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## **An Empirical Appraisal of McKinnon's Complementarity Hypothesis in Tanzania**

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### **Abstract**

The prediction of McKinnon's Complementarity Hypothesis (McKinnon 1973) is that money and investment are complimentary due to self-financed investment and that the real interest rate is the key determinant of capital formation for financially repressed developing economies. Tanzania has experienced a long spell of financial repression as manifested in government putting caps or ceilings on interest rates, state ownership or control of domestic banks and financial institutions, heavy bank borrowing by government, restrictions on entry to the financial industry and directing credit to certain sectors and public entities. Although financial repression can facilitate economic development, for the case of most developing countries it is hypothesized by McKinnon (1973) and Shaw (1973) that it retards savings and investment and thereby inhibits capital formation and economic growth. This paper critically appraises the complementarity hypothesis in Tanzania by an empirical approach. The Autoregressive Distributed Lag (ARDL) model estimation results and the Bounds Test are supportive of the hypothesis, confirming basic complementarity between accumulation of money balances and investment. Higher real interest rates raise capital formation via the increase in real money balances. The policy implication is an exit from financial repression by achieving positive market determined interest rates in order to secure greater levels of investment.

**Key Words:** Tanzania; McKinnon Complementarity Hypothesis, ARDL; Innovation Accounting

**JEL Classification:** E02, E42, E43

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## **1. Introduction**

The McKinnon (1973) complementarity hypothesis states that money and real capital assets are complements in developing countries. Due to absence of deep financial markets and extensive financial intermediation, before indivisible investment projects can be undertaken money balances have to be accumulated. This implies that the higher the real rate of return, the greater the accumulation of money balances and the larger will be the inducement to invest. Since investment is indivisible the demand for money will be larger, the greater the ratio of investment to total income. In developing countries, there is lack of organized capital and money markets, absence of wide spectrum of financial and physical instruments for the individuals to store their wealth and absence of deep financial markets and extensive financial intermediation. The implication is that money balances have to be accumulated before indivisible investment projects can be undertaken. In addition, the indivisibility of investment means that the demand for money will be larger the greater the ratio of investment to total income. Furthermore, the lack of organized capital and money markets limits the spectrum of financial and physical instruments for the individuals to store their wealth.

The important point of McKinnon's hypothesis is that an increase in the desired rate of capital accumulation (private savings) at any given level of income leads to an increase in the average demand for real balances. This implies that a rise in return on capital leads to an increase in the need of real cash balance holding for accumulation purpose. Thus, money is not a competing asset; rather money is conduit through which accumulation takes place in developing countries. This implies that an increase in real return on money can raise sharply investment saving propensities in contrast to neoclassical theory where return on money does not directly affect propensity to save because all firms have perfect access to external finance. So higher return on money enlarges real cash balance holding thus relaxing the saving- investment bottleneck in developing countries. The McKinnon hypothesis provides theoretical basis for the policy of financial liberalization and it has brought a shift in the policy priorities of different countries in different regions.

The government of Tanzania implemented typical sets of restrictions during the 1970s to the 1990s. The restrictions, apart from interest rate controls, included government ownership of commercial banks on which severe liquidity restrictions were imposed; snuffing out competition by restricting private ownership and foreign banks' entry; discriminatory credit policies where very few sectors enjoyed unfettered credit at low interest rates to exclusively licensed import activities, highly protected manufacturing, crop boards, cooperative societies and publicly controlled utilities; compulsory holding of low yielding government debt and foreign exchange restrictions.

During 1970s to mid 1990s high cash requirements and direct credit allocation were introduced. During the same period, due to nationalization of financial institutions and industrial units, the landscape of financial sector was totally changed from privatized to complete nationalized one. The period of 1970s and 1980s is marked with direct monetary controls like direct credit allocation and annual credit plan etc. From 1991, Tanzania embarked on the policy of financial liberalization. Substantial institutional changes have taken place in the financial sector and a number of steps are being taken in this regard. The Banking sector is almost totally privatized and monetary policy is being pursued through indirect market measures. Therefore, it would be very important to have a

fresh look over the issue that money and capital are complements or substitutes in Tanzania. This paper critically appraises the complementarity hypothesis in Tanzania by an empirical approach for the period 1970 to 2010.

After this introduction the paper is organized in five other sections. Section 2 presents a brief overview of financial repression as a basis of complementarity between money and investment in Tanzania. While section 3 reviews the literature, section 4 sketches out the methodology. Section 5 reports and discusses the findings and section 6 concludes.

## **2. A Brief Overview of Financial Repression in Tanzania**

McKinnon, (1973) and Shaw, (1973) were the ones who introduced the term financial repression. Broadly speaking, financial repression is a term that describes measures by which governments channel funds to themselves as a form of debt reduction. Financial repression can include such measures as directed lending to the government, caps on interest rates, regulation of capital movement between countries and a tighter association between government and banks. The term was initially used to point out bad economic policies that held back the economies in less developed nations, (Goldsmith, 1969; Fry, 1982, 1988; King and Levin, 1993).

An efficient financial system is a key element that influences growth of an economy as it allows efficient allocation of capital by bringing together deficit spending units and surplus spending units. Unfortunately, the importance of this process has received little attention in both developed and developing countries as governments have restricted competition, intervened and regulated the financial sector. It is believed that a repressed financial sector discourages both saving and investment because the rates of return are lower than what could be obtained in a competitive market.

The rationale for financial repression has been the response to the simplistic interpretations of Keynesian theories. It was thought that, by controlling interest rates at reasonably low levels and by expanding the scope of government direct intervention, investment would greatly increase. Features of financial repression have revolved around several actions by government including caps or ceilings on interest rate, government ownership or control of domestic banks and financial institutions, creation or maintenance of a captive domestic market for government debt, restrictions on entry to the financial industry and directing credit to certain sectors.

It is shown in URT (2001a) and BOT (2016) that after the Arusha Declaration in 1967 the Tanzania government stiffened its control over the financial system by nationalizing commercial banks, lending rate controls and by starting state development banks for industry and agriculture. Interest rate controls were strictly applied from the 1970s to the late 1980s to all types of loans and deposits. The structure of interest rates was largely determined by the Bank of Tanzania, the central bank. Credit planning, a formal system of directed credit was undertaken through the Annual Finance and Credit Plans covering a large percentage of total lending. Likewise, concessionary lending rates were offered to priority sectors. The early nineties were marked by the establishment of a process of gradual liberalization of the financial system. Ceilings on lending rates began to dissolve in mid 1990s. However, the government still provided indicative interest rate levels.

