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No. 05/12

On Interest Rates and Other Determinants of Financial Savings: An Empirical Investigation in Tanzania

Michael O. A. Ndanshau

Abstract

This paper investigates determinants of financial saving in Tanzania during the period 1967-2010. Both OLS method and dynamic error correction (coitegration) model (ECM) approaches were employed to test the hypothesis that the interest rate elasticity of financial savings was positive during the study period. The regression results rejected the hypothesis that the interest rate of financial savings was negative and statistically insignificant for the period 1967-1986, a period that was characterised by staunch Government regulation and control of the financial sector. Also unexpectedly, the results rejected the hypothesis that the interest rate elasticity of financial savings was positive during the period 1987-2010, a period that was characterized by market determined interest rates. The results also showed a decrease in absolute size of the real interest rare elasticity of financial savings over the two sub-sample period. Several robustness tests confirmed the estimated sign and sensitivity of financial savings to real interest rates for both sub-sample periods. The results, however, are inconsistent with the traditional theory and therefore demands for further empirical investigation.

Key words: Financial liberalization, financial saving, real interest rate, financial deepening, interest rate spread, cointegration and error correction model.

JEL Classification: E2, E4, E5.

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Acknowledgement

On Interest Rates and Other Determinants of Financial Savings: An Empirical Investigation in Tanzania[1]

1. INTRODUCTION

Liberalization of the financial sector is one of the policies in economic reform programmes implemented in a number of the sub-Sahara African (SSA) countries since the 1980s. In theory, the practice of financial sector liberalization encapsulated several measures, chief of which was deregulation of interest rates.[2] The liberalization of interest rate built on financial repression hypothesis (FRH) of McKinnon (1973) and Shaw (1973) in which the main argument is that positive real interest rates are crucially necessary for the increase of the volume of savings available for private investment that would elicit high and sustained rate of economic growth in financially repressed financial systems in developing countries (Reinhart and Tokatlidis, 2003; Bandiera *et al*., 2000; World Bank, 1989; Fry, 1978).

This paper presents empirical evidence on the effect of interest rates on financial savings in Tanzania. The study claims its justification from the role interest rates plays both in macroeconomic policy and, more so, dearth of empirical studies in Tanzania. In the theory and policy fronts interest rates elasticity of saving "bear on a number of central macroeconomic questions" (Rossi, 1988: 105). However, previous studies on saving in Tanzania only secondarily focused on interest rates; and, by and large, covered the period 1967-1990 that was characterized by setting and regulation of interest rates by the Government. For example, among others, Mduma (1999) used annual time series data for

[1] The author acknowledges with thanks comments on the draft of this paper by Prof. Asmerom Kidane (Asmara University, Eritrea). The usual disclaimer applies that the responsibilities for any fault or error in this paper is, of course my own.

[2] For details, see Nyawata and Bird (2004) and Montiel (1995).

the period 1967-97; and, Nyagetera (1997) and Nyagetera *et al*. (1997) also used time series data for the period between 1966 and 1990. Furthermore, the previous studies on Tanzania did not focus on interest rate elasticity of financial but aggregate savings that has been found to be unresponsive to interest rate (Thirlwall, 2003; Giovannini, 1983). This study, therefore, complements the previous studies in several ways: a) uses more data points that cover regimes of interest rates ceilings and liberalisation in effect since August 1994; b) specifically explores responsiveness of financial savings to interest rates and other macroeconomic factors; and, c) complements the OLS (Ordinary least Squares) long-run results, which is common in previous studies, with use both cointegration and error correction mechanism (ECM) that shed light on long-run and short-run dynamics of financial savings function in Tanzania.

The rest of the paper is organized as follows. Section 2 dwells on the evolution of interest rates and financial savings in Tanzania. Section 3 surveys the relevant literature on saving and interest rates. Methodology of the study is covered in Section 4; and, Section 5 presents and discusses the econometric results. Section 6 concludes by a presentation of the main findings, their policy implications and areas for further research.

2. EVOLUTION OF INTEREST RATES AND FINANCIAL SAVINGS IN TANZANIA

At the attainment of political independence in 1961 the financial system inherited from the British colonial government was dominated by private banks and non-bank financial intermediaries (NBFIs) that operated under the East African Currency Board (EACB) as an apex monetary institution synonymous to a central bank. In the early post-colonial

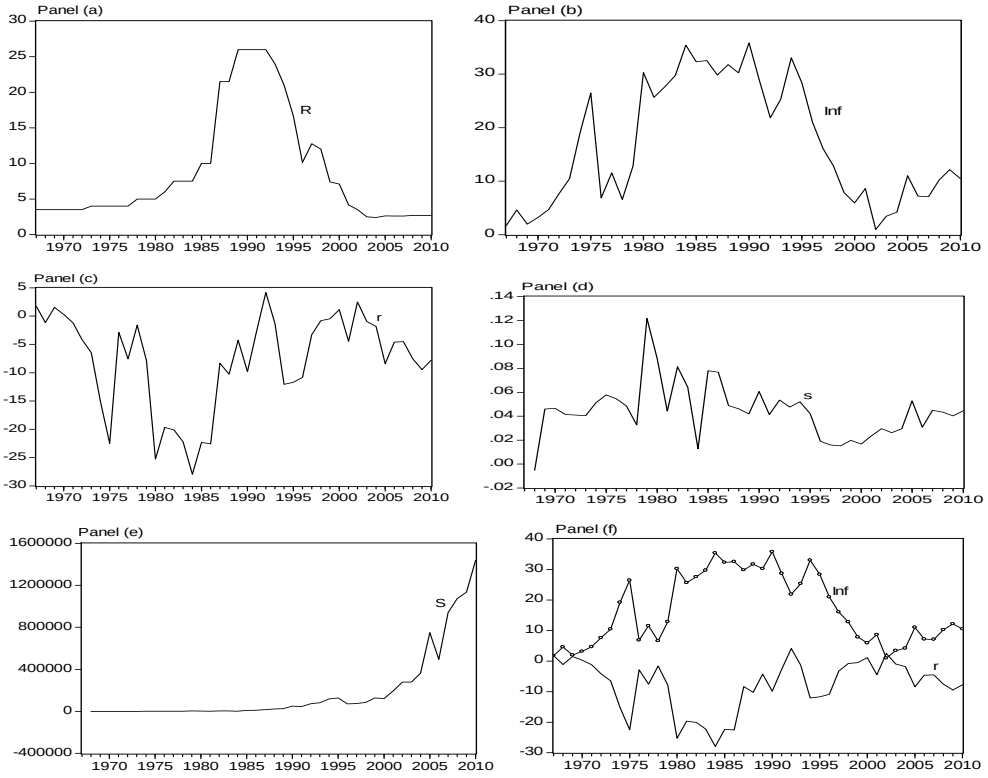
years (1961-66) the banks and the NBFIs operated under quite a liberal market economy regime that marked by lack of government intervention in pricing of financial products and directed lending to potential clientele. In effect, to the extent that the banks and NBFIs were mostly branches of foreign banks, their deposit and lending interest rates in the domestic economy were determined in the foreign money markets, among others, that in London. Socio-political and economic developments in the early post-colonial period prompted the government to promulgate Arusha Declaration of 1967 that, among others, carried the *Ujamaa* and Self-Reliance Policy and a vision to the development of a Socialist state in Tanzania.

