

Twinoburyo, Enock Nyorekwa; Odhiambo, Nicholas M.

## Article

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# Can Monetary Policy drive economic growth? Empirical evidence from Tanzania

Enock Nyorekwa Twinoburyo<sup>1</sup>, Nicholas M Odhiambo<sup>1</sup>

## 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. To our knowledge, this study may be the first of its kind to examine in detail this nexus in Tanzania. The study uses two proxies of monetary policy, namely, money supply and interest rate, to examine this linkage. The empirical results of this study reveal no impact of monetary policy on economic growth in the long term – irrespective of the proxy used to measure monetary policy. However, the short-term results 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. The study findings suggest that monetary policy may not be a panacea for economic growth in Tanzania.

**KEY WORDS:** Monetary policy, economic growth, interest rate, money supply

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

<sup>1</sup> University of South Africa, South Africa

## 1. Introduction

Economic growth is traditionally believed to be driven by a wide range of factors, mainly by primary factors such as capital accumulation, growth in labor participation, advancement of knowledge, and technological progress (see, among others, Anyanwu, 2014; Barro & Sala-i-Martin, 1995; Levine & Renelt, 1992; Mankiw & Taylor, 2007). However, the primary factors are believed to be affected by other factors, including the policy environment (Smith, 2004). Economic growth is also largely attributed to real shocks that are linked

to technological progress and cannot be effectively offset by monetary policy (Lucas, 2003). This postulation is supported by empirical evidence suggesting that monetary policy has a limited role in driving economic growth, particularly in the long term (Arestis, 2007; Asongu, 2014; Fontana & Palacio-Vera, 2007). The results of the both theoretical and empirical literature on the role of monetary policy instruments in stimulating economic growth are not universally generalizable and remain variant, inconsistent, and inconclusive (see, among others, Amarasekara, 2009; Dele, 2007; White, 2013).

The notion of monetary policy promoting economic growth by maintaining price stability has garnered increasing theoretical and empirical consensus particularly in the short term (Fontana & Palacio-Vera, 2007;

Correspondence concerning this article should be addressed to: **Enock Nyorekwa Twinoburyo**, University of South Africa - Department of Economics, P.O Box 392, Pretoria 0003, Pretoria, South Africa. E-mail: [etwinon@gmail.com](mailto:etwinon@gmail.com)

Mester, 2015). This view is also enshrined in the Bank of Tanzania Act, 1966. In recent practice, a growing number of central banks have focused on inflation targeting to indirectly spur higher growth rates (Heintz & Ndikumana, 2010). While the literature on the linkage between monetary policy and economic growth through the promotion of price stability is wide ranging, empirical research questions continue to abound (Lacker, 2014; Papademos, 2003).

On the one hand, monetary policy yielding low and stable inflation is believed to spur economic growth, mainly in the short term (Fontana & Palacio-Vera, 2007; Papademos, 2003; 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 term (see, among others, Barro, 1997; Fischer, 1993; Hossain, 2014). On the other hand, some empirical studies discount the negative relationship between inflation and economic growth (Levine & Renelt, 1992; McCandless & Weber, 1995). Monetary policy actions driving steady and stable inflation tend to have a depressing effect on economic growth, resulting in a sacrifice ratio (Dornbusch, Fischer & Startz, 2012; Mankiw, 2010). Broadly, countercyclical monetary policy can be counterproductive.

Uncertainty about the effect of monetary policy on economic growth, particularly in developing economies, continues to prevail (Berg, Charry, Portillo & Vlcek, 2013; Papademos, 2003). Some studies suggest that a monetary policy impetus to spur growth is likely to be inflationary, 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 & Billmeier, 2007; Mishra, Montiel & Spilimbergo, 2010; Monteil, Adam & O'Connell, 2012). In addition, some studies confirm a weakening relationship between money supply and policy objectives (International Monetary Fund [IMF], 2014; White, 2013). In some instances, the appropriateness and relevance of monetary policy has been questioned, particularly for some developing countries with large informal sectors, a poorly inte-

grated financial sector, and low financial development and where the fiscal policy plays the dominant role in the economy (Weeks, 2010).

