preference Theory of Money Demand

Compared to other proponents of theory of money demand, Keynes offered a more rigorous approach on the issue. Keynes (1936) postulated three motives for individuals to hold money namely, transactions, precautionary and speculative. The role of money as a medium of exchange explains the transactions motive and is similar to the quantity theories of money. The precautionary motive emanates from the mismatch of payments and receipts and therefore the demand to hold money to smoothen out these future uncertainties.

The speculative motive bore the liquidity preference theory of money demand and emphasizes the store-of-value function of money. According to this theory, individuals can hold their wealth in either money or bonds and the rate of interest determined the preference for either form of holding wealth. The value attached to liquidity leads to the introduction into the money demand function. Thus, expressing the demand for money in equation form becomes;

$$M^d = f\ (y, i)$$

Where the demand for real balances M^d is a function of real income y and interest rate i.

Post Keynesian researchers latched onto Keynes contribution to the theory of money demand to put forward other theories that include both income and interest rates to explain the nature and determinants of the money demand functions. These include the inventory-theoretic approach, the precautionary demand for money approach, money as an asset approach, and consumer demand theory approach.

2.2.3. Inventory-Theoretic Approach

In this approach developed by Baumol (1952) and Tobin (1956), money is viewed as an inventory asset held for transactions purposes. An individual could hold liquid financial assets which offer higher yields than money but involve transactions costs of converting the assets into money, therefore justifying holding money as inventory. The household's portfolio dilemma is the optimal holdings of money to minimize transactions costs and financial assets to maximize on interest earnings. This approach is summarized as (Sriram, 1999);

$$M^* = \sqrt{(a_0 y)/2r}$$

Where the optimal demand for real money balances (M^*) is directly proportional to transactions costs (a_0) and real income (y), and inversely proportional to the interest rate (r). Therefore, according to Baumol (1952), the stock of cash acts as an inventory, 'serving then as its possessor's part of the bargain in an exchange'.

2.2.4. The Precautionary Demand for Money Approach

Whallen (1966) exposits that individuals hold money for precautionary motives because of uncertainty about the future payments. Individuals hold money and therefore reduce the costs of illiquidity while it reduces interest earnings. Accordingly, Dornbusch and Fischer (1990) postulate that the optimal solution is found by weighing the interest costs against the advantages of liquidity. The assumption of certainty in receipts and payments underlying inventory models are relaxed in this approach. Therefore, Sriram (1999) summarizes the optimization behavior of an economic agent of 'the amount of precautionary cash balances to hold by carefully weighing the interest costs against the advantages of not being caught illiquid'

2.2.5. Money as an Asset Approach

Since money stores value, it is therefore treated as an asset in a portfolio of assets held by an economic unit. Such assets are accompanied by a certain risk and yield expected returns. Judd and Scadding (1982), theorizes that holding money as an asset eases transactions and provides liquidity and safety. This approach links demand for money to interest rates as well as showing the importance of wealth and liquidity as key variables in the model. Therefore, inclusion of scale variable as well the opportunity cost variable in the model for this study will be based on this theoretical approach.

2.2.6. Consumer Demand Theory Approach

Friedman (1956) and Barnett (1980) used the consumer demand theory of utility to analyze the demand for money. This approach bore the Friedman's 'restatement of the quantity theory'in which the demand for assets is seen on axioms of consumer choice.

Thus real goods should also be included in the portfolio of financial assets since they yield flow of services. This aspect therefore introduces inflation in the money demand function as a proxy for yield on real goods.

The enduring argument in the theoretical evolution of demand for money is that the optimal stock of real money balances is inversely related to the interest rate and positively related to real income. However, deviations among proponents of various approaches are in the use of scale variable and the opportunity cost of holding money (Sriram, 1999). The scale variable in this study will be the real gross domestic product and the opportunity cost of holding money will be represented by interest rates, inflation rates and exchange rates.

2.3. Empirical Literature

The subject of determinants of money demand has elicited considerable attention among scholars in both the developed and developing economies across the globe. While it is true that the industrialized economies pioneered in the empirical studies on money demand, there has been considerable interest in the developing countries as Central Banks come to appreciate the role of money demand in the conduct of monetary policy.

A money demand model developed by Goldfield (1973) relating real money balances to a scale measure, such as an income and the opportunity cost of holding money measured by returns of one or more alternative assets has provided the ground work of most empirical studies on determinants of money demand in developing countries.

Mwega (1990), motivated by the dearth of literature on the fiscal and monetary policies conduct in Kenya, sought to examine the determinants of

money demand in the country as well as assess the stability of the function. A semi log-linear regression model was used on quarterly data for the period 1973:3 – 1988:4. The analysis used basic linear regression with controls on the equations for first order serial correlation using the Cochrane and Orcutt technique. The regression model was found to explain the real demand for money in Kenya. Since the time of this study, Kenya has undergone various financial changes and thus these studies cannot effectively provide framework for the conduct of monetary policy in the country. Also, the estimation methods have evolved from the simple regression analysis amenable to spurious results.

An estimation of money demand function for the countries in West African Economic and Monetary Union (IMF, 1998) found consistent results in line with economic theory when narrow money (M1) was used as compared to the broad money (M2). The study used data for the WAEMU member countries from 1973 to 1996 and estimated the model using OLS method. Aggregating the countries in which the individual country observations were summed together may hide country-specific characteristics which are important for robust analysis. Additionally, the use of OLS may result to spurious findings which may be unreliable for policy inferences.

Ndele (1991) specifically analyzed the effects of non-bank financial intermediaries on demand for money in Kenya. Introducing NBFIs into the money demand function for a country with undeveloped financial market like Kenya helps to capture the full effects of monetary transmission, unlike when attention is only focused only on commercial banks. Using both annual and quarterly data over the period 1973.1 to 1987.4, the model was specified to include the lagged dependent variable as an independent variable. Linear regression analysis produced results indicating 'that NBFI

deposits are substitutes for commercial banks deposits and should thus be subjected to monetary controls.' This study was done in the era of interest rate controls and thus may not be applicable in the current era of market determined interest rates.