In the 1960s, the economy performed fairly well as low inflation rates prevailed and moderate per capita income growth and investment rates were attained. However, the impressive performance was reversed beginning the mid 1970s as a number of shocks both internal and external led to severe macroeconomic imbalances. The shocks also hit hardest the financial sector undermining its efficiency and its role in influencing good performance of the economy. Ndanshau and Kilindo (2016) observe that between 1972 and 1975 the State owned financial intermediaries as a measure towards providing finance for development. Institutions were established to support agriculture and housing and the Annual Finance and Credit Plan (AFCP) provided monetary policy implementation instead of monetary policy instruments. Based on the AFCP, the Government assumed the role of setting interest rates while State Owned Enterprises (SOEs) were assured of credit. Most credit was allocated to public institutions many of which were not operating commercially. Despite that the government was not able to introduce tight financial discipline under a regime of high nominal interest rates and weak financial structure of key financial institutions for fear of making many public enterprises and co-operatives collapse.

The financial sector mainly rationed credit to government and public enterprises. To make things worse, the commercial requirement of paying interest and principal was not strictly followed and as a result, a number of enterprises accumulated payments arrears to the banking system. The private sector largely depended on self finance. The intermediation between private savers and private investors was not being attained. Reforms were called for to enable investors in the private sector to have access to loanable funds from financial institutions.

It is further shown in Ndanshau and Kilindo (2016) that the interest rate ceilings set for lending by financial intermediaries led to very low nominal deposit rates that remained constant for an extended period only being increased in 1979 and 1981. Despite government control of commodity prices which underestimated official inflation both lending and savings interest rates remained negative prior to the reforms of 1986. Thus, the period 1967 to 1988 recorded low savings in general and financial savings in particular. Interest rates can be effective in mobilizing financial savings depending on the confidence of economic agents have in the banking system, the network of bank branches and efficient operation of the banks. The real interest rate in turn can be used in allocating credit depending on whether the banking system operates commercially and enterprises, including those in the public sector are required to pay back loans and interest. As mentioned above this was not the case during the period of financial repression.

There was rapid increase in money supply mainly caused by borrowing by non-government institutions particularly marketing boards. Six marketing boards for coffee, cotton, cashew nut, sisal, tobacco and the National Milling Corporation were highly indebted to the banking system. There was continuous need for the government to provide finance to the marketing system indicating weakness of the marketing structure. The financial burden made it difficult to check inflationary monetary expansion.

To address ailments of the financial sector the president appointed a commission to review the structural, procedural and organizational arrangements and policy issues related to the financial system, The Presidential Commission of Inquiry into the Monetary and Banking System in Tanzania, referred to as The *Nyirabu* Commission. The commission identified among other problems, that the financial sector was repressed by state ownership of banks and financial

institutions which were monopolies and centrally controlled. The state and the party interfered in the business of the institutions and competition was stifled as they were highly protected. The government interfered in lending operations of banks and the fiscal stance was characterized by huge budget deficits coupled with high inflation (Satta, 1999; URT, 2007a). The presidential commission pointed out two major deficiencies. First was that the financial system did not adequately specify, and vest in the bank of Tanzania, the central bank, powers to license and supervise the banks and financial institutions. Secondly, no criteria were laid down for ensuring the soundness of the financial structure and management of banks and financial institutions.

Until 1990, about 80 percent of the national bank of commerce loan portfolio involved loans to only twenty borrowers of which 19 were public enterprises and 65 percent of the loans were considered non-performing. The restructuring of public enterprises was thus required for health of the financial system to be attained (BOT, 2016). The recommendations of the Nyirabu Commission were addressed by reforms in the financial sector through the First- and Second-Generation Financial Sector Reforms (FGFSR and SGFSR) URT (2007a). The major policy measures of the First-Generation Financial Sector Reforms removed the rigid controls of the government, and created the competitive environment by allowing the private sector to enter the financial sector services provision in Tanzania.

The Bank of Tanzania had to strengthen their supervisory capacity, which is necessary for the stability and safety of the financial system. The FGFSR also established the foundation of the functioning of indirect monetary policy. The FGFSR main activities were in the restructuring and privatization of the State-owned Banks. The second-generation reforms were centered in a number of activities including among others: improving the monetary policy framework, improving the supervisory function, developing financial markets, establishing and promoting a viable and sustainable microfinance industry and establishing a policy framework and legal infrastructure for provision of long-term development financing.

The Second Generation Financial Sector Reforms were succeeded by legislation of a number of acts covering institutions in the financial sector URT (2007a). These include the Banks and Financial Institutions Act (1991), Loans and Advances Realization Trust,(1991) the Foreign Exchange Act,(1992) the Capital Markets and Securities Act(1994), the Bank of Tanzania Act (1995), the Insurance Act(1996) and the Land Act (1999). Major reforms in accordance to the recommendations elevated the economy to a stable macroeconomic environment through the 1990s to early 2000s. Despite that a joint WB/IMF report of 2003 observed that the financial system still played a limited role in the economy as depth and efficiency were not adequately achieved. Other financial repression indicators like small proportion of credit to the private sector, high interest rate spreads and huge bank holdings of government bonds still prevailed, URT (2007a).

