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Monetary vs. Fiscal Policy: An Empirical Investigation in Tanzania, 1966–2013

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Abstract

This study examines the relative importance of fiscal and monetary policy on economic growth in Tanzania by using quarterly time series data for the period 1966: I to 2013: IV. The hypotheses tested are that fiscal rather than monetary policy tools exert a relatively stronger and larger influence on economic activity; and the impact of fiscal policy is more predictable than that of monetary policy. The analysis was based on the original and a modified St. Louis equation in the form of a Distributed Lag Model estimated by using the Restricted Vector Autoregressive (VAR) model and Autoregressive Distributed Lag (ARDL) technique. The study finds that monetary policy tools, measured by money supply, had a relatively stronger, larger and predictable impact on economic growth than fiscal policy, measured by government expenditure. Also, the shocks associated with changes in money supply were larger than the shocks due to changes in fiscal policy. However, over the short-run the shock due to changes in fiscal policy on economic activity was larger; and that of monetary policy was larger over the long-run. The estimation results suggest that the modified St. Louis equation was more superior to its original form. The results suggest the relative dominance of monetary over fiscal policy, implying that stabilization policy can be successfully pursued by the former rather than the latter policy. However, either of the policy should not be used exclusively because even fiscal policy is found to have an effect on growth, at least over the short-run period.

Keywords: *fiscal dominance, monetary policy, economic growth, autoregressive distributed lag model.*

JEL Classification: *E31, E37*

1. Introduction

The attainment of high and sustained rate of economic growth and price stability are two main objectives of the macroeconomic policy in Tanzania. Accordingly, the prime objective of monetary policy programming and implementation by the central bank has been to formulate, define and implement monetary policy directed to the maintenance of price stability conducive to the attainment of balanced and sustainable rate of economic growth (Bank of Tanzania Act, 2006). In relation to this, has been the formulation of prudent fiscal policy actions pertaining to revenue collection, expenditure and debt so as to avert inflation or economic deflation. In practice, the formulation and implementation of monetary and fiscal policy actions have been complementary and jointly pursued by the Bank of Tanzania (BoT) and the Ministry of Finance (MoF) to achieve targeted macroeconomic goals of the country.

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The purpose of this paper is to investigate empirically the relative impact of fiscal and monetary policies on economic growth in Tanzania. Specifically, it seeks to determine whether government expenditure exerts a relatively larger influence on economic growth than changes in money supply. Further, the paper carries an analysis of the predictability of fiscal policy action relative to monetary policy actions. The findings fill a gap in the existing literature on the relative importance of fiscal and monetary policies in Tanzania; and the study findings may also provide a better understanding of the relative importance of monetary and fiscal policies in Tanzania.

The paper is organized as follows. Following this introduction, section two gives a brief overview of fiscal policies, monetary policies and economic growth. Section three presents a survey of the relevant theoretical and empirical literature. Section four carries the methodology of the study. Section five presents and interprets the empirical results, while section six concludes the paper.

2. Fiscal and Monetary Policy in Tanzania: An Overview

Monetary policy in Tanzania, which is a developing country in sub-Sahara Africa (SSA), is formulated and implemented by the BoT, which was established in 1965 and became operational in June 1966. By its Charter of 1965, the BoT was empowered to achieve price stability through the use of conventional indirect instruments of monetary policy. In 1971 the use of indirect monetary policy instruments was replaced by what Honohan and O'Connel (1997) refer to as a 'rationing regime' that followed the amendment of the BoT Act of 1965, which instituted the Annual Finance and Credit Plan (AFCP) and the Foreign Exchange Plan (FEP) to serve as direct instruments of monetary policy in the country. The AFCP was ostensibly used in the allocation (set ceilings) and direction of credit to the preferred sectors at set interest rates charged by specialized development finance institutions that were established by the government. Similarly, the FEP catered for the rationing of foreign exchange to the prioritized sectors of the economy at fixed rates. To ensure the availability of credit to the preferred sectors, the amendment of the BoT Act in 1978 added developmental functions on the regulatory role of the BoT defined in its 1965 Act. Among others, the amendment bestowed on the BoT the role of providing refinance facility and guaranteeing lending by banks and other financial intermediaries to firms in the designated sector of the economy (BoT, 2011a).

In effect, the use of the AFCP precluded the use of indirect instruments of monetary policy (BoT, 2011). In this regard, the BoT lost control over its traditional functions, more importantly, the formulation and deployment of indirect instruments of monetary policy desirable to the attainment of macroeconomic stability (BoT, 2011). Instead, the developmental role bestowed on BoT rendered it synonymous to an apex development finance institution (DFI), or a government department that guaranteed a soft budget constraint to borrowing DFIs for on-lending to designated service and productive sectors at concessionary interest rates so as to provide for attainment of the goals of socialism and self-reliance (Skoog, 2000; Kweka & Morrisey, 2000; Bagachwa, 1996; Ndanshau, 1995). The direct control of the financial system by the

government led to the development of a weak financial system based on public sector banks that mostly lent cheap credit to the so-called preferred public enterprises (PEs) in key sectors of the economy; and served the monetization of government fiscal budget deficits. The soft budget constraint enjoyed by PEs and the government translated to the expansion in domestic credit that led to rapid growth in money supply (Nyasebwa & Ndanshau, 2012; Kilindo, 1997; Ndanshau, 1982). As Kilindo (1997) and Ndanshau (1982) note, during the period 1967-1986, the actual annual rates of money supply exceeded the planned rates set in the AFCP.

