

# UNISA ECONOMIC RESEARCH WORKING PAPER SERIES

## CAN MONETARY POLICY DRIVE ECONOMIC GROWTH? EMPIRICAL EVIDENCE FROM TANZANIA

Enock Nyorekwa Twinoburyo

Nicholas M. Odhiambo

Working Paper 14/2016

August 2016

Enock Nyorekwa Twinoburyo  
Department of Economics  
University of South Africa  
P. O. Box 392, UNISA  
0003, Pretoria  
South Africa  
Email: [etwinon@gmail.com](mailto:etwinon@gmail.com)

Nicholas M. Odhiambo  
Department of Economics  
University of South Africa  
P. O. Box 392, UNISA  
0003, Pretoria  
South Africa  
Email: [odhianm@unisa.ac.za](mailto:odhianm@unisa.ac.za) /  
[nmbaya99@yahoo.com](mailto:nmbaya99@yahoo.com)

---

*UNISA Economic Research Working Papers constitute work in progress. They are papers that are under submission or are forthcoming elsewhere. They have not been peer-reviewed; neither have they been subjected to a scientific evaluation by an editorial team. The views expressed in this paper, as well as any errors, omissions or inaccurate information, are entirely those of the author(s). Comments or questions about this paper should be sent directly to the corresponding author.*

---

# CAN MONETARY POLICY DRIVE ECONOMIC GROWTH? EMPIRICAL EVIDENCE FROM TANZANIA

Enock Nyorekwa Twinoburyo<sup>1</sup> and Nicholas M. Odhiambo

---

## Abstract

*The role of monetary policy in promoting economic growth remains empirically an open research question. This paper attempts to bridge the knowledge gap by investigating the impact of monetary policy on economic growth in Tanzania during the period from 1975 to 2013 – using the autoregressive distributed lag (ARDL) bounds-testing approach. The study uses two proxies of monetary policy, namely, money supply and interest rate, to examine this linkage. The empirical results of this study confirm the existence of long-run monetary policy neutrality – irrespective of the proxy used to measure monetary policy. However, the short-run results only confirm the existence of monetary policy neutrality – but only when the interest rate is used as a proxy for monetary policy. When money supply is used to measure monetary policy, a negative relationship between monetary policy and economic growth is found to predominate*

**Key Words:** Monetary Policy, Economic Growth, Interest Rate, Money Supply

**JEL Classification:** E1, E43, E51 and E52.

---

<sup>1</sup> Corresponding author: Enock Nyorekwa Twinoburyo, Department of Economics, University of South Africa (UNISA). Email address: etwinon@gmail.com

## **1 Introduction**

Economic growth is traditionally believed to be driven by a wide range of factors but mainly by primary factors such as capital accumulation, growth in labour participation, advancement of knowledge, and technological progress (see, among others, Levine and Renelt, 1992; Barro and Sala-i-Martin, 1995; Mankiw and Taylor, 2007; Anyanwu, 2014). These are, however, believed to be affected by a host of other factors, including the policy environment (Smith, 2004). Output movements are largely attributed to real shocks linked to technological progress and cannot be effectively offset by monetary policy (Lucas, 2003). Conventional thinking, supported by empirical evidence, suggests that monetary policy has a limited role in driving economic growth, particularly in the long run (Arestis, 2007; Fontana and Palacio-Vera, 2007; Asongu, 2014). The literature on the explicit role of monetary policy instruments in stimulating economic growth, however, is not universal, and the results remain varying, inconsistent, and inconclusive (see, among others, Dele, 2007; Amarasekara, 2009; White, 2013).

The implicit role of monetary policy in promoting economic growth by maintaining price stability has garnered increasing empirical consensus, underpinned by near universality in theoretical literature, particularly in the short run (Fontana and Palacio-Vera, 2007; Mester, 2015). This view is also enshrined in the Bank of Tanzania Act, 1966. In recent practice, a growing number of central banks focus on inflation targeting to indirectly spur faster growth (Heintz and Ndikumana, 2010). While the literature on the indirect linkage between monetary policy and economic growth through the promotion of price stability is wide ranging, empirical research questions continue to abound (Papademos, 2003; Lacker, 2014).

On the one hand, monetary policy yielding low and stable inflation is believed to spur economic growth, mainly in the short run (Papademos, 2003; Fontana and Palacio-Vera,

2007; Yilmazkuday, 2013). Poor monetary policies associated with high and volatile inflationary tendencies distort the allocation of productive resources, eventually harming economic growth in the long run (see, among others, Barro 1997; Hossain, 2014). On the other hand, some empirical studies discount the negative relationship between inflation and economic growth (Levine and Renelt, 1992; McCandless and Weber, 1995). Monetary policy actions in driving steady and stable inflation tend to come with a depressing effect on economic growth, resulting in a sacrifice ratio (Mankiw, 2010; Dornbusch *et al.*, 2012).

Uncertainty about the effect of monetary policy on economic growth, particularly in developing economies, continues to prevail (Papademos, 2003; Berg *et al.*, 2013). Some studies suggest that a monetary policy impetus to spur growth is likely to be inflationary – the latter having a countervailing effect (Issing, 2001). The recent surge of non-conventional monetary policy in the wake of the global crisis of 2008 highlights the limited role of conventional monetary policy.

The link between monetary policy, inflation and economic growth has been found to be weak, particularly in developing countries (Al-Mashat and Billmeier, 2007; Mishra *et al.*, 2012; Monteil *et al.*, 2012). In addition, some studies confirm a weakening relationship between money supply and policy objectives (White, 2013; IMF, 2014). In some instances, the appropriateness and relevance of monetary policy has been questioned, particularly for some developing countries with informal sectors, a poorly integrated financial sector, low financial development, and where the fiscal policy plays the dominant role in the economy (Weeks, 2010).

Against this backdrop, the aim of this paper is to empirically investigate what monetary policy can or cannot do in relation to driving economic growth in Tanzania, both in the short and long run – a subject that has received very limited attention in scholarly work on Tanzania. The article adopts two monetary policy variables of money supply in tandem with monetarist theory and short term interest rates premised on the Keynesian theory. The paper also includes inflation as one of the variables in the growth equation in order to capture the indirect impact of monetary policy on economic growth by maintaining price stability.

This paper also makes an additional contribution by employing the superior autoregressive distributed lag (ARDL) bounds testing approach by Pesaran *et al.* (2001) in an attempt to establish the effect of monetary policy on economic growth in Tanzania. The rest of the paper is organised as follows: Section 2 gives an overview of monetary policy reform and economic performance in Tanzania, while Section 3 presents the empirical literature review. The empirical model and estimation methods are presented in Section 4. Section 5 presents the empirical results and discussion, while Section 6 provides the conclusion.