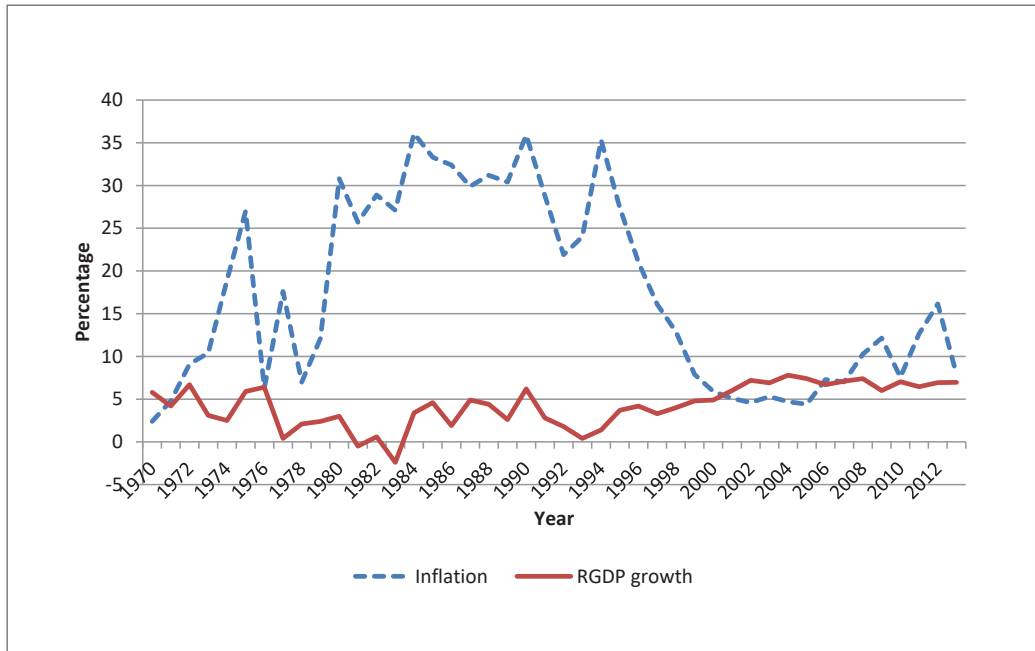
Against this backdrop, the aim of this paper is to empirically investigate what monetary policy can or cannot do in relation to driving economic growth in Tanzania, in both the short and long terms – a subject that has received very limited attention in scholarly work on Tanzania. The article adopts 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 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, Shin & Smith (2001) in an attempt to establish the effect of monetary policy on economic growth in Tanzania. The rest of the paper is organized 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

The Bank of Tanzania (BoT) was set up in June 1966, becoming a cornerstone for monetary policy reform in Tanzania (Bank of 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 and in part explained by macro-economic stabilization and economic reforms that commenced in the late 1980s (BoT, 2011; Ndulu, 1987).

The current economic structure remains consistent with the characteristics of low-income countries, characterized by high dependency on the primary sectors of agriculture and mining. The economy is largely service-sector driven – accounting for 43.5% of GDP



**Figure 1.** Inflation and economic growth performance (1970–2013)

Source: Adapted from "Publications and Statistics" by Bank of Tanzania (2014). Available at <https://www.bot.go.tz/Publications/PublicationsAndStatistics.asp#Statistics>