Following the Arusha Declaration, first, in 1967 the government nationalized all, except one, (branch of) foreign commercial banks in mainland Tanzania (Nyagetera, 1997). Instead, the government established a State-owned commercial bank, namely, National Bank of Commerce (NBC), which became operational in February 1967. Moreover, the government also nationalized the NBFIs that operated in the country, including insurance companies, and established instead a state-owned National Insurance Company (NIC). In effect, therefore, the nationalization led to almost total government ownership and control of the financial system in the country.

The nationalizations aside, the government further instituted several other measures targeted to provide for effective financial support of the goal of building *Ujamaa* and Sel-Reliance by the state owned financial intermediaries. Among others, between 1972 and 1975 the government: a) established three development finance institutions for serving agriculture and housing sectors, namely, Tanzania Housing Bank (THB), Tanzania Rural Development Bank (TRDB), and Tanzania Investment Bank

(TIB); and, b) innovated Annual Finance and Credit Plan (AFCP) that replaced the indirect monetary policy instruments enshrined in the Bank of Tanzania Act of 1965. On the basis of the AFCB the Government assumed the role of setting nominal interest rates; and, by annual credit plan (allocations), guaranteed cheap lending to the state-owned enterprises (SOEs) in the key sectors of the economy—agriculture, industry, trade, mining, etc. To also guaranteed access to credit by the SOEs the government dictated upon the branching by the banks and the NBFIs.

Figure 1: Interest Rate and Inflation in Tanzania, 1967 - 2010



The interest rate ceiling set for lending by financial intermediaries led to very low nominal deposit rates that remained virtually constant for an extended period. It is on record that prior to the launch of economic reforms in mid-1986 the Government had

only increased interest rates two times, in 1979 and in 1981. Thus, while government control of commodity prices may have underestimated official inflation, both lending and deposit rates prior to the launch of economic reforms in 1986 turned out to be very negative in real terms for a prolonged period (Figure 1). In theory, and as established by some studies in Tanzania the negative deposit interest rates during the period 1967-1988 taxed depositors and, as a result, undermined saving in general and financial savings in particular.[3] On this account and an appreciation of growth implications of poor saving, the government brokered with the IMF (International Monetary Fund) and the World Bank implementation of an economic reforms programme (ERP) that encapsulated liberalization of the financial sector since the mid-1986.

Like most other SSA countries, the liberalization of the financial sector in Tanzania was guided by policy prescription of the financial repression hypothesis (FRH) innovated by of McKinnon (1973) and Shaw (1973) which maintains that positive real interest rates are a prerequisite for capital formation, quality investment, and attainment of both economic growth and development (Agénor and Montiel, 2008: 73; Collier and Mayer, 1983). Accordingly, the Government initiated deregulation of interest rates in order to encourage savings and reduce excess demand for loanable funds (Tanzania, 1986:14-15). In addition, in 1991 the government liberalised the financial sector by enacting a Banking and Financial Institutions Act (BFIA) No. 12 that allowed entry (and exit) of private institutions in the financial sector.

The deregulation of interest rates was gradually managed upward by the Bank of Tanzania (BoT) between 1986 and 1994 when they became fully liberalised. In practice,

[3] Among others, see Bagachwa (1995), World Bank (1994), Nissanke (1990), Tanzania (1990), and Nyagetera, Osoro and Lipumba (1989).

at the commencement of the reforms in 1986 BoT determined an official structure of multiple fixed interest rates and fixed differentials, namely 10 deposit rates and 30 lending rates (Tuni, 1997; Knight and Green, 1992: 22). Since 1991 the BoT allowed banks to set own interest rates subject to a maximum lending rate of 31 percent and a 12-month savings deposit rate above the expected inflation rate (Mduma and Kazi, 2005; Knight and Green, 1992: 22). Restriction was set, however: only a single change of interest rates by the financial intermediaries was allowed per annum, a restriction that rendered the financial intermediaries to match changes in asset rates in a timely manner (Ibid.). In July 1991 the BoT set a uniform primary discount rate of 27 percent to support interest rate liberalization. In 1992 the interest rates were deregulated with an aim of providing "realistic interest rates that (would) at least be above the level of the rate of inflation" (Bank of Tanzania, 1996b: 2). In 1994 all interest rates were deregulated fully. As a result, the commercial banks and other financial institutions were empowered to set own interest rates, but on the basis of the discount rates out turn in the Treasury Bills (TBs) markets introduced by the BoT in August 1993 to serve as one of the monetary policy instruments for mopping excess liquidity in the economy.

Figure 1 shows that the nominal interest rate on saving (pass book) deposits rose sharply during the period 1986-1991 when liberalisation of interest rates was administrative managed by the central bank (Figure 1). Thereafter, the nominal deposit rate stabilised temporarily before it took on a downward trend; and, like most other SSA countries that reformed their financial sectors since the 1980s, the real pass book interest rate in Tanzania remained negative in most of the sample period.[4] Mugizi, Ndanshau and

[4] Among others, see Nyawata and Bird (2004) in the case of countries in the Southern African Development Community (SADC).

Aikael (2011) also shows that the spreads between both nominal and real interest rates for savings deposits and short-term lending rates widened during the period.

The persistence of negative real interest rates on savings in Tanzania since the launch of economic reforms is consistent with experience elsewhere in SSA, among others, Ghana, Malawi and Nigeria (Aryeetey *et al*., 1997). And, the outcome has been inconsistent with policy ideal of providing real interest rates that would elicit saving. Unfortunately, the lending rates remained high and sticky downwards despite of the fall in both the TBs and nominal deposit rates of interest (Bank of Tanzania, 1996a). Owing to its implication on the mobilisation of domestic resources, the central bank in Tanzania has continued to sensitize the banks on the "importance of maintaining lending and deposit rates that are consistent with the developments in the Treasury Bills market" (Bank of Tanzania, 1996a: 7). It is thus of interest to establish empirically the sensitivity of financial savings interest rate policies during and before the reforms in Tanzania.

