



Full Length Research Article

THE IMPACT OF FINANCIAL DEVELOPMENT ON INCOME VELOCITY OF MONEY IN KENYA

Benjamin Pkemei Ng'imor and *Dr. Samuel Muthoga

Department of Economic Theory, School of Economics, Kenyatta University, Nairobi, Kenya

ARTICLE INFO

Article History:

Received 04th November, 2014
Received in revised form
12th December, 2014
Accepted 31st January, 2015
Published online 27th February, 2015

Key words:

Like income velocity,
Financial development,
Money supply,
Monetary authority,
Demand for money,
Institutional variable and
Debt asset ratio.

ABSTRACT

The primary roles of monetary authority are to ensure that the level of money supply in the economy spurs economic growth and ensures price stability in the economy. Economic theory and practice show that velocity of money is a crucial element in understanding the nature of money demand in the economy. Velocity of money is critical in formulation and implementation of monetary policies in the economy. In Kenya, the stability of velocity of money is fundamentally affected by institutional and structural changes such as robust growth of the financial sector, financial innovation, increased pace of monetization in the economy among others. To this end, there was needed to investigate structural and institutional factors affecting velocity of money in Kenya. This study is guided by two main objectives; First: to assess the determinants of velocity of money giving particular emphasis to structural factors in the financial sector. Secondly, to determine the extent to which institutional and structural factors affect the income of velocity of money in Kenya. The investigation was guided by nonexperimental research design. Time series data from CBK and Economic Surveys was used for analysis. An ARDL model was estimated. To address the first objectives, the significance of the coefficients of key independent variables was evaluated. To address the second objective, stepwise regression model was used where the effect of individual institutional and structural independent variables on the dependent variable was evaluated. The F-statistics and adjusted R-Square was used for examination. The findings revealed that real exchange rate, was an important negative influence on income velocity. Real GDP had a positive effect on income velocity. The results also confirmed that financial sector growth has a significant negative relationship on income velocity. The study recommended that policies on financial sector development should focus on stabilization of real exchange rate in order to maintain a stable money demand function.

Copyright © 2015 Benjamin Pkemei Ng'imor and Dr. Samuel Muthoga. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

CHAPTER ONE

Background of the study

Velocity of money is the rate at which money is exchanged from one transaction to another, and how much a unit of currency is used in a given period of time. Velocity of money is usually measured as a ratio of GNP to a country's total supply of money (Rami, 2010). Gill (2010) observed that the total money supply in an economy is determined by the quantity of money and rate of circulation of money (the velocity of money).

So to determine the optimal amount of money in an economy, the numerical value of velocity of money and its determining factors is as vital as the total quantity of money. Credible monetary policy programs setting require the understanding of velocity of money and its determining factors. This plays a major role in ensuring the effectiveness of monetary policy for purpose of ensuring price stability and rapid economic growth in any country (Akinlo, 2012). Velocity of money (the ratio of nominal income to the stock of money), is an embodiment of the relationship between money, income and price. The level of any given stock of money corresponds to a whole range of potential spending levels depending upon the magnitude of velocity of money (Rami, 2010). In view of this, velocity of money assumes crucial importance in monetary policy formulation. Monetary contraction aimed at containing inflationary pressure is not likely to succeed if the contractionary impulse is neutralized by a simultaneous rise in the velocity of money. Judd and Scadding (1982) argued that

***Corresponding author: Dr. Samuel Muthoga**

Department of Economic Theory, School of Economics, Kenyatta University, Nairobi, Kenya

in mid 1980s, several developing countries developed far reaching reforms in financial sector. The sole objective of such reforms was to enhance the efficiency of the economy as whole. The implementation of such financial reforms and innovations however would have some implications on the stability of money demand and subsequently on velocity of money. Financial reforms could change velocity of money especially in cases where the velocity is a variable which makes the relationship between money and income uncertain hence less predictable. The volatility in velocity cuts the link between income and money, since a change in money supply may lead to surge or otherwise in velocity rather than producing the desired outcomes on effects on income and spending.

During the last several decades there were endeavors to explain the determinants of money velocity both in developed and developing countries (Bordo and Jonung, 1987). The main reason for such attempts was a fact that with unstable velocity, monetary economists cannot make correct predictions about the effects of velocity of money supply in the economy. This leads to the problems with implementation of monetary policy. For example, in 1982, the deep recession experienced in the United States was partly as a result of large, unexpected, and unexplained decline in money velocity (Mankiw, 2008). The change in money velocity in developing countries of Latin America caused serious problems for proper prediction of inflation and therefore producing huge swings in the level of real interest rate, causing shrinkage of long-term investments. Monetarists hold that the volatility of money growth has two effects; the money demand effect and the real income effect. The money demand effect explained the behavior of the demand for money due to the uncertainty in the financial markets. The uncertainty increased the demand for money for precautionary purposes, which in turn decreases the velocity of money. The real income effect was not clearly explained by Friedman. For the real income effect, Friedman analyzed the direct effect of volatility of money on income.

Variability of money growth causes money demand to increase, its velocity to decrease and this has an adverse effect on GNP. Friedman further clarified that inflation has inertia and there is a lengthy lag between monetary change and inflation, the short run influence of the monetary change is reflected more on real income than on nominal income (Mankiw, 2008).

Profile of Kenya’s financial sector growth

Immediately after independence in 1963, Kenya experienced an impressive economic performance. However, this was not sustained owing to both internal and external shocks (Irungu, 2003). The 1973/4 oil crises and 1979, 1984, 1992 and 1994 droughts crippled the economy. Moreover multiparty politics in 1990 also affected the economy. This became worse in 1992 when donors including Bretton Woods withdrew their funding to Kenya. However the Kenyan economy recovered from these effects in 2002. The effects were unfavorable balance of payments, exchange rate depreciation, increased current deficits, accelerating inflation rates, and increased account deficits. The costs of production of essential inputs increased which made investments to reduce. After her independence in 1963, liberalization in Kenya started slowly. In 1980, major reforms had been undertaken which were induced by World Bank’s structural adjustment programs (SAPS). The most radical liberalization programs started in 1989 and targeted the financial market, the foreign exchange market, external trade, domestic price controls, the capital account, and domestic marketing (Kinyua, 2001). Financial sector has undergone tremendous growth over the last two decades. Growth in broad money supply, M3, has grown by more than 15 percent year-on-year from 2009 to date to stand at approximately 1.514 trillion as of 2012 (CBK, 2012). Figure 1.1 shows the trend of private sector credit as a percentage of GDP from 2003 to 2012. Figure 1.1 shows that private sector credit as a percentage of GDP increased from approximately 40 billion in 2003 to 160 billion in mid 2012.