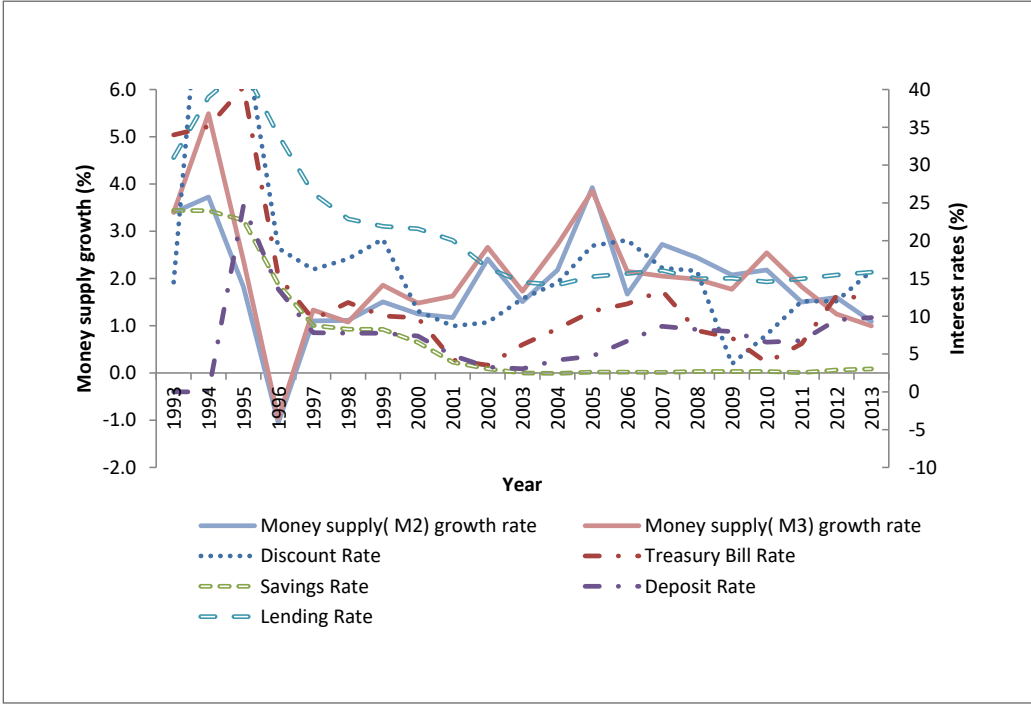
in 2014 – but also remains largely rural-based, with a rural population of 70%. Trade volumes as a share of GDP remain low at 49.4% of GDP in 2014 (World Bank, 2015).

In 1967, the Arusha Declaration was put in place, putting emphasis on state ownership, nationalization of foreign-owned enterprises, and 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, characterized 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 realization until the 1990s. Socioeconomic policies characterized by sizeable government

controls and domestic borrowing prevailed until 1986, when an economic recovery program aimed at market-driven economic reforms through gradual deregulation of segments of the economy was adopted (Maehle, Teferra & Khachatryan, 2013; Ndulu, 1987). 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.

In 1986, Tanzania adopted the IMF- and World Bank-led economic recovery program, eventually guiding the actual transitioning from directly controlled monetary policy to indirect (market-driven) monetary



**Figure 2.** Monetary growth and interest rate structure (1993-2013)  
Source: Adapted from “Publications and Statistics” by Bank of Tanzania (2014). Available at <https://www.bot.go.tz/Publications/PublicationsAndStatistics.asp#Statistics>

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 liberalization of the banking sector in 1991, the eventual change of the exchange rate to a free floating regime in 1996, and the introduction of government securities (Treasury bills and bonds) in the 1990s and longer-term bonds of five, seven and ten years in 2002 (BoT, 2011; Nord et al., 2009). 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 liberalized its capital account of the balance of payments, allowing only transactions to East African Community (EAC) residents, while it committed to extending the liberal-

ization to the rest of the world (IMF, 2016). However, Tanzania 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 encouraging 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 characterized by relatively high rates and spreads.

3. Empirical Literature Review

Buigut (2009), using recursive vector autoregression (VAR) on annual data from 1984 to 2005, examined monetary transmission mechanisms in Uganda, Kenya,

and Tanzania. The results 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, Dixit & Pinter (2013), who applied a structural VAR, Bayesian VAR, and factor-augmented VAR to monthly data from 2000 to 2010 for all 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 more forward-looking monetary policy frameworks are in place.