The predominance of fiscal rather than monetary policy tools in macroeconomic management apparently became eroded after the government launched financial sector reforms that climaxed to the enactment of the BoT Act 1995, which was later repealed by the BoT Act of 2006. The BoT charter of July 1995, among others, emphasized macroeconomic management based on the use of indirect rather than direct monetary policy instruments to achieve only one objective: price stability.[1] Thus, the BoT (2011: viii-ix) explicitly notes: "The enactment of the Bank of Tanzania Act of 1995 provided the Bank with the requisite autonomy important for an effective discharge of its core role of maintaining price stability in the economy, mainly through the use of market-based policy instruments."

Also notable, the freeing of the government from direct control of monetary policy and the ownership and control of financial institutions provided for the existence in the country of what approximates what Honohan and O'Connel (1997) refers to as "pure market clearing monetary policy regime," considered as the most powerful strategy to the attainment of macroeconomic stability with growth. Honohan and O'Connel (1997) also informs that the shift to pure market clearing monetary policy regime was considered necessary for the suppression of significant fiscal impact on monetary affairs, and for the latter to provide a "… stable price and exchange rate environment (that would serve) as a platform for sound evolution of financial intermediation and, more generally, for trade and investment" (ibid: 16).

Fiscal policy in Tanzania has long been relied upon by the government to realize development aspirations, especially since the promulgation of the Arusha Declaration in 1967. In this regard, between the mid-1960s through the early 1980s, the government used more of a discretionary fiscal policy to promote investment and economic activities in the country. As a result, during the early 1970s government expenditure grew by an average of 12 percent per annum, and real GDP growth averaged 5 percent per annum. Furthermore, the share of government expenditure in the GDP rose from 21.6 percent in 1970 to 31.5 percent in 1975. Notable, during the same period the real rate of GDP growth increased by 0.1 percent from 5.6 percent to 5.7 percent (Fig. 1).

[1]The macroeconomic management by the BoT since 1995 was based on monetary targeting framework and use of indirect instruments, including open market operation (OMO), repurchase agreements (REPOs), discount window, Lombard facility, statutory minimum reserve (SMR) requirement, and moral suasion (Bank of Tanzania, 2011, p. 3).

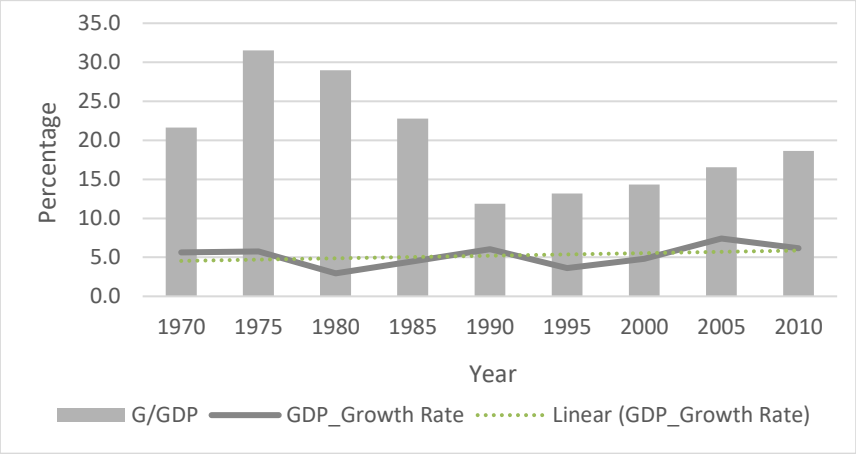

Figure 1: ***Government Expenditure to GDP and GDP Growth Rate, 1970–2010 (%)***

It should be noted that the ratio of government expenditure to GDP was higher before the launch of economic reforms in 1986. However, the increase in government size was not accompanied by major gains in economic growth, which plummeted to negative rates in the early 1980s. Fig. 1 shows that since 1990 the ratio of government expenditure to the GDP rose to a maximum of about 18.6 percent in 2010. However, the increase in the size of the government appears to have lacked a strong positive impact on real economic growth during the period.