3. REVIEW OF RELEVANT LITERATURE

3.1 Analytical Framework

The theoretical model for the study of saving behaviour in developing countries basically nests several hypotheses: the Keynesian absolute income hypothesis (AIH), and life-cycle-permanent hypothesis (LCH-PIH) of Ando Modigliani (1963, 1957) and Friedman (1957). In more recent times models estimated have included a test of financial repression hypothesis (FRH). In this regard, the estimated saving function have traditionally included income based variables, including either measured income, permanent income, wealth, transitory income (y^T), rate of economic growth, and demographic factors

(Chandarvarkar, 1990). In a developing country like Tanzania an investigation of the the AIH and LC-PIH based factors in explaining saving is pertinent. However, there features in the literature several other hypotheses of interest for nesting in this study on financial saving in Tanzania.[5]

First, on account of the financial repression hypothesis (FRH) and the LCH real interest rate features as one of the determinants of saving. In the context of the LCH saving is an increasing function of the real interest rate. Similarly, in accordance with the LCH saving is an increasing function of the real interest rate provided economic growing is high (Sheshinsk and Tanzi, 1989: 12). Second, is inclusion in a saving function of a measure of financial intermediation to capture the credit channel of financial intermediation or even the borrowing constraint hypothesis per which the underlying argument is that saving is not only determined by incentive and capacity to save but also transaction costs and reciprocity, that is, enhanced possibility that depositors at a financial intermediary may obtain loans from the financial intermediary (Vogel and Burkett, 1986: 426).[6] In the context of credit channel theory the effect of the financial intermediation should be positive. In the context of the borrowing constraint hypothesis the effect of the financial intermediation is positive if borrowing constraint is binding as in repressed financial systems; and, it is negative in non-repressed financial systems where access to credit substitutes for saving (Nwachukwu and Egwaikhide, 2007; Mavrotas and Kelly, 2001; Loayza and Shankar, 2000; Bayoumi, 1993). Third, is modeling of macroeconomic instability in saving function. The argument, as put by

[5] For purpose of details, among others, see Masson, Bayoumi and Samiei (1998) and Schmidt-Hebbel, Servén, and Solimano (1996).

[6] Montiel (1995) suggests several other indicators of financial development: ratio of M1, M2 to GDP, volume of private lending to GDP.

Hadjimichael and Ghura (1995), among others, is that saving is an increasing function of macroeconomic stability. Fourth, Tanzania and many other developing economies experienced distortion in the exchange rate market leading to parallel foreign exchange market during the between the 1970s and the mid-1990s (Malyamkono and Bagachwa, 1990). As maintained here and elsewhere, parallel foreign exchange markets adversely impact on financial saving in the domestic economy in favour of capital flight.

3.2 Review of Empirical Literature

There are several empirical studies on determinants of saving behaviour in LDCs.[7] The focus is diverse: some studies are on determinants of private savings while others are on determinants of either national savings, aggregate savings or financial savings. The hypotheses tested are also varied as well as the methodologies put to use. Studies prior to the 1980s mainly tested relevance of either AIH or LCH and PIH in the LDCs. Subsequent studies motivated by FRH, among others, focused on the nature of interest rate elasticity of saving.

The empirical evidence on the responsiveness of saving to interest rate is mixed. On the one hand, some studies have established a significant positive interest rate elasticity of saving in LDCs. Study by Elbadawi and Mwega (2000) established a significant positive effect of ex-post interest rate on private saving in sub-Saharan African (SSA) countries and countries in other regions; and study by Villagómez (1994) found the positive real interest effect on saving only obtained in low inflation developing countries. This evidence is strongly supported by some country specific studies, for

[7] For a review of empirical studies in and outside SSA prior to the 1990s, among others, see Clarke (1996), Thornton (1991), Arrieta (1988) and Khatkhate (1988).

example, Kendall (2000) established a significant positive effect of positive interest rate on national savings ratio in the Guyana; Hussein and Mohieldin (1997) in a study on Egypt found a one-period lagged real interest rate was an important determinant of financial savings during the period 1966-90. Furthermore, Warman and Thirlwall (1994) established sensitivity of financial savings to the real interest rate in Mexico during the period 1960-1990; Odhiambo (2009), Azam (1996) and Oshikoya (1992) in studies on Kenya; and, Seck and Nil (1993) in a study that covered nine African countries. Notable, however, a study on Nigeria Soyibo and Adekanye (1992), however, found the effect of real interest rate on saving was weak.

Other studies, however, carry evidence not supportive to the real interest rate policy. Among others, la grande study by Loayza, Schmidt-Hebbel and Servén (2000) which sought to establish drivers of saving across the world found the effect of real interest rate on saving was negative. Also in a comparative study in Asia Cho and Khatkhate (1990) found interest rate was not an important determinant of saving. Similarly, a study Bandiera *et al*. (2000), which covered Ghana and Zimbabwe and other six countries outside the SSA bloc established existence of a negative influence of real interest rate on saving—specifically in Ghana and Indonesia. Furthermore, in a study which covered 62 countries Hussein and Thirlwall (1999) found real interest rate was not an important determinant of saving. Lack of empirical evidence in support of the hypothesized positive effect of real rates of interest on saving emerged also from, among others, a study on Nigeria by Nwachuku and Egwaikhide (2007) and one on Ghana by Ziorkhui and Barbee Jr (2003) found the effect of real interest rate on financial saving was negative. Moreover, studies on Kenya by Kariuki (1995) and Mwega, Ngola and

Mwangi (1990) failed to establish existence of a positive effect of real interest rates on financial savings in Kenya.

A general conclusion from this and previous surveys of the empirical literature is that, first, cross-country studies dominate the literature on saving behavior in LDCs. Thus, there is a dearth of country specific studies on saving in LDCs. In Tanzania there have only been very few empirical empirical studies on saving by, among others, Mduma (1999), Nyagetera, (1997), Nyagetera, Lipumba and Osoro (1997) and Rutayisire (1990). Second, albeit of the differing methodologies in previous studies, the evidence weighs more in favour of a conclusion from literature survey by Reinhart and Ostry (1995) as well as Clarke (1996) that "there does not appear to be any systematic relationship between rates of return and consumption/saving behavior in LDCs; and, regional variations exists on interest rate elasticity of saving" (p. 2).[8] Incidentally, only few studies in Tanzania have focused on the sensitivity of financial saving to interest rates per se and the real interest rates in particular. Suffice it to note, however, that the evidence on the interest rate elasticity of financial saving in Tanzania may not be credibly defended because estimation mostly covered the period of interest rates regulation; and, this was not modeled in estimation. Third, most previous studies cover the period of economic crises and early economic reforms, including the financial sector reforms. Granted, outcomes from the shift in policy regime and effect of structural reforms on the financial sector is yet to be established. It is on account of this and preceding issues from literature that this study claims its value addition It fills the gap that exists in the literature in

[8] The difference in empirical results could also be attributed to several factors: data problems—quality of data; lack of sophistication and depth of financial markets—no true market determination of interest rates; direct regulation of financial systems; subsistence consumption; liquidity constraint—such that current income matters the most. Even more significant is diversity of the measures of savings used in previous studies. Some use either or a combination of financial savings, private, or aggregate savings.

Tanzania by using a larger and more recent data points to undertake a "quasi postmortem" of the positive real interest rate policy with respect to financial savings in Tanzania. More frontiers methods are used to analyse the data, among others, explicit modeling of the financial repression hypothesis in the estimation model, investigation of the relative importance of nominal and real interest rates in explaining saving, and an analysis of the long-run and short run dynamics of financial saving in Tanzania in Tanzania by using an error correction model (ECM).