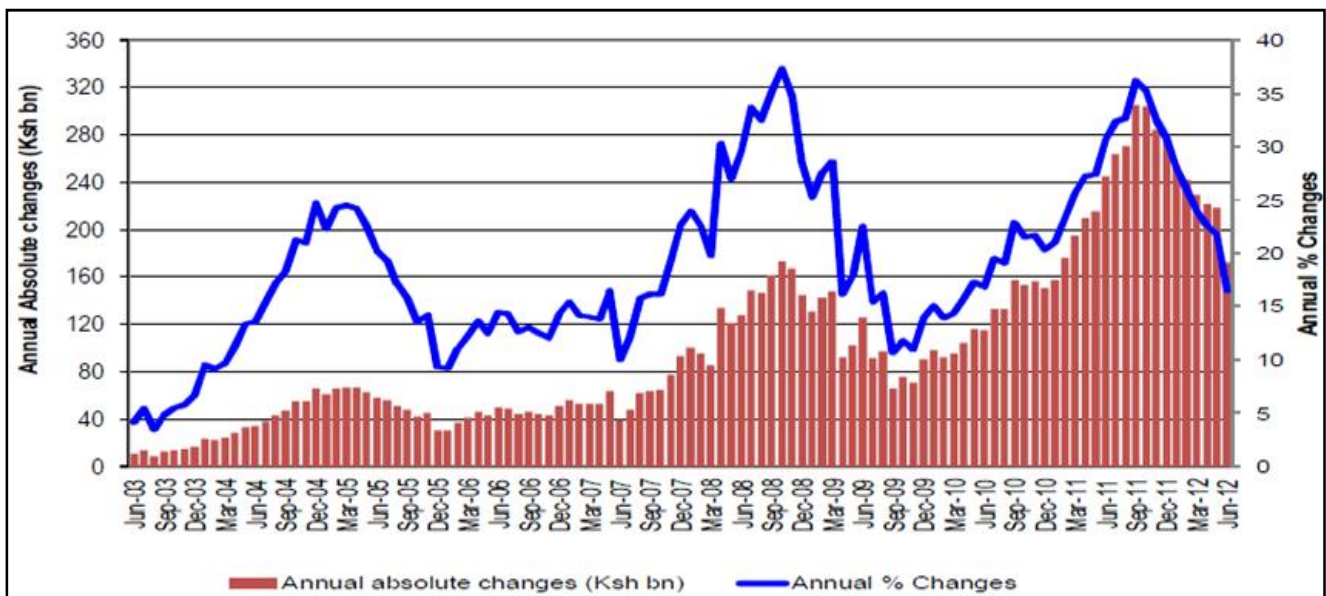


Figure 1. 1. Quarterly fluctuation of private sector credit

Source: CBK, 2012

However, the trend shows that there have been significant fluctuations with significant troughs registered between 2005 to 2007 and 2009 respectively (CBK, 2012). From June 2012, Domestic credit growth decelerated sharply owing to strong reduction in credit to the private sector. Credit extended to the private sector increased by Ksh 172.2 billion (16.5 percent) in the year to June 2012 compared with Ksh. 245.5 billion (30.7 percent) in the year to June 2011 and corresponding target of 16.8 percent in June 2012 (Figure 1.1). During the year to June 2012 credit to private sector accelerated sharply through September 2011 attaining 36.3 percent growth. However, further analysis show that private sector credit as a percentage of GDP grew significantly over the last two decades. Table 1.1 shows the domestic credit as a percentage of GDP.

Table 1.1. Domestic Credit as a percentage of GDP

YEAR	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Percentage	27.3	27.9	27.0	34.5	29.3	24.6	25.9	25.2	28.4	29.3
YEAR	2004	2005	2006	2007	2008	2009	2010	2011	2012	
Percentage	29.9	26.9	26.1	25.9	26.8	36.6	38.1	33.8	30.3	

Source: World Bank Database

Table 1.1 shows that from 1990 to 2012, private credit as a percentage of GDP increased with a significant rate with the year on year increase of more than 25 percent year on year. It is worth noting that from 2008 to 2012 domestic credit as a ratio of GDP grew by more than 30 percent annually. This growth threatened the external balance of the economy and coincided with 9.3 percent share of the current account deficit in GDP in September 2011. The CBK tightened monetary policy stance which helped slowdown credit growth to private sector. Meanwhile, growth in net credit to Government increased by Ksh 14.7 billion (5.3 percent) in the year to June 2012 compared with an increase of Ksh 0.1 billion (0.04 percent) in the corresponding period in 2011 (CBK, 2012).

The banking system lending was largely absorbed by the private sector which accounted for 78.5 percent of total lending in June 2012 compared with the net credit to the government which accounted for 18.9 percent (CBK, 2012). Commercial banking has registered tremendous growth with number of branches doubling from approximately 617 in 2006 to 1272 and more than 18000 agent banks across the country in 2013. Currently commercial banks assets stand at 2.5 trillion an increase of 15 percent from 2.2 trillion in 2012 (Kiragu, 2013). Moreover, introduction of mobile money transfer continues to dominate the industry with over 475 million dollars being transacted daily via M-Pesa, the country's leading mobile-money transfer service.

Velocity of Money in Kenya

Figure 1.2 shows the trend of velocity of money –measured as the ratio of GDP to money supply – from 1998 to 2012. Figure 1.3 shows the trend of money supply and GDP from 1998 to 2012.

Figure 1.2 shows that velocity of money as measures with respect to M1 has significantly reduced from approximately 9 in 1998 to around slightly less than 5 in 2012. However, income velocity of money with respect to M2 and M3 has generally remained stable fluctuating between 2 and 3 over the last fifteen years.