Fig. 1 portrays a mixed pattern between government expenditure and the growth rate of real GDP. The share of government expenditure in the national income (GDP) was higher prior to the launch of economic reforms in mid-1986. The higher government expenditure (G) to the GDP ratio was not accompanied by high rates of economic growth during the period. Apparently, the rate of economic growth largely decreased as the ratio of government expenditure to the GDP increased. Seemingly, a decrease in the share of government expenditure in GDP—occasioned by the implementation of economic reform programmes since the early 1980s—appear to have impacted positively on economic growth: the real rate of economic growth rose since 1980. Notable, the increase in government expenditure since 1990 was accompanied by a rise in the rate of economic growth only to slack off after 2005, probably due to external shocks, for example, the global financial crisis of 2008 that could have worked against the would-be positive effect of government expenditure on growth (Fig. 1). Apparently, therefore, the effect of fiscal action and its relative importance over monetary policy actions in explaining economic growth in Tanzania is not explicit.

This paper empirically investigates how the economy in Tanzania responded to the shift in policy regime from concessionary fiscal policy to indirect monetary policy. It also investigates and analyses the relative effect of fiscal and monetary policy instrument on economic activity over the sample period.

3. Literature Review

3.2 Review of Theoretical Literature

In classical macroeconomic theories, at least before the Great Depression of 1929, economies were presumed to always be and operate at full employment level of output and prices. Following Jean-Baptiste Say's (1767-1832) law that supply creates its own demand, classical economists emphasized the existence of full employment equilibrium that render economic stabilization unnecessary by either discretionary fiscal and/or monetary policy actions.

In contrast to the classical view, Keynesianism—championed by John Maynard Keynes (1936)—refuted the classical theory by maintaining that general unemployment was logically a possible outcome in an economy. In this regard, Keynesian economists—elsewhere referred to as structuralists—maintained for the need of either or both discretionary fiscal and monetary policy actions to promote economic activity and employment, or to purely stabilize the economy over the short-run period (Vladimir & Neichera, 2008). In the Keynesian context, discretionary fiscal policy actions—including increase (decrease) in government spending and transfers, coupled with decrease (increase) in taxation—would necessarily increase aggregate demand, a prerequisite for increase in investment whose multiplier effect would impact positively on economic activity and employment in an economy. Keynesians also maintained that discretionary monetary policy actions, including change in interest rates or money supply, would necessarily but not strongly help stabilize an economy over the short-run period.

In contrast to Keynesians, monetarists—a school of thought that believed that money supply plays a key role on nominal income—maintained the classical stance of self-regulating economy. Unlike Keynesians, monetarists maintained that discretionary fiscal actions were not necessary and, at best, would undermine economic activity by crowding out private investment. Nevertheless, they maintained the superiority of rule-based monetary policy actions over discretionary fiscal policy in the process of economic growth and development.

3.2 Review of Empirical Literature

Literature is replete with several empirical studies on the relative importance of fiscal and monetary policies in and outside developing countries. The pioneer study on the USA by Friedman and Meiselman (1963) established that consumption was more strongly correlated with monetary than fiscal policy variables in the country during the period 1897-1958, except during the early years of the Great Depression (Ando & Modigliani, 1965). First, these findings were criticized on methodological grounds by Ando and Modigliani (ibid.); a development that led to the so-called AM-FM debate, i.e., a stereo debate between Ando and Modigliani (AM) on the one hand, and Friedman and Meiselman (FM), on the other).[2] Second, a study by Andersen and

[2] The debate that raged on in the USA in the 1960s through the 1970s was between two opposing camps, AM tuned Keynesians with fiscal policy FRB-MIT model, on the one hand, and FM tuned monetarists with monetary policy tuned St. Louis equation. For a detailed review of the debate, among others, see Andersen (1973), Kretzmer (1992), Batten and Thornton (1986), and Gurley (1972).

Jordan (1968), which used quarter-to-quarter data to estimate a reduced form equation referred to in the literature as the St. Louis model, found monetary actions in the USA more important than fiscal actions as established by Friedman and Meiselman (1963).

Subsequent studies on the USA that were based on the original St. Louis equation, (e.g., Senbet, 2011; Brunean & De Bandt, 2003; Snyder & Bruce, 2002; Sawyer, 2000; Sawyer, 2000; Kretzmer, 1992; Hafer, 1982; Nitsch, 1972; Keran. 1969) also established that monetary actions were more superior over fiscal actions. Similar studies on other economically developed countries also generated empirical evidence in support of monetarists. These include works by Keran (1970) in a study that covered eight countries (Belgium, Canada, France, Germany, Japan, and the UK); Batten and Hafer (1983) in a study on the USA and other five developed countries that included Canada, France, Germany, Japan, and the UK; Dewald and Marchon (1978) in a study on Canada, France, Germany, Italy and the UK; and Melitz (2000) in a study that covered countries in the European Union (EU), excluding Luxemburg, and five other Organization for Economic Cooperation and Development (OECD) countries.

Some studies on the USA that were based on the original St. Louis equation established that fiscal actions were more important in influencing economic activity rather than monetary actions (e.g., Andersen & Jordan, 1986; Friedman, 1977; de Leeuw & Kalchbrenner, 1969). The superiority of fiscal policy in explaining economic activity in Denmark, Finland, Norway, and the USA also emerged from studies based on the econometric model of the US economy developed by the Federal Reserve Bank (FRB) and the Massachusetts Institute of Technology (MIT); referred to as the FRB-MIT model (see, e.g., Raj & Siklos, 1986; Modigliani & Ando, 1976; and Teigen, 1975). However, a study on Sweden by Lybeck and Teigen (1975) found the influence of monetary actions on economic activity more important, both over the short- and long-run.