4. METHODOLOGY OF THE STUDY

4.1 The Estimation Model

On account of the diverse hypotheses in the conceptual framework are nested here in a variant of the most common saving function estimated in previous studies, among others, by Mwega, Ngola and Mwangi (1990), Ziorklui and Barbee Jr. (2003), de Melo and Tybout (1986), and Warman and Thirlwall (1994). The estimation model reads as follows:

$$s_t = -\beta_0 + \beta_1 r_t - \beta_2 y_t^{pc} + \beta_3 fd_t + \beta_4 expr_t + \beta_5 mi_t + u_t \qquad (1)$$

It is notable, a priori that dependent variable (s) in equation (1) is financial saving (s) rather than aggregate savings as in Nyagetera, Lipumba and Osoro (1989) and most other previous studies.[9] The s is measured here as the ratio of financial savings (S) to the Gross Domestic Product (GDP); and, like Warman and Thirlwall (1994) and others, the S is the

[9] While the interest on financial saving is of specific interest in this study, McKinnon (1991) has also noted that aggregate savings are not very sensitive to real interest rates.

first difference of broad money supply ($M2$) that in Tanzania sums the traditional narrow money ($M1$) and both saving (SD) and time (TD) deposits of the commercial banks denominated in domestic currency.[10] Two approaches are used in the measurement of the real interest rate (r) in equation (1).[11] First, consistent with the traditional theory, the r is measured as nominal interest rate (R) net of the expected rate of inflation (π^e). As in Mwega, Ngola and Mwangi (1990) and Azam (1996) it is assumed that inflationary formation is static. By this assumption the π^e is measured as a one-period lagged inflation rate (π_{t-1}).), which is measured as the first difference of the natural logarithm of the Consumer Price Index (CPI). Consistent with the FRH the real interest rate is expected to impact positively on financial saving, given negligible income and substitution effects.

The other determinants of saving in equation (1) include real income per capital (y^{pc}), which is the nominal GDP deflated by the CPI and population (N) in Tanzania; and, its effect is expected to be positive.[12] The ratio of the share of private sector credit in total credit of the commercial banks to the GDP (fd) is used as a measure of the outreach and access to financial services, mainly saving and borrowing avenues. The effect of fd on financial saving is ambiguous: negative if credit substitute for saving; positive if

[10] According to Goldsmith (1969) and Gurley and Shaw (1955), a definition of financial savings should be comprehensive to cover all financial savings that exists in the country. The $M2$ is narrow but has been used because it is the only broadest financial aggregate for which consistent and reliable data were available for the sample period. Thus, the $M2$ does not captures other forms in the informal financial sector and also that in the modern (formal) financial sector, for example, savings in foreign currency, stokes, treasury bills, currency hoards. As a result, the marginal propensity to save could be inflated since only a small proportion of the population in the high income strata operates in the formal financial sector. I acknowledge Prof. Kidane for this observation.

[11] Bank charges imposed on savings deposits reduced the incentive to save as contended by BoT (www.tanzania.go.tz/economic survey1/2002). This has not been taken into account in this study.

[12] Some commentators maintain that the savings function, especially in LDCs, is not linear in real income per capita. Rather, saving rates in LDCs rise but at a decreasing rate to the asymptotic of the marginal propensity to save (Thirlwall, 2003; Fry, 1978). This hypothesis is not investigated.

access to financial services promotes saving. The exchange rate premium ($expr$) is measured as the difference between the purchase price of a unit of the dollar of United States of America (USA) in the parallel and the official foreign exchange market. The effect of $expr$ on financial saving is expected to be negative. Macroeconomic instability (mi) is measured as the standard deviation of the rate of inflation (π); and, is expected to bear a negative effect on saving. The stochastic error term (u_t) is, by assumption, a white noised process with zero mean and a constant variance.

It should be noted that interest rates in Tanzania were pegged in a larger part of the sample period but became liberalized since 1994. In this regard, first, since a shift interest rate policy regime is known, a dummy variable (DUM) is introduced in estimation. A value of 1 is assigned for the period 1967-1993 that was characterized by interest rates regulation; and, zero is assigned to the period 1994-2010 when interest rates were market based. *Ceteris paribus*, the interest rate elasticity of financial saving estimated for the period 1967-2010 should be positive and relatively larger than that estimated for the period 1967-1993 so as to connote an increase in sensitivity of financial saving to interest rate after they became liberalised in 1994.[13]

Second, real interest rates in Tanzania were very low and even negative in most of the sample period. Granted, following Azam (1996) the most important determinant of saving with the formal financial sector would not be the explicit but implicit interest rate that encapsulated "valuable services" offered that prompted the households to "accept willingly to hold" deposits "which paid negative real rate of interest" (p.34). While such an implicit interest rate in Tanzania may have included entitlement to loan, safety and

[13] This builds on the thesis that thinness of financial markets in Africa and other LDCs caused by financial repression render saving less responsive to interest rate. See World Bank (1994).

convenience as claimed by Azam (1996), two additional factors may have accounted for saving with banks at low and negative real interest rates that existed before they became liberalized in 1994.[14] One were government directives to public and private enterprises to pay wages and salaries through the banks; second, use of depository services of banks by multifarious rural and urban based micro-finance institutions (MFIs) in the country either for safety reason or purpose of leveraging funds; and, third, the increase in the number of SOEs that banked with the sole state owned bank, that is, the National Bank of Commerce (NBC) since the launch of Arusha Declaration in 1967 until the launch of privatization policy in 1992.[15] In this regard, therefore, by following an approach by Azam (1996) originally used by Roubini and Sala-i-Martin (1992), a dummy variable (FR) is introduced in the estimation of equation (1) to capture severity of financial repression. The FR is assigned three values, viz, 1 for positive real interest rates, 2 for real interest rate between 0 and -5 percent, and, 3 for real interest rate below 5 percent. By this approach equation (1) is first estimated with the real interest rate r_t and FR and then with FR and an interaction term (rFR), which is a non-linear way of capturing shift in real interest rate regime.[16]

[14] However, in appreciation of the level of financial sector development and socio-economic and cultural factors particular to Tanzania, the Bank of Tanzania observed that: "Interest rates alone are not as effective in mobilising and allocating resources in Tanzania as in countries with more developed financial markets. Other factors such as the availability of banking services, the level of education and cash income are also important" (Tanzania 1986, p. 18).

[15] The number of SOEs rose from 43 in 1966 to 73 in 1967 and 380 in 1979. The number of SOEs had rose to 425 in 1984; and, included the only two commercial banks, namely, the NBC and Cooperative and Rural Development Bank (CRDB) Ltd. See Moshi (1996, 1994).

[16] According to Azam (1996) the use of these approach rests on intuitive idea that "the absolute value of a negative real rate of interest is a natural indicator of the intensity of financial repression" (p. 36).

