EFFECTS OF FINANCIAL DEEPENING ON ECONOMIC GROWTH IN KENYA

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ABSTRACT

Various scholars and researchers have recognized that the development of the financial sector has productivity and growth-enhancing effects. In this regard,several policies that increase financial deepening have been nurtured with the aim of improving economic growth both in developed and developing countries. This study sought to investigate the effects of financial deepening on economic growth in the Kenyan banking sector. The study achieves this objective using quarterly time series data from 2000 to 2013. Financial deepening, the independent variable was captured by four alternative indicators: Liquid Liabilities (LL) as ratio to nominal Gross Domestic Product (GDP); Credit to the Private Sector (CPS) as ratio to nominal GDP; Commercial Bank Assets as ratio to commercial bank assets plus Central Bank Assets (CCBA); and Commercial Bank Deposits (CBD) as ratio to nominal GDP. The dependent variable, economic growth, was measured by real GDP. All the variables were integrated at level I (1) and the Johansen Jeluisus cointegration test showed evidence of cointegrating equations between GDP and financial deepening indicators. Four models were estimated to determine the long run and short run effects. The study found that banking sector in Kenya has an important role in the process of economic growth. Specifically, the empirical results reveal that liquid liabilities, credit to the private sector, commercial-central bank assets and commercial bank deposits have positive and statistically significant effects on GDP. The study recommends therefore to reinforce existing policies that will encourage the public to save more money with commercial banks. Increasing the interest rate paid to depositors on their deposits for example, will incite people to save more. In addition, the study recommends the intensification of financial inclusion policies through increased access and usage of formal banking services while reducing banks transaction costs. This will encourage more people to participate in economic activities, to borrow and invest more.

Key words: *Financial Deepening, Economic growth, Johansen cointegration, ECM*

1. INTRODUCTION

1.1. Background of the Study

The seminal work of Schumpeter (1911) and other researchers such as McKinnon (1973) and Shaw (1973) have recognized that the development of the financial sector has productivity and growth-enhancing effects. Therefore, the relationship between financial development and economic growth has received considerable attention in both developed and developing economies. This concern about financial deepening and economic growth finds its justification in the policy implications that the relationship can bring about, as improved living standards for their citizens as well as increased economic growth rates are the goals sought by many governments. Moreover, recent research findings have indicated that countries with better developed financial systems tend to have a faster rate of economic growth. As a result, financial deepening has emerged as a strategy to enhance economic growth more so in developing nations such as Kenya.

The literature on financial deepening and economic growth has mostly dealt with the causality issue between the two concepts with two main hypothesis: the first one, the supply-leading hypothesis argues that financial deepening drives economic growth through the presence of efficient markets while the second, the demand-leading hypothesis posits that economic growth is a response to the expansion of financial markets and progress. However, one thing that can be deducted from these different hypotheses is the positive contribution of financial development to the economic growth process, with an essential role played by financial intermediaries. The main view being that the increased availability of financial instruments and institutions reduces transaction and information costs in an economy. According to Endogenous growth literature, well-developed financial systems support the growth process through savings and investments. They help households and firms grow, trade and raise investments by mobilizing savings, ensuring that these funds are allocated to the most productive use, spreading risk and providing liquidity so that firms can operate efficiently (Benston and Smith, 1976; and Tobin, 1963).

The liberalization of financial markets and the presence of efficient financial markets allow the increase in financial assets which reflects an increasing use of financial intermediation as well as the monetization of the economy. As such, the economic growth and development of a country depend greatly on the deepening of its financial system. This has been argued by authors such as Gurley and Shaw (1955) and Goldsmith (1969) who stressed the role of financial intermediation in the saving-investment process, where money, whether defined narrowly or broadly, forms a part of a wide spectrum of financial assets in the portfolio of wealth-holders.

Empirical studies on financial deepening have been carried out with mixed results on its effects and impact on economic growth. These mixed results depend not only on countries stages of development but also on the data sets and the proxies used to measure financial deepening. In various studies, financial deepening has been measured using several indicators. For instance, the ratios M1/GDP, M2/GDP, M3/GDP or market capitalization/ GDP have been employed to measure the size of the financial sector (King and Levine, 1993). The activity of the financial sector has also been a proxy for financial deepening, using indicators such as credit to the private sector/GDP and /or value traded ratio. Financial deepening in some other studies has been measured in terms of the efficiency of the financial sector using indicators such as turnover ratio, banks overhead costs or net interest margins (Antzoulatos et al, 2008). Several studies however, have made used of different combinations of these indicators to measure the development of the financial system in different countries. (Huang, 2005; Antzoulatos et al, 2008).

In various empirical studies, cross-countries studies suggest a positive association between financial deepening and economic growth indicating also that the initial level of financial development is a good predictor of the subsequent rates of economic growth (Levine and King, 1993) whereas other studies present evidence of negative effects of financial deepening on growth (De Gregorio and Guidotti, 1995). However, cross-countries studies fail to address countries specific macroeconomic environment leading to biased policy implications. Therefore, it is crucial to investigate the effects of financial deepening on economic growth based on a country case

Vision 2030, the Kenyan economic development blueprint has set the goal of transforming the country into a newly industrialized, "middle-income country providing high quality of life to all its citizens by the year 2030''. The transformation entails doubling deposits mobilization from 44 percent to 80 percent of GDP and enhancing growth of savings channeled into productive investments from 14 percent to over 30 percent. The financial sector that plays a pivotal role in the achievement of this goal hinges on three essential pillars: access, efficiency and stability.

Kenya is one of the countries in the African continent having a well-developed financial system based on the ground that it has banking, insurance, capital markets, pension funds, quasi-banking crafted by Savings and Credit cooperative Societies (SACCOs), Microfinance institutions (MFIs), building societies, Development Finance Institutions (DFIs) and informal financial services such as Rotating Savings and Credit Associations (ROSCAs) (Popiel (1994) as quoted by Uddin, Sjö and Shahbaz (2013)). The banking system, dominated by the banking sector, comprises of the central bank (the regulatory) authority, 43 commercial banks (out of which 31 are locally owned banks and 13, foreign owned banks) 1 mortgage finance company as at September 2014. Other financial institutions in the banking system include pension funds, insurance companies, hire purchase companies and 9 micro-finance banks

During the last two decades, several reforms translated by developments and innovations have taken place in the Kenyan banking sector that have led to the increase in the sector's assets. Such developments are mainly been driven by financial innovations in the sector. Specifically, the reduction of the retention ratio from 6 to 5.25 percent by the Central Bank of Kenya (CBK) made loans more affordable to the public; the transformation of Non-Bank Financial Institutions (NBFI) into commercial banks(e.g. Equity and Family banks); and the introduction of new products and financial service delivery channels (such as M-pesa, Islamic banking, mobile banking, agency banking and the integration of Automated Teller Machines (ATMs) by micro finance institutions) to name a few.

The rationale behind the financial sector reforms embarked upon by CBK(such as the 1995 amendments of the Banking Act to further strengthening supervision of the banking industry and broaden the responsibilities and coverage of institutions, the revision of capital requirements to avoid a repeat of the banking crises experienced in the mid-1980s and early 1990s, the adoption of the Basel I standards on capital adequacy) aimed at strengthening the sector that was experiencing difficulties as outlined in the Economic Recovery Strategy paper on Wealth Creation and Employment published by the government in 2003.These reforms thus, have highly contributed to the deepening the banking sector leading to the expansion of new financial instruments/assets and techniques as well as the adaptation of existing ones to meet new demands and new circumstances. These developments consequently translated to an increase in money supply, liquidity and reserve money; the growth of domestic credit with the private sector dominating the segment in terms of lending; the growth in net domestic asset and in the net foreign asset.

While the financial sector is constantly expanding in Kenya, the economic performance of the country is inconsistent since independence. After the millennium, the country experienced high growth rates which peaked in 2007 with7 percent .The GDP growth reduced to 1.5 percent in 2008, but the economy rebounded in 2010 by attaining growth rate higher than 5 percent. In 2011 and 2012, the growth rates were respectively 4.4 and 4.6 percent. In 2014, the growth rate was rebased upwards by 25 percent from 2009, expanding therefore the economy by 5.7 percent increase in GDP.

1.2. Problem Statement

Financial deepening plays an important role in determining the growth of an economy. It broadens its resource base, raises the capital needed to stimulate investment through savings and credit, and boosts the overall productivity. The design and implementation of effective interventions and programs in the Kenyan banking sector has led to a continued growth in financial assets, with a direct contribution from financial intermediaries of 7.2 percent to the country GDP in 2013. However, economic growth in Kenya, whether as a result of financial development or other factors has been fluctuating over the last decade with rates as low as 1.5 percent in 2008. Therefore, it is of importance to assess the effects on economic growth of the banking sector deepening in Kenya

Several studies with mixed results have been conducted across countries to investigate the relationship between financial deepening and economic growth. Some studies have used developed and developing cross-countries data sets (King and Levine, 1993). Other studies have used a sub-regional African approach (Nguena and Abimbola, 2013; Ndebbio, 2004). In individual African countries context such as South Africa (Jalil, Wahid and Shahbaz, 2010); Nigerian (Onwumere, Ibe, Ozoh and Mounanu, 2012; Nzotta, 2009) findings suggested mixed results depending on financial deepening indicators employed. In the Kenyan context, studies conducted by Odhiambo (2008), Wolde-Rufael (2009) Waiyaki (2013) Uddin, Sjö and Shahbaz (2013): Onuonga (2014) have mainly focused on determining the direction of causality between financial deepening variables and economic growth with different conclusions on how both concepts affect each other.

This study aims to provide further evidence by examining the effects of financial deepening on economic growth in the Kenyan banking sector for the 2000-2013 period. Specifically, it extends the previous studies by widening the scope of financial deepening indicators to include in the study, the ratio commercial bank assets to commercial plus central bank assets, as a measure of the extent to which commercial banks allocate savings in the Kenyan economy against the central bank. The study goes further to use extended broad money measured as liquid liabilities, bank credit to the private sector and commercial bank deposits to measure activity and the size of the banking sector in Kenya, therefore filling the knowledge gap in the existing literature.

1.3. Objectives of the Study

The main objective of the study was to determine the effects of financial deepening on economic growth in Kenya.

The specific objectives were:

1. To determine the effects of commercial banks' liquid liabilities on GDP growth in Kenya;
2. To determine whether credit to the private sector has an impact on GDP growth in Kenya;
3. To determine the effects of the ratio of commercial banks' assets to commercial banks plus central bank assets on GDP growth in Kenya; and

4. To determine whether commercial bank deposits have impact on GDP growth in Kenya.

1.4. Research Questions

1. How do commercial banks' liquid liabilities impact the GDP growth in Kenya?
2. How does credit to the private sector influence GDP growthin Kenya?
3. What is the impact of the ratio of commercial banks' assets to commercial banks plus central bank assets on GDP growthin Kenya?
4. How do commercial bank deposits affect GDP growth in Kenya?

1.5. Justification of the Study

According to Carmen Lawrence (2011), the goal of economic growth is clearly the touchstone for judging major public policy decisions. Research in the last decade shows that countries with higher degree of financial deepening tend to post higher economic growth. Therefore, exploring the channels through which financial sector development affects economic growth, is critical for policy design. Hence, the study would be valuable to policymakers who have to prioritize among multiple policy reforms to help the societies grow faster. The study will be important for future researchers and scholars especially in the area of finance-growth relationship.

1.6. Scope of the Study

This research study was undertaken in Kenya, covering all the forty three banks licensed, supervised and regulated by CBK as at December 2013. The study covered a time frame of 56 quarters starting from January 2000 to December 2013.

1.7 Organization of the Paper

This paper is structured as follows. The first section presents the introduction to the study. Section two reviews the theories and empirical studies related to financial development and economic growth. Section three gives the data and methodology that has been used in the paper. Section four presents the findings from the estimation results and section five concludes and provides policy implications of the study

2. LITERATURE REVIEW

2.1. Theoretical Review

2.1.1 The Theory of Financial Intermediation

The theory of Financial Intermediation advocates that financial intermediaries play a crucial role of intermediation in the growth process by transferring financial resources from the net savers to net borrowers, thus influencing investment and thereby economic growth. The theory suggests that financial intermediaries can overcome a market failure and resolve an information asymmetry problem by transforming the risk characteristics of assets. These asymmetries in credit markets arise because borrowers generally know more about their investment projects than lenders do. Information failures lead to specific forms of transaction costs and financial intermediaries appear to overcome these costs, at least partially. The notion of transaction costs encompasses not only exchange or monetary transaction costs (Tobin, 1963) but also searches, monitoring and auditing costs (Benston and Smith, 1976).