## **2 Monetary Policy Reform and Economic Performance in Tanzania: An Overview**

Bank of Tanzania (BoT) was set up in June 1966, becoming a cornerstone for monetary policy reform in Tanzania (BoT, 2011). The performance of the economy has, since then, been mixed owing to the varying economic policies over the corresponding period. The most resolute macro-economic performance in the form of sound economic growth and low inflation is traced back to the 1990s -- in part explained by macro-economic stabilisation and economic reforms that commenced in the late 1980s (Ndulu, 1987; BoT, 2011).

The current economic structure remains consistent with the characteristics of low-income countries, characterised by high dependency on the primary sectors of agriculture and mining.

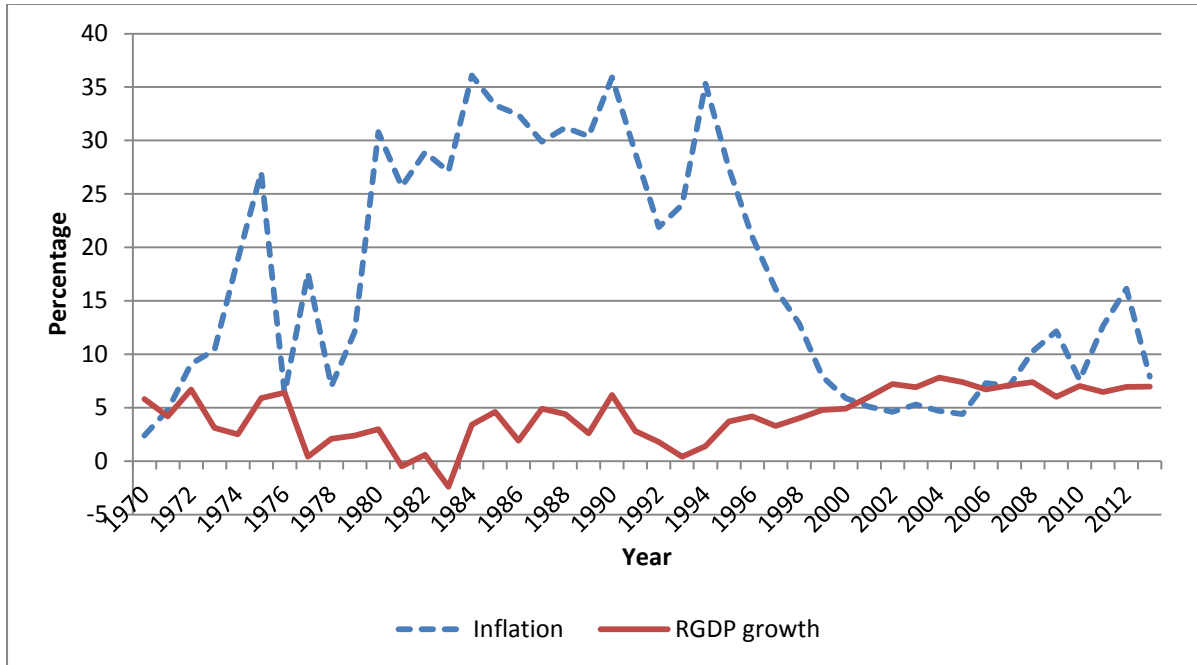
The economy is largely service-sector driven -- accounting for 43.5% of GDP in 2014 -- but also remains largely rural-based with a rural population of 70%. Trade volumes as a share of GDP remain low at 49.4% of GDP in 2014 (World Bank, 2015).

In 1967, the Arusha Declaration was put in place, putting emphasis on state ownership, nationalisation of foreign-owned enterprises, and the control of production by the state (Nyerere, 1977). This laid the foundation for the subsequent administrative control of all interest and exchange rates by government throughout the 1970s. Eventually, all major economic activities, including trade and credit, were controlled by government following the establishment of the confinement policy in 1972 (Ndulu, 1987). Fiscal dominance increased, characterised by heightened government borrowing and financial repression (BoT, 2011).

While Tanzania commenced discussions of macro-economic adjustment reforms in the 1980s, these did not reach full realisation until the 1990s. Social-economic policies characterised by sizeable government controls and domestic borrowing prevailed until 1986, when the economic recovery programme aimed at market-driven economic reforms through gradual deregulation of segments of the economy was adopted (Ndulu, 1987; Maehle *et al.*, 2013). As a result, the real GDP growth rates that averaged over 6% per annum in the late 1960s decelerated in the 1970s, finally reaching negatives in the early 1980s (Maehle *et al.*, 2013). For the corresponding period, inflation persisted in double digits but dwindled in a deflation in the early 1980s, consistent with the subdued growth and recessionary trend (BoT, 2011; Maehle *et al.*, 2013). The associated economic performance in the form of a scissor co-

movement between inflation and economic growth for the period from the mid-1970s to 2013 is also shown in Figure 1.

**Figure 1: Inflation and economic growth performance (1970-2013)**



Source: Bank of Tanzania (2014)

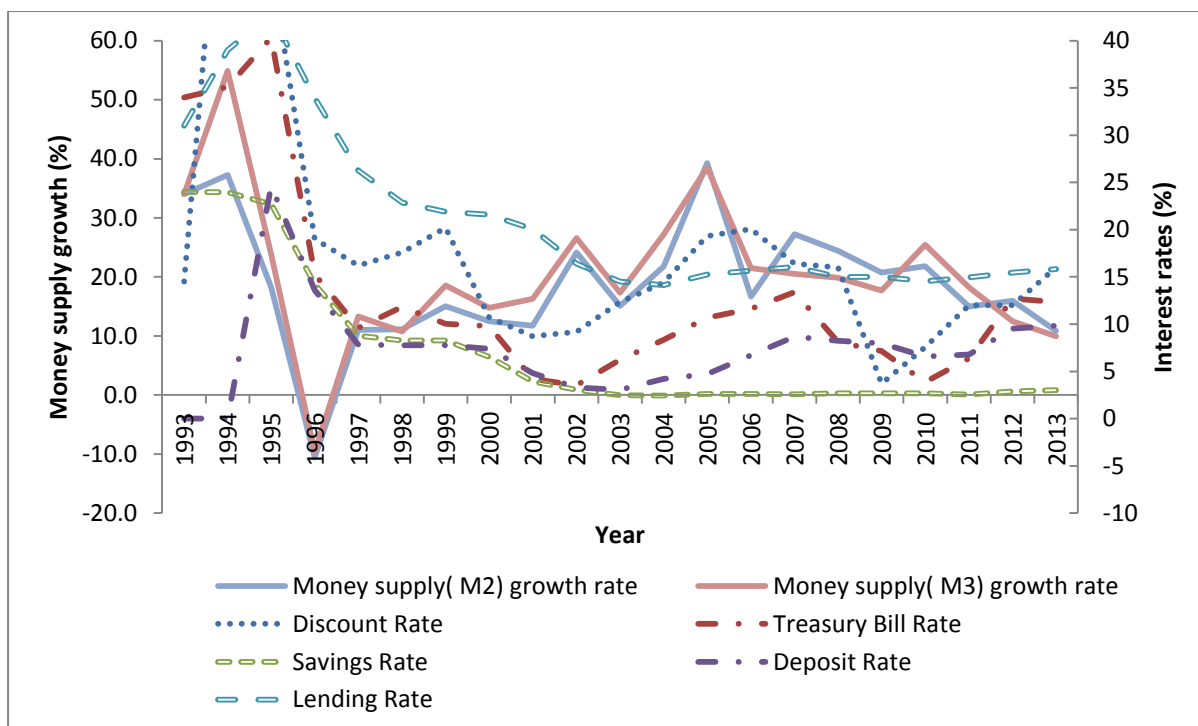
In 1986, Tanzania adopted the IMF and World Bank led economic recovery programme, eventually guiding the actual transitioning from direct controlled monetary policy to indirect (market-driven) monetary policy in the early 1990s (Nord *et al.*, 2009). The mainstream economic reforms included, inter alia, the adoption of a monetary-targeting regime in 1993, the liberalisation of the banking sector in 1991, the exchange rate eventually becoming free floating in 1996, and the introduction of the government securities (Treasury bills and bonds) in the 1990s and the longer-term bonds of five, seven and ten years in 2002 (Nord *et al.*, 2009; BoT, 2011).