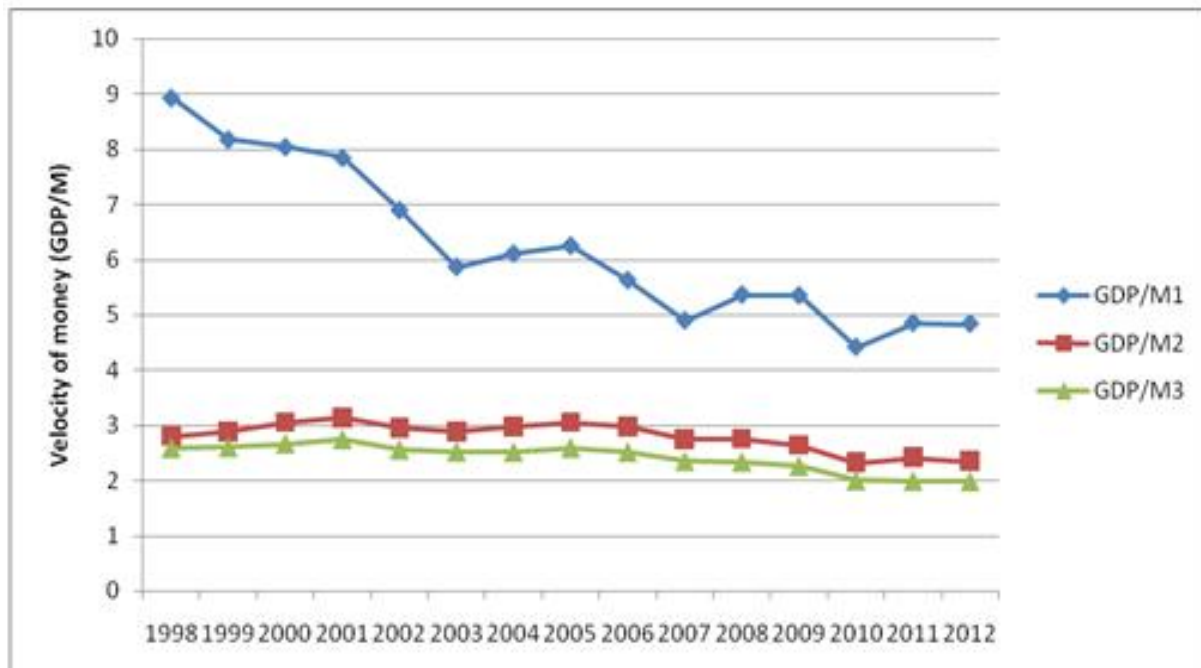


Figure 1.2. Trending velocity of money

Source: KNBS

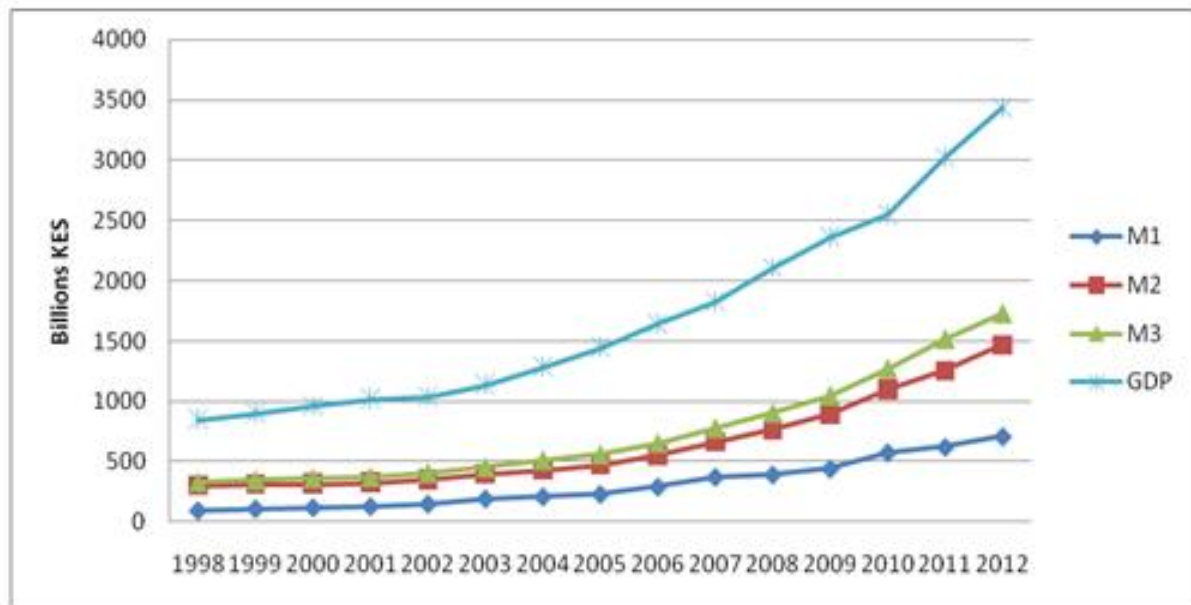


Figure 1.3. Trending Money supply and GDP

Source: KNBS

Figure 1.2 shows that generally, velocity of money has been reducing though at a slow rate. Central Bank of Kenya (2011) explains that stability and gradual decrease in velocity of money has fundamentally been driven by robust growth of financial sector, introduction of financial innovation and increased financial deepening in the economy. However, figure 1.3 also indicates that the money supply has also been on an upward trend similar to the GDP indicating that the above explanation of the CBK may be debatable. This trend shows that increase in money supply has generally been in line with GDP growth in Kenya.

To this end, extent to which transformation of the financial sector enhances stability or instability in velocity of money in Kenya is not clear (CBK, 2010, Rotich *et al.*, 2007). For example Rotich *et al.* (2007) noted that Central Bank does not have direct control of M3 money which is regarded to be an important source of fluctuation in velocity in Kenya. Emerging challenges are to a large extent associated with the impact of structural transformation and dynamics in the financial sector and more so banking industry (CBK, 2010 and Njuguna, 2011). Mwege *et al.* (2012) reported that financial innovative products such as Mobile –Money transfer, deposit taking micro financing institutions (DTM's), agency banking and infusion of technology in financial product development have promoted financial sector growth by lowering transaction costs, enhancing financial services accessibility and ultimately boosting private sector growth in the economy. However, Ouma, S. *et al.*, (2010) found out changes in the structure of the financial sector significantly affect the income velocity and by extension monetary policy in Kenya.

Statement of the problem

For an efficient monetary policy conduct, reliable estimates of velocity of money and its forecasts is very crucial. If velocity of money is not predictable, the demand for money is also

unstable making prediction, management and control of monetary policy weak and even ineffective (Gill, 2010). The critical concern of the monetary authority is to ensure adequate supply of money to spur economic growth without causing inflation. This goal cannot be achieved if velocity of money is not stable. The volume of money supply and its speed of circulation links money to the economic activity in a country. The velocity of money is therefore important in the design and implementation of monetary policy (CBK, 2012). Financial sector has undergone rapid development over the last two decades. Central Bank of Kenya (2013) reported that the growth in broad money supply, M3, increased to 17.3 percent to approximately 1.5 trillion in April 2013.

Institutional and structural factors such as financial sector growth and financial innovation have played a significant factor in reducing velocity of money in Kenya. It is argued that reduced transaction cost and accessibility brought about by financial development contributes to the stability of velocity of money in an economy. However, financial sector development and emerging issues that drive financial transformation generally challenges the canonical assumption of a constant income velocity of money. Increase in domestic credit, introduction of new financial products and upsurge of financial deepening in the economy has led to significant and constant changes in velocity of money. To this end, the degree to which financial development factors promote or demote stability of velocity of money is still debatable. It is this fact that prompts the need to constantly evaluate and monitor of velocity of money function. In addition, the failure to account for structural and institutional changes that determines the velocity of money leads to ineffective monetary policy as money demand instability affects the velocity function (Judd and Scadding, 1982). Studies aimed at investigating the determinants of the velocity of money with emphasis to the impact of institutional and structural factors have not been adequately conducted in light of the problem statement above.

Research questions

This study sought to answer the following questions;

- What are the determinants of velocity of money in Kenya?
- To what extent do structural factors affect income velocity function in Kenya?
- What are the policy implications of the study's findings?

Objectives of the study

The general objective of this study was to establish the determinants of money velocity and its stability in Kenya. The specific objectives of this study were:

- To establish the determinants of velocity of money in Kenya
- To determine the extent to which structural factors affect the income velocity function in Kenya.
- To derive policy implications from the study findings.

Significance of the Study

Knowledge of the velocity of money is useful for governments, Central Banks, other authorities and policymakers that shape monetary and fiscal policy of the country. Due to the inherent linkage between velocity and price level in the country authorities should account for velocity effects while considering their actions.

CHAPTER TWO

Literature review

Introduction

This chapter reviews theoretical and empirical literature in an attempt to identify methodological model and important variables to be used in the study. Firstly, theoretical literature was reviewed. Secondly, relevant empirical literature highlighting variables and study approach used other studies was reviewed and lastly, an overview of literature was reviewed in an attempt to identify the gap.