Using the structural vector autoregressive method, Azali and Matthews (1999) found out that innovation in the financial sector influenced national output thus influencing the demand for money in Malaysia. This study introduced the measure of financial innovation as an important variable explaining output fluctuations and subsequently the demand for money balances.

King'ori (2003) studied the determinants of money velocity in Kenya for the period 1992 – 2002 by determining four velocity functions of money as currency in circulation, narrow money, broad money and extended broad money. Using the cointegration and error correction models, the study established long-run relationship and short run dynamics. The results of the study revealed that short run money velocity as highly influenced by financial innovations and the exchange market; while real interest rate had lesser effect. Inflation rate did not have any significant effect on money velocity. The real per capita income had inverse relationship with money velocity. This study misses the recent financial sector innovations in the country despite introducing the new aspect of measuring the velocity of money.

Bahmani-Oskooee and Gelan (2009) investigated the stability of the M2 demand for money in 21 African countries (including Kenya) using quarterly data over the period 1971Q1-2004Q3.the study used a bounds testing approach to co-integration and error-correction modeling and found

out that in almost all 21 countries, M2 demand for money is stable. This could be due to incorporating the short-run adjustment process in testing for the stability of the long-run elasticity estimates. Like in all cross-country comparison studies, the generalities inherent in such studies do not reveal the country specific characteristics of money demand determinants.

Misati et al. (2010) examined the role of financial innovation on the monetary policy transmission in Kenya using Two Stage Least Squares (2SLS) and monthly data covering the period, 1996-2007 and established that financial innovation dampens the interest rate channel of monetary transmission mechanism. The paper was motivated by the fact that the rapid financial innovation in the country could have contributed to possible implications on monetary transmission mechanisms, which would necessitate constant revision of policy and instruments, targeting frameworks and operating procedures to enhance monetary policy effectiveness. The study focused on the interest rate channel through which the Central Bank implements monetary policy which significantly changes from including the financial innovation variable in a money demand function.

Khan and Hye (2011) estimated the role of financial liberalization on the demand for money in Pakistan using annual data for the years 1971 – 2009. To capture the effect of financial liberalization in the model, the study used time trends instead of dummy variables that capture structural breaks. Using the cointegration and auto regressive distributed lag (ARDL), the study estimated long run equilibrium relationship between broad money and composite financial liberalization index along with other determinants of demand for money such as GDP, real deposit rate and exchange rate. Results indicated existence of a long run money demand function in respect

of broad money and that financial liberalization positively affect the demand for money in the long as well as short-run. Due to technical and data limitations, this study will however use dummy variables to cater for various structural breaks in the financial liberalization in Kenya, during the study period.

Suliman and Dafaalla (2011) estimated the determinants of narrow money demand in Sudan and found both long and short run relationship between real money balances and real GDP, rate of inflation, and exchange rates in Sudan using annual observations for the period between 1960 and 2010. The study applied both cointegration and error correction model to test the relationship. The use of narrow money has some advantages such as amenability to control and appropriate in countries with weak banking system and undeveloped markets. However, it is not easy to distinguish M1 from other categories of money balances because of shifting boundaries and the estimation results using M1 are less useful in policy since its relationship with nominal income varies considerably.

Bitrus (2011) disaggregated money stock into M1 and M2 and using data in Nigeria from 1985-2007 found differences among the determinants for different components of money. For instance, income was found to be insignificant with narrow money, both M1 and M2 did not show any relationship with interest rates and inflation as well as giving mixed reactions for exchange rate. The model used in this study may have been mis-specified and the use of OLS may compromise the estimation hence the results.

Sichei and Kamau (2012) estimated the demand for money functions in Kenya motivated by the fact that since the last study on the subject, the

country had undergone financial reforms in the late 1980s and early 1990s as well as adopted a floating exchange rate regime. The specific objective of the study was to use newest data to ascertain the stability of the estimated relationship. Using cointegrated vector autoregression (VAR) analysis for the quarterly data of the period between 1997:4 to 2011:2, the study found out that demand for the different monetary aggregates are affected to varying degrees by changes in real GDP, nominal Treasury bill rate, nominal exchange rates and nominal foreign interest rate. The findings also indicated that the demand for the different monetary aggregates was unstable implying that the current monetary policy framework based on stable and predictable demand for money was inappropriate. The study uses the number of automated teller machines (ATMs) to measure the impact of financial innovation in the demand for money in the country. Measuring financial innovation by the number of ATMs may miss other uses of quasi-money such as use of debit and credit cards as well as money transfer through mobile telephony such as M-Pesa. That is why this study will measure financial innovation differently. Additionally, the data period is fairly recent and may not capture the impact of various structural breaks in the Kenyan economy that may affect the long-run demand for money. This study will contribute to the existing body of literature by introducing a new measure of financial innovations and capturing structural changes in the macroeconomic landscape in the country from 1970 to 2011.

In general, the empirical examination of money demand applies the conventional theoretical formulation of money demand relationship of the form $m = f\ (y, r)$ relating demand for money balances (m) to a measure of transactions or scale variable (y) and the opportunity cost of holding money (r). The scale variables could include real income, expenditure or wealth. Other studies also include own rate of return on money (Sichei &

Kamau, 2012) as well as lagged dependent variable to capture adjustments in the real and desired demand for money balances (Mwega, 1990; Ndele, 1991).

2.4. Overview of Literature

There exists a large body of literature devoted to the estimation of money demand functions in both the developed and developing economies. This is expected given the role of a stable money demand function for the conduct of monetary policy.

Various money demand theories exist that examine demand for money from the transactions, speculative, precautionary and utility perspectives. Sriram (1999) concluded that the theories spurned by these diverse perspectives agree on the variables that determine the demand for money (such as scale variables and opportunity cost variables) but differ on the specific role assigned to each variable in money demand equation.

The empirical studies reviewed estimate the demand for money basing on scale variables (range from income to wealth) and the opportunity cost of holding money (involves own-rate of money and rate of return on assets alternative to money and is measured as interest rates, yields on government securities, commercial paper and savings deposits, expected rate of inflation and exchange rates). The stock of money balances is represented by various definitions of broad and narrow money, with these classifications differing in countries. In Kenya, the broad money measured by M3 is used commonly because of its role as the intermediate target under the current monetary policy framework (Sichei & Kamau, 2012).