These reforms were supported by legislative reforms, including the amendment of the BoT Act in 1995, making price stability its primary objective (BoT, 2011). Further amendments to the BoT Act were undertaken in 2006, enriching the Central Bank's independence (Nord *et al.*, 2009). The Government of Tanzania only recently partially liberalised its capital account of the balance of payments, allowing only transactions to EAC residents while committing to extend it to the rest of the world (IMF, 2016). Tanzania, however, will retain less restrictive prudential rules, including minimum holding periods for debt inflows and participation in short-term papers (IMF, 2016).

The post-1990 reforms arguably created a supportive environment for strong macro-economic performance in terms of reducing inflation rates and robust economic growth (also see Figure 1). The period 1993-2013 was associated with astounding nominal monetary growth per annum, as shown in Figure 2. The interest structure, also shown in Figure 2, remains characterised by relatively high rates and spreads.

**Figure 2: Monetary growth and interest rate structure (1993-2013)**





Source: Bank of Tanzania ( 2014)

### 3 Empirical Literature Review

Buigut (2009), using recursive Vector Auto Regressive (VAR) on annual data from 1984 to 2005, examined monetary transmission mechanisms in Uganda, Kenya, and Tanzania. They revealed that an interest rate (monetary policy variable) shock has no effect on inflation and economic growth in all three countries.

Using Structural VAR on monthly data from January 2002 to September 2010 to investigate monetary transmission mechanisms in Tanzania, Monteil *et al.* (2012) found that a positive shock to reserve money has no effect on output. The results are consistent with Davoodi *et al.* (2013) who applied a Structural VAR, Bayesian VAR, and Factor- Augmented VAR to monthly data from 2000 to 2010 for all East African Community (EAC) countries, namely, Uganda, Kenya, Tanzania, Rwanda, and Burundi. Their results, however, reveal that a negative shock to interest rates has a significant, positive effect on output in Kenya, Burundi,

and Rwanda, while a positive shock to reserve money increases output significantly in Uganda, Rwanda, and Burundi.

Berg *et al.* (2013) adopted a Romer and Romer (1989) narrative approach with a focus on the contractionary monetary policy undertaken by four members of the East African Community -- Kenya, Uganda, Tanzania, and Rwanda -- in 2011. Their main finding is that the effect of monetary policy on output in Tanzania is limited. The effects of monetary policy on output are, however, more pronounced in Kenya and Uganda, where the more forward-looking monetary policy frameworks are in place.

The limited respective literature that exists on Tanzania confirms no role of monetary policy in boosting economic growth. These results are consistent with some other country studies. Mutoti (2006), employing a cointegrated structural VAR, showed that the impact of money supply shocks on Zambia's output was minor and temporary.

Maturu *et al.* (2010), applying the recursive and structural VAR on Kenya's quarterly data from the first quarter of 2000 to the second quarter of 2010, indicated that an expansionary monetary policy (positive shock to M3) has no effect on output.

Lashkary and Kashani (2011), using econometric regression model analysis on annual data for Iran from 1959 to 2008, revealed no impact of monetary policy (money volume) on economic growth. Also, Mutuku and Koech (2014), using recursive VAR on Kenyan data from 1997 to 2010, revealed that money supply and short-term interest rates (monetary policy variables) had no effect on output.

Mugume (2011), using a non-recursive VAR on Uganda's quarterly data from the first quarter of 1999 to the first quarter of 2009, found that a positive shock to interest rates

(contractionary monetary policy) only significantly drives output up to 2 quarters. A shock to money supply (M2) is found to have no effect on output.

However, there are studies that offer alternative views and results, some suggesting a positive impact of monetary policy on economic growth. Khabo and Harmse (2005) utilised Ordinary Least Squares (OLS) methodology on annual data series from 1960 to 1997 and established that money supply (M3) had a significant, positive impact on economic growth in South Africa. Similar results were obtained by Ali *et al.* (2008) using an ARDL bounds test on South Asian countries, based on annual data from 1990 to 2007.

Also, studies by Ogunmuyiwa and Ekone (2010) and Nouri and Samimi (2011), both using OLS methodology, respectively found a positive impact of money supply on economic growth in Nigeria and Iran. Similar results were obtained by Jawaid *et al.* (2011) and Senbet (2011), respectively for Pakistan and United States of America. The findings are corroborated by more recent studies of Onyeiwu (2012), Kareem *et al.* (2013), and Havi and Enu (2014).

Using both recursive and non-recursive structural VAR on Kenya's monthly data from 1997 to 2005, Cheng (2006) found that a positive shock to interest rates led to a short-term rise in output, contrary to theoretical expectation. Applying recursive VAR and semi-structural VAR methodology to monthly data for Sri Lanka for the period from 1978 to 2005, Amarasekara (2009) revealed that a positive shock on interest rates reduced economic growth. Similar findings were found in the study by Vinayagathan (2013) using a structural VAR model on monthly data for Sri Lanka covering the period from January 1978 to December 2011.

## **4 Empirical Model Specification and Estimation Methods**

### **4.1 Empirical Model**

The empirical growth literature is wide-ranging, buttressed by both neoclassical and endogenous growth models (see Levine and Renelt, 1992; Mansouri, 2005, Anyanwu, 2014).