Theoretical literature

Inquiry into determinants of velocity of money is pegged on Classical, Keynesian and Friedman expositions on quantity theory of money demand. This section reviews competing and complementary theories centered on the equation of exchange in an attempt evaluate theoretical contribution on determinants velocity of money.

Quantity theory of money: Classical view

Classical view uses the equation of exchange to show the relationship between inflation rate to the growth of money supply. The clearest classical postulation was provided by an American economist by the name of Irvin Fisher (1867-1947) and begins by defining velocity of money as the number of times money changes hands in a given period of time or the

rate at which money circulates. Fisher held that velocity of money can be measured as a ratio of the value of total spending divided by the quantity of money such that:

$$V = \frac{P \times T}{M} \dots\dots\dots \text{Eqn 2.1}$$

Where

P:- Is the economy's price level

T:-Total volume of all transactions

M:- is the stock of money at a given point in time (Money supply)

Multiplying both sides by M yields the equation of exchange which relates the total value of all transactions (nominal income) to the quantity and velocity of money.

$$M.V = P.T \dots\dots\dots \text{Eqn 2.2}$$

The equation of exchange shows that nominal income changes in the same direction as growth of money supply. The theory proposed by Fisher adopts three key assumptions. First, quantity of money was exogenously determined by the economy's monetary authority, and second, the level of transaction was also fixed given the classical assumption of full employment of resources. Thirdly and more important to this discourse, velocity of money was determined by technical and institutional factors which would make it constant in the short run.

According to Fisher, velocity of circulation depends on institutional factors such as methods and mode of factor payments such as frequency of payments of wages and development of banking and credit systems which regards to speed with which cheque are cleared, loans are granted and repaid. Given that velocity of money and level of transaction was fixed then Fisher concluded that demand for money was purely determined by income and level of prices were primarily determined by the quantity of money circulating in the economy. Fisher's theory has been criticized as being too simplistic to the extent that it only looks at money as a medium of exchange and posits that demand for real money balances is a function of income and not interest rates In addition, level of transaction and price level are too difficult to estimate such that even if a numerical value could be assigned to the level of transaction it would be ambiguous because existence of raw, intermediate and final goods and all services would lead to multiple counting. Nevertheless Fisher's main contribution is the assertion that velocity of income was dependent upon institutional and technical factors prevailing in the economy.

Cambridge approach to money demand

Cambridge version believed that money was both a medium of exchange and a store of wealth. It was introduced by Alfred Marshal and Professor Pigou in 1920's. These economists used Fisher's equation of exchange to demonstrate that people's level of wealth also affects demand for money. Cambridge economists adopted the income version and believed that in nominal terms, wealth was a proportion of nominal income such that:

$$M = \frac{1}{v}(P \times Y) \dots\dots\dots \text{Eqn 2.3}$$

Where

Y:- Aggregate output meaning that $(P \times Y)$ is equivalent to nominal GDP.

If we let $\frac{1}{v}$ be k , then equation 2.3 represents Cambridge version of money demand such that:

$$M^d = \frac{1}{v}GDP = k \times GDP \dots\dots\dots \text{Eqn 2.4}$$

Where k is the constant of proportionality

Although Cambridge economists assumed that k is constant, they allowed it to fluctuate because of the decision to use money as a store of wealth. Therefore, the greater the proportion of nominal income held—when k is high – the smaller the velocity of money, the opposite is also true. Cambridge economists therefore factored in prevailing interest rates in the economy. The decision to hold money depended on the yields and expected returns on assets that also function as store of wealth. To this end, both Cambridge and Fisher used the equation of exchange. However, Fisher emphasized on technological and institutional factors as determinants of velocity of money and thereby ruled out interest rates. On the other hand, Cambridge version used velocity to model individual choice and therefore factored in interest rates.

Keynesian liquidity preference theory

Keynes in his book, ‘*The General Theory of Employment, Interest and Money*’, negated the classical view that velocity was constant. Keynes agreed with Cambridge version on the importance of interest rates in determination of demand for money. Keynes provided three motives explaining why people demand money; the transaction motive, precautionary motive and speculative motive. Transactionary motive refers to money held to bridge the gap between receipt of payments and expenditure. Secondly, precautionary motives refers to money balances held for uncertainty and unforeseen contingencies. Keynes explained that both transactionary and precautionary motives are functions of income such that the higher the income the higher the money held for these two motives. Lastly, speculative motive encompassed money held to take advantages for changes in opportunities that present themselves in the market. Keynes held that assets that can be used to store wealth are either cash balances or interest bearing bonds. Therefore, interest rates as the reward of parting with liquidity for a specified period of time. Keynes believed that individual had expectations about interest rate movement such that if they expect interest rates to rise above the normal value, then they would part with money balances in order to make returns. However, if interest rates are expected to fall, individual would rather hold their assets in liquid form. To this end, demand for real money balances had a direct relationship with income but an inverse relationship with interest rates such that:

$$\frac{M^d}{P} = f(Y, i) \dots\dots\dots \text{Eqn 2.5}$$

Where Y is the individual’s income such that $f'(\cdot) > 0$ with respect to Y i is the individual’s income such that $f'(\cdot) < 0$ with respect to i . Taking the inverse of equation 2.5 and multiplying both sides by Income yields the velocity such that:

$$V = \frac{GDP}{M^d} = \frac{PY}{M^d} = \frac{Y}{f(Y,i)} \dots\dots\dots \text{Eqn 2.6}$$

From equation 2.6, Keynes liquidity preference theory shows that velocity is constantly fluctuation as it is influenced by level of interest rates. Keynes explained that changes in money supply may reduce interest rates thus inducing people to hold idle cash and thereby reducing velocity of money. Therefore prices do not necessarily have to change with changes in money supply. To this end, Keynes held that since velocity is positively related to interest rates, then it follows that it is constantly changing depending on the prevailing market interest rates.

Friedman Money demand theory

Milton Friedman’s approach viewed demand for money as synonymous to demand for any other asset. Friedman’s theory -which is also referred to as modern quantity theory of demand for money -was introduced in 1970’s and asserts that economic agents want to hold certain quantity of real money balances. The level of real balances depend on permanent income, (Y_p) opportunity cost of holding money which is represented by the difference between expected returns on bonds minus return on money, $(r_b - r_m)$ expected return on equity minus return on money $(r_e - r_m)$ and expected inflation rate minus return on money $(\pi^e - r_m)$. That is:

$$\frac{M^d}{P} = f(Y_p, (r_b - r_m), (r_e - r_m), (\pi^e - r_m)) \dots\dots\dots \text{Eqn 2.7}$$

According to Friedman, demand for real money balances is positively related to permanent income and negatively related to the opportunity cost of holding money as measured by $(r_b - r_m)$, $(r_e - r_m)$ and $(\pi^e - r_m)$.