In developing countries, some studies on Asian countries—among others, Bangladesh, India, South Korea, Malaysia, Pakistan, and Thailand—carry mixed results on the relative effectiveness of fiscal and monetary policy actions. Some of the studies that used a modified version of the St. Louis equation—estimated by the ordinary least square method (OLS)—found that the effect of monetary actions on economic activity were stronger than those of fiscal actions. However, the opposite was established by other studies (Chowdhury, 1986a; Choudhury, 1986b; Jawaid et al., 2010; Hussain, 1992; Fatima & Iqbal, 2003).[3] A comparative study on the relative effectiveness of fiscal and monetary actions in Latin American countries—including, Brazil, Chile, Mexico, Peru and Venezuela—found fiscal policy actions to be important determinants of economic growth in all the five countries (Darrat, 1984). In the South Pacific Island countries—among others, Fiji, Tonga and Vanuatu—studies established that fiscal actions, rather than monetary

[3]For more details see the review in Rakić and Radenović (2013).

actions, had a relatively stronger impact on economic growth (Dahalan & Jayaraman, 2006; Jayaraman, 2001). However, fiscal policy actions were found to be stronger in Samoa (Jayaraman, 2001).

Literature, however, is replete with studies on the relative effectiveness of fiscal and monetary policy actions in explaining economic growth in the Sub-Sahara African (SSA) countries.[4] The seeming pioneer study is by Ajayi (1974) on Nigeria, which was based on the original St. Louis equation that was estimated by using the OLS method for the period 1960–1970. Ajayi (ibid.) found that the calculated beta coefficients of monetary actions variables that were alternatively measured by the money stock and high-powered money were larger and statistically significant in explaining economic activity than that of fiscal actions that were calculated from the estimated coefficients of either/or a combination of government expenditure, tax revenues and full employment budget deficit/surplus. Moreover, the size of the t-statistics of the monetary action variables was more reliable and predictable than fiscal actions in influencing economic activity in Nigeria during the sample period.

Subsequent studies on SSA countries estimated the original or a modified St. Louis equation by using either the OLS or modern econometrics approaches, more so the cointegration, error correction and vector autoregressive (VAR) models. Some few studies on Nigeria have found both fiscal and monetary policy actions to exert positive effect on economic growth (Ezeji & Michael, 2013; Owoye & Onafowora, 1994). Other studies in Nigeria and Kenya have found fiscal policy actions as more important than monetary policy actions (Olaloye & Ikhide, 1995; Cyrus & Elias, 2014; Owoye & Onafowora, 1994; Bynoe, 1994; Ubogu, 1985). There are also studies that found monetary policy actions to be stronger than fiscal policy actions in Ghana, Kenya, Nigeria and Sierra Leone (Adefeso & Mobolaji, 2010; Ajisafe & Folorunso, 2002; Bynoe, 1994; Ubogu, 1985; Nyamongo et al., n.d.).[5] While generally studies on the USA and other developed economies suggest that monetary actions exert a "… stronger, more predictable and faster impact" (Darrat, 1984: 271) on economic activity than do fiscal actions, evidence from developing countries is mixed: some studies have established a relatively stronger impact of monetary policy on economic activity; and others have established fiscal actions exert stronger impacts than monetary actions.

Generally, the debate on the relative effectiveness of fiscal and monetary policies is characterized by several features of interest. First, empirical studies so far have been characterized by estimation of either the original St. Louis equation or its modified version, whereby the variables have been cast in real growth rates (Batten & Hafer, 1983; Chowdhury, 1986b). Second, the measures of fiscal and monetary

[4]There exists in the literature several grey area studies on SSA countries not reviewed in here, mainly to save space. For a review of such studies, among others, see Rakić and Radenović (2013).

[5]The study covered Benin, Cameroon, Central African Republic, Chad, Egypt, Ethiopia, Ghana, Gabon, Nigeria, Republic of South Africa (RSA), Senegal, Somalia, Sudan, Tunisia, and Zaire (Democratic Republic of Congo).

actions are diverse. Third, some studies on LDCs included, in the estimated equations, proxy measures for structural/ institutional factors—e.g., exports as a measure of the degree of openness (Chowdhury, 1986b)—or excluded from analysis measures of monetary actions on the guise that they were not important. Fourth, while some studies used simple single equation models, others used either spectral analysis, VAR, or cointegration and error correction models (ECM). Fifth, the studies are country-specific and of varied sample periods. In view of the preceding factors, it is unlikely that the findings would be similar and easily comparable. Sixth, only few are studies on SSA. In Tanzania, in particular, there are even fewer studies that have specifically focused on the relative importance of monetary and fiscal actions in explaining economic growth (Kilindo, 1996; Mkupete, 2013). This study seeks to complement the previous studies in and outside Tanzania in two ways: (i) it uses a larger sample size; and (ii) it employs more frontier econometric methods to analyse the relative effectiveness of fiscal and monetary policy actions over regime changes in the history of the financial sector development and conduct of monetary policy by a central bank.