This paper narrows the scope, drawing from the St Louis equation and McCallum (1991) on the role of monetary policy. The selected set of control variables is supported by the aggregate production empirical models used in literature (Anyanwu, 2014). This paper specifies a modified equation for economic growth including two independent proxies for monetary policy – money supply and short-term interest rates – to capture the effect of monetary policy on economic growth. In addition, capital stock, trade openness, inflation, and exchange rate are included as control variables. The modified equation is presented in equation 1.

$$RGDP_t = C + \varphi RM2_t + \lambda IR_t + \alpha RK_t + \theta REXC_t + \gamma TO_t + \delta INF_t + \varepsilon_t \quad (1)$$

where RGDP is real gross domestic product, a proxy for economic growth; M2 is real money supply; IR is the interest rate, RK is capital stock; REXC is the real exchange rate; TO is trade openness; and INF is inflation. All variables are expressed in natural logarithm, except interest rates.

In this paper, real GDP is used as a proxy for economic growth, as has been extensively done in the literature (see Nogueira, 2009). The monetary policy variables of money supply (measured by M2) and interest rates (proxied by the 3-month Treasury bill rate) are adopted owing to their empirical use in a wide range of studies (Ivrendi and Yildirim, 2013; Christiano *et al.*, 1999). Expansionary monetary policy (increase in money supply or a reduction in interest rates) is expected to spur growth.

Capital stock, proxied by real gross fixed capital formation, is one the fundamental engines of economic growth, and its effects are expected to be positive (see Havi and Enu, 2014; Fosu and Magnus, 2006; Kohpaiboon, 2004). Trade openness, measured by the sum of exports and

imports to GDP, is believed to have a positive and statistically significant impact on economic growth (Sakyi, 2011; Fosu and Magnus, 2006; Arezki and Gylfason, 2011).

Low and stable inflation is believed to create a favourable environment for economic growth, while volatile and high inflation (beyond a threshold level) deters economic growth (Yilmazkuday, 2013; Pollin and Zhu, 2006; Khan and Senhadji, 2001). Real exchange rate has garnered ground in research as a proxy for external competitiveness. While the findings are inconclusive, the majority support a positive relationship between real exchange rate and economic growth (Haddad and Pancaro, 2010; Rodrik, 2008).

#### **4.2 Estimation Methodology**

To investigate the long-run and short-run relationship between monetary policy and economic growth, this paper adopts the approach of Pesaran *et al.* (2001) to cointegration, known as autoregressive distributed lag (ARDL). This approach has distinct advantages over other cointegration procedures proposed by Engle and Granger (1987) and Johansen and Juselius (1990). Following the establishment of the order of the ARDL model, the single reduced equation can be estimated by OLS. This approach does not require the order of integration of the variables to be the same, implying that the bounds test works well whether underlying regressors are purely  $I(0)$ , purely  $I(1)$ , fractionally integrated, or mutually cointegrated. In addition, this technique is suitable for small or finite sample size and provides unbiased estimates of the long-run model even when there is endogeneity in some of the explanatory variables (see also Harris and Sollis, 2003).

The ARDL bounds testing procedure involves two stages. First, the ARDL model of interest, specified in equation 2, is estimated by using the OLS in order to test for the existence of a long-run relationship among the relevant variables. An F-test for the joint significance of the lagged levels of the variables is performed in order to test the null hypothesis of no long-run

relationship among the variables in the equation. If the F-statistic is above the upper critical value, the null hypothesis of no long-run relationship can be rejected, irrespective of the orders of integration of the time series. Conversely, if the test statistic falls below the lower critical value, then the null hypothesis cannot be rejected. However, if the statistic falls between the upper and the lower critical values, then the result is inconclusive.

The second stage involves the estimation of the long-run and short-run coefficients once the long-run relationship or cointegration has been established. The optimum order of the variables is obtained using Schwarz-Bayesian Criterion (SBC) or Akaike Information Criterion (AIC).

Based on equation 1, the ARDL-Bounds model used in this study can be expressed as follows:

$$\begin{aligned}
\Delta RGDP_t = & \delta_0 + \sum_{i=1}^n \delta_{1i} \Delta RGDP_{t-i} + \sum_{i=0}^n \delta_{2i} \Delta M2_{t-i} + \sum_{i=0}^n \delta_{3i} \Delta IR_{t-i} + \sum_{i=0}^n \delta_{4i} \Delta RK_{t-i} \\
& + \sum_{i=0}^n \delta_{5i} \Delta REXC_{t-i} + \sum_{i=0}^n \delta_{6i} \Delta TO_{t-i} + \sum_{i=0}^n \delta_{7i} \Delta INF_{t-i} + \alpha_1 RGDP_{t-1} \\
& + \alpha_2 M2_{t-1} + \alpha_3 IR_{t-1} + \alpha_4 RK_{t-1} + \alpha_5 REXC_{t-1} + \alpha_6 TO_{t-1} + \alpha_7 INF_{t-1} \\
& + \vartheta_t
\end{aligned} \tag{2}$$

Where  $\Delta$  denotes the first difference operator,  $\delta_0$  is the drift component,  $n$  is the lag length and  $\vartheta_t$  is the white noise residuals,  $\delta_{1i}$ - $\delta_{7i}$  coefficients of short-run dynamics, and  $\alpha_1 - \alpha_7$  are the long-run relationship. The variables are as defined in equation 1. All variables are expressed in natural logarithm, except interest rates.

The corresponding general error-correction model (ECM) is formulated as follows:

$$\begin{aligned}
\Delta RGDP_t = & \delta_0 + \sum_{i=1}^n \delta_{1i} \Delta RGDP_{t-i} + \sum_{i=0}^n \delta_{2i} \Delta M2_{t-i} + \sum_{i=0}^n \delta_{3i} \Delta IR_{t-i} + \sum_{i=0}^n \delta_{4i} \Delta RK_{t-i} \\
& + \sum_{i=0}^n \delta_{5i} \Delta REXC_{t-i} + \sum_{i=0}^n \delta_{6i} \Delta TO_{t-i} + \sum_{i=0}^n \delta_{7i} \Delta INF_{t-i} + \gamma_1 ECM_{t-1} \\
& + \tau_t
\end{aligned} \tag{3}$$

Where ECM is the error correction term, which captures the correction of the long-run economic growth model to its steady state position in case of any short term disturbances. The ECM is expected to be negative and statistically significant.  $\tau_t$  is the white noise error term.

### 4.3 Data Sources

The Tanzania dataset used in this study covers the period, 1975-2013. The real values of GDP, gross fixed capital formation, and money supply (M2) were obtained by dividing them by the Tanzania Consumer Price Index (CPI). The Tanzania CPI and the US CPI were obtained from the International Financial Statistics (IFS). Nominal values of GDP and money supply (M2) were obtained from Bank of Tanzania.