Empirical literature

Kingori (2003) studied the extent to which real and monetary factors affected income velocity of money in Kenya for the period 1992:1 to 2002:12. The study used autoregressive lag distributed model and an error correction model to examine the long run relationship between velocity of money as the dependent variable and real income, real exchange rate, expected inflation rate, and bank asset to GDP ratio as dependent variables. The study established that financial innovation as proxied by bank asset to GDP ratio was highly significant. Real interest rates were found to be significant but inflation rate was found to be insignificant. The broad money velocity function was found to be stable implying that broad money was suitable for monetary policy formulation. Duczynski (2004) examined the determinants of velocity of money in developed countries and Latin-American countries for the period 1975 to 2000. The study used a univariate model consisting of interest rates as the independent variable. In both categories, velocity of money was found to be unstable (not constant) in the long run. It was also established that first lag

interest rate were more significant than current interest rates. The relationship between interest rates and velocity of money was found to be higher in Latin-American countries compared to developed countries. Rami (2010) investigated velocity of money function for India using time series data from 1972 to 2004. The study used auto regressive lag model with velocity of money as the dependent variable and real income, short term interest rates, population of banks, share of monetary assets, degree of monetization and stock of money as dependent variables. The study found out that velocity of broad money was highly predictable. Institutional factors namely population of banks and degree of monetization were found to be significant in velocity of broad money (M3) but degree of monetization was found to be insignificant in determining narrow money.

Kumar *et al.*, (2010) studied money demand stability in Nigeria. Using data from 1960 to 2008, the study modeled an error correction model using real income, interest rate, inflation rate. The study also included structural breaks by incorporating trend, interest and slope coefficient changes. The study found existence of co integration before and after incorporation of structural breaks. It was established that a long run relationship between real money balances, real income, cost of holding money- proxied by inflation rate, real exchange rate and nominal interest rates- in Nigeria. A break date of 1986 was also established and found to be sensible as it represent the impact of reforms introduced by adoption of IMF's structural adjustment program (SAP).

Njenga (2013) evaluated demand for money function in Kenya for the period 1980 to 2011. The study modeled three components of money M1, M2 and M3 against real GDP, nominal interest rates, real exchange rate using vector auto regression model (VAR). The study established that the demand for money function was stable with R-Square of 94%, 93% and 98%. It was found out that a long run relationship among the variables that influence demand for money. However, the study found out that money demand function was unstable from 2007. This result implies that financial innovation and in particular introduction of M-Pesa affected demand of money function.

Overview of literature

Theoretical literature established that velocity of money is one of the most important but debated variable in determination of money demand function. While classical and neoclassical theories believe that it is constant in the long run, Keynesian economics argued that velocity is constantly fluctuating. Despite the varied opinion, the theory affirms that the modified version of the equation of exchange is an important theoretical construct in determination of velocity of money. Classical, Keynesian and Modern quantity of money supports the assertion that canonical factors namely real income and interest rates, institutional factors such as level of development of the banking system and opportunity cost of holding money are key factors that influence velocity of money. Empirical literature has shown mixed results across countries, while demand for money function appears to be stable in other countries thus supporting the classical approach; instability has also been established in others implying Keynesian theory of

money demand is also observed in other countries. Canonical variables namely real income and interest rates have been found to be significant in almost all countries but the significance of institutional and opportunity cost factors vary across countries. In Kenya, demand for money function was found to be stable between the period 1980 to 1993 but unstable thereafter. However, studies focusing on velocity – one of the most debated money demand component had not been adequately addressed especially for the period 2002 to 2013. Given significant changes in banking and financial environment in the country, the need to investigate the extent to which canonical, institutional and opportunity cost factors affect velocity of money demand was a gap that this research intended to address.

CHAPTER THREE

MATERIALS AND METHODS

Introduction

This chapter outlines the methodology used to evaluate the influence of canonical, institutional and opportunity cost factors on velocity of money. The section discussed research design, theoretical and model analyzed and procedure for data analysis that was used in the investigation.

Research design

This study sought to analyze the determinants and stability of velocity of money in Kenya. The research was guided by time series research design under non –experimental research design. Secondary data from CBK and Various issues of Economic survey was used in the investigation. The regression analysis was applied to measure the relationship and address the objectives herein stated.

Theoretical framework

The methodology adopted was based on modern quantity of theory approach as proposed by Friedman. This theory was adopted because it not only conforms to Keynesian and Cambridge versions but also accommodates institutional and opportunity cost factors in its analysis of velocity of money function. Therefore, this study combined the classical argument with Friedman's money demand function (equation 2.7) as follows:

The classical equation of identity (Equation 2.2) can be presented as:

$$V = \frac{P \times Y}{M^s} \dots\dots\dots \text{Eqn 3.1}$$

Where $P \times Y$ is equivalent to the nominal GDP, while M^s is money supply.

$$\text{Therefore: } -V = \frac{\text{GDP at Mkt prices}}{M^s} \dots\dots\dots \text{Eqn 3.2}$$

According to monetarists, Real money balances can be estimated as:

$$\frac{M^d}{P} = f(Y^{\alpha_1}, REER^{\beta_2}, i_r^{\beta_3}, \pi^{\beta_4}, \theta^{\beta_5} \varepsilon) \dots\dots\dots \text{Eqn 3.3}$$

$$\Rightarrow M^d = P[f(Y^{\alpha_1}, REER^{\beta_2}, i_r^{\beta_3}, \pi^{\beta_4}, \theta^{\beta_5} \varepsilon)] \dots\dots\dots \text{Eqn 3.4}$$

Assuming equilibrium exists in the money market, then:

$$\frac{M^d}{P} = M^s \Rightarrow M^d = P[f(Y^{\alpha_1}, REER^{\beta_2}, i_r^{\beta_3}, \pi^{\beta_4}, \theta^{\beta_5} \varepsilon)] = M^s \dots\dots\dots \text{Eqn 3.5}$$

From the equation of exchange holds that:

$$V = \frac{GDP}{M^s} = \frac{GDP}{M^d} = \frac{GDP}{P[f(Y^{\alpha_1}, REER^{\beta_2}, i_r^{\beta_3}, \pi^{\beta_4}, \theta^{\beta_5} \varepsilon)]} \dots\dots\dots \text{Eqn 3.6}$$

Transforming equation 3.3 into log linear form yields:

$$\ln V_t = \beta_0 + \beta_1 \ln Y_t + \beta_2 \ln REER_t + \beta_3 \ln i_t + \beta_4 \ln \pi_t^e + \beta_5 \ln \theta_t + \varepsilon^* \dots\dots\dots \text{Eqn 3.7}$$

Where β_0 is the intercept
 $(1 - \alpha_1) = \beta_1$ is the elasticity
 Y_t where Income at time t
 $REER_t$ is the real exchange rate at time t
 i_t Interest rate at time t
 π_t^e Expected inflation rate at time t
 θ_t Institutional factors at time t
 ε_t such that $\varepsilon \sim iid(0, \sigma^2)$

Model Specification

Given the scope and objectives of this research, equation 3.6 forms the basic equation of analysis. For in-depth analysis three measures of velocity were used as dependent variables. These represented the three main components of money supply namely narrow money M1, quasi money M2 and broad money M3 and are given as:

$$V_1 = \frac{GDP}{M1}, \quad V_2 = \frac{GDP}{M2}, \quad V_3 = \frac{GDP}{M3}$$

Secondly, given the gap explored in this study, two main measures of institutional factors were introduced. Rami (2010) suggested two set of variables as proxies of institutional proxies namely degree of monetization which entails progressive widening of the use of money in the economy. Degree of monetization was expected to negatively influence velocity of money. Secondly, the level of development or maturity of the financial sector is an institutional factor that affects the structure of financial system and thereby the velocity of money. Sophistication or maturity of the financial sector was expected to positively influence on velocity of money. According to King'ori (2003) the degree of monetization is measured using the ratio of bank asset to GDP. On the other hand, level of development of the financial system was measured using the population of bank branches. This was found to be an effective measure as it captures financial deepening and financial depth as it reflects the degree to which the monetized sector has penetrated in the economy.