Most of the empirical studies reviewed expressed the money demand functions in real terms and specified the models as log-linear with the estimation relying mainly on error correction models. The contemporary studies acknowledged the role of changing external and internal economic and financial landscape, as well as the achievements in the time series econometric estimation of money demand functions.

Studies in Kenya have not included in the money demand estimations the role of financial innovations witnessed in the country since the financial liberalization of 1980s and 1990s. This study will measure and include financial innovations in the money demand function as well as capture the impact of financial liberalization since it will use data for pre and post liberalization. Other determinants to be estimated include the level of national output, price levels and the level of interest rates.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This section provides the systematic procedures adopted in conducting the study towards achieving of the research objectives.

3.2. Descriptive Study Design

The main objective of this study was to establish the factors determining demand for money in Kenya. The study used quantities of real money balances as the dependent variable and regressed it with established determinants of money demand such as real GDP, price levels, interest rate levels and the pace of financial innovation. The research was designed to explore the causal relationship between these factors and money demand.

The analytical framework for this study was guided by the variables identified in the literature review. Using the theoretical grounding provided by literature, hypotheses were formulated on the relationship of study variables to guide inference making. Quantitative data (from secondary sources such as CBK, KNBS, and international data compendiums) were then applied to the analytical model to test the validity of the hypotheses.

3.3. Theoretical Framework

The underlying argument in the theory of money demand as summarized by Nachega (2001) is that the demand for real money balances is a function of a scale variable (as measured by income, wealth or expenditure), the own rate of return on money, and the opportunity cost of holding money (indicated by domestic interest rate and/or expected rate of inflation).

The rate of return on alternative financial assets is proxied by the domestic interest rate while the expected inflation is a proxy for alternative physical assets.

This relationship can therefore be expressed as;

$$\left(\frac{M^d}{P}\right) = f(Y, R) \qquad \text{……. 3.1}$$

Where Mf^d is the demand for nominal money balances, P is the price level, Y is the scale variable (income, wealth or expenditure, in real terms) and R is a vector of expected rates of return (the opportunity cost of holding money). It is assumed that in the long run, the money market is in equilibrium such that money demand will equal money supply. Therefore, the money supply M deflated by the price level P is equal to the real demand for money (M^d/P).

3.4. Model Specification

Following the theoretical framework of the study variables expressed in equation 3.1, a model for this study can be specified generally as follows;

$$M_t^d = f(GDP_t, DER_t, INFL_t, YTB_t, EXCH_t, FIN_t) \qquad \text{..... 3.2}$$

A detailed model is specified as;

$$M_t^d = \alpha_0 + \alpha_1 GDP_t + \alpha_2 DER_t + \alpha_3 INFL_t + \alpha_4 YTB_t + \alpha_5 EXCH_t + \alpha_6 FIN_t + \mu_t \qquad \text{…….3.3}$$

Where M_t^d represents demand for real money balances, expressed here as M3. According to Sichei and Kamau (2012), M3 is the intermediate target under the current monetary policy framework in Kenya. The broader

money measure has the distinct advantage in empirical analysis because it is more stable relative to narrow money and thus useful in policy analysis but less amenable to control (Ericsson & Sharma, 1996).

GDP_t represents the scale variable; DER_t is the deposit rate and represents the own rate of return on money; $INFL_t$ is inflation rate and represents rate of return on alternative physical assets. Nachega (2001) emphasizes inclusion of the expected rate of inflation in the model especially in the case of developing countries where physical assets represent major hedge against inflation due to undeveloped monetary and financial systems and non-market determined interest rates.

YTB_t is the yield on treasury bills and represents rates of return on alternative financial assets while $EXCH_t$ is the exchange rate of KES to the USD, included in the model to capture the external influence. μ_t is the error term to capture the unexplained variations in the model.

FIN_t represents the financial innovation process over time and it is measured as the ratio of M2 to M1. According to Arrau et al. (1991, p. 16), this measurement is based on the rationale that 'the greater the array of money substitutes (reflected in the quasi-money component of M2) the lower the demand for narrow money'

The model is specified in the log form, in line with the consensus in literature that this form is the most functional (Sriram, 1999). Thus, equation 3.3 becomes;

$$LnM_t^d = \alpha_0 + \alpha_1 LnGDP_t + \alpha_2 LnDER_t + \alpha_3 LnINFL_t + \alpha_4 LnYTB_t + \alpha_5 LnEXCH_t + \alpha_6 LnFIN_t + \mu_t \quad \ldots\ldots. 3.4$$

There are significant differences in the variables used by Sichei and Kamau (2012) and this study. The former does not include inflation and financial innovation variables in the model, which are used in the current study.

3.5. Working Hypotheses

The hypothesis in this study is that demand for money balances in Kenya is determined by the country's gross domestic product (GDP), the level of interest rates and the pace of financial innovation.

3.6. Definition and Measurement of Variables

A summary of the definition of variables used and how they are measured is stated below. The observable attributes of the variables are used to make inferences about the determinants of money demand. Defining and measuring the study variables helps in making the study concepts operational.

Money demand (M3): referred to as broad money. It consists of M2 and includes longer-term time deposits and money market funds with more than 24 – hour maturity. Its measured in KES

GDP- the total market value of all final goods and services produced in a country in a given year. It is measured in KES

Deposit rate (DER): The interest rate paid by financial institutions to deposit account holders. Its measured as a percentage.

Inflation (INFL) - The overall general upward price movement of goods and services in an economy. It is expressed as percentage change in consumer price index

Treasury bill rate (YTB): Interest rate on 91-day Treasury bills measured as a percentage.