Table 1 displays some indicators of financial performance. Currency as a percent of M2 has stayed at around 30 percent for most of the period under study showing low rate of savings in banks. The real interest rate is still low despite reaching higher rates in recent years. This was not an outcome of interest rate increases but decline in inflation. Broad money ratio to output experienced up-and down swings during the period while claims on government as a share of total credit was high during the repression decade of 1980 to 1990. This indicator has declined by half beginning the year 1991 when liberalization measures resumed. Private sector credit is still below twenty percent

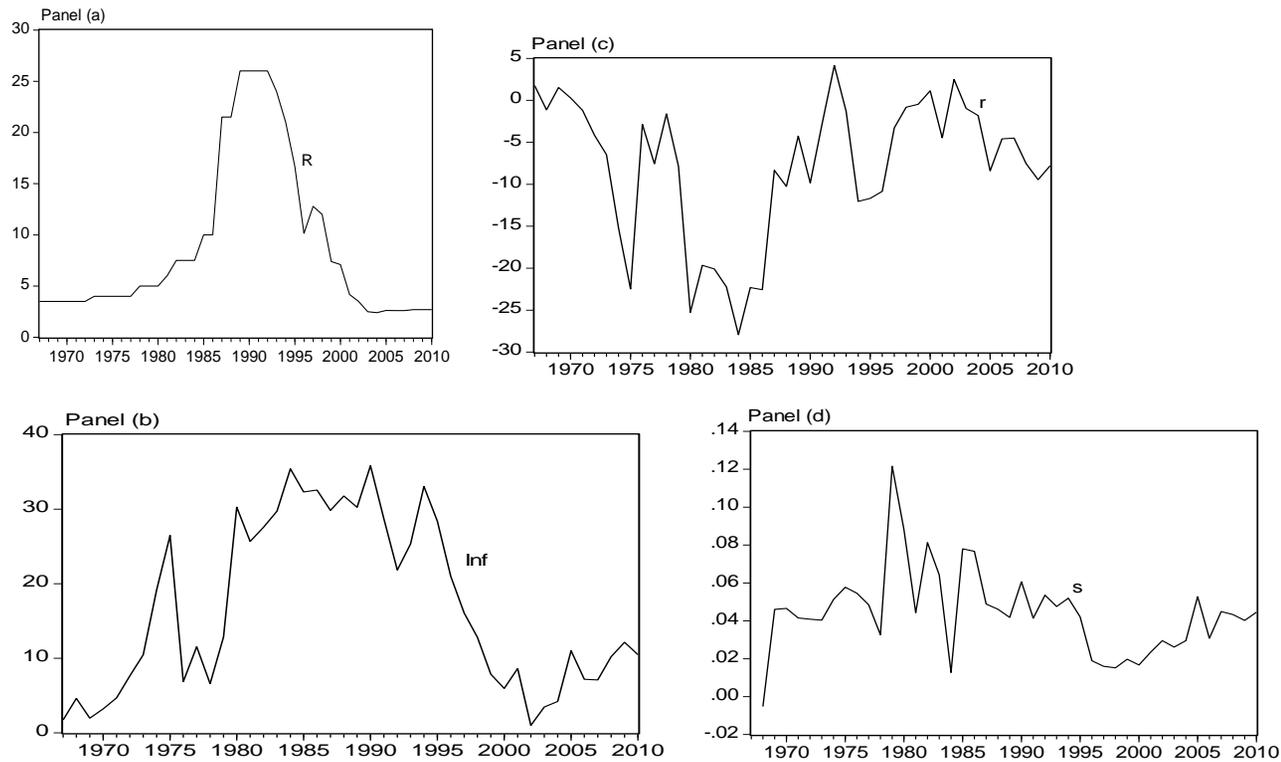
but has marked a big improvement from below 10 percent during the past two decades. Fluctuations have been experienced in bank deposits with an upward trend during the past fifteen years beginning year 2000. This coincides with increased entry of foreign banks following the opening up of the banking sector.

Ndanshau and Kilindo (2016) evidence a repressive financial sector as shown by high inflation and low nominal and negative real interest rates during the period under study as shown in Figure 1. In the figure, panel (a) we display the nominal passbook interest rate, in panel (b) the inflation rate and in panels (c) and (d) are the real passbook interest rate and the savings rate respectively. The real pass book interest rate in Tanzania remained negative in most of the sample period. This was notwithstanding successful judicious monetary policy drives to tame inflation—which fell from 35 percent in 1995 to 2% in 2004. Apparently, in spite of the upward adjustment of interest rates between 1986-1991, inflation decisively accounted for the negative real interest rate during and beyond the period. The slight improvement of real interest rates in the mid 1990s and 2000 was attained after abating inflation. In panel (d) it is seen that the ratio of the nominal financial saving to the nominal Gross Domestic Product (GDP) declined between 1995 and 2000 but rose thereafter.

**Table 1: Selected Financial Indicators in Tanzania**

Indicator	1980 -1985	1986-1990	1991-1994	1995-2000	2000-2010
Currency /M2	0.31	0.36	0.34	0.32	0.34
M2/GDP	0.32	0.36	0.34	0.41	0.35
Private sector credit/GDP	3.4	4.6	5.1	11.7	14.3
Claims on Government% of total credit	70	44	32	29	30
Bank Deposits/GDP	35.13	11.03	15.30	15.3	13.5