To this end, the model specified in this study is given as:

$$\ln V_{it} = \beta_0 + \beta_1 \ln Y_t + \beta_2 \ln REER_t + \beta_3 \ln i_t + \beta_4 \ln \pi_t^e + \beta_5 \ln PBO_t + \beta_6 \ln MON_t + \varepsilon^* \dots\dots\dots \text{Eqn 3.7}$$

Where i = 1, 2, 3

Where PBO_t population of bank branches in a given point in time Mon_t degree of monetization which is measured as $\frac{Bank\ asset}{GDP}$ at a given point in time

Data and Data sources

Annual time series data was used for analysis sample data ranges from 1970 to 2012.

Definition and measurement of variables

Type	Variable	Measure	Description
Dependent variables	Velocity of money	V1	Velocity of money given money supply is assumed as narrow money M1
		V2	Velocity of money given money supply is assumed to be quasi money M2
		V3	Velocity of money given money supply is assumed to be broad money M3
Independent variables	Real GDP	Income	Represent the real output or real GDP of the economy. Deflated using GDP deflator
		Real Interest rates	Opportunity cost variable
	PBO	Institutional variable	Number of bank branches in Kenya
	Bank assets-GDP ratio	Institutional variable	This represents the degree monetization and by extension the level of financial system development
	ε_t	Percentage	error term. Defined in eqn. 3.7

Data Analysis

To analyze the data, ARDL models was used with equation 3.7 as the basic equation of analysis. Three regression models were estimated with V1, V2 and V3 as respective independent variables. The first objective was to investigate the determinants of velocity of money. To measure this objective, all three regression models were used and the significance of each independent variables specified in equation 3.7 was evaluated. The second objective was to analyze the stability of the velocity of money function. F statistics and adjusted R-square was used to evaluate the degree to which the model predicts proportional change in velocity of money. Higher adjusted high level of R-square and F-statistics indicated stability, the opposite is true. Stepwise regression technique was used to evaluate the degree to which canonical variables, - that is GDP and interest rates-institutional variables and opportunity cost variables contribute to predictability of the model. Given the analytical procedures used to test the

objective, Augmented Dickey Fuller (ADF) test was used to test for stationary and determine the order of integration. Given Stationarity condition, appropriate model was adopted AIC and Schwartz criteria were used to choose the appropriate number of lags. ARDL Bound test was used to test for co integration. According to Pesaran and Shin (2001), this procedure is advantageous over Engle-Granger and Johansen because it can be applied regardless of whether the regressors are $I(1)$ or $I(0)$, secondly, unlike Johansen test, the method is more reliable even handling small samples. Thirdly, it allows testing of variables with different lag criteria.

$$\Delta \ln V_{it} = \beta_0 + \gamma_1 \sum_0^p \Delta \ln Y_t + \gamma_2 \sum_0^p \Delta \ln REER_t + \gamma_3 \sum_0^p \Delta \ln int + \gamma_4 \sum_0^p \Delta \ln \pi^e_t + \gamma_5 \sum_0^p \Delta \ln PBO_t + \gamma_6 \sum_0^p \Delta \ln MON_t + \phi_1 \ln Y_{t-1} + \phi_2 \ln REER_{t-1} + \phi_3 \ln i_{t-1} + \phi_4 \ln \pi^e_{t-1} + \phi_5 \ln PBO_{t-1} + \phi_6 \ln MON_{t-1} + \mu \dots \dots \dots \text{Eqn 3.8}$$

Where μ and Δ represent white noise and first difference operator respectively. Lag selection was estimated using AIC or SBC criteria. According to Pesaran and Shin (2001) null hypothesis of no co-integration tested using the hypothesis: $H_0: \phi_1 = \phi_2 = \phi_3 = \phi_4 = \phi_5 = \phi_6 = 0$ against the alternative hypothesis $H_A: \phi_1 \neq \phi_2 \neq \phi_3 \neq \phi_4 \neq \phi_5 \neq \phi_6 \neq 0$. Wald test is used to test the hypothesis and two sets of critical values are provided with no of parameters as degree of freedom. If the F-statistics is above the upper bound critical values, reject the null, which implies co integration.

If the F-statistics is below the lower bound critical value, we fail to reject the null, which implies no co integration. If the F-statistics lie between the lower and upper bound critical values, the test is inconclusive. Based on Stationarity and co integration results, the appropriate model parametrized in equation 3.5 was estimated. A series of diagnostic tests were conducted; Breusch-Godfrey LM test was used to test for presence of autocorrelation. Autoregressive conditional heteroskedasticity LM test (ARCH LM test) was applied to evaluate heteroskedasticity in the residual term. Appropriate model was applied given the heteroskedasticity condition. Adjusted R square and F statistics was used parsimony, stability and reliability of each model (Wooldridge, 2003). Stata 11 software package was used to conduct the investigation.

CHAPTER FOUR

RESEARCH FINDINGS

Introduction

This chapter presented the research findings obtained from the investigations. Quarterly data from the first quarter of 1992 to the last quarter of 2012 was used for analysis. The chapter is organized as follows. Firstly, correlation analysis was presented. Secondly, the time series stationary conditions of key variables are provided. Lastly, the research findings are presented.

Correlation analysis and Stationarity Analysis

Table 4.1 shows correlation coefficient for all variables under investigation

Firstly, table 4.1 shows that there is a strong positive association between the three measures of income velocity. Secondly, there is a strong positive association between log of monetization and log of number of branches. These results indicate that growth of bank branches and degree of monetization growth of bank branches is an important indicator development of financial sector and financial deepening in the economy. It is also important to note that strong association between the three levels of economy means that either narrow money or broad money can be used as a proxy in analyzing the relationship between income velocity and independent variables of interest. Before the model estimation, stationary conditions were investigated and the results presented in table 4.2. The results above shows that log of inflation, real interest rates, real exchange rate and real interest rate were stationary at level. Log of all three income velocity measures were trend stationary while degree of monetization (log of mon) and number of branches (log of pbo) were difference stationary. Therefore as expected of economic variables, some are integrated of order zero, $I(0)$, while others are integrated of order one $I(1)$. This implies that the co integration analysis is vital to determine existence of long run relationship between the dependent variable and independent variables (Greene, 2002, Wooldridge, 2003).