Exchange rate (EXCH): Exchange rate of KES to US Dollar. It is measured in KES

Financial Innovation: Technological advances which facilitate access to information, trading and means of payment, and to the emergence of new financial instruments and services. It is measured as the ratio of M2 to M1

3.7. Data Type and Sources

This study used secondary data, which refers to data that have already been collected and analyzed (Kothari, 2004). Therefore, data for the study period were collected from published reports such as Statistical Abstracts, Economic Surveys; Central Bank of Kenya published reports; and international data repositories such as World Bank and the International Monetary Fund. Caution was observed to ensure that data is only collected from credible sources that guarantee the reliability, suitability and adequacy of the data.

3.8. Time Series Properties

Various estimation challenges are inherent in time series data. These include non-stationarity of data, the problem of spurious regression, random walk phenomenon and the inability to conduct causality before

establishing stationarity (Gujarati & Porter, 2009). If OLS is used to estimate the relationships of variables of a non- stationary series, there is the likelihood to have misleading inferences. Conventional tests of hypothesis based on statistics computed from variables of such series are likely to be biased towards rejecting the null hypothesis even when it should have been accepted. Therefore, the study sought to establish whether the time series observations were stationary. The study used the unit root test, specifically by applying both Augmented Dickey-Fuller test and the Phillips-Peron Unit Root Tests.

3.9. Cointergration and Error Correction Mechanism

Trending time series usually result into spurious results. The solution is to difference the data in order to achieve stationarity. Differencing, however, leads to loss of long run properties as the model will have no long run solution. This can be remedied by measuring variables in the level form while maintaining stationarity with short run (impact effect) and long run properties simultaneously incorporated by the use of the error correction mechanism (ECM,) or feedback mechanism in the cointegration analysis. Cointegration solves the problem associated with the loss of information associated with de-trending or by the attempts to address the stationarity through differencing. Time series variables are said to be cointegrated if they have a long term or equilibrium relationship between them (Gujarati & Porter, 2009). This happens if two or more series are individually integrated, but some linear combinations of them are integrated at lower level. Presence of cointegration, among the variables establishes existence of an error-correction mechanism in the model, and thus it can be stated that there is a long run or equilibrium relationship between the variables.

Where cointegration is rejected, then there will be no long run relationship between the non-stationary series. Imposition of ECM will be rejected by the data and the solution will be to specify the model in another form in which no long run relationship appears.

3.10. Diagnostic Tests

Diagnostic tests are used as means of indicating model inadequacy or failure. In the case of linear regression model for example which is estimated by OLS, a series of the assumptions required for OLS to be the best linear unbiased estimator (BLUE) appear to be violated. These assumptions include serially un-correlated and homoskedastic error- term, absence of correlation between the error-term and regressors and correct specification of the model. Applied econometric work can be viewed as consisting of a number of steps, including specification of the model(s) estimation and model evaluation. Diagnostic testing plays an important role in the model evaluation stage of econometric studies.

3.11. Data Analysis

The data collected were categorized into information that targeted the objectives of the study. The validity of the study data was established by checking for omissions and consistencies. Unit root test of every variable was done to establish the order of integration. The next step entailed establishing whether any of the independent variables and the demand for money balances in Kenya was cointegrated. This analysis established the variables containing long-run relationship with the dependent variable.

E-VIEWS software was used for regression and analyzing of the data while Ordinary Least Squares technique was used to generate the regression coefficients and other estimates.

Finding a statistically significant connection achieved the objectives of this study regarding the relationship between the demand for money and its determinants.

CHAPTER FOUR

EMPIRICAL RESULTS AND INTERPRETATION

4.1. Introduction

In this chapter, the results of the empirical analysis based on the econometric framework in chapter three are reported. All the relevant variables were used in building the regression equation for determining the factors affecting money demand in Kenya. Before the study delves into the time series issues, it starts with the descriptive statistics and also analyses the various relationships between the variables (correlation matrix)

4.2. Descriptive Statistics

Table 4.1 displays the descriptive statistics of the variables of interest over the period of analysis (1970-2012) in Kenya.

Table 4.1: Descriptive Statistics

Variable	DER	EXCH	FIN	GDPGROWTH	INFL	M3 GROWTH	YTB
Mean	8.60	40.30	2.09	4.26	11.57	15.14	11.58
Median	6.64	28.07	2.01	4.38	10.50	14.31	9.59
Maximum	18.40	88.81	3.38	16.12	46.00	47.73	55.70
Minimum	2.43	6.90	1.53	-1.08	1.60	2.36	1.42
Std. Dev.	4.58	30.46	0.47	3.01	7.99	8.72	9.33
Skewness	0.55	0.20	1.36	1.30	2.21	1.13	2.56
Kurtosis	1.99	1.30	4.24	7.01	9.68	5.81	12.69
Jarque-Bera	4.01	5.48	15.99	40.90	114.87	22.62	215.31
Probability	0.13	0.06*	0.00***	0.00****	0.00***	0.00***	0.00***
Sum	369.73	1733.02	89.79	183.22	497.30	651.03	497.93
Sum Sq. Dev.	880.24	38960.90	9.24	380.36	2679.56	3190.04	3654.77
No. of observations	43	43	43	43	43	43	43

N.B: ***, **, * Indicate significance at the 1%, 5% and 10% levels, respectively.

Where: DER is deposit rate; EXCH is exchange rate of KES to the USD; FIN is financial innovation process over time; GDPGROWTH is annual %

growth in GDP; INFL is inflation rate; M3GROWTH is the % broad money growth over time and YTB is yield on treasury bills

From table 4.1, it is found that most of the variables of interest have not been stable over the period but rather fluctuating. For example, the highest inflation rate experienced in the country over the period is 46% with the least being 1.6%. From the average inflation value during the period (11.6%), the target of 5% has not been realized. On the exchange rates, the mean over the period is 40.3. Highest exchange rate during the period is 88.8 and the least is 6.90. Equally, real GDP growth rate, deposit interest rate, demand for real money balances and broad money have been fluctuating. During the study period the nation realized the highest growth rate of 16.2% and least value of -1.08%. Equally the interest deposit rate has stabilized at about 8.6% with a minimum of 2.4% and a maximum of 18.4%.

4.3. Correlation Analysis Results

To establish the level and direction of correlation among the variables of interest, Correlation Matrix was generated using covariance analysis: correlations with probabilities using Eviews6. The results are presented in table 4.2.