The work of Schumpeter (1911), supports the view that well-functioning financial intermediaries can promote the overall economic efficiency. By pooling and allocating funds, financial intermediation promotes entrepreneurship and innovation which are necessary components for economic development.

Gurley and Shaw (1960) supported the view that financial intermediaries are an opportunity to enhance borrower's financial capacity in the savings and investment process. Thus, the higher the intermediation level in the financial sector, the higher the savings mobilized and higher would be investments, which in turn will increase the level of economic growth. In the same way, according to Goldsmith (1969), the financial structure of an economy accelerates economic performance to the extent that it facilitates the migration of funds to the best user, i.e., to the place in the economic system where the funds yield the highest social return". The opinion of Greenwood and Jovanovic (1990) is in line with this view; they argue that financial intermediation promotes growth because it allows a higher rate of return to be earned on capital, and growth in turn provides a means to implement costly financial structures.

2.1.2. The Theory of Financial Liberalization

Financial Liberalization refers to the process to liberalize the financial sector of a country with an aim to create favourable environment to increase the money demand in the economy. This is assumed to take place in two ways; (i) By increasing the financial resources to lead the supply-induced demand for money (ii) By creating suitable environment to make investments in the economy.

The theory of financial liberalization pioneered by Mac Kinnon (1973) and Shaw (1973) advocates for the liberalization of the financial sector as an effective way to accelerate growth. The theory suggests that the liberalization of financial markets allows financial deepening which reflects an increasing use of financial intermediation by savers and investors as well as the monetization of the economy. In other words, by lowering financial market frictions, domestic savings are increased and foreign capital is attracted. The theory is based on the premise that the higher the real rate of interest, the greater the degree of financial deepening, the more saving there will be, and financial saving will be allocated and invested more efficiently than if saving is invested directly in the sector in which it takes place, without financial intermediation (Thirlwall 2005). The McKinnon-Shaw theory of financial liberalization suggests a complementarity relationship between the accumulation of money balances (financial assets) and physical capital accumulation in developing countries, leading to economic growth.

2.2. Empirical Review

Empirical studies suggest that financial deepening has different effects on economic growth depending on the financial deepening indicator used, the period of the study and the data sets that vary from panel data across countries, sub regions to individual countries.

King and Levine (1993) conducted a cross country analysis as well as a pooled cross country, time series study using Barro's endogenous growth models to examine the link between financial development and economic growth. The measures of financial development was done using several indicators such as the ratio of liquid liabilities of banks and nonbank institutions to GDP(M2/GDP), ratio of bank credit to the sum of bank and central bank assets, ratio of private credit to domestic credit and ratio of private credit to GDP. They found that the average level of financial development for the period. 1960-89 is very strongly associated with growth.

From a sub-regional African perspective, Ndebbio (2004) investigated the relationship between financial deepening, economic growth and development in 34 selected a sub-Saharan African countries (SSA). Financial deepening was captured by two variables: the degree of financial intermediation (M2/Y) and the growth rate in per capita real money balances. Ordinary least squares multiple regression was adopted to examine the relationship among the variables. Two policy implications were derived from the

study: the first, that SSA countries should strive hard to make real money balances grow, and that these countries should also come up with policies to improve financial development/intermediation.

Nguena and Abimbola (2013) investigated the implication of financial deepening dynamics for financial policy coordination in the West African Economic and Monetary Union sub-region (WAEMU). They adopted a hypothetical-deductive theoretical approach and an empirical investigation in both static and dynamic panel data econometrics. The study recommended the implementation of a financial policy directed at increasing the level of savings rate, GDP per capita growth rate and density. It also recommended the reduction of the level of reserves in the sub-region.

At a country level in Malaysia, Ang (2007) examined to what extent financial development contributed to output expansion during the period 1960-2003. Using augmented neoclassical growth framework to provide an evaluation of the impact of financial sector development on economic development and the Autoregressive Distributed Lag model (ARDL) bounds procedure, the researcher found that aggregate output and its determinants are co integrated in the long-run, suggesting that financial development, private capital stocks and the labor force exert a positive impact on economic development whereas the accumulation of public capital appears to curtail output expansion in the long run.

In the study conducted on Northern Cyprus, Guryay, et al (2007), examined the link and causal relationship between financial development and economic growth. Applying the tool of Ordinary Least Squares (OLS), the authors utilized time series data for 18 years, covering the periods of 1986-2004. Their findings revealed an insignificant positive relationship between financial development and economic growth. Another important finding worthy of reporting has to do with the direction of the causality between the two variables. Results from this test revealed that the causality runs from economic growth to financial development.

In South Africa, Jalil, Wahid and Shahbaz (2010) investigated the relationship between development of the financial sector and economic growth. They used time series data for the 1965-2007 period and set the estimation strategy under the ARDL model. The variables used for financial deepening were liquid liabilities to nominal GDP (M2/GDP), credit to private sector to nominal GDP; Commercial/Central Bank asset ratio. The researchers found a positive monotonic relationship between financial development and economic growth for South Africa. Trade openness and per capita real capital were found as the other important determinants of economic growth.

Onwumere, Ibe, Ozoh and Mounanu (2012) examined the impact of financial deepening on economic growth from a Nigerian perspective and adopted the supply-leading Hypothesis. The researchers used variables such as broad money velocity, money stock diversification, economic volatility, market capitalization and market liquidity as proxies for financial deepening and gross domestic product growth rate for economic growth. Their study adopted a multiple Regression Model (MRM).and revealed that broad money velocity and market liquidity promote economic growth in Nigeria while money stock diversification, economic volatility and market capitalization did not within the period studied (1992-2008).

Nzotta (2009) did an empirical investigation on financial deepening and economic development of Nigeria between 1986 and 2007. In the analysis, financial deepening defined as the ratio of money supply to GDP, was a function of nine variables namely: the value of cheques cleared to GDP, value of cheques to money supply, ratio of private sector credit to GDP, financial savings to GDP, rate of inflation,

real lending rates, deposit money bank assets to GDP and currency outside banks to money supply. The study found that financial deepening index is low in Nigeria over the years. But four of the variables; lending rates, financial savings ratio, cheques/GDP ratio and the deposit money banks/GDP ratio had a significant relationship with financial deepening. The study concluded that the financial system had not sustained an effective financial intermediation, especially credit allocation and a high level of monetization of the economy.

Bwire and Musiime (2006) investigated the connections between financial development and economic growth in Uganda during the period 1970-2005 through the use of modern multivariate technique and Granger causality test. They found significant evidence that financial sector reforms adopted in the early 1990s have generally had positive contributions to the real GDP of Uganda. In addition, the study concluded that financial development was necessary, but not a sufficient condition for stimulating economic growth.

In the Kenyan perspective, Odhiambo (2008) using time series of the period 1968–2002 and adopting a dynamic causality model investigated the causality between financial development and economic growth in Kenya. The study used broad money (M2), currency ratio (CC/M1) and credit to private sector as proxies of financial development. The results suggested that causality between financial development and economic growth depends on the proxy used for financial development in Kenya, and that causality on the balance runs from economic growth to financial development.

Wolde-Rufael (2009) examined the casual relationship of financial development and economic growth in Kenya using a quadvariate Vector Auto Regressive (VAR) framework, in which exports and imports were included as additional variables. Three measures of financial development namely: domestic credit provided by the banking sector; total domestic credit provided by the banking sector and liquid liabilities showed a bi-directional Granger causality.

Waiyaki (2013) carried out an assessment of the relationship between financial development, economic growth and poverty in Kenya for the 1997-2012 period. The study attempted to determine the direction of causality between financial development and economic growth as well as the effect of financial development on economic growth with a focus on the banking sector, and the stock market in Kenya. The variables used included broad money supply M3, credit to private sector, bank deposits, stock market capitalization, stock market turnover and volume of stocks traded. The study used OLS method under the PARCH model. The findings show that some financial development variables such as M3 and credit to the private sector did not lead to growth while bank deposits did during the period of the study.

Uddin, Sjö and Shahbaz (2013) looked at the relationship between financial development and economic growth in Kenya over the period of 1971-2011. The study was based on a Cobb-Douglas production augmented by incorporating financial development. The study established that, in the long run, development of financial sector, (measured by domestic credit provided by banking sector; domestic credit to private sector; money plus quasi money (M2) as a ratio of money (M1) had a positive impact on economic growth.

Onuonga (2014) examined relationship between economic growth and financial development in Kenya over the period 1980–2011. Financial development was measured by M2 and domestic credit to the private sector. The study used autoregressive distributed lag framework and Granger causality analysis to determine the direction of causality. Findings indicated that there was a stable long-run relationship among, financial development, trade openness and economic growth in Kenya. It also found

that financial development had a significant positive effect on economic growth. The interpretation of the findings implied that financial development accelerated and augmented economic growth in Kenya and that economic growth led to development of the financial sector in Kenya.

2.3. The Concept of Economic Growth

Economic growth is the increase in the capacity of an economy to produce goods and services from one period of time. It occurs when the productive capacity of a country increases. As an aggregate measure of total economic production for a country, it represents the market value of all final goods and services including personal consumption, government purchases, private inventories, paid-in construction costs and the foreign trade balance.

There are two main measures instituted and used to measure economic growth. The first is Gross national product (GNP) that computes the total value of goods and services produced by all nationals within and outside the country over a given period, and the second is Gross Domestic Product considered as the broadest indicator of economic output and growth. It is designed to measure the value of production of those activities that fall within the boundary of the national accounts system. GDP measures economic growth in monetary terms and looks at no other aspects of development. GDP can be expressed in nominal terms which include inflation or in real terms which are adjusted for inflation. Short term GDP is the annual percentage change in real national output. Long term GDP is the increase in trend or potential GDP. In order to compare countries of different population sizes, GDP per capita is generally used.

2.4. The Concept of Financial Deepening

Shaw (1973) defined financial deepening as: ‘‘the accumulation of financial assets at a faster pace than the accumulation of non-financial wealth and output’’. Levine, (2005) gave a broader definition by explaining that financial deepening occurs when financial markets (primary, secondary and retail), instruments (deposits, loans, foreign exchange, bonds and debt securities) and stakeholders (banks, contractual savings institutions, companies) interact to reduce the costs of contract enforcement, transaction and information in order to perform five main functions namely: i) facilitate goods and services exchange (e.g. payment services), ii) mobilize and pool savings of a large number of investors iii) acquire and process information about the companies and the potential investment projects and therefore allocating public savings to the most productive uses, iv) follow investments and exert corporate governance, and v) diversify and reduce liquidity risk and inter-temporal risk (Levine, 2005; King and Levine, 1993). For the purpose of this study, financial deepening will be defined as the increase in the supply of financial assets in the economy.

From the theoretical and empirical review, it is expected positive and significant coefficients of the independent variables leading to an increase in the dependent variable. This means that liquid liabilities, credit to the private sector, commercial-central bank assets and commercial bank deposits when converted into production and sparking market demand act as an incentive to real GDP rise in the country.

2.5. Research Gap

Studies in Kenya have mostly focused on the direction of causality between financial deepening and economic growth and have produced mixed results. Moreover, most of the studies reviewed have focused on traditional indicators such as the ratio M2/GDP and credit to the private sector/GDP. This study examines the effects of financial deepening on economic growth in Kenya for the 2000-2013 period using quarterly data. The study provides further evidenceto the existing ones by making use of

complementary variables such as the ratio liquid liabilities to GDP which is a measure of extended broad money, the ratio of commercial bank assets to commercial plus central bank assets, the ratio credit to the private sector to GDP and the commercial bank deposits to GDP.

3. DATA AND METHODOLOGY

The objectives of the study were to find out the effects of financial deepening through liquid liabilities, credit to the private sector, commercial-central bank assets and commercial bank deposits (independent variables) on GDP growth (dependent variable) in Kenya for the 2000-2013. Quarterly time series data was collected from the various CBK statistical bulletins for financial deepening indicators while real GDP data was collected from various economic survey reports available online from Kenya National Bureau of Statistics (KNBS) website

3.1. Definition of Variables

This study will use four variables to determine different aspects of financial deepening on economic growth, since all measures capture different information on the role of the financial intermediaries on economic growth.