Cointegration Analysis

Given that some variables were $I(0)$ while others are $I(1)$. ARDL bound test specified in equation 3.8 was used for investigation

Table 4.1. Correlation Analysis

	Lnbran	Lninfl	lnmon	lnreer	Lnrgdp	lnrint	lnv1	lnv2	lnv3
Lnbran	1								
Lninfl	-0.1447	1							
lnmon	0.9154	-0.1157	1						
lnreer	0.7581	-0.2292	0.8338	1					
Lnrgdp	0.7749	-0.275	0.6543	0.6811	1				
lnrint	0.3048	0.2143	0.0981	0.0568	0.0005	1			
lnv1	-0.8307	-0.0037	-0.948	-0.7769	-0.7871	-0.0714	1		
lnv2	-0.9341	0.1114	-0.9767	-0.7905	-0.7934	-0.1705	0.9373	1	
lnv3	-0.9005	0.0408	-0.9651	-0.7361	-0.7411	-0.174	0.9633	0.9852	1

Source: Author

Therefore, the short run model was used for analysis and the results presented in the succeeding section.

Estimated Results

This section presents the short run model. Table 4.4 presents the short run version of equation 3.7 with differenced log of V3 as dependent variables. Firstly, income velocity estimated using broad money (M3) was used as the dependent variable. The choice of log V3 as representative of income velocity is based on the fact that there was a strong positive correlation between the three income velocities specified in chapter three. In this regard, they could be used interchangeably. Secondly, due to high correlation between degree of monetization and number of branches, both variables could not be included. Diagnostics show that all the models could be relied for prediction. F-statistics in all models was significant implying that the variables jointly explained changes in log of income velocity. Secondly, Breusch-Godfrey tests had a p-value that is greater than 0.05. This means that the null hypothesis of no autocorrelation was not rejected. Thirdly, VIF was less than 5, according to Gujarati (2006) VIF of less than five indicate absence of multicollinearity problem.

Lastly, ARCH LM test indicates that presence of heteroskedasticity was observed in model I and II but absent in model III, Newey-West estimator was used to correct heteroskedasticity. The first objective sought to determine the factors that affect income velocity. Comparison of regression results in table 4.4 show that the coefficient of change in rate of inflation was significant in model I (-0.082) and model II (-0.034) at 1 percent and 5 percent significance level respectively. However, the coefficient of change in rate of inflation in model III and all lagged values in all models were insignificant. This implies that inflation is a significant variable that negatively impacts velocity. For example, model I and II shows that one percent increase in inflation rate reduces velocity rate by approximately 8 percent (as measured narrow money (M1)) and 3.4 percent (as measured by broad money (M2)) respectively. This is consistent with theory and empirical studies in developing countries, households prefer to hold their wealth in real assets rather than liquid assets if they anticipate inflation increase.

It is worth noting the insignificant relationship between rate of inflation and broad money may that inflationary pressure may be advantageous as it may influence economic activity without necessarily affecting money demand function (King'ori, 2003). The results show that change in the rate of interest and its lags were insignificant at 5 percent level for all the three models. This implies that change in real interest rates may not play an important role in determining changes in income velocity. This results supports the argument that interest rates are sticky in the short run making the relationship between income velocity and prices weak insignificant in the short run. This results are consistent with other results in developing economies which are relatively interest inelastic (King'ori, 2003; Mwega *et al.*, 2012). The results also show that there is a significant positive relationship between change in income velocity and real GDP in Kenya. The coefficient of real GDP in model II (0.37) and model III (0.269) were significant at one percent level. The results show that a percentage increase

in real GDP increases rate of income velocity by 37 percent (as measured by M2) and 26.9 percent (as measured by M3) respectively. These results are supported by theory as increase in real GDP generally improves purchasing power and thus leading to increased economic activity and consequently income velocity in the short run. It is noteworthy that the lagged value of real GDP is significant and negative in model I and II but insignificant in model III.

Real exchange rate was a significant determinant in all the models at 5 percent level of significance or higher. There is a significant negative relationship between real exchange rate and income velocity. The coefficients of real exchange rate in model I (-0.873) and III(-0.377) are significant at one percent level while the coefficient in model II (-0.415) was significant at 5 percent level. The results show that a percentage increase in real exchange rate decreases rate of income velocity by 87.3 percent (as measured by M1), 41.5 percent (as measured by M2) and 37.7 percent (as measured by M3) respectively. These results may indicate that Kenyan economy is highly influenced by international economy. Negative significant relationship between real exchange rate and income velocity indicate that depreciation of the local currency leads to capital flight as investors prefer foreign assets to domestic assets. The second objective sought to evaluate the extent to which structural factors affect income velocity in Kenya. Two structural factors namely degree of monetization and number of bank branches were used for analysis.

Firstly, the diagnostic statistics show that compared to the model without structural variables (Model I), Adjusted R-Square increases by approximately 25 percent. This means that structural variables increase significantly improve predictability and by extension the influence of income velocity. Secondly, results in Model II and III show that structural changes in financial sector are significant determinants of income velocity. Increase in number of bank branches negatively influences changes income velocity almost instantaneously. However, lagged values of bank branches were not significant. The coefficient of current difference in degree of monetization and the first lag were significant at 1 percent level. The result shows that increase in degree of monetization in present and previous time periods decreases income velocity by 0.66 and 0.17 respectively. These results conform with theory and support the assertion that as financial deepening and innovation improves the economy holds and transact less with liquid cash (Kingori, 2003, Akinlo, 2012; Scadding, 1982).

CHAPTER FIVE

Summary, Conclusion and Recommendations

Summary

This study investigated the determinants of income velocity with particular emphasis on the extent to which structural changes in the financial sector impact income velocity. The investigation was based on quantity theory approach and Monetarists theory which state that income velocity is affected by opportunistic factors as measured by income growth, prices and interest rates, and the structure and level of financial

development. Quarterly time series data from the first quarter of 1992 to fourth quarter of 2012 was used in the analysis. The findings show that interest rates and inflation have a weak influence on changes in income velocity in the short run. These findings conform to monetarists approach that hold that prices maybe sticky in the short run. As expected, there was a significant positive relationship between income velocity and growth of income. Structural factors had a significant influence on income velocity. Interestingly, real exchange rate significantly affected income velocity implying that international factors affect stability of money demand dynamics and income velocity function.

Conclusion

The main findings revealed that financial deepening, innovation and development in Kenya has changed the mode of economic transaction by reducing the use of liquid forms of payment. In addition, real exchange rate negatively influences income velocity while change in real GDP is positively influences income velocity. These findings suggest that:

Recommendations

First, fluctuation of real exchange rate has a significant impact on the dynamics of money demand function. Given that Kenya is a net importer and in light of increased liberalization and opening of the economy, the monetary authority should ensure that real exchange rate depreciation remains in check to avoid capital flight. Secondly, expected inflation and interest rate changes were insignificant determinants of income velocity. Therefore, the government can employ seignorage. In addition, monetary authority may focus on economic growth objective and allow some inflationary pressure on the economy at least in the short run. Lastly, structural factors are highly significant factors, therefore the monetary authority should introduce policies geared towards financial sector growth and financial deepening with the aim of stabilizing money demand function in the economy.

Limitations of the Study

The major limitation encountered in the duration of this study was the fact that long run function could not be estimated. These imply that the long run income velocity function and the findings interpreted and discussed only apply in the short run.