Table 4.2: Correlation Matrix

Variable	Deposit rate	Exchange rate	Financial innovation process	Gross Domestic Product	Inflation rate	Broad money	Yield on treasury Bills
Deposit rate	1.000						
Exchange rate	0.008	1.000					
Financial innovation process	0.673***	0.507***	1.000				
Gross Domestic Product	0.015	0.903***	0.360	1.000			
Inflation rate	0.380**	-0.031	-0.079	-0.059	1.000		
Broad money	-0.227	0.787***	0.127	0.907***	-0.1355	1.000	
Yield on treasury bills	0.775***	0.256	0.522***	0.1622	0.642***	-0.0374	1.000

N.B: ***, **, * Indicate significance at the 1%, 5% and 10% levels, respectively.

From the table, it is observed that there is positive and significant relationship between exchange rates (EXCH) and demand for real money balances (M3). This is also true for the relationship between GDP and Real money balances. While deposit rate (DER) has a negative relationship with real money balances, the relationship is not significant. Similarly, financial innovation process over time (FIN) has insignificant but positive relationship with real money balances.

Among the explanatory variables, high positive and significant relationship is observed between deposit rate and financial innovation process; deposit rate and yield on treasury bills (YTB); exchange rate and financial innovation process; exchange rate and GDP; financial innovation process and yield on treasury bills; and Inflation and yield on treasury bills.

Unlike positive relationships, negative relationships between exchange rates and inflation; financial innovation process and inflation; and GDP and inflation are all insignificant. Finally the highest relationship (0.91) is witnessed between GDP and real money balances showing how closely the two are related and move in the same direction.

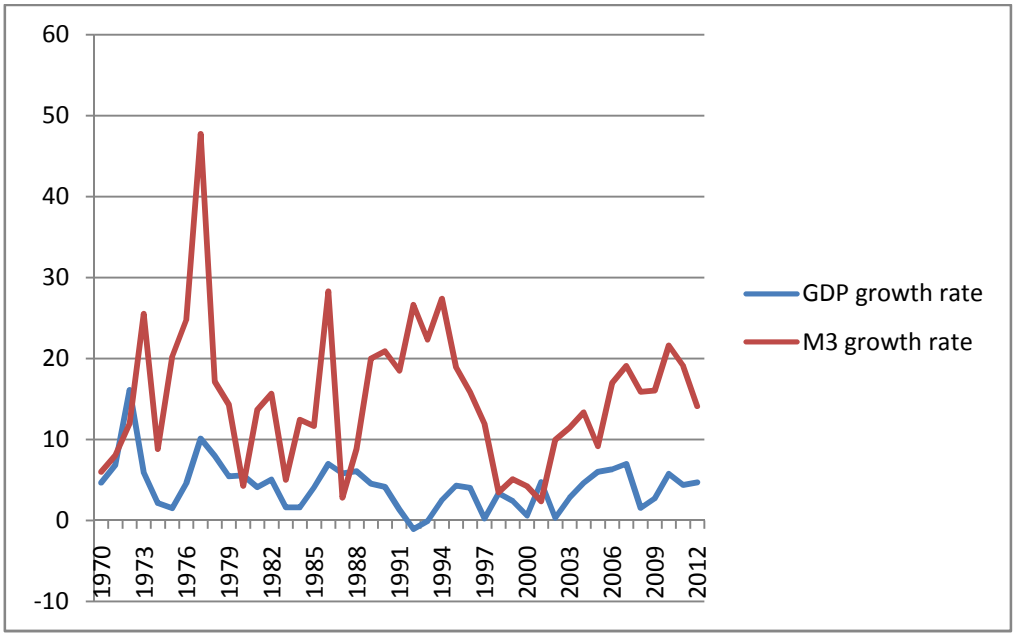

Figure 4.1: Annual growth rates for demand for real money balances and GDP

Source of data: Central Bank of Kenya complemented with World Bank Development indicators.

The figure clearly show that the changes in the demand for real money balances have been closely associated with the changes in economic activity as represented by GDP growth rate. During the study period, the growth rates in demand for real money balances has been fluctuating just as that of GDP growth.

4.4. Stationarity Test Results

Before estimations were conducted, the data series were subjected to unit root tests to establish their stationarity conditions i.e. their orders of integration. This was done for the logs of demand for real money balances and GDP, Deposit rate, Inflation rate, yield to treasury bills, exchange rates and financial innovation processes.

Where a series is found to be non-stationary at levels, it is differenced until it is stationary to avoid using non-stationary data in estimations which yields to non-sensible or spurious regression results. In time series data, there are two common methodologies for testing for unit roots; Augmented Dickey-Fuller (ADF) test and Phillips-Perron test. The study used both Augmented Dickey-Fuller (ADF) test and Phillips-Perron test methodologies. These tests form the preamble to the econometric analysis of long-run equilibrium proposed by economic theory. A stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed (Gujarati, 2007).

The order of integration of different variables is also determined by first differencing the change in various variables on a one year lag of the variable and the error term. This is done based on three main regressions: Augmented Dickey Fuller and Phillips-Perron tests with intercept only,

intercept and trend and finally first difference when the variable turns out to be non-stationary. The results are presented in Table A1 (appendix).

The results from Table A indicates that yield on treasury bills and Inflation rate are integrated of order zero i.e. are stationary at levels while M3, GDP, deposit rate, exchange rate and financial innovation are integrated of order one i.e. are stationary after first difference.

As the results show, the dependent variable (demand for real money balances, log M3) has a unit root, hence the need to test for cointegration.

4.5. Cointegration Test Results

As already shown in the preceding sub-section, the dependent variable has a unit root. Therefore, the study proceeded to test for cointegration. This was done by regressing the dependent variable against the variables that are integrated of the same order i.e. the I(1) variables. This represents the long run equation.

The residuals series from the above equation were then obtained and tested for stationarity of the residuals using ADF. Unit root test results of the residual series obtained from the long run equation above presented in table A2 in the appendices.