Nominal exchange rate obtained from Bank of Tanzania is multiplied by the ratio of the US CPI to the domestic CPI to obtain the real exchange rate. Inflation rate, nominal Treasury bill rate for Tanzania (1993 to 2013), and export and import values were also sourced from Bank of Tanzania. The 1975-1993 set of Treasury bill rate series was obtained from the BoT annual publications and IFS books (various issues). Nominal gross fixed capital formation was obtained from the World Bank (2015).

## 5 Empirical Analysis

### 5.1 Unit root tests

Owing to the weaknesses of the traditional Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979), particularly for small samples, this paper adopts the Dickey-Fuller - Generalised Least Square (DF-GLS) de-trending test proposed by Elliot *et al.* (1996). In addition, the Phillips-Perron (PP) by Phillips and Perron (1988) is also used.

The graphical representation of the data series suggests that the variables, real GDP, real gross fixed capital formation, and consumer price index are trend stationary, while trade openness, real Treasury bill rate, and real exchange rate are difference stationary. The Dickey-Fuller Generalised Least Square (DF-GLS) and the Phillips-Perron unit root tests presented in Table 1 include constant and trend for the trend stationary variables and only constant for the difference stationary variables. The respective tests confirm the absence of  $I(2)$  and beyond. Both tests confirm that only the Treasury bill rate is an  $I(0)$ , while the rest are  $I(1)$ .



**Table 1: Stationarity (unit root) tests**

Variable	Dickey-Fuller Generalised Least Square (DF-GLS)				Phillips-Perron test			
	Stationarity of Variables in levels		Stationarity of Variables in difference		Stationarity of Variables in levels		Stationarity of Variables in difference	
	Constant	with trend	Constant	with trend	Constant	with trend	Constant	with trend
<b>RGDP</b>	-	-1.653	-	-4.343***	-	-1.955	-	-4.642***
<b>RM2</b>	-	-2.591	-	-3.995**	-	-1.311	-	-4.218**
<b>IR</b>	-2.140**	-	-	-	-2.674*	-	-	-
<b>RK</b>	-	-2.174	-	-4.148***	-	-1.626	-	-4.423***
<b>REXC</b>	-1.303	-	-5.132***	-	-1.573	-	-5.083***	-
<b>TO</b>	-1.497	-	-4.337***	-	-1.964	-	-4.783***	-
<b>INF</b>	-	-1.065	-	-3.194**	-	-0.223	-	-3.571**

Note: Note: for all p-values: \*\*\* 1% significance level; \*\* 5% significance level; \* 10% significance level.

## 5.2 ARDL-Bounds Testing Approach

Table 2 presents the bounds test for the existence of a long-run relationship among real GDP, money supply, interest rates (Treasury bill rate), capital (investment), real exchange rate, trade openness, and inflation.

**Table 2: ARDL bounds test results**

Dependent Variable	Function	F-test Statistics					
<b>LRGDP</b>	F(RGDP RM2,IR,RK,REXC, TOP,INF)	4.63***					
<b>Asymptotic Critical Values</b>							
<b>Pesaran et al. (2001), p.300. Table CI(III)</b>	1%	5%		10%			
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	
	2.12	3.23	2.45	3.61	3.15	4.43	

Note: \*\*\* denotes significance at the 1% level

The computed  $F$  – statistic is 4.63, as shown in Table 2, and is statistically significant at the 1% significance level, implying that these variables have a long-run relationship among themselves. Following the confirmation of the existence of a long-run relationship between the variables in the model, the long-run and short-run models were derived using SBC due to the more superior results relative to AIC. The selected ARDL model, based on the SBC criteria, is an ARDL model (1, 0, 1, 0, 2, 1, 2).

**Table 3: Results of ARDL model (1,0,1,0,2,1,2)**

<b>Panel A: Long-run Coefficients - Dependent Variable is RGDP</b>				
<b>Regressor</b>	<b>Coefficient</b>	<b>Standard Error</b>	<b>T-Ratio</b>	<b>Probability</b>
<b>C</b>	6.453***	2.219	2.908	0.008
<b>RM2</b>	-0.679	0.447	-1.518	0.143
<b>IR</b>	-0.002	0.003	-0.745	0.464
<b>RK</b>	0.640***	0.224	2.845	0.009
<b>REXC</b>	-0.308	0.312	-0.987	0.334
<b>TO</b>	0.512	0.355	1.442	0.163
<b>INF</b>	0.202***	0.072	2.806	0.010
<b>Panel B: Short-run Coefficients - Dependent Variable is <math>\Delta</math>RGDP</b>				
<b><math>\Delta</math>RM2</b>	-0.205***	0.069	-2.940	0.007
<b><math>\Delta</math>IR</b>	0.001	0.781	1.507	0.143
<b><math>\Delta</math>RK</b>	0.193***	0.055	3.527	0.002
<b><math>\Delta</math>REXC</b>	0.163***	0.488	3.339	0.002
<b><math>\Delta</math>REXC1</b>	0.083*	0.041	2.036	0.052
<b><math>\Delta</math>TO</b>	-0.060	0.066	-0.900	0.376
<b><math>\Delta</math>INF</b>	-0.216	0.266	-0.811	0.424
<b><math>\Delta</math>INF1</b>	-0.513**	0.241	-2.130	0.042
<b>ECM (-1)</b>	-0.301**	0.117	-2.572	0.016
<b>R-Squared</b>	0.911		<b>R-Bar-Squared</b>	0.861
<b>SE of Regression</b>	0.017		<b>F-Stat F(9,27)</b>	26.155 (0.000)
<b>Residual Sum of Squares</b>	0.007		<b>DW statistic</b>	2.172
<b>Akaike Info. Criterion</b>	92.542		<b>Schwarz Bayesian Criterion</b>	81.266

Note: \*\*\* denotes significance at the 1% level

The long-run results reported in Panel A of Table 3 indicate that the coefficients of both monetary policy variables, i.e., interest rate and money supply, are statistically insignificant, suggesting long-run monetary policy neutrality. The long-run monetary policy neutrality is backed by a wide range of empirical findings (see, among others, Bullard, 1999; Nogueira, 2009). The coefficient of capital is positive in the long run, consistent with previous studies of Havi and Enu (2014) and Fosu and Magnus (2006). Also, the long-run effect of inflation is found to be positive, which is contrary to the *a priori* expectation of a negative sign. The long-run positive effect of inflation on economic growth is supported by empirical evidence from Malik and Chowdhury (2001).

As seen in Panel B of Table 3, the short-run effect of the interest rate monetary policy variable is insignificant, while the coefficient of money supply is found to be negative and statistically significant, contrary to *a priori* expectation. While the short-run money supply's negative effect on economic growth was unexpected, a few studies have similar findings (Jawaid *et al.*, 2011).