**Source: Bank of Tanzania (2016)**



**Figure1: Inflation, Savings and Interest Rates**

### **3. Literature Review**

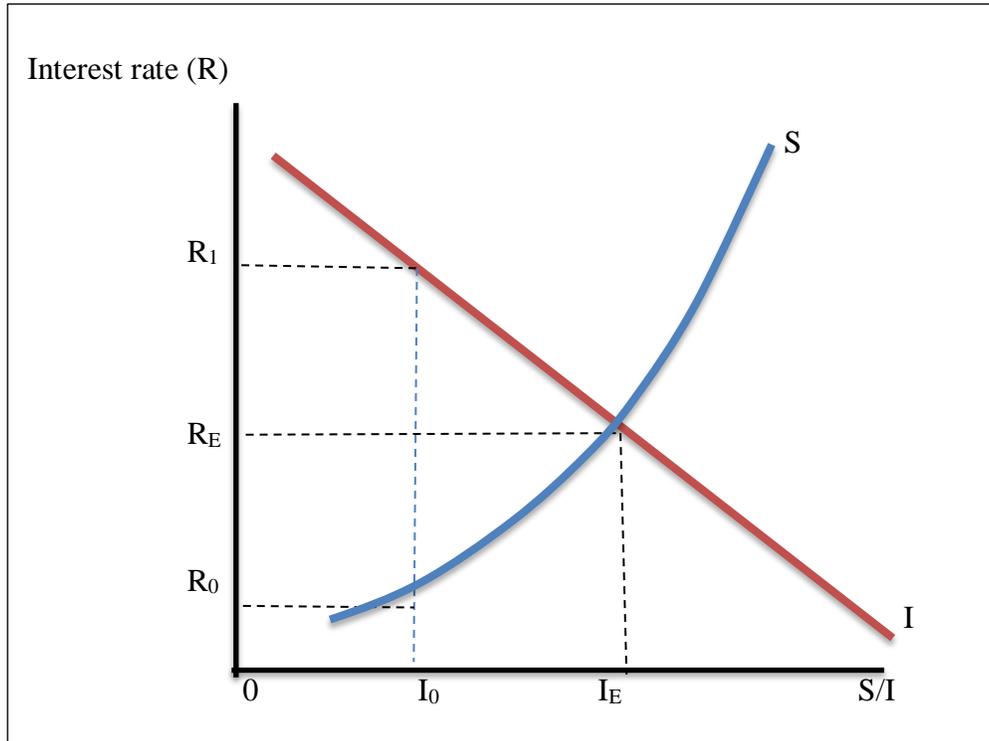
#### ***3.1 Theoretical Literature***

The theory of financial repression is based on the causal relationship between financial development and economic growth. Patrick (1966) distinguishes the relationship in two causal relationships named 'demand-following' and 'supply-leading'. The framework defines 'demand-following' as a phenomenon whereby modern financial institutions and financial services are created in response to demand in the real economy while 'supply-leading' is referred to creation of financial institutions and financial services is done in advance of demand for them.

According to the 'demand-following' theory financial markets develop and progress following the increased demand for the services from the growing economy and evolution in financial markets is taken as a passive response to the growing economy. According to this theory, growth and expansion of the real sector generates new demands for financial services which in turn exert and intensify pressure to establish large and more sophisticated financial institutions to satisfy the new demand. From this point of view, financial repression is a by-product or an outcome of continued government interference in the real sector.

The opposing view of 'supply-leading' is that the presence of efficient financial markets increases the supply of financial services in advance of the demand for them in the real sector of the economy. When financial institutions are well-functioning economic efficiency is promoted, credit is created and expanded, savings are mobilized, capital accumulation is enhanced, and resources are transferred from the traditional sector to growth-leading sectors such as industry and services (Levine, 1993; Edwards, 1995; Fry, 1997; Gitau, 2014).

The view is based on McKinnon (1973) and Shaw (1973) with the policy of interest rate control, high reserve requirements coupled with inflation leads to negative real deposit rates and this impedes the financial deepening process. Low interest rates do not increase investment as Keynesian analysis postulates as savings mobilization is stifled. Figure 2 borrowed from Peter and Temidayo (2017) illustrates financial repression due to low interest rates.



**Figure 2: Financial Repression**

In the vertical axis we have  $R$ , the real interest rate and on the horizontal axis we have savings,  $S$  and investment  $I$ . Savings is a positive function of real interest rate, and investment, a negative function of real interest rate. Following the theoretical exposition in Peter and Temidayo (2017) and Oluleye (2017), in a repressed financial sector the interest rate at  $R_0$  is set below the equilibrium interest rate  $R_E$ , the intersection of the savings function and investment function. This results into a lower level of savings and thus lower investment at  $I_0$  compared to equilibrium investment at  $I_E$ . This exerts pressure in the demand for loanable funds which ought to increase the interest rate but financial repression limits it. In the presence of limits in both deposit and loans more demand for investment occurs. Low interest rates on savings curb financial savings causing inadequate deposits to fund demanded level of investments. In such a situation banks are forced to ration credit in favour of big borrowers while small borrowers are deprived of credit, hampering development, Peter and Temidayo (2017).

On the other hand, setting interest rates above equilibrium at  $R_1$ , increases the level of savings. This constraints investment when ceilings are imposed on deposits but not on loans. Banks may hike interest rates on loans, making investors refrain from borrowing and hence hamper investment. In the absence of financial constraints,  $R_E$  will be equilibrium real interest rate where  $S=I$ . But because of financial repression, the institutional interest rate given is less than the free market equilibrium real rate. The amount of actual investment is constrained to  $I_0$  because of the limited saving that is available at  $R_0$ . As shown in Oluleye (2017) the basis of the argument is

Keynesian theory which asserts that, at a very low level of interest rates, people would prefer to hold their money balances in form of cash and thereby not avail them to deficit spending units for investment, Keynes (1936). Other effects of financial repression include lower consumption, if consumers refrain from savings and lower employment as less investment is realized. According to theory, if the monetary authorities are bold enough to abolish financial repression altogether and decide to dispense with the ceiling on the interest rate, then the level of actual saving and investment will rise further leading to a further expansion of income.

Critics of the repression hypothesis including-van Wijnbergen, (1983a,b); Kohsaka, (1984), Lim, (1997), Liang, (1988), Shahin, (1990, 1996) arrived at their conclusions after examining the impact of financial liberalization policies and stabilization measures on economic activity when informal loan markets are incorporated in economic models. In the models it is assumed that the informal loan market is the only market determined one and the organized loan markets are fully efficient in channeling funds in the intermediation process. Van Wijnbergen (1983a) argues in favour of financial repression rather than financial liberalization because financial repression has many benefits for example on the bases of lower rate improve the loans performance, on the lower capital price enhance the equity, rate of growth accelerate if the loan is targeted in the direction of exporter and highly technological. He notes that McKinnon had not focused on informal real credit market where the poor borrower and lender involve for lending and borrowing purpose. Other opposing views are by Fry (1978) who asserts that in this theory monetary as well as non-monetary assets both should be included. While McKinnon said availability of self-finance is important for private investment while according to Neoclassical approach price of capital is important for private investment. Moore (2010) argues that the financial repression theory is not suitable for middle income group of countries it's just applicable for the less develop countries. Increase in real rate of return doesn't increase the proportion of saving because of external finance from which firms increase cash holding balances.

Financial liberalization under this approach has been analyzed along four areas. The first area assumes that an increase in the deposit rate would motivate the unorganized market funds into the banking system. The act of siphoning assets held in informal loan markets to the banking system may convey contraction moves to economic activity. The reason for this is that only a portion of funds deposited in the banking system is channeled into investments due to the rule of holding required reserves. The second argument is that the decrease in informal market funds raises the informal market loan rate or the cost of financing working capital. This may result in inflation. According to Shahin (1990), this may result into stagflation as inflation and economic contraction are combined.