4. Methodology

4.1 The Estimation Model

A review of empirical literature suggests that the so-called St. Louis equation attracted empirical studies directed to investigate the relative importance of fiscal and monetary actions in and outside developing economies. Andersen and Jordan's (1968) original model, also referred to as A-J reduced form equation, reads:

$$\Delta Y_t = \alpha + \beta(L)\Delta M_t + \gamma(L)\Delta G_t + u_t \qquad (1)$$

where, following Andersen and Carlson (1986), Y is total nominal spending; M is nominal money stock; G is nominal government expenditure; Δ is a first difference operator; α is a constant that captures average autonomous and non-fiscal and monetary forces that affect economic activity; t is time in quarterly annual period, L is a lag operator, and u_t is a stochastic error term.

The testable null hypotheses in (1) in this study is that the response of economic activity to fiscal actions is stronger, more predictable, and faster than monetary policy actions (Andersen & Jordan, 1968: 11). Separately, the null hypotheses are that the positive effect of G on Y is stronger, more predictable, and faster than the positive effect of M on Y.[6]

Three important innovations have been made in the estimation of the original St. Louis equation. First, is its estimation in real rather than nominal variables, as in Choudhury (1986a). The main argument is that the effectiveness of either or both

[6]The relative strength of the fiscal and monetary policies was measured by *beta* coefficient defined as coefficient of independent variable multiplied by the standard deviation (SD) of the independent variable divided by the SD of the independent variable. The predictability was measured by the magnitude of the t-statistics; and the degree of fastness was based on the size and statistical significance of the coefficients of the lags.

fiscal and monetary policies should be measured in terms of their relative impact on real variables and not in prices as implicit in equation (1) (Senbet, 2011: 2). Second, according to Carlson (1978) and Andersen and Jordan (1968, 1986), the estimation of (1) in rates rather than in first difference gives better estimation results. On this and the preceding account, equation (1) is re-cast to read as:

$$\Delta y_t = \alpha + \beta(L)\Delta m_t + \gamma(L)\Delta g_t + u_t \qquad (2)$$

where y is real income, m is money stock, g is real government expenditure: all expressed in natural logarithm.

Equation (2) is almost similar to that estimated by, among others, Darrat (1984), Chowdhury (1986a) and Dahalan and Jayaraman (2006). The estimation of equation (2) controls biased parameter estimates and statistical inference from the heteroscedasticity problem in the original St. Louis equation noted by Carlson (1978); and established empirically by Seaks and Allen (1980). Following the A-J single equation model, the effect of real money stock growth (Δm) and real growth in government spending (Δg) on real economic growth (Δy) are positive.

Third, Senbet (2011) also notes that "… the impact of monetary or fiscal policy on prices and also issue of endogeneity between the economic and policy variables is not given any attention in equation (1)."[7] These criticisms are addressed by an estimation of a vector autoregressive (VAR) model that reads:

$$\Delta X_t = A_1\Delta X_{t-1} + \cdots + A_p\Delta X_{t-p} + B_1\Delta Z_t + e_t \qquad (3)$$

where ΔX_t is a vector of endogenous variables $(\Delta y, \Delta m, \Delta g)'$; Z_t is a vector of an exogenous variable, the exports (X) in particular; A_t and B are matrices of parameters for estimation; p is the order of the lag structure; t is time signature in quarterly period; and e_t is a vector of properly behaved error terms.

Notable, a study by Sims (1980) found the inclusion of interest rate in a VAR system of the form in (3) leads to "… significant implications for the role of money shocks in altering prices and output" (Choudhury, et al., 1986: 795). In this regard, the VAR system was modified to include exports (X) as a proxy measure of the degree of economic openness in Tanzania, as was done in some previous studies. The null hypothesis tested is that economic openness did not impact positively on economic activity in Tanzania during the sample period, and that the inclusion of economic openness in the St. Louis model does not improve the relative impact of fiscal or monetary policy actions on economic activity.

[7]The criticism was on reliability of the reduced form equation and failure of the model to account for the feedback effects of short run dynamics from endogeneity of the variables and policy effects. For details, see McCallum (1985), Ando and Modigliani (1965, 1976), Hester (1964), De Prano and Mayer (1965), Blinder and Goldfeld (1976), and Benjamin Friedman (1977). Nonetheless, the estimated VAR model attends to the simultaneity and missing variable biases (Chowdhury, 1986a)).