REFERENCES

- Akinlo, A. 2012. "Financial Development and the Velocity of Money in Nigeria: An Empirical Analysis," *The review of Finance and Banking*. Vol. 4, No. 2, pp 97 - 113
- Bordo, M.D. and Jonung, L. 1987. "The Stochastic Properties of Velocity: A New Interpretation," *National Bureau of Economic Research, Working Paper Series*, Paper No. 2255.
- CBK, 2010. 27th Monetary Policy Statement, Central Bank of Kenya, December 2010, Nairobi.
- CBK, 2011. 28th Monetary Policy Statement, Central Bank of Kenya, June 2011, Nairobi.
- CBK, 2012. 2012 Annual Report, Central Bank of Kenya, December 2012, Nairobi.
- CBK, 2013. 2013 Annual Report, Central Bank of Kenya, December 2013, Nairobi.
- Duczynski, P. 2004. "The Velocity of Money and Nomina Interest Rates: Evidence from Developed and Latin-American Countries", unpublished paper, University of Hradec Kralove, Czech Republic.
- Gill, R. A. 2010. "Determinants of Velocity of Money Supply in Pakistan," Paper presented to International Conference of Applied Economics, 2010
- Greene, W. H. 2002. "Econometrics Analysis," Fifth Edition. Prentice Hall Pub. Upper Saddle River: New Jersey.
- Gujarati, D.N. 2006. "Essentials of Econometrics," 3rd Edition, McGraw-Hill, Boston.
- Judd, J. and Scadding, J. 1982. "The search for a stable Money Demand Function," *Journal of Political Economy*. Vol. 84 (5) pp 993 – 1023.
- Kinyua, J. May 2001. "Monetary Policy Evolution in Kenya: Evolution and Current Framework," Central Bank of Kenya, Nairobi.
- King'ori Zacharia Irungu, June 2003. "The determinants of Income Velocity of Money in Kenya (1992:1 – 2002:12)," MSc Economics, Research Paper, University of Zimbabwe.
- Kiragu, P. 2013. "Kenya: Bank Assets now hit 2.5 Trillion-CBK," *The Star Newspaper*, June 26th 2013.
- Kumar S. Webber J.D., Fargher S. 2010. "Money Demand Stability: A Case Study of Nigeria", *Journal of Policy Modelling*, 2013, Vol 35, Issue 6, pp 978 – 991.
- Mankiw, N. G. 2008. "Principles of Macroeconomics" 5th Edition, Australian Southern-Western, 2008.
- Mwega, F, Mbiti, I. and Weil, D. 2012. "The Implications of Innovations in the Financial Sector on the Conduct of Monetary Policy in East Africa," *International Growth Center, working paper*, paper 12/0460, July 2012.
- Njenga, E. 2013. "The Demand for Money in Kenya: An Empirical Enquiry," MA Research Paper, University of Nairobi.
- Njuguna, N. 2011. "Strengthening Regulatory Frameworks in the Finance Industry: A Key Enabler for Private Sector Development," Keynote speech at the 1st African Banking and Finance Conference, Nairobi in February 2011.
- Ouma *et al.* 2010. "Financial Innovation and Monetary Policy Transmission in Kenya," *International Research Journal of Finance and Economics*, Issue 50 (2010) EuroJournals Publishing, Inc.
- Pesaran, M.H., Shin, Y. and Smith, R.J. 2001. "Bound testing Approaches to the analysis of Level Relationships," *Journal of Applied Econometrics*. Vol. 16. pp. 289-326
- Rami, G. 2010. "Velocity of Money functions in India: Analysis and Intepretations," *Quest-Journal of Management and Research*, Vol 1, Issue 1, June 2010. Pp 15-26
- Rotich, H., Kathanje, M. and Maana, I. 2007. "A Monetary Policy Reactions Function for Kenya," A paper presented during the 13th Annual African Econometrics Society Conference in Pretoria, South Africa in July 2008.
- Wooldridge, J.M. 2003. *Introduction to Econometrics: A Modern Approach* (5th Ed.). UK: Cengage Learning.

APPENDIX

Table 1. Results from ARDL Bound Test Model

Dep. Var	Dep Variable D(lnv1)			Dep. Variable D(lnv2)			Dep. Variable D(lnv3)		
D(lnv1): lag 1	-0.041	0.3	0.766	-0.078	-0.59	0.559	-0.004	-0.03	0.973
D(lninfl)	-0.013	-0.82	0.418	-0.012	-1.04	0.302	-0.009	-0.77	0.445
D(lninfl):lag1	-0.082	0.56	0.576	-0.004	-0.38	0.703	-0.005	-0.52	0.608
D(lninfl):lag 2	0.012	0.79	0.43	0.004	0.41	0.683	0.008	0.77	0.444
D(lnmon)	-0.709	-7.27	0.000	-0.701	-9.96	0.000	-0.727	-10.26	0.000
D(lnmon):lag 1	-0.025	-0.22	0.823	-0.121	-1.29	0.201	-0.11	-1.19	0.241
D(lnmon):lag 2	-0.081	-1.18	0.242	-0.089	-1.78	0.081	-0.116	-2.28	0.026
D(lnreer)	-0.445	-3.62	0.001	-0.307	3.46	0.001	-0.319	-3.57	0.001
D(lnreer): lag 1	0.232	1.83	0.072	0.274	2.98	0.004	0.322	3.6	0.001
D(lnreer): Lag 2	0.069	0.65	0.518	0.088	1.02	0.312	0.038	0.44	0.665
D(lnrint)	-0.002	-0.08	0.933	-0.018	-0.95	0.345	-0.026	-1.45	0.153
D(lnrint): lag 1	0.051	2.08	0.043	0.022	1.23	0.225	0.026	1.45	0.153
D(lnrint): Lag 2	-0.015	-0.61	0.545	-0.013	-0.73	0.467	-0.013	-0.72	0.477
D(lnrgdp)	0.33	3.36	0.001	0.356	5.00	0.000	0.325	4.59	0.000
D(lnrgdp): lag 1	-0.019	-0.2	0.843	-0.064	-0.89	0.376	-0.101	-1.44	0.155
D(lnrgdp): Lag 2	-0.116	-1.44	0.155	-0.112	-1.91	0.061	-121	-2.05	0.046
D(lnbran)	-0.104	-0.41	0.684	-0.094	-0.51	0.608	-0.048	-0.26	0.795
D(lnbran): lag 1	-0.147	-0.82	0.415	-0.065	-0.52	0.611	-0.009	-0.07	0.947
D(lnbran): Lag 2	0.285	0.192	1.48	0.253	1.84	0.071	0.349	2.52	0.015
lninfl:lag1	-0.005	-0.4	0.694	-0.004	-0.43	0.67	-0.005	-0.55	0.584
lnmon:lag1	-0.142	-1.51	0.136	-0.206	-2.95	0.005	-0.189	-2.72	0.009
lnreer:lag1	0.53	0.55	0.583	0.052	0.76	0.452	0.044	0.64	0.528
lnrint:lag1	-0.004	-0.24	0.812	-0.011	-0.86	0.392	-0.01	-0.77	0.446
lnrgdp:lag1	-0.008	-0.11	0.909	0.026	0.53	0.595	0.019	0.39	0.695
lnbran:lag1	0.171	1.56	0.125	0.195	2.42	0.019	0.19	2.31	0.025
Cons	-1.14	-1.58	0.12	-1.42	-2.65	0.011	-1.31	-2.45	0.018