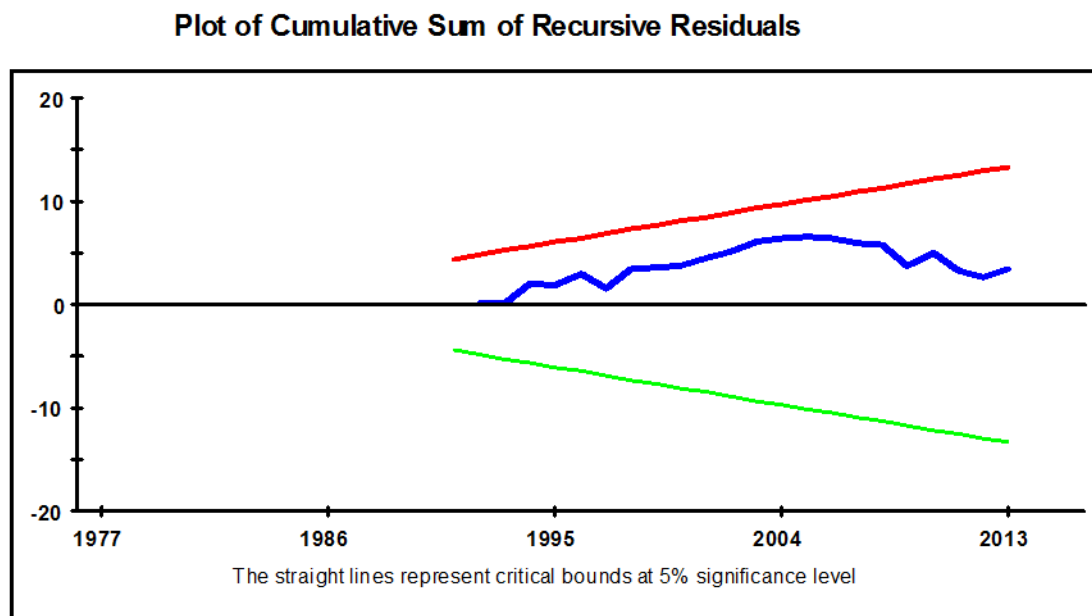
Also, in the short run, the coefficient of capital, real exchange rate and its lag are found to be positive and statistically significant. Unlike the long-run results, the coefficient of inflation is statistically insignificant, but its lag is found to have a negative and significant impact on economic growth. The coefficient of ECM (-1) is -0.301 and is statistically significant at the 5% level. This implies that the disequilibrium occurring due to a shock is totally corrected in about 3 years and 4 months at a rate of about 30.1% per annum.

The results displayed in Table 4 show that the model passes the diagnostic tests of serial correlation, normality, functional form, and heteroscedasticity. The plots of the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMQ), reported respectively in Figures 3 and 4, are within the 5% critical lines, revealing that the model is stable and confirms the stability of the long-run coefficients of the regressors.

**Table 4: ARDL-VECM model diagnostic tests**

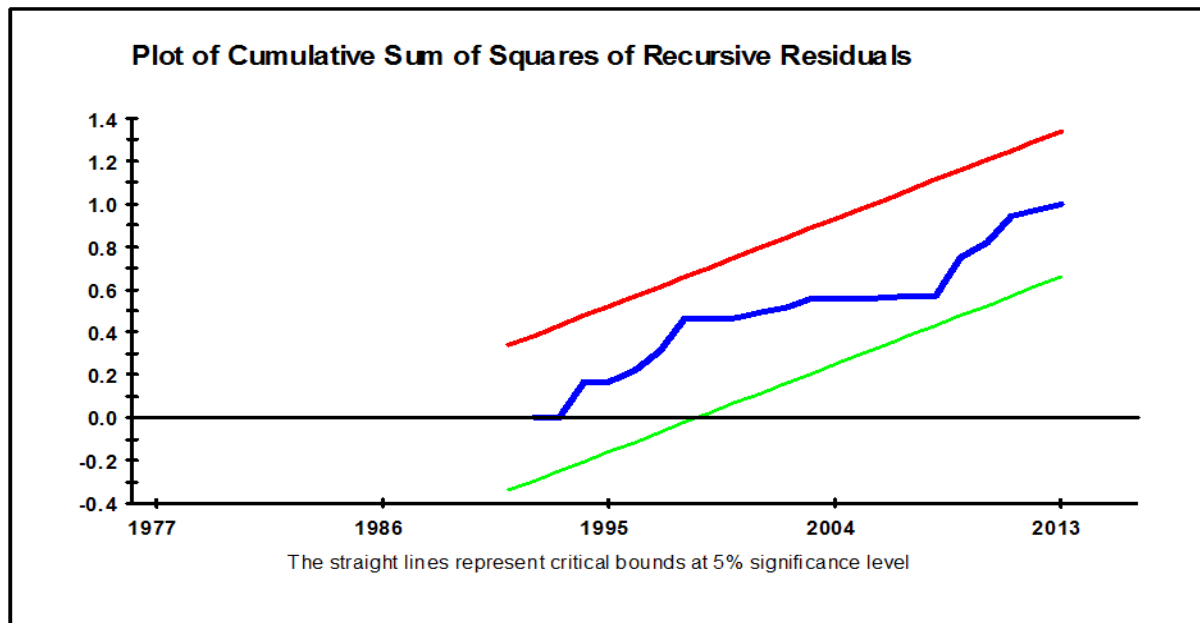
Test Statistics	Results
Serial Correlation	0.514 (0.473)
Functional Form	2.308 (0.129)
Normality	2.362 (0.307)
Heteroscedasticity	0.486 (0.486)

**Figure 3: CUSUM**





**Figure 4: CUSUMQ**



## 6 Conclusion

The role of monetary policy in promoting economic growth, both directly and indirectly, through maintenance of price stability, remains mixed and inconclusive. This paper empirically investigates what monetary policy can or cannot do in relation to driving economic growth in Tanzania, both in the short and long run, a subject that has received very limited attention in scholarly work on Tanzania. Unlike the respective empirical studies on Tanzania that have relied mainly on VAR methodology, this paper uses the autoregressive distributed lag (ARDL) to examine this nexus. The results confirm long-run monetary policy neutrality – irrespectively of whether money supply or interest rate is used as a proxy for monetary policy. The short-run results, on the other hand, confirm neutrality of monetary policy only when interest rate is used as a proxy for monetary policy. When interest rate is used as proxy for monetary policy, a negative effect of monetary policy on economic growth is found to prevail. There was no

established impact of inflation on economic growth in the short run, suggesting no role of monetary policy in the short run.

## References

Acikgoz, S. and Mert, M. (2014). Sources of Growth Revisited: The importance of the nature of technological progress. *Journal of Applied Economics*, Vol. 17, No. 1, pp. 31-62.