Liquid liabilities (LL): The ratio of liquid liabilities to nominal GDP provides a measure of the size of the financial intermediaries. The size of financial sector is a measure of its depth (Goldsmith 1969, Levine 1993, and Rousseau and Wachtel, 2000). This study will thus consider Liquid liabilities that mainly consist M3, which is an extended monetization measure including foreign reserves and other large demand deposits and monetary deposits.

The ratio credit to the Private Sector (CPS) relative to nominal GDP indicates the level of financial services and is employed to measure all private resources used to finance the private sector. It is the most important measure of financial intermediary development, (Levine and Zervos (1998) and Yartey (2007)) as it captures the channeling of funds from savers to investors in the private sector (Ang, 2007). This indicator excludes credit to government, government agencies and public enterprises as well as credit issued by the Central Bank (Levine, et al 2000).

Commercial-Central Bank Assets (CCBA*)* is the ratio of commercial bank assets to commercial plus central bank assets .King and Levine (1993) took account of the central banks along with the commercial banks in the measurement of financial sector indicators and assessed the extent to which commercial banks channel savings into investment, monitor firms, influence corporate governance and undertake risk management, relative to the central bank (Huang 2005). Commercial banks are expected to be more efficient and effective in allocating the savings in productive and profitable projects compared to central banks.

Commercial Bank Deposits (CBD) is the ratio of commercial banks deposits to nominal GDP thatshows the liquidity of the banking sector (Levine and Zervos, 1998) as quoted by Waiyaki (2013). Commercial bank deposits equal demand deposits plus time and saving deposits. The indicator provides an alternative measure to a broad money ratio, especially for developing countries, where a large component of the broad money stock is held outside the banking system (Kar and Pentecost, 2000).

This study makes use of real GDP as the dependent variable to measure economic growth. This choice is in line with the works of Ujah (2010)

3.2. Empirical Model

This study followed the steps of Jalil, Wahid and Shahbaz (2010) and Waiyaki (2013) and adopted the endogenous growth model. Proponents of the endogenous growth models such as Pagano, (1993), hold that capital accumulation can increase the long run trend rate of economic growth. However, to permit capital accumulation it is necessary to increase the savings ratios. Thus, a well-functioning financial system encourages investment, promotes technological innovation that ultimately leads to economic growth through savings. To capture the potential effects of financial deepening on economic growth, we considered the simplest endogenous growth model: the 'AK' model, where aggregate output is a linear function of the aggregate capital stock

$Y_t = AK_t$ ---------- (1)

Where, Y_t is output at time t, A is total factor productivity and K_t is the measure of real capital stock.

The AK model can be derived assuming that the population is stationary and that only capital stock is subject to constant return to scale. Conventionally to estimate the capital stock, K_t is measured as the previous period amount of capital (K_{t-1})corrected for depreciation (δ)plus gross investment in current period (I_t). Thus, with capital depreciating at the rate δ, the gross investment becomes:

$I_t=K_{t+1} - (1- \delta)K_t$ ---------- (2)

In a closed economy with no government, capital market equilibrium requires that Savings equals investment. However, Pagano (1993) assumes that a proportion of 1-θ is lost during the process of financial intermediation and thus the fraction (θ) of total savings can be used to finance investment. Therefore, the savings-investment relationship can be written as:

$\theta S_t=I_t$ ---------- (3)

From equation (1), we introduce the growth rate at time t+l which is $g_{t+l}=Y_{t+l}/Y_t - l=K_{t+l}/K_t-l$. Using eq. (2) and dropping the time indices, the steady-state growth rate can be written as, the steady state growth rate of output becomes:

$g_y=A\ I/Y- \delta= A\ \theta S - \delta$ ----------(4)

The capital market equilibrium condition (3) has been used and denoted the gross saving rate s or S_t/Y_t.Thus, $s=S_t/Y_t = S_t/ AK_t$

Equation 4 expresses that economic growth depends on the total factor productivity (*A*), the efficiency of financial intermediation (θ), and the rate of savings(*S*). Financial deepening is assumed to affect growth through the amount of savings put in investment. Wurgler (2000) as quoted by Ngugi, Amanja and Maana (2012) shows that even if financial development does not lead to higher levels of investment, it allocates existing investment better and therefore promotes economic growth. Importantly, when the rate of depreciation is assumed to be constant, economic growth depends on financial deepening. From the above Y_t can be expressed as follows:

$Y_t=\beta_0 + \beta_1 S_t/Y_{it}+\varepsilon$ ---------- (5)

Whereby Y_t is the natural logarithm of real GDP of Kenya and S_t/Y_{it} the natural logarithm of savings to nominal GDP that proxies financial deepening (S_t/Y_{it} = FD). B_0 is the intercept, β_1 is the

coefficient that gives the effects of financial development on economic growth while ε is the error term.The generic model estimated was given as:

$GDP=\beta_0 + \beta_1 FD_{it} + \varepsilon t$ ---------- (6)

In equation (6), FD was estimated using each alternative measure namely: liquid liabilities to GDP (LL), credit to the private sector to GDP (CPS), commercial bank deposits to GDP (CBD).(CCBA) on the other hand is the commercial bank assets to commercial bank and central bank assets

3.3. Unit Root

It is established in the literature that most financial deepening time series variables exhibit a stochastic trend or are known to be non-stationary. By stationarity, it is meant that the mean, variance and covariance of each variable should be time invariant. The use of non-stationary variables in a bid to obtain robust estimates may give spurious regression and misleading results. A variable is said to be stationary if it does not have a unit root or is integrated of order zero I (0). Similarly, a variable can be non-stationary in its level form but stationary in its first difference form. In this case it is said to be integrated of order I (1).

The Philip-Perron (PP) unit root test was employed to determine the order of integration of the variables in an attempt to establish stationarity level of the variables. The PP unit root test conventionally is said to have a greater unit root detection ability as compared to the ADF unit root test.The PP test is thus preferred to the Augmented Dickey Fuller (ADF) because it deals with potential correlated error by employing a correction factor that estimates the long run variance of the error process. The PP tests are based on the following model with constant and trend:

3.4. Cointegration

The cointegration test determines if the integrated variables are cointegrated. Cointegration regressions measure the long-term relationship between the dependent and the independent variables. The Johansen maximum likelihood procedure in a vector autoregressive framework introduced by Johansen (1988) is an essential tool in the estimation of models that involves time series data. The Johansen cointegration approach is preferred in this study as it allows the researcher to estimate a dynamic error correction specification, which provides estimates of both the short and the long run dynamics. The approach has also been found to be the most reliable and appropriate for small sample properties. Johansen (1990) developed two likelihood ratio tests: the Trace Test and the Maximum Eigen value Test. The two procedures test for the presence of a cointegrating vectors between financial development and economic growth. The long run equation estimated was expressed as follows:

$$\Delta(GDP)_t = \beta_0 + \beta_1(GDP)_{t-1} + \beta_2(FD)_{t-1} + \sum_{i=1}^{p}\beta_3\Delta(GDP)_{t-i} + \sum_{i=4}^{p}\beta_4\Delta(FD)_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots(7)$$

Where: Δ expresses the difference operator.Furthermore, the first part of the equation with the coefficients $\beta 1$ and β_2 are long-run parameters. The short-run effects are captured by the coefficients of the first-differenced variables in equation represented by β_3 and β_4. In addition, *p* represents the maximum lag length which is determined by the user.

3.5. Error Correction Model

Granger (1987), showed that if two variables are cointegrated, then they have an error correction representation. The Error Correction Model (ECM) provides information about the long run, short run

relationship as well as the speed of adjustment between the variables in incorporating to the estimated equation, the error correction term (ECT). Therefore, the following error correction model was estimated:

$$\Delta(GDP)_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta(GDP)_{t-i} + \sum_{i=4}^{p} \beta_2 \Delta(FD)_{t-i} . + \beta_3 ECT_{t-1} . + \varepsilon_t \ldots\ldots\ldots\ldots(8)$$

Where β_3 is the coefficient of the ECT.

The ECM enables to distinguish between the short-run and the long-run and its results indicate the speed of adjustment back to long run equilibrium after a short run shock. The estimated equation is used to obtain the ECT (ECT_{t-1}) which is later used in the ECM.

3.6. Residuals Diagnostics

Post estimation tests are conducted in order to confirm the adequacy of the model as well as to ascertain the validity of inferences made from the estimated result, based on an examination of the structure of the residuals. The diagnostic tests of the estimated model suggest that the model passes the residuals normality test, the residuals serial correlation LM test, and the residuals heteroskedasticity test. The plots of the cumulative sum of recursive residuals (CUSUM) is as well included to test if the estimated model is stable over the study period.

4. RESEARCH FINDINGS AND DISCUSSIONS

4.1. Descriptive Statistics

The normality test was conducted with a particular focus on the J-B probability. For normal distribution, the JB statistics is expected to be statistically indifferent from zero thus: H_0: JB=0 (normally distributed) and H_1: JB≠0 (not normally distributed). Rejection of the null hypothesis for any of the variable would imply that the variables are not normally distributed. Table1 below represents the results of the descriptive statistics of all the variables.

Table 1: Descriptive statistics

	GDP	LL	CPS	CCBA	CBD
Mean	12.66476	1.036250	1.034387	0.980636	1.009771
Median	12.68009	1.032693	1.031162	0.980538	1.005622
Maximum	13.00863	1.048641	1.051025	0.983615	1.027069
Minimum	12.34784	1.025770	1.024359	0.977779	0.995476
Std. Dev.	0.183298	0.007104	0.008569	0.001553	0.010158
Skewness	0.079316	0.647585	0.821455	-0.037706	0.524185
Kurtosis	1.831024	1.886145	2.114475	1.911027	1.801626
Jarque-Bera	3.247226	6.808985	8.127710	2.780279	5.915422
Probability	0.197185	0.033224	0.017183	0.249041	0.051938

Table1 shows that the skewness coefficients for GDP, LL, CPS, CCBA and CBD are respectively (0.079316), (0.647585), (0.821455), -0.037706) and (0.524185) indicating that the distribution of GDP and CCBA are symmetrical around the mean and thus close to normal distribution. On the other hand, LL, CPS and CBD have skewness coefficients far greater than zero (0.647585), (0.821455) and (0.524185) respectively) implying that they may not be symmetrical around the mean and thus deviating from normal distribution. The negative skewness coefficient of CCBA indicates that its distribution is slightly left skewed while the other variables are right skewed.

GDP LL CPS CCBA and CBD's coefficients of kurtosis are respectively (1.831024.) (1.886145) (2.114475) (1.911027) and (1.801626) and therefore less than 3. This means that they are flatter than a normal distribution with a wider peak. Therefore,based on the Kurtosis, none of the variables exhibit a normal distribution.

The normality test using the J-B probability is (0.197185),(0.033224), (0.017183), (0.249041) and (0.051938) for GDP, LL, CPS, CCBA and CBD respectively. This implies that GDP CCBA and CBD are normally distributed since their probability value is above 5percent significance level. On the other hand, LL and CPS with probability values less than 5 percent are not normally distributed. From these preliminary tests, all the variables do not exhibit a normal distribution. However, we may not reject the nullhypothesis that these variables are normally distributed until we subject the data to further tests (Gujarati, 2004).

4.2. Correlation Results

Correlation ranges between -1 and +1 and quantifies the direction and strength of the linear association between the two variables. The sign of the correlation coefficient indicates the direction of the association. The magnitude of the correlation coefficient indicates the strength of the association. A correlation above 0.8 between explanatory variables signifies high correlation of the variables. Table 2 presents the correlation matrix showing the relationship between financial deepening measuresamong themselves and GDP.