The limited literature that exists on Tanzania confirms no role of monetary policy in boosting economic growth (Berg *et al.*, 2013). 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. Additionally, 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) applied ordinary least squares (OLS) methodology to 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.

Additionally, studies by Nouri and Samimi (2011) and Ogunmuyiwa and Ekone (2010) 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, Quadri & Ali (2011) and Senbet (2011), respectively for Pakistan and the United States of America. The findings are corroborated by the more recent studies of Onyeiwu (2012), Kareem, Afolabi, Raheem & Bashir (2013), Havi and Enu (2014).

Applying both recursive and non-recursive structural VAR to 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 and 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 (Anyanwu, 2014; Levine & Renelt, 1992; Mansouri, 2005). 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 the 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.

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

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 (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 (Christiano, Eichenbaum, & Evans, 1999; Ivrendi & Yildirim, 2013). Expansionary monetary policy (increase in money supply or 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 (Fosu & Magnus, 2006; Havi & Enu, 2014; Kohpaiboon, 2003). 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 (Fosu & Magnus, 2006; Sakyi, 2011).

Low and stable inflation is believed to create a favorable environment for economic growth, while volatile and high inflation (beyond a threshold level) deters economic growth (Khan & Senhadji, 2001; Pollin & Zhu, 2006; Yilmazkuday, 2013). 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 & Pancaro, 2010; Rodrik, 2008).

#### 4.2 Estimation Methodology

To investigate the long-term and short-term relationships 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 co-integrated. In addition, this technique is suitable for small or finite sample size and provides unbiased estimates of the long-term model even when there is endogeneity in some of the explanatory variables (see Harris & 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 to test for the existence of a long-term relationship among the relevant variables. An F-test for the joint significance of the lagged levels of the variables is performed to test the null hypothesis of no long-term relationship among the variables in the equation. If the F-statistic is above the upper critical value, the null hypothesis of no long-term 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-term and short-term coefficients once the long-term relationship or cointegration has been established. The optimal order of the variables is obtained using the Schwarz-Bayesian criterion (SBC) or the Akaike information criterion (AIC).



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

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

where  $\Delta$  denotes the first difference operator;  $\delta_0$  is the drift component;  $n$  is the lag length;  $\vartheta_t$  is the white noise residuals;  $\delta_{1i}$ - $\delta_{7i}$  are the coefficients of short-term dynamics; and  $\alpha_1$ - $\alpha_6$  represent the long-term relationship. The variables are as defined in equation 1. All variables except interest rates are expressed in natural logarithm.

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

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

where ECM is the error correction term, which captures the correction of the long-term 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.

#### 4.2.1 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 the Bank of Tanzania.

The nominal exchange rate obtained from the Bank of Tanzania is multiplied by the ratio of the US CPI

to the domestic CPI to obtain the real exchange rate. Nominal values of M2, inflation rate, nominal Treasury bill rate for Tanzania (1993 to 2013), and export and import values were sourced from the 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).

### 4.3 Empirical Analysis

#### 4.3.1 Unit root tests

Owing to the weaknesses of the traditional augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979), particularly for small samples, this paper adopts the Dickey-Fuller - generalized least squares (DF-GLS) de-trending test proposed by Elliot, Rothenberg & Stock (1996). In addition, the Phillips-Perron (PP) unit root test 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 DF-GLS and the Phillips-Perron unit root tests presented in Table 1 include the constant and trend for the trend stationary variables and only the constant for the difference stationary variables. Both 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  $I(1)$ .