Adefeso, H. A. and Mobolaji, H. I. (2010). The fiscal-monetary policy and economic growth in Nigeria: *Pakistan journals of social sciences*, Vol. 7, No.2, pp.137-142.

Al-Mashat, R. and Billmeier, A. (2007). The Monetary Transmission Mechanism in Egypt. *IMF Working Paper*, No. 285.

Amarasekara, C. (2009). The impact of monetary policy on economic growth and inflation in Sri Lanka. *Central Bank of Sri Lanka Staff Studies*, Vol 38, pp. 1-44.

Anyanwu, J. C. (2014). Factors Affecting Economic Growth in Africa: Are there any lessons from China? *African Development Review*, Vol. 26, No. 3, pp. 468-493.

Arestis, P. (2007). *What is the New Consensus in Macroeconomics?* In P Arestis (Ed.), *Is There a New Consensus in Macroeconomics?* (22-42). New York: Palgrave Macmillan.

Asongu, S. A. (2014). A note on the long-run neutrality of monetary policy: new empirics. *European Economics Letters*, Vol.3, No.1, 1-6.

Bank of Tanzania (2011). Tanzania Mainland's 50 Years of Independence: A review of the role and functions of the Bank of Tanzania (1961-2011). June



Barro, R. and Sala-i-Martin, X. (1995). *Economic Growth*, McGraw-Hill, New York.

Barro, R. J. (1997). *Determinants of Economic Growth: A Cross-Country Empirical Study*, *The MIT Press*, Cambridge, Massachusetts.

Berg, A., Charry, L., Portillo, R. and Vlcek, J. (2013). The monetary transmission mechanism in the Tropics: A Narrative Approach. *International Monetary Fund Working Paper*, No. 197. Washington, D.C.

Berg, A., Charry, L., Portillo, R. and Vlcek, J. (2013). The Monetary Transmission Mechanism in the Tropics: A Narrative Approach. *IMF Working Paper*, 197. Washington, D.C.

Buigut, S. (2009). Monetary policy transmission mechanism: Implications for the proposed East African Community (EAC) Monetary Union. Available at: <http://www.csae.ox.ac.uk/conferences/2009-EdiA/paperlist.html>

Bullard, J. (1999). Testing long-run neutrality propositions: Lessons from the recent research. *Federal Reserve Bank of St. Louis Review*, Vol. 81, No. 6, pp. 57-78.

Cheng, K. C., (2006). A VAR Analysis of Kenya's Monetary Policy Transmission Mechanism: How Does the Central Bank's REPO Rate Affect the Economy. *IMF Working Paper*, No. 300.

Christiano, L., Eichenbaum, M. and Evans, C. (1999). *Monetary policy shocks: what have we learned and to what end?* In *Handbook of Macroeconomics*, ed. by J. Taylor, and M. Woodford. North Holland.

Davoodi, H., Dixit, S. and Pinter, G. (2013). Monetary transmission mechanism in the East African Community: An empirical investigation. *IMF Working paper*, No. 39.

Dele, B.E. (2007). Monetary Policy and Economic Performance of West African Monetary Zone Countries. *Munich Personal RePEc Archive*, Vol. 4308.

Dornbusch, R., S. Fischer and R. Startz (2012). *Macroeconomics*. 10th Edition, New Delhi, McGraw Hill Education (India) Pvt. Ltd.

Elliot, G., Rothenberg, T. and Stock, J. (1996). Efficient Tests for an Autoregressive Unit Root. *Econometrica*, Vol. 64, pp. 813-36.

Engle, R. F. and Granger, C. J. (1987). Cointegration and Error-correction -Representation, Estimation and Testing. *Econometrica*, Vol. 55, pp. 251-78.

Fasanya, I. O. and Onakoya, A. B. O., and Agboluaje, M. A. (2013). Does monetary policy influence economic growth in Nigeria? *Asian Economic and Financial Review*, Vol, 3, No.5.

Fischer, S. (1993). The role of macroeconomic factors in growth. *Journal of Monetary Economics*, Vol. 32, No. 3, pp. 485-512.

Fontana, G. and Palacio-Vera, A. (2007). Are long-run price stability and short-run output stabilisation all that monetary policy can aim for? *Metroeconomica*, Vol. 58, No. 2, pp. 269-298.

Fosu, E . O. A and Magnus, F. J. (2006). Bounds testing approach to cointegration: An examination of foreign direct investment trade and growth relationships. *American Journal of Applied Sciences*, Vol. 3, No. 11, pp. 2079-2085.

Haddad, M and Pancaro, M. (2010). Can Real Exchange Rate Undervaluation Boost Exports and Growth in Developing Countries? Yes, But Not for Long. *Economic Premise 20*, World Bank PREM Network, June.

Harris, R. and Sollis, R. (2003). *Applied Time Series Modelling and Forecasting*. Wiley, West Sussex.

Havi, E. D.K. and Enu, P. (2014). The effect of fiscal policy and monetary policy on Ghana's economic growth: which policy is more potent? *International Journal of Empirical Finance*, Vol 3, No.2, pp. 61-75.

Heintz, J. and Ndikumana, L. (2010). Is there a case for formal inflation targeting in Sub-Saharan Africa? *Political Economy Research Institute University of Massachusetts Amherst*, 218, March.

Hossain, A. (2014). Monetary policy, inflation, and inflation volatility in Australia, *Journal of Post Keynesian Economics*, Vol 36, pp. 745-780.

IMF (2014), Regional Economic Outlook. Washington, DC. April.

IMF (2016). Third review under the policy support instrument for United Republic of Tanzania.

IMF Country Report, No. 29. Available at:

<http://www.imf.org/external/pubs/ft/scr/2016/cr1629.pdf>

Issing, O. (2001). Why Price Stability. In A. Garcia-Herrero, V. Gaspar, L. Hoogduin, J. Morgan and B. Winkler (eds.), *Why Price Stability?*, *European Central Bank*, Frankfurt am Main.

Ivrendi, M. and Yildirim, Z. (2013). Monetary policy shocks and macroeconomic variables: evidence from fast growing emerging economies. *Economics Discussion Papers*, No. 61, Kiel Institute for the World Economy.

Jawaid, S. T., Quadri, F. S. and Ali, N. (2011). Monetary-fiscal-trade policy and economic growth in Pakistan: Time Series Empirical Investigation. *International Journal of Economics and Financial Issues*, Vol.1, No. 3, pp.133-138.

Johansen, S. and Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics*, Vol. 52, pp.169-210.

Kamaan, C, K. (2014). The effect of monetary policy on economic growth in Kenya. *International Journal of Business and Commerce*, Vol 3, No.8, (April).