4.2 Data Type, Sources and Properties

The analysis is based on annual time series data for the period 1967-2010. The data for monetary aggregates, price level (CPI) and interest rates were obtained from two main sources: one is *Economic and Operation Reports* (various) and quarterly *Economic Bulletin* (various) of the BoT. The data for parallel market exchange rate premium is based on parallel exchnae rate market in Mwinyimvua (1996) and the official exchange rate of the bureau d'change, on an assumption that it was synonymous to the exchange rate in the parallel market. The other is a CD-Rom of November 2008 of International Financial Statistics (IFS) of the International Monetary Fund (IMF), a source of annual data for the nominal Gross Domestic Product (GDP).

4.3 The Estimation Methods

Ordinary least squares (OLS) method was used to estimate the basic long-run equation (1). It should be noted, however, that the series of the data points was too short for an explicit estimation of equation (1) for the post-interest rates liberalization period (1994-2010). For this reason equation (1) was estimated for both pre-and post interest rates liberalization period (1967-2010) but with a shift variable (DUM) for the shift in interest rate policy regime in 1994.

Following Odhiambo (2005), Ikhide (1992) and Gupta (1987) equation (1) was estimated by explicitly modeling as regressors the nominal interest rate and inflation rate so as to allay a fear that the latter rather than the former was a more important determinant of financial saving during the period 1967-1993. However, the long-run regression results could be spurious when the data in level are not stationary (Granger

and Newbold, 1974). Thus, to test the robustness of the long-run results, first, Augmented Dickey Fuller (ADF) method was used to establish the order of integration of the data in level.[17] The ADF test equation was estimated with and without a deterministic trend (t); and, its lag length was determined by Schwartz's Bayesian Information Criteria (BIC). Second, cointegration of the variables of the estimation model was explored by using Engle and Granger (1987) two step procedure.[18] Lack of cointegration is the null hypothesis tested; and disproof of the null hypothesis suggested results from estimation of (1) would indeed not be spurious.

By Granger (1986) Representation Theorem, the long-run properties and short-run dynamics of financial saving are estimated by using an unrestricted error correction model (ECM) that reads as follows:

$$\Delta s_t = \beta_0 + \sum_{i=0}^{p} \beta_{1i} \Delta r_{t-i} + \sum_{i=0}^{p} \beta_{2i} \Delta y_{t-i} + \sum_{i=0}^{p} \beta_{3i} \Delta fd_{t-i} + \sum_{i=0}^{p} \beta_{4i} \Delta expr_{t-i} + \sum_{i=0}^{p} \beta_{5i} \Delta mi_{t-i} + \sum_{i=1}^{p} \beta_{6i} \Delta s_{t-i} + \theta ec_{t-1} + e_t \quad (3)$$

where Δ is a first difference operator, ec_{t-1} is a one period lagged error term estimated for the cointegarting equation (1), p is the optimal lag length selected by Schwartz's BIC, u_t is the usual white noise error, and other variables are as already defined. The coefficient (θ) of the one-period lagged error terms (ec_{t-1}) is expected to be negative and

[17] According to Thomas (1997) the ADF results should be interpreted with care because the method quite frequently fails to reject the non-stationarity hypothesis even in cases where the variables are cointegrated.

[18] There are several other Cointegration test procedures but the Engle-Granger approach was used because is the simplest, efficient. The other common test in the literature is that associated with Johansen and Juselius (1990) and Johansen (1991). For details, among others, see Cheung and Lai (1993). Pesaran, Shin and Smith (2001) have also innovated a cointegation test based on unbound autoregressive distributed lag (ARDL) schema. The procedure has not been tried here because it also require a relatively larger sample of observations.

statistically significant to imply that the error correction work to push back to the long-run equilibrium the adjustment between the regressand and the regressors of the estimation model. Third, the equations estimated were subjected to stability test by using CUSUM and CUSUMSQ methods.

5. ECONOMETRIC RESULTS

5.1 Descriptive Statistics and Reliability of the Data

Following Mukherjee, White and Wuyts (1998) exploratory data analysis (EDA) by using graphs and both mean and order based tests for normal distribution in variables (in level) were employed. The prerequisite for a normal distribution include zero skew and kurtosis equal to 3 (Mukherjee, White and Wuyts, 1998: 6).

Table 1. Descriptive Statistics of the Variables Used in the Analysis, 1967 – 2010

Variables	s	r_t	R	π	mi	exr_pre	y^{pc}	fd
Mean	0.05	-8.22	9.15	15.57	3.27	77.61	7.74	5.06
Median	0.04	-7.00	5.00	12.08	2.38	36.45	7.73	4.64
Maximum	0.12	4.15	26.00	30.62	13.87	510.90	8.25	12.64
Minimum	0.01	-27.92	2.40	1.00	0.07	-6.40	7.16	1.62
Std. Dev.	0.02	8.38	7.99	9.52	2.74	107.10	0.25	2.63
Skewness	1.15	-0.80	1.17	0.14	2.21	1.95	-0.03	0.82
Kurtosis	5.36	2.62	2.85	1.49	8.89	7.55	3.41	3.06
Jarque-Bera	19.00	4.68	9.58	4.15	94.91	62.69	0.30	4.71
Probability	0.00	0.10	0.01	0.13	0.00	0.00	0.86	0.10
Observation	42	42	42	42	42	42	42	42

Note: s=saving to GDP ratio; r=real interest rate (nominal less inflation rate); R=nominal interest rate; π=inflation rate; mi=macroeconomic volatility; exr_pre=parallel market exchange rate premium; y^{pc}=natural logarithm of real per capita income; fd=ratio of real private investment to the real GDP.

This requirement is satisfactorily met by most variables of the estimation model: while are not skewed, they do not have a kurtosis equal to 3. However, the p-value of the Jarque-Bera statistics suggests that all the variables of the estimation model have very significant kurtosis, that is, larger than normal tails. It should be noted that transformation of data by natural logarithm operator eliminate the kurtosis problem in some of the variables, notably the fd and R but not the s.

5.2 Unit Root and Cointegration Test Results

The Augmented Dickey Fuller (ADF) unit root tests results with and without a trend (t), suggests that all variables, except the nominal interest rate (R), are $\mathrm{I}(1)$ in level and are first difference stationary ($\mathrm{I}(0)$) at the conventional test levels (Table 2). Granted, serve for the rate R, which is a secondary variable of interest in the analysis, the primary variables of the estimation model are integrated of order one; and, this suggests that they are potentially cointegrated.