Thirdly when funds move into savings out of unproductive assets such as currency or gold, and if the substitution effect between informal loans and bank deposits is low and reserve requirement is low, increasing the deposit rate could be expansionary. Kohsaka, (1984) amplifies the above point by arguing that a high responsiveness of flow of savings with respect to the real interest rate on bank deposits is also necessary for successful liberalization policies. It has also been argued that though the long-term impact of savings may become very powerful in increasing real wealth and even overcoming the decrease in aggregate loan supply, in the short run they may not expand economic activity. Despite the counter-arguments, financial liberalization has received great attention in development policy.

Chari *et.al.*, (2016) observe that the idea that governments use banks to help raise funds is a conventional one. Central banks were founded specifically to raise funds for war expenditures. The banks were then governed and regulated to ensure that the government had access to a stable source of funding beyond national defense. Hayes (2020) observes that financial repression was a key element in explaining periods of time when advanced economies were able to reduce their public debt at a relatively quick pace. These periods tended to follow an explosion of public debt. In some cases, this was a result of wars and their costs. More recently, public debts have grown as a result of stimulus programs designed to help lift economies out of recessions and hence possible resurgence of financial repression.

According to Chari et al. (2016) financial repression was common immediately following World War II. Facing large postwar debts, many Allied countries practiced it on a large scale and ceased to do so only when their debts were reduced. Financial repression in this period involved regulatory measures requiring financial institutions to hold government debt and restricting international capital flows, thereby limiting the ability of consumers and financial intermediaries to invest in substitutes for their own government's debt.

The policy has re-appeared more recently in the wake of the recent Great Recession when, in the face of severe fiscal stress, numerous countries reinstated various measures of financial repression. For developed countries, the urgent need to issue debt typically results from a sharp increase in government expenditures that occur in wartime. For emerging market economies, this same urgent need often results from a "sudden stop" in the willingness of foreigners to lend money to their domestic government. Hoffmann (2019) opposes the view that governments might have to consider another wave of financial repression as a way out of the low growth-high debt trap. He argues that the history of advanced economies and the liberalization experience of the lagging countries suggest that an exit from financially repressive policies is the better alternative to promote growth and the sustainability of government finances.

### ***3.2 Empirical Literature***

Literature reveals that there are two opposing views on the effect of financial repression on economic growth. On the one side, in the spirit of McKinnon (1973) and Shaw(1973) it is argued that financial repression would have negative consequences on economic growth and financial development. Following this view are Vogel and Buser (1976), Kapur (1976), Fry, (1982,1988) and more recently Reinhart, (2012), Chari et al. (2016), Oluleye (2017) and Peter and Temidayo (2017).

The argument put forward by anti-repression policies is that there is a link between the money demand of consumers/savers to growth. A ceiling on deposit rate will reduce the tendency to hold money (deposits). This constraint on the liability side of the banking system balance sheet will lead to a reduction in credit supply. The ensuing reduction in working capital will reduce the growth rate, Kapur (1976). More specifically, financial repression has several effects as spelt out in Espinosa and Hunter (1994), Kilindo (2002, 2009a; b), Ndanshau and Kilindo (2016).

The strand of literature arguing against financial repression recommend financial liberalization as the way to attain fast economic growth , (Amsden and Euh, 1993; Arestis and Demetriades, (1997,1999). Espinosa and Hunter(1994) and Gill (2005) list the specific ways that a financially repressed economy is likely to be adversely affected in a number of ways. First, reduction of the flow of loadable funds through the organized banking system, forcing potential borrowers to rely more on self-finance. Second, variation of interest rates on the reduced flow of bank lending from one class of favored or disfavored borrower to another. Third, impairing the process of self-finance within business enterprises and households. This results from a negative real yield on deposits, as well as coin and currency thus firms and families cannot easily accumulate liquid assets in preparation for making discrete investments. Fourth, significant financial deepening outside the repressed banking system becomes impossible when firms are dangerously illiquid and/or inflation is high or unstable.

On the other side, Keynesians argue that controlling interest rates at low levels and increased government intervention makes investments increase. According to Stiglitz (2000) government intervention in financial markets in the forms of financial repression and direct intervention through public sector banks - based on their assumed market failure- in line with a more or less stringent command economy, enables it to direct resources to encourage the take-off of the country and concentrate those resources in sectors and companies that favor economic growth and development. The intervention by government in interest rate setting accelerates growth as lower interest rates encourage savings and the level of interest rates should bring full employment. Financial controls enhance aggregate savings and hence boost capital formation, investment and overall growth, World Bank (1993); Edwards, (1995). In Stiglitz (1984) and Fry (1997) it is further argued that raising interest rates may increase the demand for credit by those who are most unlikely to repay their loans. The demand pushes further interest rates which in turn increases interest rate costs, pulling down profits earned by firms. Firms undertake riskier investments further increasing probability of defaults and adverse selection of projects. This may lead to deterioration of banks' portfolios. Thus Stiglitz, *op.cit.* points out that raising interest rates beyond a certain level may lower banks' overall return. Thus in order to raise the expected quality of borrowers, interest rates should be kept low. In that way financial repression can be used to encourage higher savings and more efficient allocation of capital for increased economic growth.

Those who regard financial repression as a means used by governments to extract much needed development finance from the private sector and enhance development include Stiglitz (1984,1994, 2000), Yulek (1997, 2017) Amsden and Euh (1993) . They argue that policies such as selective credit have produced positive results in Japan. Policies such as selective credit have produced positive results in Japan, South Korea and East Asian economies and China. Moreover, Xun,(2013) and Huang and Wang (2011) maintain that financial repression can lead to capital flight but causality running from financial development to growth has been verified in Thailand China, Indonesia, Singapore, India and Malaysia and thus supporting the views of financial liberalization. Stiglitz (1994) argues in favor of certain forms of financial repression. His views are that repression can have several positive effects such as: improving the average quality of the pool of loan applicants by lowering interest rates; increasing firm equity by lowering the price of capital; and accelerating the rate of growth if credit is targeted towards profitable sectors such as exporters or sectors with high technological spillovers.

According to the proponents of financial liberalization developing countries are supposed to allow the financial sector to operate without restrictions in order that it operates efficiently, become healthier and deeper so that private business initiatives find financial support. This is in the spirit of growth theory suggesting supply-leading hypothesis that a country with a robust financial intermediation will grow faster. This then calls for reform of the capital market. It is believed by those supporting financial liberalization that shortcomings of financial repression that were thwarting economic progress such as credit shortage and deprivation of credit to private sector projects will end by lifting restrictions on banks and allowing private and foreign banks.