4.2 Measurement of Variables

The variables are measured as follows. As in the original A-J model, economic activity (Y) is measured first by nominal Gross Domestic Product (GDP) and real output (y), which is the nominal GDP deflated by the national Consumer Price Index (CPI). Like in the other studies that used the original St. Louis model, in this study monetary policy actions are basically measured using the narrow measure of money supply ($M1$) that sums currency in circulation (CC) and demand deposits (DD) of the non-bank public denominated in domestic currency. In addition, however, we test the relative superiority of $M1$ over the broad measure of money supply ($M2$) in serving as a measure of monetary policy actions in explaining output.[8] The use of $M2$, which sums the $M1$ and savings and time deposits of the commercial banks denominated in domestic currency, was prompted by the fact that it is a monetary aggregate that is used as an intermediate target of monetary policy. As in the original A-J model, fiscal policy actions were measured by nominal government expenditure on goods and services (G), and then real government expenditure (g).[9] The general price level (P) used to deflate the nominal variables is measured by the CPI, with a base year in 2001. No shift variable was used in estimation.

4.3 Data Type, Sources and Estimation Methods

This study uses quarterly time series data for the period 1966: I–2013: IV. The annual data on nominal GDP that was interpolated into quarterly data were obtained from the International Financial Statistics (IFS) published by the International Monetary Fund (IMF), and the annual data for government expenditure, which was also interpolated into quarterly data, was obtained from the quarterly and annual operation reports of the BoT. The quarterly time series data for money supply were also obtained from the quarterly and annual operation reports of the BoT. The variables of the estimation were expressed in their growth rates obtained by taking a first difference of the natural logarithm of the respective variables in level.

The variables in the estimation model were subjected to the unit root test for which the Augmented Dickey Fuller (ADF) was the preferred method. In addition, the Johansen (1991, 1995) procedure was used to test for the existence of a long-run equilibrium relationship between the variables in the estimation model. The model was estimated by an Autoregressive Distributed Lag (ARDL) technique, which is associated with Pesaran, Pesaran and Smith (1998). The technique was preferred because (i) it yields robust results even when variables exhibits unit root or fractional cointegration; and (ii) it yields results that are free from the bias caused by the simultaneity problem and endogeneity of variables of the estimation model (Pesaran & Shin, 1999; Pesaran, Pesaran, and Smith, 1998; Pesaran and Pesaran, 1997). The Akaike Information Criteria (AIC) was used to establish the optimal lag length of the ARDL model.

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[8]The $M2$ sums the $M1$ and savings and time deposits, that is, other deposits, of the commercial banks denominated in domestic currency.

[9]The deflation of the G by p targets to "… eliminate likely feedback of the latter to the former, a main cause of the feedback of inflation to budget deficits." For details see, among others, Aghevli and Khan (1978) and Nyasebwa and Ndanshau (2012).

5. Empirical Results

5.1 Unit Root Test Results

The estimation of the original St. Louis single equation model was not preconditioned on the stationarity of the variables. The ADF test was used to check for unit root and order of integration of the variables used to estimate the ARDL model. The ADF results, which have not been reported here for reasons of space, suggested all the variables, except exports, were first difference stationary. Notable, the estimation models used in the analysis were not sensitive to the existence or absence of a unit root problem because the variables used in the estimation were in their first difference and growth rate that are stationary in nature. It should be noted, however, that the ARDL models are sensitive to the order of integration; and may not be used where regressors are integrated of an order above one.

5.2 Results of the Original and the Modified St. Louis Equations

Equation 4 presents the ordinary OLS results for the original St. Louis equation (1) that was estimated by using first difference nominal variables with two (2) lags that were determined by the AIC. The estimated coefficient of determination ($\bar{R}^2$) is about 0.81, implying that the estimated St. Louis equation was powerful in that about 81 percent of the changes in economic activity is explained by changes in fiscal policy and/or monetary policy actions (equation (4)). The results show that only the two-period lagged change in fiscal action (ΔG_{-2}) exerted a significant positive effect on economic activity. Notable, the coefficient of ΔG_{-2} is statistically significant at the 1 percent test level. Also evident in equation (4), the coefficient of the two-period lagged measure of monetary actions ($\Delta M2_{-2}$) is also statistically significant at the 1 percent test level. The cumulative effects on economic activity of the changes in fiscal actions ($\sum_{i=0}^{2} \Delta G$) and monetary actions ($\sum_{i=0}^{2} \Delta M2$) are 1.203 and 3.235, respectively.

$$\begin{array}{lllll} \Delta NGDP = & \text{-}0.976\,\Delta M2 + & 0.778\,\Delta M2(\text{-}1) + & 3.434\,\Delta M2(\text{-}2) - & 0.974\,\Delta G \\ \text{(s.e)} & (0.632) & (0.783) & (0.646) & (0.402) \end{array}$$

$$\begin{array}{ll} + 0.234\,\Delta G(\text{-}1) + & 1.943\,\Delta G(\text{-}2) \\ (0.493) & (0.401) \end{array}$$

$$R\text{^}2 = 0.81 \qquad (4)$$

The results based on the original St Louis equation suggest that both monetary and fiscal policies had significant positive impact on economic activity. Nevertheless, the results suggest that over the long-run the effect of monetary policy actions on output was larger than that of the fiscal policy actions. The estimated size of the coefficients in monetary actions, as measured by changes in broad money, and their estimated t-statistics are larger than those on changes in fiscal actions, measured by government expenditure. This finding is consistent with that of, among others, Ajayi (1974), Hussain (1992) and Ajisafe and Folorunso (2002). Also, the finding suggests that the impact of monetary policy on economic activity in Tanzania was faster and more predictable than that from the fiscal policy. This conclusion is consistent with that made by Bynoe (1994) from a study of five African countries that included Ghana, Kenya, Nigeria, Sierra Leone and Tanzania, which found that monetary policy to be more important than fiscal policy.