Table 2. Unit Root Test Results Based on Augmented Dickey-Fuller Approach

	ADF							
	With a Constant				Level with constant and a trend			
Variables	Level	Critical value (1% &5%)	First difference	Critical values (1% &5%)	Level	Critical values (1% &5%)	First difference	Critical values (1% &5%)
s	-4.137*	-3.597 -2.604	-8.132*	3.605 -2.606	-4.087*	-4.192 -3.191	-8.099*	-4.205 -3.194
R	-1.809	-3.601 -2.935	-2.730	-3.601 -2.935	-0.869	-4.186 -3.518	-2.815	-4.198-3.524
r	-2.840	-3.592 -2.931	-7.657*	-3.597 -2.933	-2.919	-4.186 -3.518	-7.581*	-4.192 -3.521
π	-1.903	-3.597 -2.933	-6.996*	-3.601 -2.935	-1.972	-4.192 -3.521	-7.106*	-4.198 -3.524
mi	-1.971	-3.615 -2.941	-7.113*	-3.615 -2.941	-4.895*	-4.273 -3.558	-7.198*	-4.219 -3.533
$ln\ y$	0.478	-3.592 -2.603	-4.910*	-3.597 -2.933	-1.951	-4.192 -3.521	-4.959*	-4.192 -3.521
g^y	-4.910*	-3.597 -2.933	-8.576*	-3.601 -2.935	-4.959*	-4.192 -3.521	-8.466*	-4.198 -3.524
fd	-0.809	-3.592 -2.604	-4.669*	-3.597 -2.604	-2.430	-4.192 -3.191	-4.804*	-4.192 -3.191
exr_pre	-1.225	-3.592 -2.931	-5.930*	-3.597 -2.933	-1.906	-4.186 -3.518	-5.855*	-4.192 -3.521

Cointegration test results based on Engle-Granger two step method suggested existence of an equilibrium between the estimating equation (1): the ADF test applied to the error term of the cointegrating equation is also I(0).[19] This confirms existence of a long-run relationship amongst the of the estimating equations (1). This result suggests that estimation of equation (1) in levels by ordinary least square (OLS) method would not yield spurious regression results;[20] and, by virtue of Granger (1986) Representation Theorem, an error correction model (ECM) that captures short-run and long-run dynamics between savings and its determinants can be estimated by using error term estimated for the cointegrating equation in (1).

5.2 Long-run Regression Results

Table 3 carry results of the long-run saving function estimated by using OLS method in GRETL. *A priori*, the results shows that the equations estimated of good fit and very powerful. The estimated coefficients of determination (R^2) suggests that between 61.7 percent and 63.7 percent of the variation in financial saving is explained factors included in the estimation model. Besides, the estimated F-statistics are also very high and statistically significant at 1 percent test level. This suggests that the models estimated have good overall explanatory power (Table 3). Save for model 4, the estimated p-values for RESET Regression Errors Specification Test) suggests lack of omission of important determinants of financial savings in Tanzania during the sample period.

[19] The estimated value is -6.848 against a critical value of -3.605 (1%).

[20] The rate of population growth (n_t^g) was dropped from regressions because when included it drastically reduced the explanatory power of equation (1) and also carried a wrong sign.

Results in Table 3 shows that the coefficients of the real interest rate (r) estimated for the period 1969-1993 and 1969-2010 are positive and statistically significant at 10 percent and 1 percent statistical test levels, respectively (Model 1 and Model 3). The results show that the coefficient of the nominal interest rate for the period 1969-1993 is positive signed but is statistically insignificant; and, the coefficient of inflation is negative as predicted in theory and is statistically significant at the 10 percent level (Model 1). However, both coefficients of the nominal interest rate and inflation rate estimated for the period 1969-2010 have the expected signs and are statistically significant at least at the 5 percent test level (Model 4). The results also shows that the coefficients of the measure of access to financial services (fd) estimated for the period 1969-93 and 1969-2010 are positive as expected but statistically insignificant at the conventional test levels (Table 3). Moreover, the coefficients of income per capita is positive as expected and are statistically significant at least at the 5 percent test level. On the one hand, the finding is consistent with the Keynesian absolute income hypothesis and theories that emphasizes precautionary saving and borrowing constraint as determinants of saving in LDCs. On the other hand, the results is not unexpected in view of the dominance of the bank clientele by the SOEs and their employees during the period of interest rates regulation. The results shows, however, that the coefficients of the other determinants of saving in the estimation model are not statistically significant at the conventional test levels, probably because have not been correctly measured.

Table 3: Regression Results for Long-run Equation

	Model 1: 1969-1993	Model 2: 1969-1993	Model 3: 1969-2010	Model 4: 1969-2010
c	-79.308 (-2.4827)**	-64.675 (-1.681)	-50.147 (-3.803)***	-40.755 (-2.728)**
r	0.18444 (1.9975)*		0.207 (3.989)***	
R		0.158 (1.572)		0.151 (2.244)**
π		-0.209 (-2.093)*		-0.215 (-4.153)***
fd	0.221 (0.5859)	0.151 (0.381)	0.067 (0.419)	0.064 (0.408)
y^{pc}	10.4457 (2.609)**	8.710 (1.835)*	6.616 (3.889)***	5.478 (2.883)***
exr_pre	0.012 (1.569)	0.010 (1.128)	0.007 (1.398)	0.004 (0.835)
mi	-0.184 (-1.041)	-0.173 (-0.964)	-0.117 (-0.985)	-0.118 (-1.007)
DUM			1.553 (1.925)*	1.974 (2.288)**
R^2	0.617	0.627	0.619	0.637
RESET, p-value	0.906	0.234	0.184	0.082
ARCH (1), p.value	0.632	0.758	0.945	0.768
D-W.	2.162	2.188	2.083	2.195

Note: a) *, **, and ***, respectively, are 10%, 5% and 1% test significance test levels.
b) Figures in parentheses are t-statistics..

5.3 Financial Repression and Financial Saving

Table 4 carry results based on the method used by Azam (1996) and Roubini and Sala-i-Martin (1992) to test for the effect of financial repression on saving. The regression results presented in Table 4 shows that the estimated F-statistics estimated for the two equations are statistically significant at the 1 percent test level. This suggests a very good overall explanatory power of the model estimated. The estimated DW statistics and White's heteroskedasticity test suggests lack of autocorrelation in the estimated model. And, according to RESET test the model are free from specification error. The CUSUM test for stability of parameters shows the estimated model is very stable

(Appendix2: Figure 2). Notable, however, the CUSUMSQ plot, which indicates a value outside of 95% confidence band, shows existence of a break in 1986 and a reversion to stability at the end of the 1990s.

Table 4: Regression Results, 1969 – 2010

	Model 5:1969-2010	Model 6: 1969-2010
c	-36.231 (-2.657)**	-36.682 (-2.605)**
r	0.305 (3.559)***	
FR	1.117 (0.825) 1.354	0.802 (0.985)
$r * FR$		0.091 (3.197)***
y^{pc}	4.647 (2.490)**	4.782 (2.485)**
fd	0.090 (0.536)	0.072 (0.418)
exr_pre	0.011 (2.154)**	0.009 (1.908)*
mi	-0.111 (-0.914)	-0.104 (-0.834)
R^2	0.60	0.578
RESET, p-value	0.102	0.682
ARCH (1), p.value	0.891	0.804
D-W.	1.740	1.804

Note: a) *, **, and ***, respectively, are 10%, 5% and 1% test significance test levels.
b) Figures in parentheses are t-statistics..