#### **4. Methodology**

##### **4.1: The Model**

McKinnon, (1973) asserts self-financed capital formation for financially constrained developing economies and developed the complementarity hypothesis. His contention is that a high real return on money induces the accumulation of real money balances, and this, in turn finances the costly, indivisible fixed capital. A dual process in which the demand for real balances ( $M/P$ ) depends directly on the average real return on capital, and the investment to income ratio ( $I/Y$ ) (the investment rate) rises with the real interest rate. The model assumes that government fiscal action has little role in affecting directly aggregate capital accumulation since public policy is limited to the control of the real return on holding money. Further, restrictions apply to the simplified assumptions about investment in self-financing domestic enterprises Moore (2010).

The McKinnon (1973) and Shaw (1973) methodology is the most used to establish the effects of financial repression. We follow the approach closely, using data spanning from 1970 to 2010. The McKinnon – Shaw approach starts by defining the money demand function in equation 1.

$$\left(\frac{M^d}{P}\right) = f\left(\frac{I}{Y}, y, (d - \pi)\right) \quad (1)$$

( $I/Y$ ) is the investment rate, where,  $I$  denotes private investment,  $Y$  denotes nominal income,  $P$  is the price level,  $y$  stands for real income ( $Y/P$ ); and  $(d - \pi)$  = real interest rate (nominal interest rate  $d$  minus anticipated inflation  $\pi$ ). Another important equation that explains the complementarity hypothesis by McKinnon is that the investment function is expressed in terms of the real interest rate  $(d - \pi)$  and the average return to capital  $r$ , as shown in equation 2.

$$\left(\frac{I}{Y}\right) = f((d - \pi), r) \quad (2)$$

Where,  $r$  is the average return on physical capital. Equations (1) and (2) which we adopt are mostly used in standard analysis as in McKinnon (1973); Shaw (1973); Vogel and Buser, (1976); Gbosi, (2005); Oluleye, (2017). The hypotheses with expected signs are as presented in Table 2.

The derivative of money demand to the investment ratio represents the money demand for investment. An increase of investment allows a stronger money holding. In other words, the investment increases monetary saving. This condition is important for the success of financial liberalization policy for the transmission of saving to investment.

**Table 2. Hypotheses and expected signs**

<b>S/No</b>	<b>Hypothesis</b>	<b>Expected sign</b>	<b>Economic explanation</b>
1	$\partial \left( \frac{M}{P} \right) / \delta \left( \frac{I}{Y} \right)$	Positive	An increase in investment allows a stronger money holding
2	$\frac{\partial(M/p)}{\partial y}$	Positive	Transaction demand for money increases as income increases
3	$\frac{\partial(M/p)}{\partial(d-\pi)}$	Positive	A positive real interest rate allows a greater money holding in financially repressed economies
4	$\partial(I/y) / \partial r$	Positive	When the average return to capital increases investment increases in financially repressed economies
5	$\partial(I/y) / \partial(d-\pi)$	Positive	When the real interest rate increases, investment increases.

In the estimation, investment is defined as gross fixed capital formation, the return on physical capital is proxied by average treasury bills yield and real deposit interest rate is defined as the difference between the deposit rate and the expected inflation rate. Gross Domestic Product is the measure of output, real money balances is measured by the ratio of money supply to the price level.

The empirical verification of the financial repression hypothesis is carried out following the model in Bouzid (2012).

$$\log\left(\frac{M}{P}\right) = \beta_{0t} + \beta_{1t} \log y + \beta_{2t} \log\left(\frac{I}{Y}\right) + \beta_{3t} \log(d - \pi) \quad (3)$$

$$\log\left(\frac{I}{Y}\right) = \gamma_{0t} + \gamma_{1t} \log(d - \pi) + \gamma_{2t} \log r \quad (4)$$

The financial repression theory hypothesis holds true if  $\frac{\partial(I/Y)}{\partial(d-\pi)} = \gamma_1 > 0$ , and  $\frac{\partial(\frac{M}{P})}{\partial(\frac{I}{Y})} = \beta_2 > 0$ . The next step is to capture the passage of the static to dynamic relationship. This is shown in equations 5 and 6.

$$\log\left(\frac{I}{Y}\right) = \alpha_0 + \sum_{j=0}^n \alpha_j X_{t-j} + \sum_{i=1}^p \phi \log(I/Y)_{t-1} \quad (5)$$

$$\log\left(\frac{M}{P}\right) = \mu_0 + \sum_{j=0}^n \mu_j Z_{t-j} + \sum_{j=0}^m \gamma \log\left(\frac{M}{P}\right)_{t-1} \quad (6)$$

## **4.2 Data**

Data used in the estimation was obtained from the Bank of Tanzania publication, BOT(2016) and National Accounts publications. The real money balances (M/P) was derived by dividing broad money, (M2) with the National Consumer Price Index, Income was measured by Gross Domestic Product, investment was represented by Gross Fixed Capital Formation and the real interest rate was taken as the deposit rate minus inflation lagged one period, assuming that expected inflation is equal to past period inflation. The average return on capital was proxied by Treasury bill interest rate (the average rates of the 35, 91, 180 and 364-day maturity treasury bills).

## **4.3 Estimation Procedure**

### **4.3.1 Unit root tests**

Unit root test is used in econometrics to avoid spurious regression results. More commonly defined, a variable is integrated of order 'd', that is, I(d), if it has to be differenced d-times before it achieves stationarity. There exist several tests for unit root in time series data. We use the Phillips-Peron test which is among the most commonly used like the Augmented Dickey-Fuller (ADF) test, which is associated with Dickey (1979) and Fuller (1981). The tests are based on the specification in equation 7.

$$\Delta Y_t = \alpha Y_{t-1} + x_t' \delta + \epsilon_t \quad (7a)$$

The PP method estimates the non-augmented DF test equation (7) and modifies the  $t$  ratio of the  $\alpha$  coefficient so that serial correlation does not affect the asymptotic distribution of the test statistic. The PP test is based on the statistic:

$$\tau_\alpha = t_\alpha \left( \frac{\gamma_0}{f_0} \right)^{1/2} - \frac{T(f_0 - \gamma_0)(s e(\hat{\alpha}))}{2f_0^{1/2} s} \quad (7b)$$

Where  $\hat{\alpha}$  is the estimate, and  $t_\alpha$  and  $t$ -ratio of  $\alpha$ ,  $s e(\hat{\alpha})$  is coefficient standard error, and  $s$  is the standard error of the test regression shown in equation 7. In addition,  $\gamma_0$  is a consistent estimate of the error variance in equation 7. The remaining term,  $f_0$ , is an estimator of the residual spectrum at frequency zero.