Equation (5) presents results of the basic St. Louis equation that was modified by including exports (X) to measure the importance of economic openness in conditioning the relative effectiveness of fiscal and monetary policies in Tanzania.

$$\begin{aligned} \Delta NGDP &= 0.037\,\Delta M2 + 0.845\,\Delta M2(\text{-}1) + 2.634\,\Delta M2(\text{-}2) + 0.326\,\Delta G \\ \text{(s.e.)} \quad & (0.528) \quad (0.640) \quad (0.535)^{*} \quad (0.356) \\ &+ 0.323\,\Delta G(\text{-}1) + 1.620\,\Delta G(\text{-}2) - 0.901\,\Delta X - 0.309\,\Delta X(\text{-}1) + 0.002\,\Delta X(\text{-}2) \\ & (0.427) \quad (0.341)^{*} \quad (0.160)^{*} \quad (0.204) \quad (0.188) \\ \bar{R}^2 &= 0.87 \qquad (5) \end{aligned}$$

The results in equation (5) shows that the inclusion of exports in the original St. Louis equation improved the explanatory power of the original St. Louis equation: the $\bar{R}^2$ rose from about 0.81 to about 0.87 percent, and the standard error of the regression model decreased.

The results in equation (5) also show that the coefficient of both the two-period lagged monetary and fiscal variables decreased; but remained statistically significant at the 1 percent level of statistical significance. Apparently, the inclusion of exports left the long-run effects of fiscal and monetary policies on output unchanged. The cumulative effect of monetary policy is 3.516, as opposed to 3.235 obtained by using the original St Louis equation; while the effect of fiscal policy in the modified model is 1.617, as opposed to 1.203 obtained by using the original St. Louis equation. The results re-emphasize that monetary policy actions are important in explaining changes in economic activity during the period covered by the study. The findings are also inconsistent with those obtained by, among others, Choudhury (1986) in a study on Bangladesh that augmented the St Louis equation by using exports as a measure of openness; and also by Olaloye and Ikhide (1995) in the case of Nigeria.

5.3 ARDL Results of the Original and the Modified St. Louis Equations

The original St. Louis equation was estimated by the ARDL-bound approach with and without exports.[10] *A priori*, the results suggested the variables of the original St. Louis equation were cointegrated because the calculated F-Statistics (12.29) was greater than I(0) bound and I(1) bound at 1 percent level of significance.

Given the cointegration of the variables, the ARDL was used to estimate the original and modified St. Louis equations. The ARDL results based on the original St. Louis equation (6) shows that all the coefficients on the measures of fiscal and monetary policies have the expected signs, and are statistically significant at the conventional test level. This suggests that both fiscal and monetary actions exerted significant positive effects on economic activity. However. the results also show that the effect of the change in monetary policy actions on economic activity was relatively larger and more predictable than that of fiscal actions. Over the long-

[10]The bound test shows whether there exist, over the long run a relationship between a dependent variable and some independent variables. The long run relationship, that is cointegration of the variables, would exists only if the calculated F-statistics is greater than the upper (I0) and lower (I0) bound critical values.

run, only monetary policy actions had a significant positive impact on economic activity. The results suggest that a 10 percent growth in money supply accounted for 23 percent change in nominal output:

$$Cointeq = \Delta GDPN - (0.0390 * \Delta G + 0.2379 * \Delta M2 + 0.0033) \quad (6)$$
$$\text{(s.e.)} \quad (0.001) \quad (0.098) \quad (0.112)$$

A measure of openness was further introduced in the original St. Louis equation estimation in the form of the ARDL model. Bound test results showed that the estimated F-Statistics (13.88) is greater than that of I(0) and I(1) bounds at the 1 percent level of significance test. Accordingly, the null hypothesis that the variables of the estimated model were not cointegrated is rejected in favour of the alternative hypothesis of cointegration.