#### 4.3.2 ARDL-Bounds Testing Approach

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

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-term relationship among themselves. Following the confirmation of the existence of a long-term relationship between the variables in the model, the long-term and short-term models were derived using SBC due to the superior results relative to the AIC. The selected



Table 1. Stationarity (unit root) tests

Variable	Dickey-Fuller Generalized 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
RGDP	-	-1.653	-	-4.343***	-	-1.955	-	-4.642***
RM2	-	-2.591	-	-3.995**	-	-1.311	-	-4.218**
IR	-2.140**	-	-	-	-2.674*	-	-	-
RK	-	-2.174	-	-4.148***	-	-1.626	-	-4.423***
REXC	-1.303	-	-5.132***	-	-1.573	-	-5.083***	-
TO	-1.497	-	-4.337***	-	-1.964	-	-4.783***	-
INF	-	-1.065	-	-3.194**	-	-0.223	-	-3.571**

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

Table 2. ARDL bounds test results

Dependent Variable	Function				F-test Statistics	
LRGDP	F(RGDP RM2,IR,RK,REXC,TOP,INF)				4.63***	
Asymptotic Critical Values						
Pesaran <i>et al.</i> (2001), p.300. Table CI(III)	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

ARDL model, based on the SBC criteria, is an ARDL model (1, 0, 1, 0, 2, 1, 2).

The long-term 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-term monetary policy neutrality. The long-term neutrality of monetary policy is backed by a wide range of empirical findings (see, among others, Bullard, 1999; Nogueira, 2009; Monteil *et al.* 2012). The coefficient of

capital is positive in the long term, consistent with the previous studies of Havi and Enu (2014) and Fosu and Magnus (2006). Additionally, the long-term effect of inflation is found to be positive, which is contrary to the *a priori* expectation of a negative sign. The long-term 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-term effect of the interest rate monetary policy variable is insignifi-

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

<b>Panel A: Long-term 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-term 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