Table 2:Correlation matrix

	GDP	**LL**	**CPS**	**CCBA**	**CBD**
GDP	1.000000				
LL	0.890219	1.000000			
CPS	0.657282	0.878692	1.000000		
CCBA	0.751339	0.787536	0.734739	1.000000	
CBD	0.888581	0.933484	0.760964	0.751739	1.000000

Table 2 shows that GDP and the four financial deepening indicators are positively correlated with high values as 0.89 percent for GDP with LL and 0.88 percent for GDP and CBD.The correlation between GDP and CPS; and GDP and CCBA is moderate with respective coefficients of 0.65 percent 0.75 percent. On the other hand,the four financial deepening measures are both moderately and highly positively correlated with 0.87 percent for LL and CPS; 0.78 percent for LL and CCBA, 0.93 percent for LL and

CBD, 0.73 percent for CPS and CCBA; 0.76 percent for CPS and CBD; and 0.75 percent for CCBA and CBD. The high correlation among financial deepening indicators suggests that the indicators can be used as substitutes.

4.3. Unit Root Test Results

The decision criterion in the PP unit root test involves comparing the computed PP t-statistics values with the critical values at 1 percent, 5 percent and 10 percent. If the computed PP t-statistics is greater in absolute terms compared to the critical values, then the null hypothesis of non-stationarity in time series variables is rejected and vice versa. Table 3indicates the order of integration of each of the variables.

Table 3: PP unit root Test with intercept

Variables	Critical values	t-Statistic	Probability	Stationarity Level
GDP	-3.557472* -2.916566** -2.596116***	-17.39490	0.0000	I(1)
LL	-3.557472* -2.916566** -2.596116***	-5.111158	0.0001	I(1)
CPS	-3.557472* -2.916566** -2.596116***	-4.595174	0.0005	I(1)
CCBA	-3.557472* -2.916566** -2.596116***	10.48657	0.0000	I(1)
CBD	-3.557472* -2.916566** -2.596116***	-18.39783	0.0000	I(1)

Note: the 1percent, 5percentand 10 percent level of significance is denoted by *, ** and *** respectively

The results of the PP unit root test indicate that at their levels with intercept, all the variables have a unit root meaning that they are not stationary. However, after first difference as presented inTable 3, there is no unit root and therefore, we reject the null hypothesis of non-stationarity. This implies that all the variables have become stationary at first difference level or I (1).With the establishment ofthe order of integration, we proceeded to testing for cointegration between the dependent and the independent variables to find out if there exists a long-run relationship.

4.4. Cointegration Analysis

When variables are integrated of the same order as shown in Table 3 above, the Johansen cointegration approach is appropriate in order to detect the existence of a long-run cointegrating relationship among the variables. This approach uses the Trace and the Max-Eigen Tests. The criterion decision for both tests involves comparing the computed trace statistic as well as Max-Eigen statistic values with the critical values. If the computed trace statistic and Max-Eigen statistic values are less than the critical values, the null hypothesis of number of cointegrating equations is not rejected. Tables 5 and 6 presents the results of the cointegration tests between GDP and each individual independent variable. The Trace and the Max-Eigen Tests are specified with an intercept and a trend.

Table 4:Trace Test results of cointegration of GDP with individual independent variable

Null hypothesis	Alternative hypothesis	Statistics	critical values	P-values
Cointegration test between GDP and LL				
r=0	r≥ 1	61.19569	25.87211	0.0000
r≤1	r≥ 2	7.874668	12.51798	0.2621
Cointegration test between GDP and CPS				
r=0	r≥ 1	58.70709	25.87211	0.0000
r≤1	r≥ 2	5.127891	12.51798	0.5781
Cointegration test between GDP and CCBA				
r=0	r≥ 1	61.90781	25.87211	0.0000
r≤1	r≥ 2	9.826357	12.51798	0.1353
Cointegration test between GDP and CBD				
r=0	r≥ 1	65.99327	25.87211	0.0000
r≤1	r≥ 2	15.22361	12.51798	0.0172

Notes:*r* stands for the number of cointegrating equations

The Trace statistics reported in Table 5 reject the null hypotheses of r = 0 (i.e. no cointegrating equation) between GDP and all the financial deepening measures, in favour of the general alternative hypothesis r≥1 (i.e. at least one cointegrating equation) The results indicate that at 5 percent level of significance, there is at most one cointegrating equation between the GDP and LL; GDP and CPS; and GDP and CCBA(r≤1).There is also evidence of the existence of two cointegrating equations between GDP and CBD implying that we do reject the null hypothesis of no cointegration of at most one cointegrating equation.

Table 5: Max-Eigen Test Resultsof GDP with each individual independent variable

Null hypothesis	Alternative hypothesis	Statistics	critical values	P-values
Cointegration test between GDP and LL				
r=0	r≥ 1	53.32090	19.38704	0.0000
r≤1	r≥ 2	7.874675	12.51798	0.2621
Cointegration test between GDP and CPS				
r=0	r≥ 1	53.57911	19.38704	0.0000
r≤1	r≥ 2	5.127894	12.51798	0.5781
Cointegration test between GDP and CCBA				
r=0	r≥ 1	52.08143	19.38704	0.0000
r≤1	r≥ 2	9.826363	12.51798	0.1353
Cointegration test between GDP and CBD				
r=0	r≥ 1	50.76960	19.38704	0.0000
r≤1	r≥ 2	15.22361	12.51798	0.0172

Notes: *r* stands for the number of cointegrating equations

The Max-Eigen Test reported in Table 6 confirms the results of the Trace Test by revealing the existence of one cointegrating equation between the GDP and LL; GDP and CPS; and GDP and CCBA at 5 percent level of significance. The results confirm also the existence of two cointegrating equations between GDP and CBD. Thus, from the Johansen cointegration test using both the Trace and the Max-Eigen tests, there is evidence of the existence of a long run association between economic growth and financial deepening measures.

4.5. Long Run Estimation Results

The estimation process starts with finding the appropriate value of *p*, the number of lags in the unrestricted VAR. The optimal number of lags is determined basedon the Schwarz criterion was 5. The long and short run parameters of the cointegrating equations were estimated using of theover-parameterize and the parsimonious approaches.

Table 8 presents the summarized results of the long run regression models of GDP and eachindividual independent variable.

Table 6:Long run regression resultsof individual models

Model GDPand LL (where D(GDP) is the dependent variable)				
variables	coefficient	Std Error	T-statistics	Prob
C	-0.621206	0.749852	-0.828437	0.0127
GDP(-1)	-0.037945	0.050614	-0.749691	0.0582
LL(-1)	1.075595	1.243108	0.865247	0.0217
R^2 : 0.881153	Adjusted R^2: 0.842608	DW: 2.015903	Prob(F-stat) : 0.000000	
Model GDP and CPS (where D(GDP) is the dependent variable)				
Variables	coefficient	Std Error	T-statistics	Prob
C	-0.307379	0.405178	-0.758626	0.0452
GDP(-1)	-0.007826	0.025412	-0.307984	0.0759
CPS(-1)	0.404581	0.481657	0.839976	0.0193
R^2 : 0.905739	Adjusted R^2: 0.875168	DW: 1.956684	Prob(F-stat) : 0.000000	
Model GDP and CCBA (where D(GDP) is the dependent variable)				
Variables	coefficient	Std Error	T-statistics	Prob
C	-2.071566	4.175104	-0.496171	0.0622
GDP(-1)	-0.013500	0.042197	-0.319927	0.0750
CCBA(-1)	2.303083	4.731418	0.486764	0.0214
R^2 : 0.883904	Adjusted R^2: 0.846251	DW: 1.992697	Prob(F-stat) : 0.000000	
Model GDP and CBD (where D(GDP) is the dependent variable)				
Variables	coefficient	Std Error	T-statistics	Prob
C	-0.287881	0.519231	-0.554438	0.0582
GDP(-1)	-0.029146	0.071619	-0.406953	0.0686
CBD(-1)	0.667067	1.299244	0.513427	0.0107
R^2 : 0.868564	Adjusted R^2: 0.825936	DW: 1.984945	Prob(F-stat) : 0.000000	

The results presented in Table 8 show that the R-squared (R^2) that measures the proportion of variations in the dependent variable attributed to the independent variablesare (0.881153), (0.905739), (0.883904) and (0.868564) for GDP and LL model, GDP and CPS model, GDP and CCBA model and GDP and CBD model respectively. This implies that LL, CPS, CCBA and CBD individually could explainabout 88, 90, 88 and 86 percent of the variations in GDP in their respective models.The remaining variations are the error terms and can be attributed to other factors not included in the models.

The Durbin Watson (DW) statistics seeks to establish whether there exists autocorrelation in the estimated model. A good model is one that has DW statistic close to and above 2 as it may be assumed to have no first-order autocorrelation (Gujarati, 2004).The DW of the four models estimated indicate the following statistics: (2.015903), (1.956684), (1.992697) and (1.984945). These values are very close and above 2, implying that there is no autocorrelation in the estimated models.

The probability (F-stat) that for the four models suggest that the models are statistically significant since their values are all (0.000000).

4.6. Short Run Estimation Results

We start the estimation of the short run by generating the error correction term of each model, then we use the parsimonious ECM approach (which involved here five lags of each independent variable). The parsimonious ECM result is gotten by deleting insignificant variables from the over parameterize ECM results.

Tables 10 to 13 present the short run results of individual regression models where D(GDP) is the dependent variable

Table 7: Short run regression results for GDP and LL model

Variables	Coefficients	Std. Error	t-Statistic	Prob.
D(GDP(-2))	-0.180773	0.082221	-2.198627	0.0331
D(GDP(-4))	0.790462	0.082930	9.531663	0.0000
D(LL(-1))	3.877634	2.210269	1.754372	0.0862
ECT1(-1)	-0.395115	0.164886	-2.396301	0.0208
R^2: 0.858370	Adjusted R^2:0.848928			D-W: 1.882193

Table 8:Short run regression results for GDP and CPS model

Variables	Coefficients	Std. Error	t-Statistic	Prob.
C	0.007167	0.003308	2.166342	0.0356
D(GDP(-1))	-0.128663	0.050245	-2.560740	0.0139
D(GDP(-2))	-0.275901	0.084457	-3.266769	0.0021
D(GDP(-4))	0.693340	0.084218	8.232716	0.0000
D(CPS(-1))	8.172290	1.901373	4.298099	0.0001
D(CPS(-2))	-6.298696	1.917492	-3.284861	0.0020
ECT2(-1)	-0.326607	0.778104	-0.419747	0.0194
R^2: 0.889950	Adjusted R^2: 0.877722			D-W: 2.020784

Table 9:Short run regression results for GDP and CCBA model

Variables	Coefficients	Std. Error	t-Statistic	Prob.
C	0.018929	0.005737	3.299514	0.0019
D(GDP(-1))	-0.423101	0.126278	-3.350543	0.0016
D(GDP(-2))	-0.503450	0.131571	-3.826441	0.0004
D(GDP(-3))	-0.349629	0.132997	-2.628845	0.0117
D(GDP(-4))	0.463981	0.127815	3.630102	0.0007
D(CCBA(-3))	7.722390	3.681119	2.097838	0.0416
ECT3(-1)	-0.507210	0.416692	-1.217230	0.0205
R^2: 0.871904	Adjusted R^2:0.857671			D-W:1.876427

Table 10:Short run regression results for GDP and CBD model

Variables	Coefficients	Std. Error	t-Statistic	Prob.
C	0.019824	0.005929	3.343605	0.0017
D(GDP(-1))	-0.427860	0.130842	-3.270050	0.0020
D(GDP(-2))	-0.521884	0.136044	-3.836140	0.0004
D(GDP(-3))	-0.365662	0.137598	-2.657462	0.0108
D(GDP(-4))	0.459215	0.132435	3.467489	0.0012
D(CBD(-2))	0.255368	0.846979	0.301505	0.0192
ECT4(-1)	-0.475146	0.753666	-0.630447	0.0212
R^2: 0.859377	Adjusted R^2: 0.847149			D-W: 2.042427

4.7. Residuals Diagnostics

The diagnostic tests for the long run individual model equations included the J-B normality test used to test whether the residuals are normally distributed, the Breusch-Godfrey Serial correlation LM test to test for residual serial correlation, and the Breusch-Pagan-Godfrey test whether the residual is homo skedastic or hetero skedastic.The Cumulative Sum of Recursive Residuals (CUSUM) to test residual stability. The summary of the diagnostic tests results are shown in Table 14 while individual results are reported in Appendices 11 to 15.