Equations (7) and (8) present coefficients of cointegrating long-run equation and coefficients of the cointegrated equation from the bound test results, respectively. The estimated coefficient of the error correction term (Ec(-1)) is negative (-0.594) in the required range (0,-1); and is statistically significant at the conventional test levels. The coefficient suggests the adjustment to the long-run equilibrium is strong. The result suggests that about 60 percent of disequilibrium between economic growth, money supply and exports in the country during the sample period was cleared over a quarter period.

$$\begin{aligned}\Delta GDP = {} & 0.069\,\Delta GDPN(\text{-}1) + 0.252\,\Delta GDPN(\text{-}2) + 0.347\,\Delta GDPN(\text{-}3) + 0.266\,\Delta M2 \\ & (0.071) \qquad (0.069) \qquad (0.064) \qquad (0.064) \\ & - 0.030\,\Delta X - 0.139\,\Delta X(\text{-}1) - 0.130\,\Delta X(\text{-}2) - 0.131\,\Delta X(\text{-}3) \\ & (0.028) \quad (0.029) \quad (0.029) \quad (0.028) \\ & - 0.018\,\Delta G - 0.594\,Ec\,(\text{-}1) \\ & (0.049) \quad (0.065) \qquad (7)\end{aligned}$$

$$\text{Cointeq} = GDPN - (0.3430 * M2 + 0.2281 * X - 0.0817 * G - 0.0011) \quad (8)$$

In other words, it can be maintained that the adjustment in economic growth (GDP) in Tanzania during the sample period was fast when there was growth in money supply. The effect of exports on growth was statistically significant, but very small. Accordingly, while the coefficient of money supply (M) in the cointegrating equation is statistically significant at the 1 percent level of significance test, the coefficient on the government expenditure (G) is not. The empirical results in the cointegrating equation suggests that a 1 unit change in money supply will cause a 0.34 increase in GDP; and a unit change in exports will cause GDP growth to increase by 0.22.

5.4 Results of the Vector Autoregressive Model (VAR)

A restricted VAR model of equation (3) was estimated by using real rather than nominal variables, i.e., real broad money supply (RM2), real government expenditure (RG), and real domestic products (RGDP), and also real exports (X) as an exogenous variable.

Table 1 presents results of the variance decomposition matrix that are based on fifteen-period of the short-run and long-run dynamics amongst the variables of the estimated model. The results suggest the existence of a high proportion of variation in output, measured by the real GDP, which originates from own-shock in the short-run. The remaining variation was accounted for by both changes in money supply and government expenditure. Specifically, the results show that about 97 percent of the variation in output over the short-run (of 1 to 6th period) was due to its own shock, and the remaining variation was accounted for by shock to money supply (1 percent) and government expenditure (1.6 percent). The results also suggest that own-shock accounted for about 75 percent of the variation in RGDP over the long-run period of 15 quarters. The remaining variation was accounted for by shocks in money supply (20.8 percent), and government expenditure (4.4 percent).

Table 1: Variance Decomposition of RGDP

Period	S.E.	RGDP	RM2	RG
1	639.2330	100.0000	0.000000	0.000000
2	1236.127	99.86436	0.042311	0.093329
3	1924.204	99.63141	0.128764	0.239827
4	2685.754	99.29798	0.284457	0.417565
5	3359.094	98.58184	0.525672	0.892490
6	3990.755	97.38788	1.034111	1.578008
7	4567.975	95.63551	1.927466	2.437025
8	5090.826	93.28195	3.309972	3.408074
9	5590.378	90.49701	5.348885	4.154109
10	6063.261	87.50823	7.855604	4.636167
11	6518.837	84.48097	10.67508	4.843940
12	6961.974	81.58583	13.59438	4.819793
13	7386.515	79.00072	16.28958	4.709702
14	7798.102	76.73257	18.70336	4.564070
15	8195.654	74.81221	20.75921	4.428581

The results also suggest that the response of output to the shocks in money supply and government expenditure is small over a short-run period; with relatively higher shock from government expenditure. In general, therefore, results suggest that the effect of growth in government expenditure on economic growth in Tanzania over the short-run period was relatively larger than that of the growth in money supply. In the long-run, it was growth in money supply that exerted a relatively larger impact on economic growth. This finding is consistent with that obtained by some of the previous studies in and outside Tanzania, among others, Mkupete (2013) and Were et al. (2014).

6. Conclusion

The main objective of this paper was to establish empirically the relative importance of monetary policy and fiscal policy in explaining economic activity in Tanzania. Accordingly, two main null hypotheses were tested, *viz*, government expenditure exerts a larger and more predictable influence on economic growth than monetary policy, measured by money supply. The analysis was based on the

original and modified versions of the St. Louis equation estimated using quarterly data for the period 1966:I–2013:IV. Linear, VAR and ARDL models were estimated; and so was variance decomposition.

The empirical results based on the original St. Louis equation suggested that during the sample period the effect of monetary policy on economic activity was stronger and more predictable than that of fiscal policy. The robustness of the results were confirmed by the consistency of the results of the VAR model with that obtained by using the original St. Louis equation. Variance decomposition results showed that the variation of output was largely due to own-shocks; and the residual resulted from government expenditure and money supply. However, over the short-run the positive effect of fiscal policy on economic activity was dominant; while that of monetary policy was positive and dominant over the long-run period. In policy context, the findings point to monetary rather than fiscal policy as more effective for economic stabilization in Tanzania, at least during the sample period. Nevertheless, the dominance of fiscal policy effect on output over the short-run period argue for monetary-fiscal policy mix stabilization policy regime in Tanzania.

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