The regression results of Model 5 show that the coefficient of real interest rate when it is entered linearly in the function is positive and statistically significant at the 1 percent test level (Table 4). The coefficient of the measure of financial repression (FR) is positive signed but is statistically insignificant at the conventional test levels. This finding is consistent with that obtained by, among others, Azam (1996) in a study on Kenya; and also Roubini and Sala-i-Martin (1992). It suggests that increase in financial repression was compensated for by implicit interest rate such that "savings did not fall conformably

with measured real rate" (Azam, 1996: 39). Instead, "when the real interest rate is positive, the Roubin and Sala-i-Martin repression variable is equal to one, and we get a straightforward positive impact of the real interest rate (Azam, 1996: 39). The estimation results for Model 6 in which real interest rate enters non-linearly shows a decrease in goodness of fit: the estimated (R^2) is lower but the overall explanatory power of the model, per the F-statistic, improved to become stronger. If compared with results of Model 5, the results of Model 6 shows lack of a significant difference in the size of the parameter estimated.

As before, the coefficient of real income per capita estimated for the period 1969-2010 is statistically significant. The coefficient of the exchange rate premium is also statistically significant at the 5 percent test level. Other factors included in the estimation model, namely, growth in real income per capita, measure of financial intermediation, and macroeconomic volatility are statistically insignificant at the conventional test level (Table 4, Model 7). Furthermore, the results for the model estimated with both the measure of financial repression and interaction terms shows that the coefficient of the latter is statistically insignificant at the 1 percent test levels. Other determinants of financial saving in the estimated model, including real income per capita and the exchange rate premium are statistically significant at the 5 percent and 10 percent test level, respectively.

5.4 Error Correction Model Results

Table 5 present results of the parsimonious ECM estimated by using GRETL.[21] The results show that the regressors explains about 91 percent of the variation in the regressand. The estimated F-statistics is statistically significant at the 1 percent test level. This suggests that the estimated ECM is quite powerful.

Table 5: Regression Results of the Parsimonious ECM, 1967 – 2010

Variables	*Coefficient*	*Std. Error*	*t-ratio*	*p-value*	
c	-0.155	0.329	-0.471	0.642	
Δr	0.175	0.039	4.492	0.000	***
Δr_{t-3}	0.203	0.037	5.503	0.000	***
Δfd_{t-2}	-0.350	0.164	-2.129	0.045	**
Δy^{pc}	10.346	2.671	3.874	0.001	***
Δy_{t-2}^{pc}	0.066	2.381	0.028	0.978	
Δexr_pre	0.015	0.003	4.339	0.000	***
$\Delta \exp_pre_{t-3}$	0.002	0.003	0.548	0.589	
Δmi	-0.230	0.075	-3.065	0.006	***
Δmi_{t-1}	0.036	0.087	0.410	0.686	
Δmi_{t-2}	0.239	0.087	2.742	0.012	**
Δmi_{t-3}	-0.193	0.082	-2.354	0.028	**
ΔDUM	0.225	0.411	0.548	0.589	
ec_{t-1}	-0.543	0.161	-3.381	0.003	***
Δs_{t-1}	0.223	0.125	1.781	0.089	*
Δs_{t-2}	-0.268	0.110	-2.447	0.023	**
R^2	0.934				
RESET, PF(2,20)	14.625	0.00012			
ARCH, P(Chi-square (1)	1.460	0.227			
F(15, 22)	20.726				
P-value(F)	0.000				
Schwarz criterion	151.177				
Hannan-Quinn	134.298				
Durbin's h	1.260				

Note: a) *, **, and ***, respectively, are 10%, 5% and 1% test significance test levels.

[21] Both SIC and R2 statistics were used to guide the trimming down of the over-parameterised model estimated whose results have not been reported here to serve space.

The estimated RESET statistic suggests lack of specification error in the model estimated; and, the DW statistics and White's test suggests lack of autocorrelation in the model estimated. The CUSUM and CUSUMS-q plots suggests that the estimated function is also very stable (Appendix 1, Figure 3).

The coefficient of the error correction term (ec_{t-1}) is negative signed, as expected, but small (about 0.09) and statistically insignificant at the conventional significance test levels. This suggest that adjustment of financial saving from dis-equilibrium to equilibrium in one year is insignificant and less than 10 percent. This appears to be consistent with poor potentials for mobilizing financial savings that existed in Tanzania in a larger part of the sample period covered by this study.

The ECM results suggests existence of very statistically significant (at 1 percent test level) contemporaneous effect of real interest rate on financial saving during the sample period. The effect of three years lagged real interest rate is also positive and statistically significant at the 1 percent test level. The results shows that the effect of the contemporaneous real income per capita is, as expected, positive and statistically significant at the 5 percent test level. Besides, while the effect on financial savings of the one year lagged real income per capita is positive and statistically significant at the 5 percent test level, that of two years lagged period is negative and statistically significant at the 5 percent test level. This suggests shocks in real per capital income bear alternating effect on financial savings. The results also shows that the effect of the other determinants of financial saving included in the estimation model, including black market

exchange rate premium, macroeconomic instability, and lagged saving are statistically significant.[22]

Generally, the short-run and long-run regression results are consistent with the FRH. The interest rate elasticity of financial saving for the period 1967-1993 is positive and statistically significant but due to inflation rather than nominal interest rate.[23] Besides, the real interest rate elasticity estimated for the period 1967-2010 that covers market based interest rates regime are statistically significant; and, the estimated coefficients for nominal rate of interest and inflation turned out to be correctly signed and statistically significant when the real interest rate was decomposed. Suffice it to note that the significance of the real interest rate elasticity of financial saving established by this study is consistent with that established by some of the previous studies in and outside Tanzania, for example, Odhiambo (2008) in a study in Tanzania. However, the finding, however, is inconsistent with evidence from more recent studies on private, national or financial savings in other countries, among others, Kariuki (1995) in the case of Kenya and Ziorklui and Barbee Jr. (2003) in a study in Ghana. In fact, some other studies have found a negative effect of real interest rates on saving, for example, Bandiera *et al*. (2000) in the case of Korea and Mexico. It is worth noting that results on interest rate elasticity in the case of Tanzania may also not be defended explained for two main reasons. First, statistical significance of the interest rate is realized from extension of the sample size (1967-1993) by only few data points (7 years). Second, real interest rate remained negative even after they became fully liberalized in 1994.

[22] If the constant term in s/y function is insignificant then it is consistent with s/y is independent of the level of income not growth cause s/y=-bo and s=-bo*y

[23] In a financially repressed economy the real interest rate (r) would, by no doubt, proximate the inflation rate (π).