Table 11: Summary of the residuals diagnostic tests results

J-B normality test	
GDP and LL model	Prob:0.99
GDP and CPS model	Prob: 0.56
GDP and CCBA model	Prob: 0.58
GDP and CBD model	Prob:0.87
Breusch-Godfrey Serial Correlation LM test	
GDP and LL model	Prob. Chi-square:0.11
GDP and CPS model	Prob. Chi-square:0.41
GDP and CCBA model	Prob. Chi-square:0.18
GDP and CBD model	Prob. Chi-square:0.08
Heteroskedasticity test :Breusch-Pagan-Godfrey	
GDP and LL model	Prob. Chi-square:0.2
GDP and CPS model	Prob. Chi-square:0.62
GDP and CCBA model	Prob. Chi-square:0.5
GDP and CBD model	Prob. Chi-square:0.39

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The results presented in Table 14 indicate that the J-B probability statistics are greater than 5 percent for all the estimated models. Therefore we do not reject the null hypothesis of normal distribution of the residuals. We may thus conclude that the residuals of all the estimated equations are normally distributed. Moreover, the probability values (Prob.Chi-square) of the Breusch-Godfrey serial correlation LM test show statistics above 5 percent significance level, implying that we do not reject the null hypothesis of non serial correlation among the residuals. Thus, we may conclude that the residuals of all the models are not serially correlated. In the same line, the probability values of the Breusch-Pagan-Godfrey test are greater than 5 percent, implying that the residuals of all the models are homoscedastic since the null hypothesis of non heteroskedasticity cannot be rejected. Besides, the CUSUM tests show that all the models are stable over the study period as they fall within the critical bounds of the two 5 percent lines

4.8. Discussion of the Results

In linear regression, the size of the coefficient for each independent variable gives the size of the effect that variable is having on the dependent variable, and the sign on the coefficient (positive or negative) gives the direction of the effect. The coefficient tells how much the dependent variable is expected to increase when the independent variable increases by one, holding all the other independent variables constant. The interpretation of the result sat 5 percent level of significance is provided both for the single equation model and the individual equation models.

The empirical results of long-run parameters suggest that LL as expected, has a positive coefficient. This could be interpreted asa percent increase in liquid liabilities leads to an increase in GDP by(1.075595)on average. In addition, the p-value is significant at 5 percent since 0.0217<0.05 implying that LL has a positive and significant effect on GDP. Moreover, the finding match the findings of Waiyaki (2013) who found a positive and significant relationship between M3 and economic growth in Kenya for the 1997 to 2012 period

The coefficient of CPS has a positive sign. This could be interpreted as a one percent increase in CPS increases GDP by (0.404581) on average. This means that CPS has positive influence on GDP. The probability value is significant (0.0193). This result is consistent with the finding of Onuonga (2014).

CCBA has a positive effect on GDP since our estimate in the model suggests that CCBA has a positive coefficient and is statistically significant in relation to GDP (p= 0.0214<0.05). This may be interpreted as one percent increase in CCBA will lead to an increase in GDP by (2.303083) on average. Commercial and central bank assets are hence an important factor in explaining changes in GPD for the period covered by the study. This finding is in line with Rioja and Valev (2004) who found that in countries with very low levels of financial development, the effect of Commercial and central Banks is statistically significant, positive, and economically large. A larger share of the country's savings being allocated by commercial banks is presumed to be more efficiently allocated relative to the central bank.

CBD was found to be significantly and positively affect GDP. The sign of the coefficient is positive with a probability value less than 0.05 percent (0.0107). This implies that CBD has positive and significant effects on GDP. A plausible interpretation of this result could be that a percent increase in commercial bank deposits could improve GDP by (0.667067). Bank deposits in the economy show the ease of transfers across counters as affected by interest rate controls. .As such, capital investments would be expected to flow into the economy easily from the domestic savings, large part of which are generated

from deposits. Waiyaki (2013). This finding corroborates the findings of Waiyaki (2013) and Audu and Okumoko (2013) in Kenya and Nigeria respectively.

The short run estimation results of the individual equation model are also consistent with theoretical expectations and highlight the significance of the deepening of the banking sector on economic growth in Kenya through LL, CPS, CCBA and CBD. The error correction terms of each of the four models (ect1 ect2, ect3 and ect4) which measured the speed of adjustment to equilibrium were respectively (-0.395115,-0.326607, 0.507210 and -0.475146) implying that about 39 percent, 32 percent 50 percent and 47 percent of the previous quarter`s deviations from equilibrium is corrected within the next quarter. These ECTs appear with negative sign and are statistically significant at 5 percent level, confirming the cointegration between GDP and financial deepening indicators.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

The purpose of this study was to empirically test the effects of financial deepening on economic growth in Kenya over the period 2000-2013.An error correction model was adopted to estimate the effects of each alternative measure of financial deepening namely liquid liabilities, credit to the private sector, commercial and central bank assets and commercial bank deposits on GDP. Correlation analysis showed high positive correlation among some financial deepening indicators, implying the regression of GDP with each individual alternative measure separately. Stationarity tests showed that all the variables were integrated at I(1) suggesting a test of cointegration to determine the long run relationship between the variables. The Johansen cointegration test gave evidence of the existence of cointegrating equations between GDP and each of the financial deepening alternative measures. The long run regression results revealed that liquid liabilities, credit to the private sector, commercial-central bank assets as well as commercial bank deposits had positive and significant statistical parameters in explaining economic growth in Kenya within the period of study. Evidence from our study shows that the models used were stable. The error correction terms of all the models appeared with negative signs and are statistically significant at 5 percent level, thus confirming the cointegrating relationship between GDP and financial deepening.

5.2. Conclusion

The study set the objective of determining the effects of financial deepening on economic growth in Kenyausing quarterly data collected from various CBK statistical bulletins and economic survey reports. The study covered the period running from 2000 to 2013. The main objective was broken down into four specific objectives.

The first objective was to determine the effects of commercial banks' liquid liabilities on GDP growth in Kenya. The findings suggest that liquid liabilities that measures the size of the financial sector had a positive and significant effect on GDP. Based on the period of the study, this implies, that an expansion of the size of the banking sector measured by its level of monetization significantly helped the economy to grow.

The second objective was to determine the impact of credit to the private sector on GDP growth in Kenya. Empirical findings indicated that credit to the private sectorthat measures the activity of the financial sector through the channeling of funds from savers to investors in the private sector, had

positively and significantly influenced the growth of the economy during the period of the study. The implication of this finding is that an increase in credit released to the private sector enhanced the growth of the economy.

The third objective was to determine the effects of commercial-central bank assets on GDP growth in Kenya. Commercial-Central Bank Assets(CCBA)assesses the extent to which commercial banks channel savings into investment, monitor firms, influence corporate governance and undertake risk management, relative to the central bank. This indicator was found to have positive and statistically significant effect on economic growth. The implication is that as commercial banks increase in assets, efficient allocation of assets is done relative to the central bank and this positively contributed to the growth of the economy.

The fourth objective was to determine the impact of commercial bank deposits on GDP growth in Kenya. Commercial bank deposits that show the liquidity of the banking sector had positively and significantly influenced economic growth during the period of the study. This implies therefore that an increase in domestic deposits will further push banks to lend for development and stimulate economic growth in the country.

5.3. Recommendations

The justification of this study was to provide more information to policy makers on the effects of on economic growth in Kenya, so as to make informed decisions. Based on the study that found a positive and significant effect of liquid liabilities, credit to the private sector, commercial-central bank assets as well as commercial bank deposits on GPD, we recommended for experiencing more economic growth, to strengthen existing policies that foster savings with commercial banks. This recommendation goes along with measures that aim at reducing commissions and interests paid by customers on bank transactions. This will encourage savings and borrowing for investment purposes. Increasing the interests paid to depositors on their deposits will be an incentive to encourage people to save more with commercial banks. This will encourage savings and borrowing for investment purposes. We also recommend the intensification of policies that increase access and usage of financial services to include members of the public that excluded from the formal banking system. This is because financial inclusion policies broaden the scope of activity of the financial sector, increases financial assets of formal financial institutions and gives more opportunities to economic agents to save and invest.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADF	Augmented Dickey Fuller
ARDL	Autoregressive Distributed Lag
ATMS	Automated Teller Machines
CBD	Commercial Bank Deposits
CBK	Central Bank of Kenya
CCBA	Commercial-Central Bank Assets
CPS	Credit to the Private Sector
CUSUM	Cumulative Sum of recursive residuals
DW	Durbin Watson
ECM	Error Correction Model
ECT	Error Correction Term
GDP	Gross Domestic Product
GNP	Gross national product
KNBS	Kenya National Bureau of Statistics
J-B	Jarque-Bera
LL	Liquid liabilities
MFIS	Microfinance institutions
MRM	Multiple Regression Model
NBFI	Non-Bank Financial Institutions
OLS	Ordinary least squares
ROSCAS	Rotating Savings and Credit Associations
SACCOS	Savings and Credit Cooperative Societies
SSA	Sub-Saharan African countries
VAR	Vector Auto Regressive
WAEMU	West African Economic and Monetary Union

APPENDICES

Appendix 1: GDP Unit Root Test

Null Hypothesis: D(GDP) has a unit root

Exogenous: Constant

Bandwidth: 11 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-17.39490	0.0000
Test critical values:	1% level	-3.557472	
	5% level	-2.916566	
	10% level	-2.596116	

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

Residual variance (no correction)	0.002806
HAC corrected variance (Bartlett kernel)	0.000220

Appendix 2:LL Unit Root Test

Null Hypothesis: D(LL) has a unit root

Exogenous: Constant

Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.111158	0.0001
Test critical values:	1% level	-3.557472	
	5% level	-2.916566	
	10% level	-2.596116	

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

Residual variance (no correction)	1.63E-06
HAC corrected variance (Bartlett kernel)	1.22E-06

Appendix 3:CPS Unit Root Test

Null Hypothesis: D(CPS) has a unit root

Exogenous: Constant

Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.595174	0.0005
Test critical values:	1% level	-3.557472	
	5% level	-2.916566	
	10% level	-2.596116	

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

Residual variance (no correction)	1.97E-06
HAC corrected variance (Bartlett kernel)	1.87E-06

Appendix 4:CCBA Unit Root Test

Null Hypothesis: D(CCBA) has a unit root

Exogenous: Constant

Bandwidth: 15 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-10.48657	0.0000
Test critical values:	1% level	-3.557472	
	5% level	-2.916566	
	10% level	-2.596116	

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

Residual variance (no correction)	5.97E-07
HAC corrected variance (Bartlett kernel)	2.14E-07

Appendix 5:CBD Unit Root Test

Null Hypothesis: D(CBD) has a unit root

Exogenous: Constant

Bandwidth: 10 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-18.39783	0.0000
Test critical values:	1% level	-3.557472	
	5% level	-2.916566	
	10% level	-2.596116	

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

Residual variance (no correction)	2.22E-05
HAC corrected variance (Bartlett kernel)	5.59E-06

Appendix 6:GDP and LL Johansen CointegrationTest

Sample (adjusted): 2000Q3 2013Q4

Included observations: 54 after adjustments

Trend assumption: Linear deterministic trend (restricted)

Series: GDP LL

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.627466	61.19569	25.87211	0.0000
At most 1	0.135693	7.874668	12.51798	0.2621

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.627466	53.32102	19.38704	0.0000
At most 1	0.135693	7.874668	12.51798	0.2621

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Appendix 7:GDP and CPS Johansen CointegrationTest

Sample (adjusted): 2000Q3 2013Q4

Included observations: 54 after adjustments

Trend assumption: Linear deterministic trend (restricted)

Series: GDP CPS

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.629243	58.70709	25.87211	0.0000
At most 1	0.090592	5.127891	12.51798	0.5781

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.629243	53.57920	19.38704	0.0000
At most 1	0.090592	5.127891	12.51798	0.5781

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Appendix 8:GDP and CCBA Johansen CointegrationTest

Sample (adjusted): 2000Q3 2013Q4

Included observations: 54 after adjustments

Trend assumption: Linear deterministic trend (restricted)

Series: GDP CCBA

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.618815	61.90781	25.87211	0.0000
At most 1	0.166373	9.826357	12.51798	0.1353

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.618815	52.08145	19.38704	0.0000
At most 1	0.166373	9.826357	12.51798	0.1353