From the results, it is clear that null hypothesis of non stationarity of the residuals was rejected at 1 % level of significance (or with 99 % confidence). This implied the presence of cointegration of the variables. The study then proceeded to specify an error correction model where resid03(-1) captures the error correction term. The ECM helped to show the deviation from an equilibrium position and how an adjustment towards equilibrium is made by combining both the long run and short run dynamics of the model in the regression. The Error Correction Model results are presented in section 4.7.

4.6. Diagnostic test results

This section presents various econometric diagnostic test results which were adopted to investigate whether the model was a reasonable fit for the data. One of the main reasons for diagnostic testing was to determine whether the model conformed to the classical assumptions of the Ordinary Least Squares (OLS) regressions such as normality, no serial correlation, homoscedasticity and correct functional form. These diagnostic test results are shown by the Adjusted R-Squared, the D-W statistic, and the F-statistic.

The two models in this study obtained Adjusted R-squared of 0.52 and 0.21. Subsequently, the Durbin Watson value was 1.708 for both models. This means that 52% of variations in broad money demand are explained by the variations in log of Gross domestic product, log of deposit rate, log of inflation rate, log of yield on treasury bills, log of exchange rates and and log of financial innovation process. Similarly, 21% of variations in broad money demand are explained by variations in log of Gross domestic product, log of inflation, log of financial innovation process and log of yield on treasury bills (see tables 4.3 and 4.4 below).

4.7. Regression Results

The results are presented in two steps: OLS long-run results and short-run results using the Error Correction Model (ECM). The results are as follows:

Table 4.3: OLS Long-run Results

Variable	**Robust Coefficient**	**t-statistic**
Constant	0.011640	0.222
Log of Gross Domestic product	0.000*	1.857
Log of deposit Rate	-0.076**	-2.025
Log of inflation	0.066***	4.307
Log of Yield to treasury bills	-0.021*	-1.694
Log of exchange rates	-0.017	-0.288
Log of financial innovation process	0.457***	3.832
Adjusted R-Squared	0.523	
F-statistic and Probability	7.274978 (0.000028)	
Durbin-Watson static	1.7076	

N.B: ***, **, * Indicate significance at the 1%, 5% and 10% levels, respectively

The long-run estimation indicates that the model fits the data well as evidenced by value of adjusted R-squared which is slightly above 50 percent, and significant F-statistic tests with a P-value of 0.00, indicating that the variables jointly determine demand for real money balances in the long-run. The adjusted R-squared which measures the "goodness of fit" of the equation (after taking account of degrees of freedom), show that in the long-run, 52 percent of the variations in demand for real money balances is explained by variations in the changes in GDP, deposit rates, inflation, yield on treasury bills, exchange rates and financial innovation processes .

Table 4.4: Error Correction Model (ECM) Results

Variable	**Robust Coefficient**	**t-statistic**
Constant	0.039	1.253
Differenced Log of Gross Domestic product	0.799**	2.311
Differenced Log of inflation	0.621**	3.311
Differenced Log of financial innovation process	0.094	1.577
Differenced Log of Yield to treasury bills	-0.257	-1.360
RESID03(-1)	-0.248*	-1.930
Adjusted R-Squared	0.208	
F-statistic and Probability	3.103 (0.0202)	
Durbin-Watson static	1.708	

N.B: ***, **, * Indicate significance at the 1%, 5% and 10% levels, respectively

From the estimated results in Table E, it is evident that, in the short-run, GDP, financial innovation process and inflation are significant determinants of real money demand in Kenya. The sign of the output/GDP coefficient is positive (0.799) as expected while the sign of the inflation coefficient is (0.621). Similarly, Yield on treasury bills has expected coefficient (negative) but insignificant. Since, the coefficients are elasticities; they are explained in terms of the effect of a percentage change of an independent variable on the dependent variable (M3).

It's apparent from the results that a percent increase in GDP is associated with 0.79% increase in the demand for real money balances. This provides support for the hypothesis that increased economic growth can directly cause increased demand for real money balances. Same elasticity calculation for inflation indicates that a percent increase in inflation is significantly associated with increase in demand for real money balances.

From the adjusted R-squared, which measures the "goodness of fit" of the equation (after taking account of degrees of freedom), show that in the short run, 21 percent of the variations in demand for real money balances is explained by variations in the changes in GDP, inflation, financial innovation processes and yield on treasury bills). Similarly, the F-test statistic of 3.10, with a P-value of 0.02, indicates that the independent variables jointly determine demand for real money balances in the short-run. Finally, the results show that the coefficient of the error term (ECT) has a negative sign, which is significant at 10 percent level of significance. This is in line with theory, which expects it to be negative and less than unity in absolute terms, since a 100 percent or instantaneous adjustment is not expected. Thus this significant negative sign on the ECT work together for demand for real money balances to get to equilibrium in the short-run.

The ECM results thus support the appropriateness of the error correction approach framework and that it should be used in conjunction with the long run relationship for better policy implications. In terms of meaning, the coefficient of the ECT is -0.25 implying that the 25 percent of the deviations of long-run equilibrium are corrected within the first year i.e. long-run equilibrium is corrected for a period of one year. The coefficient of the ECT was very significant at 10 percent significance level indicating that it was well defined.

In conclusion, the regression results indicate that there are only two determinates for the demand of real money balances. These are Gross Domestic product and Inflation. We discuss these in section 4.8 that follows.

4.8. Determinants of Money demand in Kenya

The results from the regression have shown that money demand in Kenya is determined by the Gross domestic Product and inflation.

4.8.1. Gross domestic product:

The sign of the coefficient of GDP is positive (as expected, given that based on the underlying theory the Gross Domestic product elasticity of money demand should be positive) as increase in real income could make money available for transaction purposes, which would be absorbed in the economic activities. Specifically, the results indicate that a one percent increase in real income leads to a 0.80 percent increase in the money demand.

4.8.2. Inflation

Unlike expected, the coefficient of inflation on money demand is found to be positive instead of negative i.e. according to the results, if there is a 1% increase in inflation, money demand for the same period will increase by 0. 62% percentage points, ceteris paribus.