On other determinants of financial saving, the effect of income per capita on financial saving over the short-run and long-run period is consistently positive as expected and established by most other previous studies, among others, Edwards (1995) and Ziorklui and Barbee Jr (2003), Nyagetera, Osoro and Lipumba (1989). Moreover, the short-run and long-run results attest for the negative effect of inflation on financial savings. The finding is consistent with theory that inflation undermines saving in favour of increasing demand for money balances and/or physical assets. The finding is also consistent with evidence from some previous studies, among others, Ziorklui and Barbee Jr (2003).

The results have shown lack of long-run effect of access to finance on financial saving during and after liberalization of the financial sector in Tanzania. This finding is partially consistent with theory of reciprocity in banking and soft budget constraint, especially during the period 1967-1993 when the government owned and staunchly controlled the financial system. The finding is also consistent with empirical evidence in some of the studies on either aggregate or private savings in and outside Tanzania that covered data set for pre financial sector reform period, for example, Nyagetera, Osoro and Lipumba (1989) and empirical evidence of some previous studies in and outside Tanzania, for example, Odhiambo (2005) in the case of Tanzania and Mwega, Ngola and Mwangi (1990) in a study on Kenya. Generally, increasing empirical evidence tends to suggest lack of a significant long-run effect of financial sector development on saving in developing countries both before and after the liberalization of the financial sector. The results of this study shows, however, existence of short-run effect on saving from access to finance, development in foreign exchange market, and macroeconomic volatility only

exerted significant short-run effect on financial savings in Tanzania during the sample period.

6. CONCLUSION

This paper has investigated the long-run and short-run responsiveness of financial savings to real interest rate and other determinants in Tanzania. The analysis was based on annual time series data for the period 1967-2010 fitted by OLS and ECM. The empirical evidence showed that the effect of the real interest rate on financial saving was positive; and, it was statistically insignificant during the period of interest rate ceilings in the country. The real interest rate effect on financial saving was also positive and statistically significant in models fitted for the period 1967-2010, a result which is consistent with theory but could not be credibly defended since real interest rates remained negative in most of the sample period. The results have also shown that real income per capita is an important determinant of financial saving. This emphasises importance of policies targeted to the increase of saving capacities in the economy, for example, the on-going implementation of strategies to the achievement of millennium development goals (MDGs).

The study has only explored the effect of real interest rate and other factors on financial savings. The result of this study are only indicative rather than definitely conclusive, mainly due to data limitations, among others, that of financial savings. Besides, while focus on financial saving is informative, it is narrow. A focus on aggregate domestic savings rather than financial savings only may help better design of policy targeted to domestic resources mobilization and economic growth. Else purely

micro studies on saving behaviour are equally important. Also notable several hypotheses on savings were not investigated, among others, the hypothesized the link between saving and dependency rates, capital flight, and economic growth. Moreover, transmission mechanism in the link between real interest rate policy, saving, investment and economic growth still also stands out as a potential area of policy oriented study in Tanzania.

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Appendix I

Correlation Matrix

Variable	s	r	R	π	mi	exr_pre	y^{pc}	fd
s	1.00	0.64	-0.22	-0.63	-0.13	0.23	0.62	0.43
r	0.64	1.00	0.06	-0.70	-0.11	0.53	0.49	0.48
R	-0.22	0.06	1.00	0.67	-0.04	0.41	-0.41	-0.16
π	-0.63	-0.70	0.67	1.00	0.06	-0.10	-0.65	-0.48
mi	-0.13	-0.11	-0.04	0.06	1.00	-0.27	-0.10	-0.22
exr_pre	0.23	0.53	0.41	-0.10	-0.27	1.00	0.41	0.62
y^{pc}	0.62	0.49	-0.41	-0.65	-0.10	0.41	1.00	0.59
fd	0.43	0.48	-0.16	-0.48	-0.22	0.62	0.59	1.00

Appendix 2

Figure 1: Long-run Financial Saving Equation

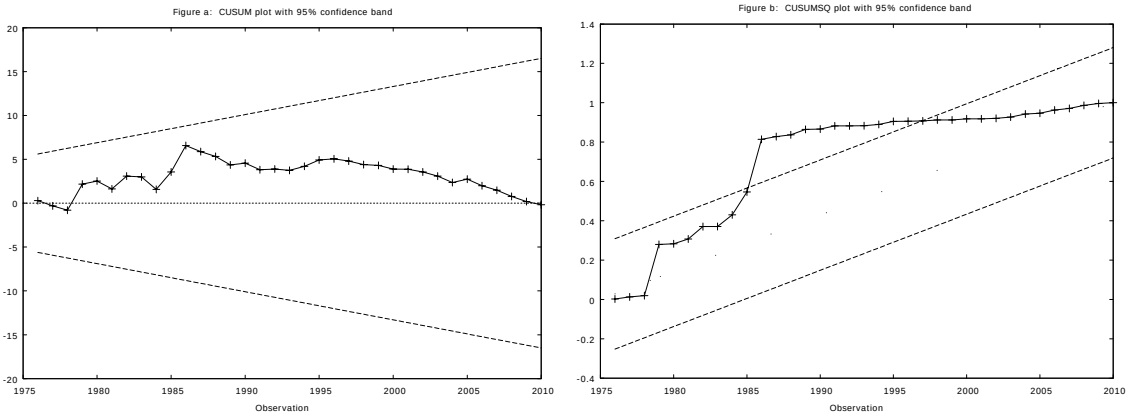


Figure 2: The Financial Repression Model

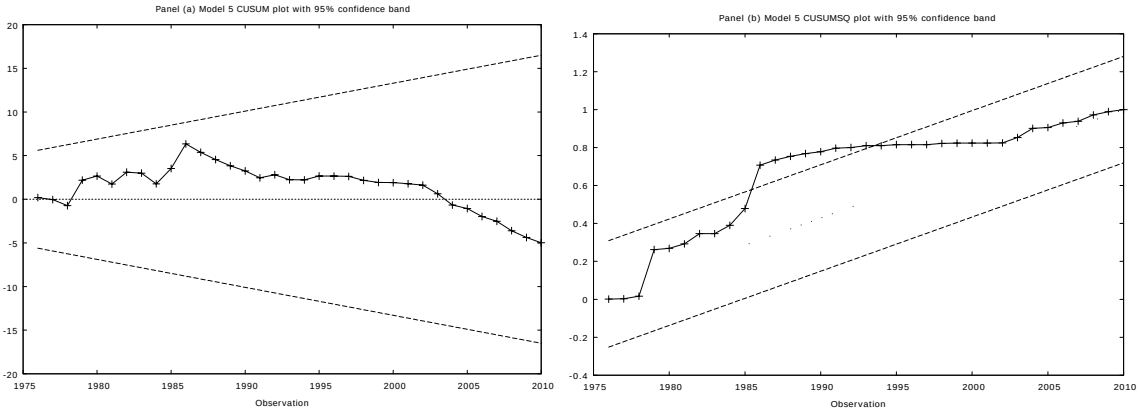


Figure 3: The ECM Model