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Appendix 9:GDP and CBD Johansen CointegrationTest

Sample (adjusted): 2000Q3 2013Q4

Included observations: 54 after adjustments

Trend assumption: Linear deterministic trend (restricted)

Series: GDP CBD

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.609442	65.99327	25.87211	0.0000
At most 1 *	0.245665	15.22361	12.51798	0.0172

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.609442	50.76966	19.38704	0.0000
At most 1 *	0.245665	15.22361	12.51798	0.0172

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Appendix 10:Long run regression results of GDP and LL model

Dependent Variable: D(GDP)

Method: Least Squares

Sample (adjusted): 2001Q3 2013Q4

Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.621200	0.749857	-0.828424	0.0127
GDP(-1)	-0.037945	0.050615	-0.749685	0.0582
LL(-1)	1.075587	1.243114	0.865236	0.0217
D(GDP(-1))	-0.317688	0.172513	-1.841531	0.0736
D(GDP(-2))	-0.368383	0.169488	-2.173503	0.0362
D(GDP(-3))	-0.212970	0.179834	-1.184258	0.2439
D(GDP(-4))	0.567201	0.164787	3.442024	0.0014
D(GDP(-5))	0.053000	0.167014	0.317336	0.7528
D(LL(-1))	4.405903	2.721874	1.618702	0.1140
D(LL(-2))	-3.554742	2.955387	-1.202801	0.2367
D(LL(-3))	-0.505333	2.908248	-0.173759	0.8630
D(LL(-4))	2.321345	2.900671	0.800279	0.4287
D(LL(-5))	-0.706804	2.790571	-0.253283	0.8015

R-squared	0.881153	Mean dependent var	0.011824
Adjusted R-squared	0.842608	S.D. dependent var	0.054771
S.E. of regression	0.031729	Akaike info criterion	-4.601432
Sum squared resid	0.017470	Schwarz criterion	-4.104306
Log likelihood	128.0358	Hannan-Quinn criter.	-4.412123
F-statistic	22.86037	Durbin-Watson stat	2.015903
Prob(F-statistic)	0.000000		

Appendix 11:Long run regression results of GDP and CPS model

Dependent Variable: D(GDP)

Method: Least Squares

Sample (adjusted): 2001Q3 2013Q4

Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.307379	0.405178	-0.758626	0.0452
GDP(-1)	-0.007826	0.025412	-0.307984	0.0759
CPS(-1)	0.404581	0.481657	0.839976	0.0193
D(GDP(-1))	-0.189248	0.166481	-1.136750	0.2630
D(GDP(-2))	-0.369961	0.149173	-2.480085	0.0178
D(GDP(-3))	-0.164544	0.159752	-1.029995	0.3097
D(GDP(-4))	0.601249	0.149516	4.021289	0.0003
D(GDP(-5))	-0.043432	0.161380	-0.269127	0.7893
D(CPS(-1))	7.734512	2.151054	3.595685	0.0009
D(CPS(-2))	-7.043301	2.730291	-2.579689	0.0140
D(CPS(-3))	2.517846	2.625921	0.958843	0.3439
D(CPS(-4))	-0.169426	2.536820	-0.066787	0.9471
D(CPS(-5))	-2.816212	2.299970	-1.224456	0.2285

R-squared	0.905739	Mean dependent var	0.011824
Adjusted R-squared	0.875168	S.D. dependent var	0.054771
S.E. of regression	0.029351	Akaike info criterion	-4.833206
Sum squared resid	0.013856	Schwarz criterion	-4.336080
Log likelihood	133.8301	Hannan-Quinn criter.	-4.643897
F-statistic	29.62740	Durbin-Watson stat	1.956684
Prob(F-statistic)	0.000000		

Appendix 12:Long run regression results of GDP and CCBA model

Dependent Variable: D(GDP)

Method: Least Squares

Sample (adjusted): 2001Q3 2013Q4

Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.071566	4.175104	-0.496171	0.0622
GDP(-1)	-0.013500	0.042197	-0.319927	0.0750
CCBA(-1)	2.303083	4.731418	0.486764	0.0214
D(GDP(-1))	-0.390694	0.165602	-2.359239	0.0237
D(GDP(-2))	-0.435963	0.155759	-2.798965	0.0081
D(GDP(-3))	-0.290662	0.162676	-1.786761	0.0822
D(GDP(-4))	0.543815	0.156052	3.484834	0.0013
D(GDP(-5))	0.062497	0.167886	0.372259	0.7118
D(CCBA(-1))	1.235085	5.170430	0.238875	0.8125
D(CCBA(-2))	-2.147112	4.828845	-0.444643	0.6592
D(CCBA(-3))	5.538739	4.630797	1.196066	0.2393
D(CCBA(-4))	-6.032391	4.527710	-1.332327	0.1909
D(CCBA(-5))	-0.937704	4.551115	-0.206038	0.8379

R-squared	0.883904	Mean dependent var	0.011824
Adjusted R-squared	0.846251	S.D. dependent var	0.054771
S.E. of regression	0.021476	Akaike info criterion	-4.624851
Sum squared resid	0.017065	Schwarz criterion	-4.127725
Log likelihood	128.6213	Hannan-Quinn criter.	-4.435542
F-statistic	23.47512	Durbin-Watson stat	1.992697
Prob(F-statistic)	0.000000		

Appendix 13:Long run regression results of GDP and CBD model

Dependent Variable: D(GDP)

Method: Least Squares

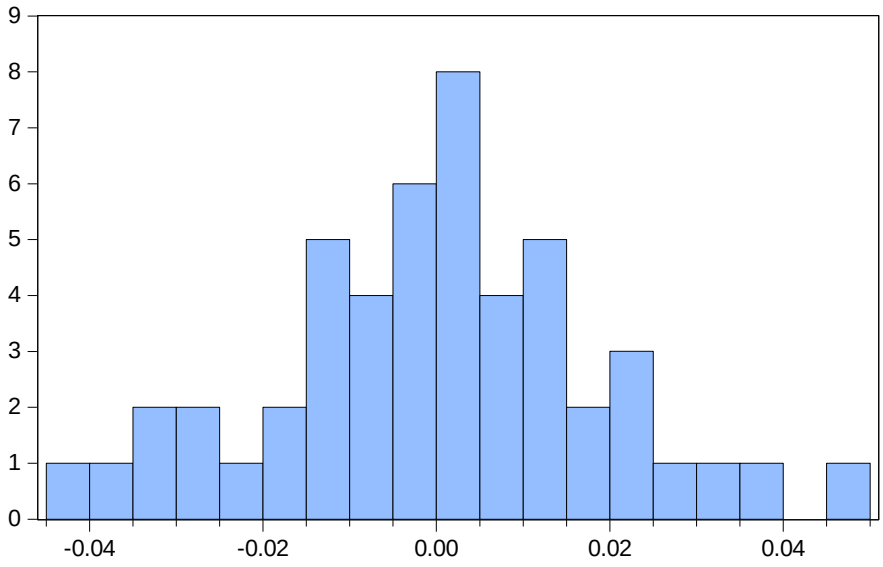
Sample (adjusted): 2001Q3 2013Q4

Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.287881	0.519231	-0.554438	0.0582
GDP(-1)	-0.029146	0.071619	-0.406953	0.0686
CBD(-1)	0.667067	1.299244	0.513427	0.0107
D(GDP(-1))	-0.448088	0.169458	-2.644240	0.0119
D(GDP(-2))	-0.431478	0.174528	-2.472253	0.0181
D(GDP(-3))	-0.288475	0.179973	-1.602879	0.1175
D(GDP(-4))	0.547898	0.167706	3.267017	0.0023
D(GDP(-5))	0.112055	0.170300	0.657986	0.5146
D(CBD(-1))	-0.291970	1.225058	-0.238332	0.8129
D(CBD(-2))	-0.778471	1.122968	-0.693226	0.4925
D(CBD(-3))	-0.382477	1.044248	-0.366270	0.7162
D(CBD(-4))	0.055533	0.939007	0.059140	0.9532
D(CBD(-5))	0.026075	0.758486	0.034378	0.9728

R-squared	0.868564	Mean dependent var	0.011824
Adjusted R-squared	0.825936	S.D. dependent var	0.054771
S.E. of regression	0.022851	Akaike info criterion	-4.500749
Sum squared resid	0.019320	Schwarz criterion	-4.003623
Log likelihood	125.5187	Hannan-Quinn criter.	-4.311440
F-statistic	20.37548	Durbin-Watson stat	1.984945
Prob(F-statistic)	0.000000		

Appendix 14: GDP -LL model normality test



Series: Residuals	
Sample 2001Q3 2013Q4	
Observations 50	
Mean	1.15e-16
Median	0.000602
Maximum	0.045294
Minimum	-0.043250
Std. Dev.	0.018882
Skewness	-0.031551
Kurtosis	3.015386
Jarque-Bera	0.008789
Probability	0.995615

Appendix 15: GDP-LL model Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.640069	Prob. F(2,35)	0.2085
Obs*R-squared	4.284386	Prob. Chi-Square(2)	0.1174

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Sample: 2001Q3 2013Q4

Included observations: 50

Appendix 16:GDP-LL model Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.418830	Prob. F(12,37)	0.2012
Obs*R-squared	15.75720	Prob. Chi-Square(12)	0.2026
Scaled explained SS	8.695025	Prob. Chi-Square(12)	0.7287

Test Equation:

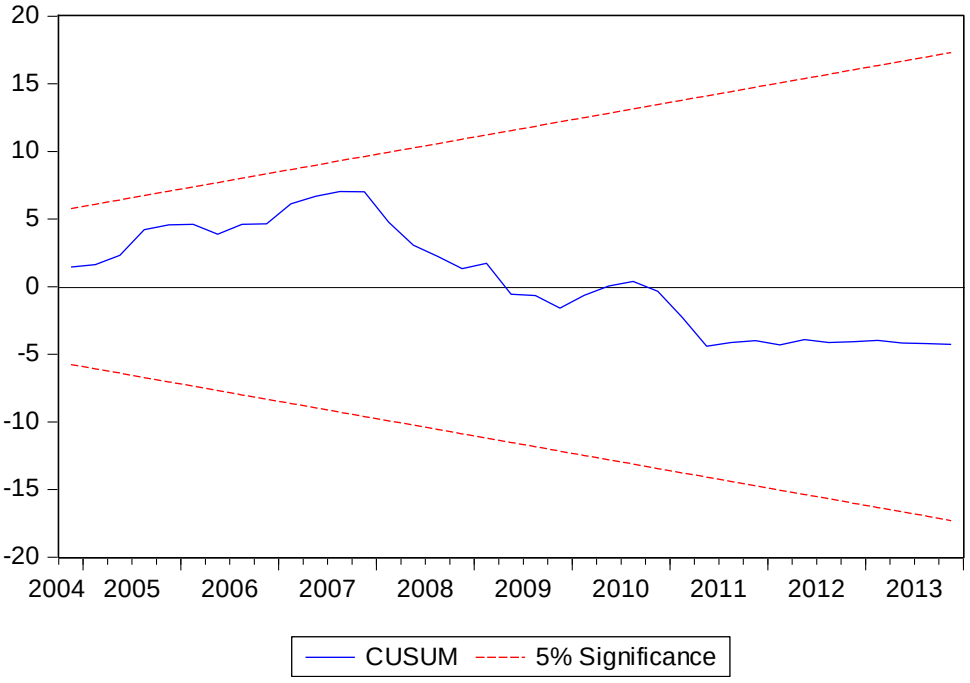
Dependent Variable: RESID^2

Method: Least Squares

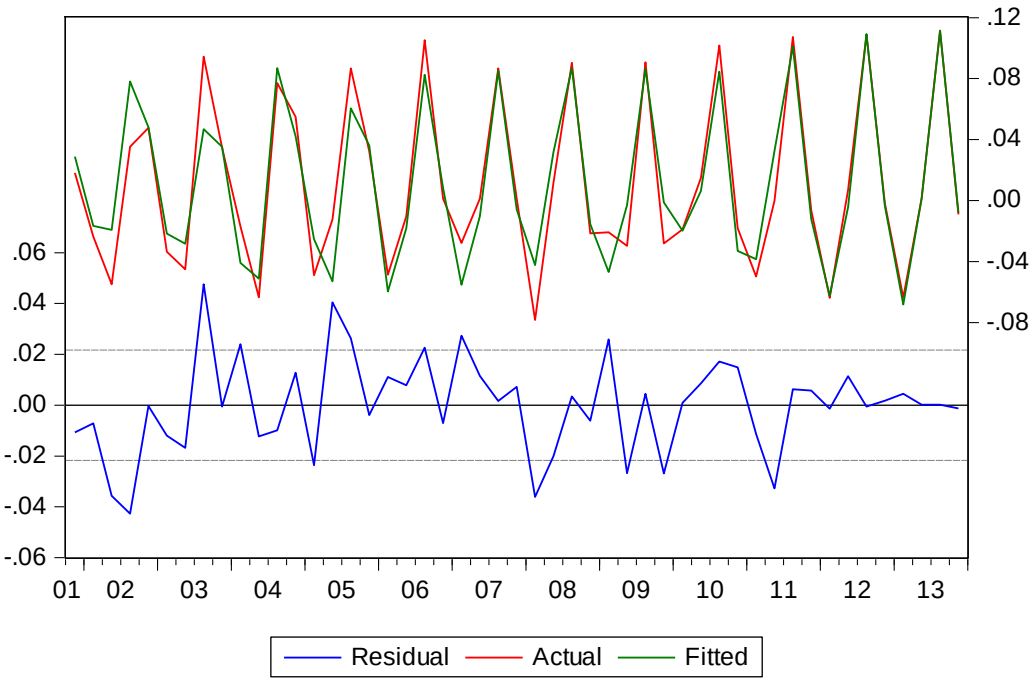
Sample: 2001Q3 2013Q4

Included observations: 50

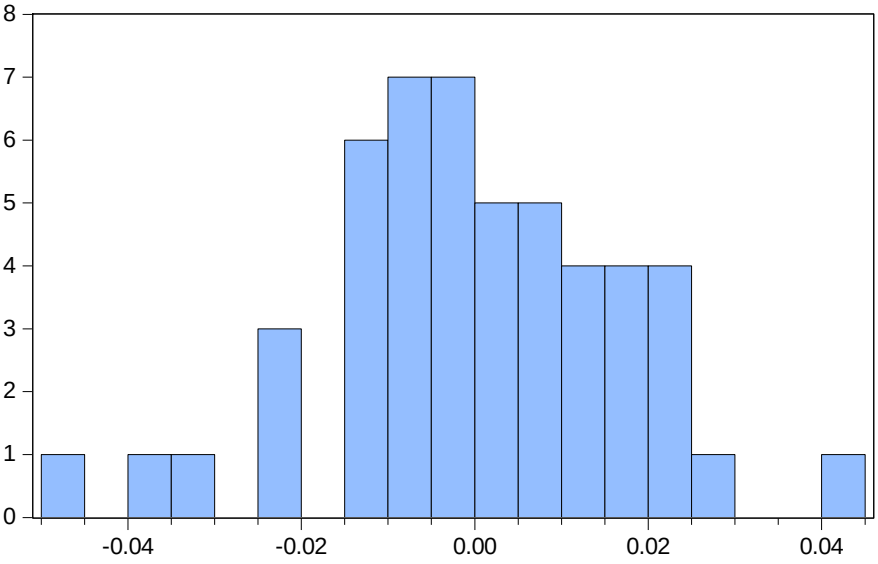
Appendix 17: GDP-LL model stability(CUSUM) test result



Appendix 18: Graphical analysis of the GDP-LLmodel residuals



Appendix 19:GDP -CPS model normality test



Series: Residuals
Sample 2001Q3 2013Q4
Observations 50

Mean	5.77e-17
Median	-0.001092
Maximum	0.043450
Minimum	-0.047277
Std. Dev.	0.016816
Skewness	-0.227425
Kurtosis	3.585641
Jarque-Bera	1.145550
Probability	0.563958

Appendix 20:GDP-CPS model Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.636122	Prob. F(2,35)	0.5354
Obs*R-squared	1.753742	Prob. Chi-Square(2)	0.4161

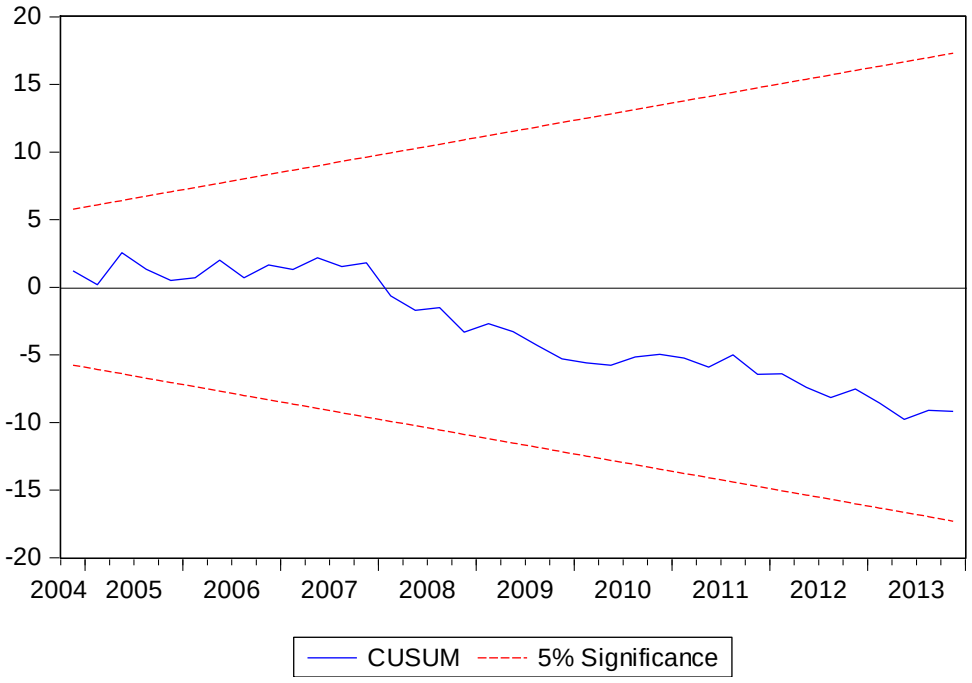
Test Equation:
Dependent Variable: RESID
Method: Least Squares
Sample: 2001Q3 2013Q4
Included observations: 50

Appendix 21:GDP-CPS model Heteroskedasticity Test: Breusch-Pagan-Godfrey

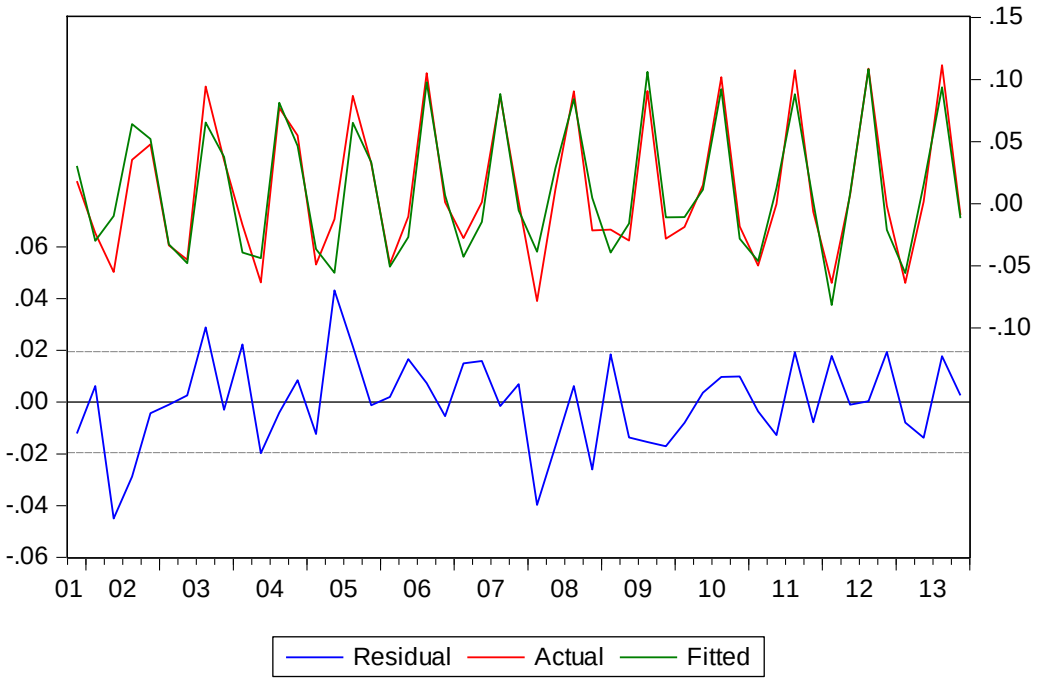
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.765777	Prob. F(12,37)	0.6801
Obs*R-squared	9.947457	Prob. Chi-Square(12)	0.6206
Scaled explained SS	7.042288	Prob. Chi-Square(12)	0.8548

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 2001Q3 2013Q4
Included observations: 50

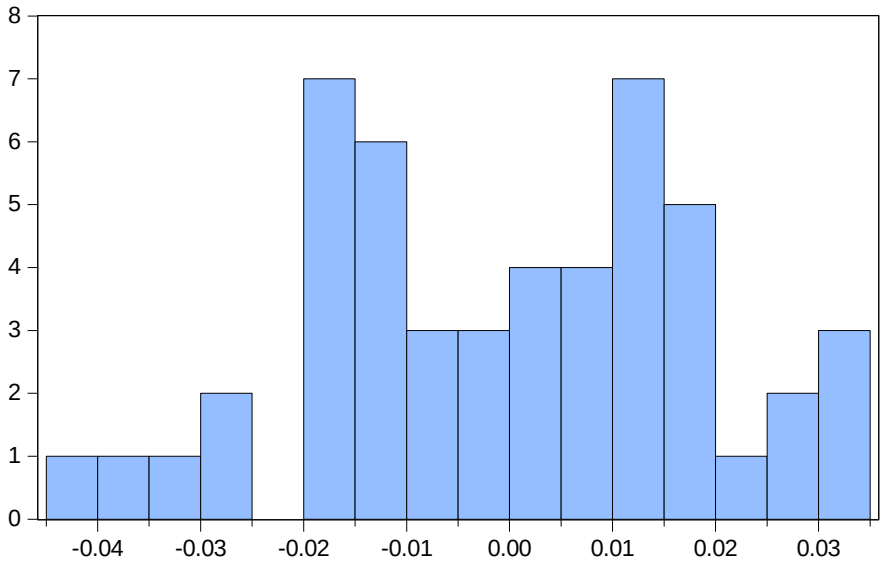
Appendix 22:GDP-CPS model stabilty(CUSUM) test result



Appendix 23:Graphical analysis of the GDP-CPSmodel residuals



Appendix 24:GDP-CCBA model normality test



Series: Residuals
Sample 2001Q3 2013Q4
Observations 50

Mean	-6.08e-16
Median	0.003058
Maximum	0.033768
Minimum	-0.041827
Std. Dev.	0.018662
Skewness	-0.113125
Kurtosis	2.323580
Jarque-Bera	1.059859
Probability	0.588646

Appendix 25:GDP-CCBA model Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.275646	Prob. F(2,35)	0.2919
Obs*R-squared	3.397075	Prob. Chi-Square(2)	0.1830

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Sample: 2001Q3 2013Q4

Included observations: 50

Appendix 26:GDP-CCBA model Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.903000	Prob. F(12,37)	0.5526
Obs*R-squared	11.32620	Prob. Chi-Square(12)	0.5012
Scaled explained SS	4.104573	Prob. Chi-Square(12)	0.9815

Test Equation:

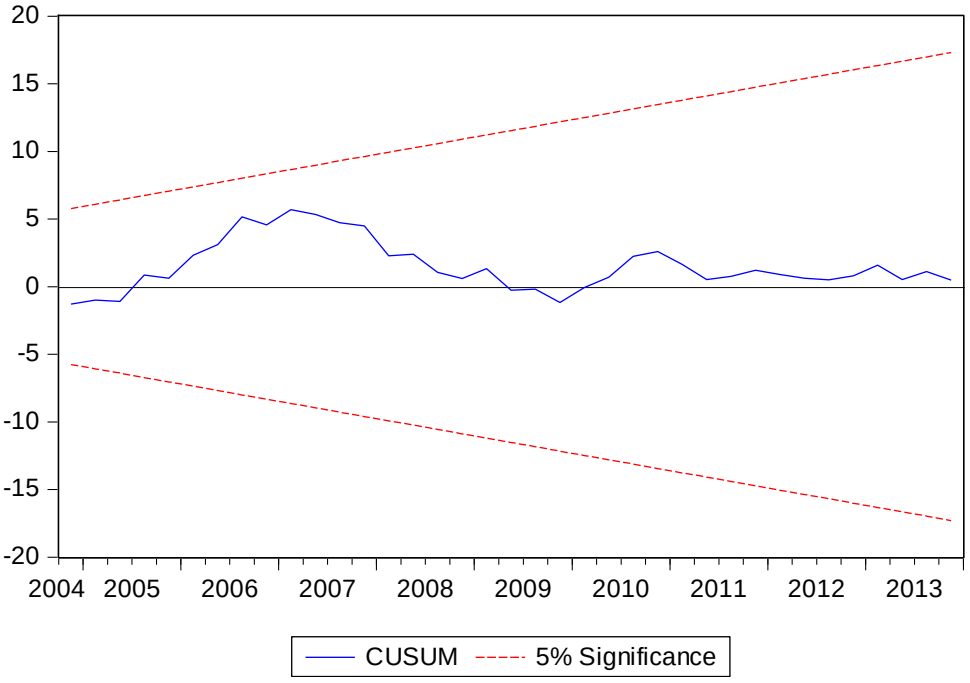
Dependent Variable: RESID^2

Method: Least Squares

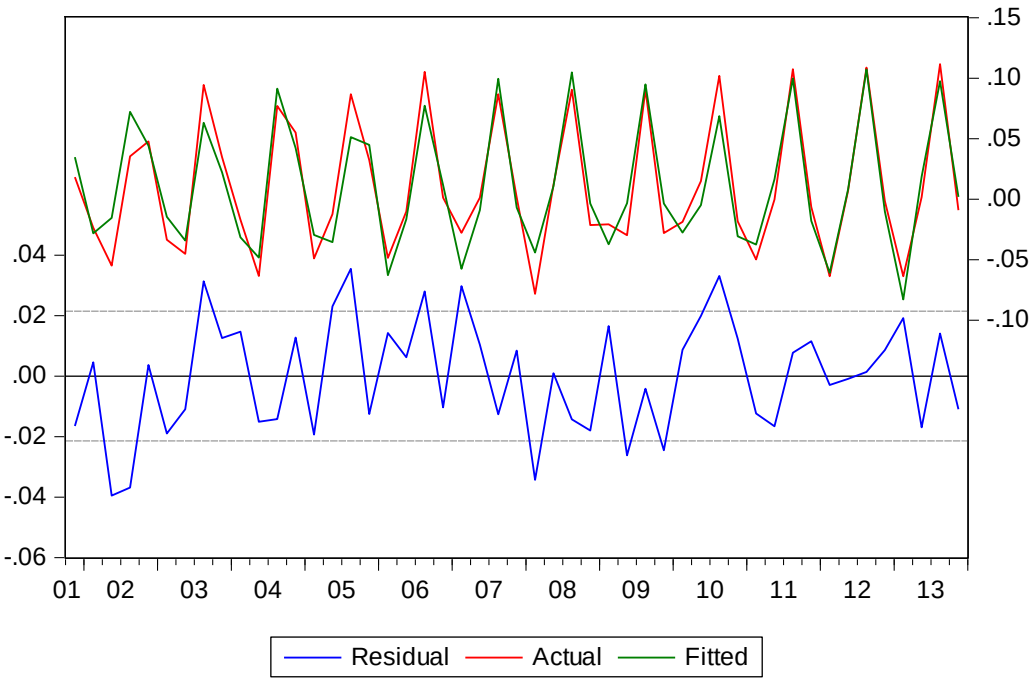
Sample: 2001Q3 2013Q4

Included observations: 50

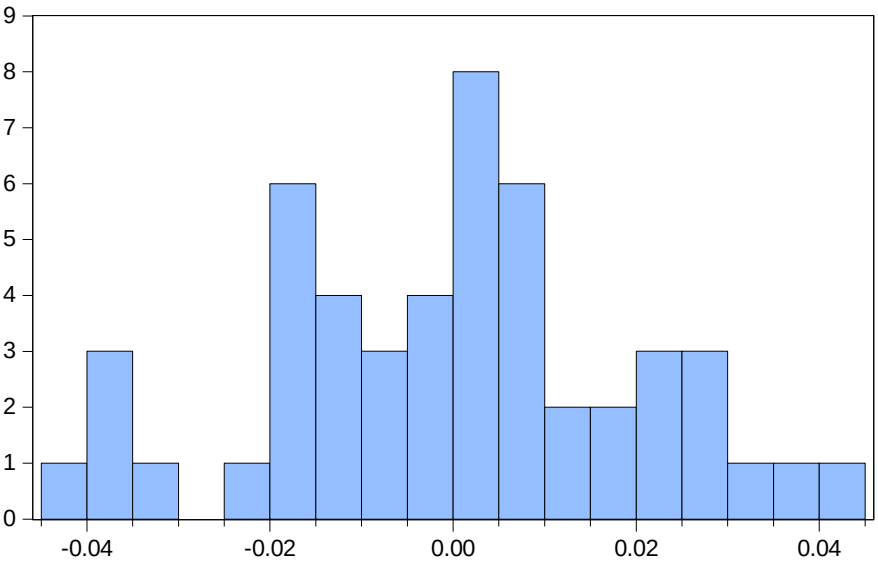
Appendix 27:GDP-CCBA model stability(CUSUM) test result



Appendix 28:Graphical analysis of the GDP-CCBAmodel residuals



Appendix 29:GDP-CBD model normality Test



Series: Residuals	
Sample 2001Q3 2013Q4	
Observations 50	
Mean	2.11e-16
Median	0.001018
Maximum	0.041300
Minimum	-0.042748
Std. Dev.	0.019857
Skewness	-0.073389
Kurtosis	2.671708
Jarque-Bera	0.269415
Probability	0.873971

Appendix 30: GDP-CBD model Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	1.960200	Prob. F(2,35)	0.1560
Obs*R-squared	5.036433	Prob. Chi-Square(2)	0.0806

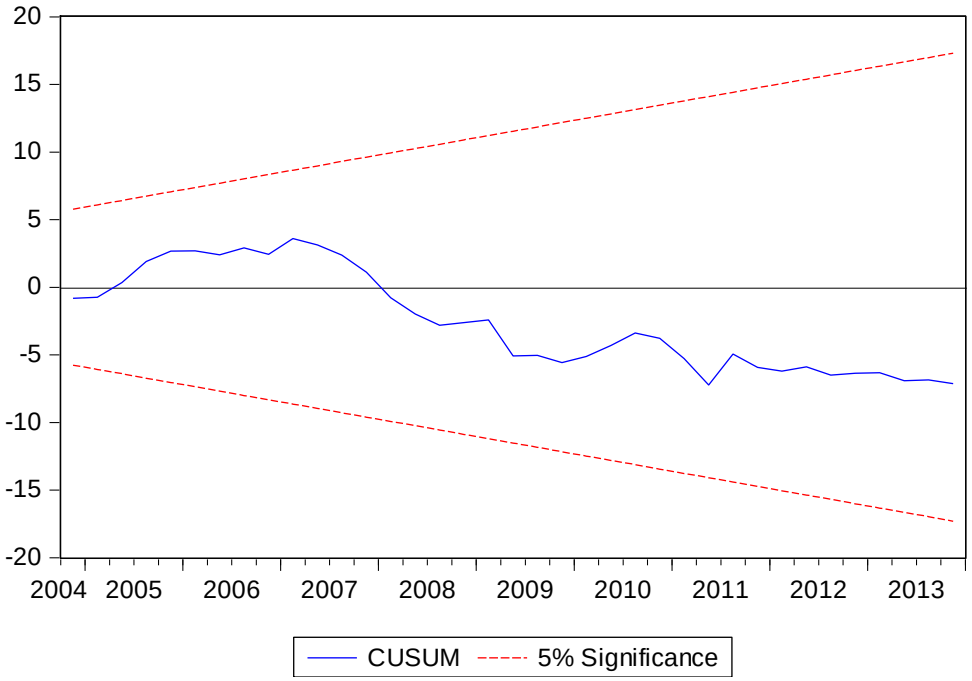
Test Equation:
Dependent Variable: RESID
Method: Least Squares
Sample: 2001Q3 2013Q4
Included observations: 50

Appendix 31:GDP-CBD model Heteroskedasticity Test: Breusch-Pagan-Godfrey

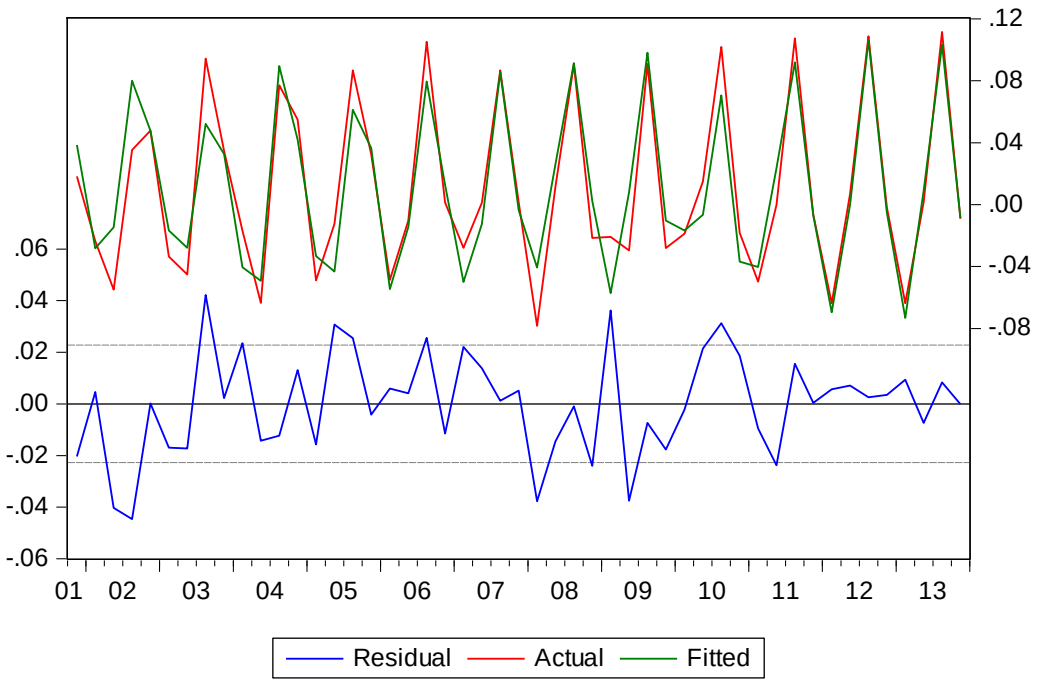
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.043086	Prob. F(12,37)	0.4327
Obs*R-squared	12.63912	Prob. Chi-Square(12)	0.3958
Scaled explained SS	5.785096	Prob. Chi-Square(12)	0.9265

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 2001Q3 2013Q4
Included observations: 50

Appendix 32:GDP-CBD model Stability (CUSUM)Test result



Appendix 33:Graphical analysis of the GDP-CBDmodel residuals



Appendix 34:Cointegration test of the single equation model

Sample (adjusted): 2000Q3 2013Q4

Included observations: 54 after adjustments

Trend assumption: Linear deterministic trend (restricted)

Series: GDP LL CPS CCBA CBD

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.678050	127.6059	88.80380	0.0000
At most 1 *	0.460073	66.40451	63.87610	0.0302
At most 2	0.251978	33.12314	42.91525	0.3303
At most 3	0.188824	17.44572	25.87211	0.3824
At most 4	0.107563	6.145159	12.51798	0.4421

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.678050	61.20141	38.33101	0.0000
At most 1 *	0.460073	33.28138	32.11832	0.0359
At most 2	0.251978	15.67741	25.82321	0.5735
At most 3	0.188824	11.30057	19.38704	0.4829
At most 4	0.107563	6.145159	12.51798	0.4421

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values