#### 4.3.2 ARDL Model

The most commonly used methods conducting the cointegration test include the residual based Engle-Granger (1987) test, and the maximum likelihood based Johansen (1991; 1995) and Johansen-Juselius (1990) tests. However, the OLS based autoregressive distributed lag (ARDL) approach to cointegration has become popular in recent years. According to Pesaran and Pesaran (1997) the main advantage of ARDL modelling lies in its flexibility that it can be applied when the variables are of different order of integration. Another advantage of this approach pointed out in Laureceson and Chai (2003) is that the model takes sufficient numbers of lags to capture the data generating process in a general-to-specific modelling framework and a dynamic error correction model (ECM) can be derived from ARDL through a simple linear transformation. The ECM integrates the short-run dynamics with the long-run equilibrium without losing long-run information. It is further shown in Laureceson and Chai (2003), that using the ARDL approach avoids problems resulting from non-stationary time series data.

Model one is specified as equation 8.

$$\begin{aligned} \Delta \ln \left( \frac{M}{P} \right) = & \delta_0 + \sum_{i=1}^p \beta_i \Delta \ln \left( \frac{M}{P} \right)_{t-i} + \sum_{i=1}^p \varphi_i \Delta \ln \left( \frac{I}{Y} \right)_{t-i} + \sum_{i=1}^p \varphi_i \Delta \ln y_{t-i} \\ & + \sum_{i=1}^p \varphi_i \Delta \ln (d - \pi)_{t-i} + \Delta \ln r_{t-1} + \zeta \ln \left( \frac{M}{P} \right)_{t-i} + \lambda_1 \ln \left( \frac{I}{Y} \right)_{t-1} + \lambda_4 \ln r_{t-1} \\ & - ECM_{t-1} + \mu_{t1} \dots \dots (8) \end{aligned}$$

The investment equation of model 2 is specified in equation 9.

$$\begin{aligned} \Delta \ln \left( \frac{I}{Y} \right) = & \tau_0 + \sum_{i=1}^p \zeta_i \Delta \ln \left( \frac{I}{Y} \right)_{t-i} + \sum_{i=1}^p \theta_i \Delta \ln (d - \pi)_{t-i} + \sum_{i=1}^p \theta_i \Delta \ln r_{t-i} + \psi_1 \ln \left( \frac{I}{Y} \right)_{t-1} \\ & + \psi_2 \ln (d - \pi)_{t-1} + \psi_3 \ln r_{t-1} - ECM_{t-1} + \mu_{t2} \dots \dots (9) \end{aligned}$$

**4.3.3 Innovative Accounting**

Innovative accounting involves estimating impulse response function (IRF) and variance decomposition (VDC). This allows us to estimate the short run dynamics of the variables in the VAR. Among the two procedures we use the VDC approach to analyze the dynamics of the system. The forecast error variance decomposition allows for inferences to be made concerning the relative importance of each innovation towards explaining the behavior of the endogenous variables, Best et. al. (2017). In the context of this study the variance decomposition is a way to ascertain how much of the variance in forecast errors of future demand for real balances and increased investment can be attributed to shocks in the independent variables.

**5. Empirical Results and Discussion**

**5.1 Descriptive Statistics Results**

Descriptive Statistics results presented in Table 2 reveal that all the variables of the estimation model are about normally distributed. The Kurtosis is positive and less than three (3) for all variables and the Skewness is positive in all cases showing non-asymmetric tail. The Jarque- Bera statistic is statistically significant suggesting lack of potential autocorrelation.

**Table 2: Descriptive Statistics Results**

Variable	Observations	Mean	Std. Dev.	Skewness	Kurtosis	Jarque Bera
ln(M/P)	41	1100000	1910000	2.244868	2.3657	0.3652
Ln <i>r</i>	41	10.424	9.435	89.01439	0.8427302	0.0094
ln( <i>d</i> - $\pi$ )	41	16.885	8.926	0.7798158	2.52984	1.0943
Ln(I/Y)	41	20.903	6.081	36.98019	0.8099039	0.0787
ln <i>y</i>	41	124000	78211.3	1.196151	2.216317	3.0152

**5.2 Unit Root Test Results**

The ADF results of the series in levels and first difference did not bring stationary series at first differencing but at second difference. We resorted to Philip-Peron (PP) stationarity test procedure whereby unit root was attained after first differencing. The results in Table 3 reject the null hypothesis that all the variables of the estimation model were stationary in level. All variables were differenced and then tested for unit root and the results are presented in Table 3.

**Table 3: Philip-Peron (PP) Unit Root at Levels**

Variable	With trend		Without trend	
	Test Statistics	Critical Value of 5%	Test Statistics	Critical Value of 5%
ln(M/P)	-0.828	-3.548	-0.041	-2.958
ln( <i>d</i> - $\pi$ )	-0.929	-3.548	-0.975	-2.958
ln <i>r</i>	-0.846	-3.536	-1.36	-2.958
ln(I/Y)	-1.733	-3.656	-0.805	-2.958
Ln <i>y</i>	-1.636	-3.564	0.335	-2.958

From Table 4, all series become stationary at first difference because the computed absolute values of exceed the critical values both with and without trend, which lead us to reject the null hypothesis ( $\delta = 0$ ) that there is unit root or the time series is non-stationary.

**Table 4: Philip-Peron (PP) Unit Root at First Difference**

Variable	With trend		Without trend	
	Test Statistics	Critical Value of 5%	Test Statistics	Critical Value of 5%
dln(M/P)	-3.738	-3.544	-3.608	-2.961
dln( $d - \pi$ )	-4.777	-3.544	-4.438	-2.961
dlnr	-5.815	-3.544	-5.671	-2.961
dln(I/Y)	-5.164	-3.544	-5.212	-2.961
dlny	-5.447	-3.544	-5.371	-2.961

### 5.3 ARDL Results

To test for the existence of long- run relationship between variables for Econometric Models 8 and 9, we look at the F test statistic. In this approach the long run relationship of the underlying variables is detected through the F statistic. In this approach, long-run relationship of the series is said to be established when the F statistic exceeds he critical value band. The Bounds Test method developed in Pesaran, Shin, and Smith (2001) is used.