Kareem, R. O., Afolabi, A. J., Raheem, K. A. and Bashir, N. O. (2013). Analysis of Fiscal and Monetary Policies on Economic Growth: Evidence from Nigerian Democracy. *Current Research Journal of Economic Theory*, Vol. 5, No. 1, pp. 11-19. (March),

Khabo, V. and Harmse, C. (2005). The impact of monetary policy on economic growth of a small open economy: the case of South Africa. *South African Journal of Economic and Management Sciences*, Vol. 8, No.3.

Khan, M. S. and Senhadji, A. S. (2001). Threshold effects in the relationship between inflation and growth. *IMF Staff Papers*, Vol 48, No.1, pp. 1–21.

Kohpaiboon, A. (2004). Foreign Trade Regime and FDI-Growth Nexus: A Case Study of Thailand. *Australian National University Working paper*.

Lacker, M. J. (2014). Can Monetary Policy Affect Economic Growth? *Johns Hopkins Carey Business School*, Baltimore, Maryland (February).

Lashkary, M. and Kashani, H. B. (2011). The Impact of Monetary Variables on Economic Growth in Iran: A Monetarists' Approach. *World Applied Sciences Journal*, Vol. 15, No. 3, pp. 449-456.

Levine, R. and Renelt, D. (1992). A Sensitivity Analysis of Cross-Country Growth Regressions. *American Economic Review*, Vol. 82, No. 4, pp. 942-63.

Lucas, R. E. (2003). Macroeconomic Priorities. *American Economic Review*, Vol. 93(1), pp. 1-14.

Maehle, N., Teferra, H. and Khachatryan, A., (2013). Exchange Rate Liberalization in Selected Sub-Saharan African Countries -Successes, Failures, and Lessons. *IMF working paper*, 32

Malik, G. and Chowdhury. A. (2001). Inflation and Economic Growth: Evidence from Four South Asian Countries. *Asia-Pacific Development Journal*, Vol, 8 (1), 123-133.

Mankiw, G.N. and Taylor, M.P. (2007). *Macroeconomics*. (European Edition ed.) Basingstoke: Palgrave Macmillan.

Mankiw, N. G. (2010). *Macroeconomics*. 7th Edition, New York, Worth Publishers.

Mansouri B. (2005). The Interactive Impact of FDI and Trade Openness on Economic Growth: Evidence from Morocco, *Paper presented at the 12th Economic Research Forum (ERF) Conference*, Cairo.

Maturu, B., Maana, I. and Kisinguh, K. (2010). Monetary policy transmission mechanism in Kenya: a VAR Approach. *Central Bank of Kenya working paper*. Available at:

Mccallum, J. (1991). Credit rationing and the monetary transmission mechanism, *American Economic Review*, Vol. 81, No. 4, pp. 946-951. .American Economic Association.

McCandless, G. T. and Weber, W. E. (1995). Some Monetary Facts. *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol. 19, No. 3, pp. 2-11.

Mester, L. J. (2015). Long-Run Economic Growth. New York University Stern *Center for Global Economy and Business*, New York, October.

Mishra, P., Montiel, P. and Spilimbergo, A. (2010). Monetary Transmission in Low Income Countries. *IMF Working Paper* , No. 223 (Washington, DC: International Monetary Fund).

Monteil, P., Adam, C., and O'Connell, S. (2012), Financial architecture and the monetary transmission mechanism in Tanzania. *CSAE Working Paper*, No 03.

Mugume, A. (2011). Monetary transmission mechanisms in Uganda. *Bank of Uganda Working paper*. Available at: <http://www.bou.or.ug/bou/home.html>

Mutoti N. (2006). Monetary Policy Transmission in Zambia. *Bank of Zambia Working Paper*, No. 2006, Lusaka.

Ndulu, B. (1987), “Structural Adjustment Policies and Programmes, case study Tanzania, *World Institute for development economics research for the united nations university*

Nogueira, R. P. (2009). Is monetary policy really neutral in the long-run? Evidence for some emerging and developed economies. *Economics Bulletin*, Vol 29, No. 3, pp. 2432- 2437.

Nyerere, J, K. (1977). The Arusha Declaration, Ten years after. Available at: <http://www.tzonline.org/pdf/thearushadeclarationtenyearsafter.pdf>

Ogunmuyiwa, M. S. and Ekone, A. F. (2010). Money supply –economic growth nexus in Nigeria. *Journal of Social Sciences*, Vol. 22, No. 3, pp. 199 – 204.

Onyeiwu, C. (2012). Monetary policy and economic growth of Nigeria. *Journal of Economics and Sustainable Development*, Vol.3, pp. 7.

Papademos, L. (2003). Economic Cycles and Monetary Policy: paper presented at the International Symposium of the Banque de France, *Monetary Policy, Economic Cycle and Financial Dynamics*, Paris, March.

Pesaran, M. H., Shin, Y. and Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships, *Journal of Applied Econometrics*, Vol. 16, No. 3, pp. 289–326.

Phillips, P. C. B. and Perron, P. (1988). Testing for a Unit Root in Time Series Regression. *Biometrika*, Vol. 75, pp. 335-446.

Pollin, R. and Zhu, A. (2006). Inflation and economic growth: A cross-country nonlinear analysis. *Journal of Post Keynesian Economics*, Vol. 28 , No. 4, pp. 593-614.

Rodrik, D. (2008). The Real Exchange Rate and Economic Growth. *Brookings Papers on Economic Activity*. Brookings Institute Press.

Nord, R., Sobolev, Y., Dunn, D., Hajdenberg, A., Hobdari, N., Maziad, S. and Roudet, S. (2009), Tanzania: The Story of an African Transition, *International Monetary Fund*, Washington, DC.

Sakyi, D. (2011). Trade openness, foreign aid and economic growth in post-liberalization Ghana: An application of ARDL Bounds Test. *Journal of Economics and International Finance*, Vol. 3, No. 3, pp. 146-156.

Senbet, D. (2011). The relative impact of fiscal versus monetary actions on output: VAR approach. *Business and Economics Journal*, pp. 1-11.

Smith, C. (2004). The long-run effects of monetary policy on output growth. *Reserve Bank of New Zealand Bulletin*, Vol. 67, No. 3.

Vinayagathan, T. (2013). Monetary policy and the real economy: A Structural VAR Approach for Sri Lanka. *National Graduate Institute for Policy Studies*, Vol.13, No.13.

Weeks, J. (2010). Why Monetary Policy Is Irrelevant in Africa South of the Sahara. *Centre for Development Policy and Research, SOAS*, No. 53, June.

White, W.R. 2013. Is monetary policy a science? The interaction of theory and practice over the last 50 years. *Globalization and Monetary Policy Institute working paper*, No.155. Federal Reserve Bank of Dallas.

World Bank. (2015). World Development Indicators 2015.



Yilmazkuday, H. (2013). Inflation thresholds and growth. *International Economic Journal*, Vol. 27, No. 1, pp. 1-10.