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

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

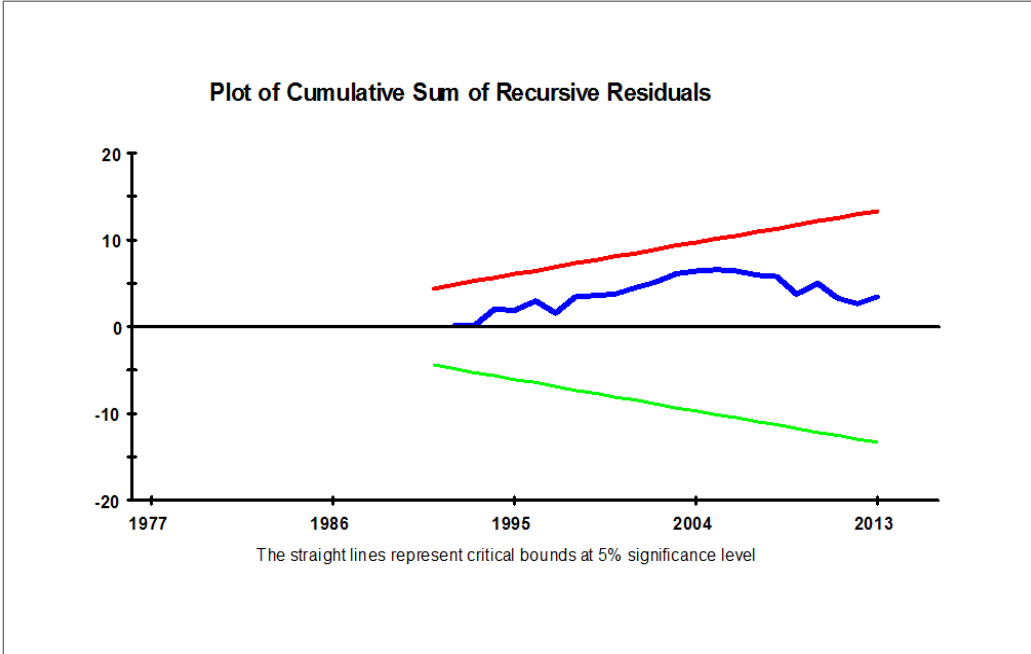


Figure 3. CUSUM

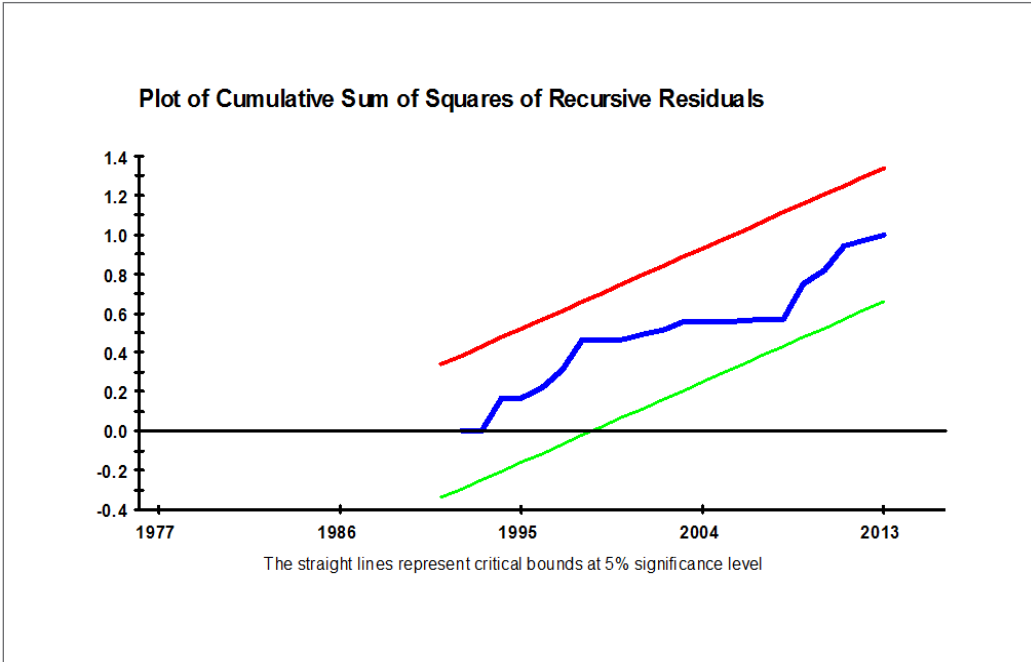


Figure 4. CUSUMQ

cant, while the coefficient of money supply is found to be negative and statistically significant, contrary to *a priori* expectation. While the short-term money supply's negative effect on economic growth was unexpected, a few studies have similar findings (Jawaid et al., 2011).

Additionally, in the short term, the coefficient of capital, real exchange rate and its lag are found to be positive and statistically significant. Unlike the long-term 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 the 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 approximately 3 years and 4 months at a rate of approximately 30.1% per annum.

The regression for the underlying ARDL model fits well, as indicated by an R-squared of 91.1%. 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 the 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 confirming the stability of the long-term coefficients of the regressors.

## 5. 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, in both the short and long terms, a subject that has received very limited attention in scholarly work on Tanzania. Unlike the 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-term monetary policy neutrality – irrespectively of whether money supply or interest rate is used as a proxy for monetary policy. The short-term results, on the other hand, confirm the neutrality of monetary policy only when interest rate is used as a proxy for monetary policy. When money supply is used as a 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 term, discounting the conventional notion that monetary policy by attaining price stability would spur economic growth. The study findings also suggest that monetary policy may not be a panacea for economic growth in Tanzania. Overall, the results of the impact of monetary policy on economic growth in Tanzania may be explained by the nature of the financial structure, characterized by a low level of development, the banking sector dominance of the financial sector and the oligopolistic nature of the banking industry. Furthermore, investment is found to have a positive impact on economic growth both in the short term and in the long term. Therefore, the study recommends that measures to further promote both public and private investments should be put in place to stimulate economic growth.

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