The positive sign of the coefficient means that an increase in the inflation rate generates an increase in the demand for money. The sign could explain either an increase in the stock of money holdings due to anticipated higher expenditure in the future given the increased level of prices or the lack of alternative assets which makes currency in circulation, deposits and real assets almost the only possible means of holding wealth.

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

5.1. Summary

This paper empirically examined the relationship between demand for money and levels of prices, interest rates, real national output and the pace of financial innovation in Kenya using latest data i.e. data from 1970 to 2012. The short-run and long-run estimation findings show that only GDP, and inflation are significant determinants of real money demand in Kenya. Specifically, the results show that increased GDP and inflation increases the demand for real money balances. The greatest effect is realized from the GDP growth (0.79 percent); followed by inflation rate (0.60 percent.

The evidence presented in the econometric estimations imply that while GDP growth is admirable and pursued, it's advisable to check on it keenly as it can yield to unnecessary demand for real money balances which can cause macroeconomic stability in the economy. Hence, it's important that the two be monitored closely.

5.2. Conclusion

The main objective of this paper was to investigate the determinants of money demand using broad money (M3) measure in Kenya. The analyses will serve as policy tools that will guide Kenyan authorities on the conduct of monetary policy and its effectiveness.

In determining the relationship between money demand and other nominal variables of interest in the study, results show significant positive relationship between money demand and Gross domestic product, and inflation, which means that, increases in these variables leads to increase in

money demand as expected. Further, the ECM shows a significant Error Correction term carrying a negative sign thereby indicating a valid cointegration relationship.

5.3. Policy Implications

A stable money demand function for the Kenyan economy could serve as a guide to policy makers in their effort of targeting inflation as envisioned in the Kenya Vision 2030. This calls for the need for M3 to be stable so as to be effectively used as a policy tool in this direction.

The results show a significant positive relationship between real money balances, M3 and the Gross Domestic Product (GDP), implying that increasing the country's GDP should be pursued with determination as this could make money available for transaction purposes, which would be absorbed in the economic activities.

Similarly, the results show the relationship between money demand and inflation as positive. This means that an increase in the general price level would decrease the value of real money balance, and hence increase the demand for money. Since both the long-run and short-run impact is significant suggesting that money demand is determined by inflationary factors in Kenya, it supports the use of monetary aggregates M3 to target inflation as a policy tool.

The findings of this study suggests that the government, through the central bank, should employ balanced policies that encourage economic growth while at the same time preventing and curbing inflation because the results show that both inflation and economic growth, proxied by Gross domestic product increases demand for money balances.

5.4. Limitations of the study

Data availability on some of the variables especially on up-to date sector contributions to GDP restricted the sample size and use of GDP to proxy for income rather than other more equally competitive variables such as GNP and household disposable income as proxies for income. This also led to the non-usage of other opportunity cost variables in addition to/ instead of Treasury bill rates such as bank lending rates.

5.5. Areas of further research

For future empirical work, it will be advisable to increase the sample size depending on availability of data so that the more accurate and reliable results are achieved. This is applicable given Kenya economy's heavy reliance on agriculture and mining sectors hence GDP may not serve as the best proxy for income. Where data allows, GNP and household disposable income may be considered as proxies for income.

Along the same line of increasing the sample size, a choice of other opportunity cost variable, instead of Treasury bill rates could be considered for demand estimation such as bank lending rates. There is also a need for future empirical work to examine in detail the relationship between money demand and inflation rate in order to shape policy efforts by the authorities as previous empirical work find mixed results.

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APPENDICES

Table A1: Unit Root Test Results

Variable Name	Augmented Dickey-Fuller Unit root test		Phillips Perron Unit root test		Durbin Watson	Order of Cointegration
	t-stat and Prob.	*Order of Integration*	*t-stat and Prob.*	*Order of Integration*		
Log of M3	-4.5825*** (0.0006)	I(1) with a constant	-4.5825*** (0.0006)	I(1) with a constant	1.980	I(1)
Log of GDP	-1.7879* (0.0704)	I(1) No constant no trend	-2.5635** (0.0116)	I(1) No constant no trend	2.172	I(1)
Deposit Rate	-5.9977*** (0.0000)	I(1) No constant no trend	-6.0425*** (0.0000)	I(1) No constant no trend	1.936	I(1)
Inflation Rate	-1.7442* (0.0770)	I(0) with a constant	-3.7328*** (0.0070)	I(0) No constant no trend	1.895	I(0)
Yield on Treasury bills	-1.6620* (0.0907)	I(0) No constant no trend	-1.6620* (0.0907)	I(0) No constant no trend	2.251	I(0)
Exchange rate	-8.6640*** (0.0000)	I(1) No constant no trend	-8.4140*** (0.0000)	I(1) No constant no trend	-1.957	I(1)
Financial innovation process	-4.0317*** (0.0002)	I(1) No constant no trend	-4.0727*** (0.0001)	I(1) No constant no trend	1.903	I(1)

N.B: Statistics shown on the first row of each respective variable are the estimated t-statistics while those in parentheses are their respective p-values. *, **, *** represent significance at 10%, 5% and 1% respectively

Table A2: Results of OLS estimation of long run equation

Variable	Robust Coefficient	t-statistic
Constant	-10.390***	-4.698
Log of Gross Domestic Product	1.471***	8.566
Log of Deposit rate	-1.036*	-1.825
Log of Exchange rate	0.708***	12.098
Financial Innovation Process	0.105*	1.735
Adjusted R-Squared	0.997190	
F-statistic and Probability	3727.329 (0.000000)	

N.B: ***, **, * Indicate significance at the 1%, 5% and 10% levels, respectively

Table A3: Unit root test for residuals

Variable	Levels	t-statistic	Probability
Augmented Dickey-Fuller test statistic		-2.949	
Residual (RESID03)	1%	-2.621	
	5%	-1.949	
	10%	-1.612	0.004
Adjusted R-Squared	0.175		
Durbin-Watson	1.729		

Table A4: The data set used for the study

Year	DER	EXCH	M2	M1	M3	FIN	GDP	GDPGROWTH	INFL	M3GROWTH	YTB
1970	3.5	7.14	3505.45	2226.02	4784.88	1.57	280490	4.65545	2.0	5.99	2.0
1971	3.5	7.14	3769.53	2371	5168.06	1.59	299700	6.848729	6.9	8.008142	1.42
1972	3.5	7.14	4295.14	2803.49	5786.79	1.53	348020	16.12279	3.6	11.97219	3.45
1973	3.5	6.9	5356.05	3449.44	7262.66	1.55	368690	5.939314	13.9	25.50412	1.92
1974	4.32	7.14	5839.1	3775.23	7902.97	1.55	376570	2.137297	15	8.816467	4.63
1975	5.13	8.26	6830.97	4159.38	9502.56	1.64	382110	1.471174	9.9	20.24037	6.08
1976	5.13	8.31	8522.78	5187.79	11857.77	1.64	399560	4.566748	11.6	24.78501	5.54
1977	5.13	7.95	12437.13	7357.36	17516.9	1.69	439970	10.11362	12.3	47.72508	2.13
1978	5.13	7.4	14277.88	8039.94	20515.82	1.78	475040	7.970998	12.3	17.12015	4.29
1979	5.13	7.33	16689.47	9927.74	23451.2	1.68	500950	5.454278	8.4	14.30789	6.01
1980	5.75	7.57	16796.88	9147.57	24446.19	1.84	528861	5.571614	12.8	4.242811	5.26
1981	8.85	10.29	18952.71	10123.86	27781.56	1.87	550545	4.100132	12.6	13.64372	7.61
1982	12.2	12.72	21442.22	10763.91	32120.53	1.99	578360	5.052266	22.3	15.61817	12.58
1983	13.27	13.8	22837.63	11944.91	33730.35	1.91	587574	1.593125	14.5	5.01181	14.15
1984	11.77	15.78	25774.98	13627.96	37922	1.89	596976	1.600139	9.1	12.42694	13.24
1985	11.25	16.28	28404.06	14473.6	42334.52	1.96	621290	4.072861	10.7	11.63578	13.9
1986	11.25	16.04	36230.35	18150.33	54310.37	2	664669	6.982086	5.7	28.28862	13.23
1987	10.31	16.51	40734.5	20037.2	55822.44	2.03	703291	5.810712	7.1	2.784128	12.86
1988	10.33	18.6	44095.1	20461.16	60727.11	2.16	746127	6.090793	10.7	8.786198	13.48
1989	12	21.6	53264	25291.13	72856.37	2.11	780107	4.554184	10.5	19.97339	13.86
1990	13.67	24.08	61493.66	29491.03	88072.91	2.09	812355	4.133792	15.8	20.88567	15.26
1991	13.91	28.07	74326.28	34339.39	104336.7	2.16	823234	1.339193	19.6	18.46628	17.19
1992	14.88	36.22	99291.86	49403.22	132094.7	2.01	814342	-1.08013	27.3	26.60425	18.15
1993	14.7	68.16	124828.5	60578.42	161589.8	2.06	813570	-0.0948	46.0	22.32875	55.7
1994	15.8	44.84	162725.6	67286.11	205821.9	2.42	834163	2.53119	28.8	27.37308	25.2
1995	13.6	55.94	231086.1	73176.52	244755	3.16	869923	4.286932	1.6	18.91592	18.98
1996	17.59	55.02	267828.2	79241.21	283549.5	3.38	904816	4.011045	9.0	15.85034	23.0
1997	16.72	62.68	294052	91061.17	317313.9	3.23	906807	0.220045	11.2	11.90776	22.49
1998	18.4	61.91	303749.9	94718.06	328320.9	3.21	937008	3.330477	6.6	3.468805	23.32
1999	9.55	72.93	312116	110080.7	345037	2.84	959561	2.406916	5.8	5.091391	13.29
2000	8.1	78.04	314686	119393.2	359646.6	2.64	965312	0.599337	10.0	4.234213	12.07
2001	6.64	78.6	322328.7	130029.2	368135.2	2.48	1010935	4.726244	5.8	2.360261	12.73
2002	5.49	77.07	350754.7	150103.1	404805.5	2.34	1013963	0.299525	2.0	9.961096	8.94
2003	4.13	76.14	395116	193855.3	451171.9	2.04	1042200	2.784816	9.8	11.45399	3.73
2004	2.43	77.34	432566.8	210598.2	511425.2	2.05	1090310	4.616197	11.6	13.35484	2.96
2005	5.08	72.37	474882.9	231155.6	558163.6	2.05	1155516	5.980501	10.0	9.138854	8.44
2006	5.14	69.4	553907.1	291789.5	653036	1.9	1228610	6.325659	6.0	16.99724	6.81

Year	DER	EXCH	M2	M1	M3	FIN	GDP	GDPGROWTH	INFL	M3GROWTH	YTB
2007	5.16	62.68	666874.6	373309.5	777595.8	1.79	1314528	6.993106	4.3	19.07396	6.8
2008	5.3	77.71	766393.1	392778.4	901055	1.95	1334604	1.52724	16.2	15.87704	7.7
2009	5.97	77.35	898099.4	442245.1	1045657	2.03	1371106	2.735044	10.5	16.04808	7.86
2010	4.56	79.23	1099234	577205.9	1271638	1.9	1450142	5.764398	4.1	21.61139	6.54
2011	4.22	88.81	1253958	622731.3	1514152	2.01	1513608	4.376537	14	19.07099	9.59
2012	7.74	84.53	1469037	710744.1	1727324	2.07	1584747	4.699962	9.4	14.07864	13.54

Source: CBK, KNBS complemented with World Bank Development indicators. The growth variables and financial innovation processes were computed by the author using the formula already mentioned in the chapter/based o theory.

N.B: EXCH-Exchange rate of Kenya Shilling to US Dollar; **FIN**- financial innovation process over time, measured as the ratio of M2 to M1.; **INF**-Inflation rate, **M3**- demand for real money balances; **YTB**- yield on treasury bills, representing rates of return on alternative financial assets**.**