The computed F statistic is 5.337 for Model 1. The relevant critical value bounds for this test presented in Pesaran, Shin, and Smith (2001) at the 10% , 5% and 1% levels are [2.86-4.01]; [3.25-4.49] and [3.74 -5.06] respectively. Since the F statistic exceeds the upper bound of the critical value band at1% level the null hypothesis of no long run relationship between the variables is rejected. This test result suggests that there exists a long-run relationship between the variables in Model 1. In addition the t-statistic is -3.73 while the Pesaran, Shin, and Smith (2001) t-statistic at 10%, 5% and 1% significance is [-2.86, -3.99]; [-3.13, -4.26] and [-3.43,-4.60] respectively. The t-ratio results reinforce our conclusion that there is a long run relationship between the variables in levels.

The computed F statistic for Model 2 is 4.952. The relevant critical value bounds for this test as shown in Pesaran, Shin, and Smith (2001) at the 10% , 5% and 1% levels are [3.79-4.85]; [4.41-5.52] and [5.15 -6.36]. Since the F statistic is less than the lower bound of the critical value band even at 10% level the null hypothesis of no long run relationship between the variables is rejected. This test result suggests that there exists a long-run relationship between the variables in Model 2 at the 10% level. In addition the t-statistic is -3.72 while the Pesaran, Shin, and Smith (2001) t-statistic bands at 10%, 5% and 1% significance is [-2.86,-3.53]; [-3.13,- 3.8] and [-3.43,- 4.10] respectively. The t-ratio results reinforce our conclusion that there is a long run relationship between the variables in levels.

Having rejected the null hypothesis of *no* long run cointegrating relationship between the variables the ARDL Model is estimated and the short-run coefficients are reported in Tables 5 and 6.

**Table 5: Model 1 ARDL Short Run Results: Dependent Variable is  $\Delta \ln(M/P)$**

	<b>Coef.</b>	<b>St.Err.</b>	<b>t-value</b>	<b>p-value</b>	<b>[95% Conf</b>	<b>Interval]</b>
$\Delta \ln(M/P)$ -2	0.2343	0.1374	1.71	-0.1879	0.5949	1.0091
$\Delta \ln(M/P)$ -3	0.5435	0.1028	3.34	0.004	0.2000	0.8871
$\Delta \ln(I/Y)$ -1	0.2641	0.1952	1.35	0.0194	0.6759	0.1477
$\Delta \ln(d - \pi)$ -2	0.1864	0.0908	2.05	0.056	-0.3784	0.0054
$\Delta \ln(d - \pi)$ -3	0.2706	0.0790	3.43	0.004	0.2122	0.9623
$\Delta \ln y$ -1	0.3311	0.2240	1.48	0.158	-0.8037	1.1415
$\Delta \ln y$ -2	0.2420	0.1941	1.25	0.229	-1.6761	0.6517
Constant	-1.0410	0.9846	-1.06	0.35	-0.1185	1.0363

Looking at the results in Table 5, we find that the coefficient on investment and the real interest rate (with lags) conform with theoretical expectations in terms of sign and significance and support the McKinnon Complementarity hypotheses. The positive coefficient of investment-income ratio on demand for real balances supports the assumption of self-finance. A rise in investment to income ratio increases rather reduces money demand. In the investment equation, it is evident the availability of credit raises the investment ratio and the positive relationship highlights the importance of high interest rates for capital accumulation.

A crucial finding is the positive and significant coefficient on (I/Y) in the money demand function and  $(d - \pi)$  in the investment function, though at the second lag. These results provide robust empirical support for the complementarity hypothesis according to McKinnon's theory. It means that in order to attract savings, real interest rates should be kept high. Lending capacity of financial intermediaries would increase funds available for investment and this can be attained by attracting more deposits. These results are in line with findings in Ndanshau and Kilindo (2016) and Kilindo, (2002, 2009a; b ) for the case of Tanzania. It is further shown in Table 6 that as the economy grows and the investment ratio increases, demand for real balances increases.

**Table 6: Model 2 ARDL Short Run Results: Dependent Variable is  $\Delta \ln(I/Y)$**

	<b>Coef.</b>	<b>St.Err.</b>	<b>t-value</b>	<b>p-value</b>	<b>[95% Conf</b>	<b>Interval]</b>
$\Delta \ln(d - \pi)$ -1	-0.0922	0.0738	-1.25	0.021	-2.131	0.5863
$\Delta \ln(d - \pi)$ -2	0.1306	0.0759	1.72	0.096	-0.0244	0.2858
$\Delta \ln r$ -2	0.1578	0.0757	2.08	0.046	0.0032	0.3127
Constant	0.3038	0.7000	1.45	0.158	-0.158	0.7388

The long run coefficients are reported in Tables 7 and 8. They represent the equilibrium effects of the independent variables on the dependent variable. The negative speed-of-adjustment coefficient

– ECM measures how strongly the dependent variable reacts to a deviation from the equilibrium relationship in one period or, in other words, how quickly such an equilibrium distortion is corrected.

**Table 7 : Model 1 Long Run Results :Dependent Variable is  $\Delta \ln(M/P)$**

	<b>Coeff.</b>	<b>St. Error.</b>	<b>t-Valu e</b>	<b>p- value</b>	<b>[95% Conf</b>	<b>Interval]</b>
$\Delta \ln(I/Y)$	0.7840	0.2991	2.62	0.0180	0.1529	1.4150
$\Delta \ln(d - \pi)$	0.5417	0.1787	3.03	0.008	0.1647	1.4150
$\Delta \ln y$	1.0320	0.2166	4.76	0.000	0.5479	1.4890
ECM(-1)	-0.5298	0.1407	-3.76	0.002	-.8268	-.2328
Constant	2.007	0.190	10.58	0.000	1.623	2.391

ARDL (4,1,4,3,3)

Log likelihood = 61.20544

Sample: 1974 - 2010

Number of obs. = 37

R-squared = 0.8457

Adj. R-squared = 0.6733

Log likelihood = 61.20544

Root MSE = 0.0683

As the real interest rate and the average return on capital increase, the investment ratio increases as the results in Table 8 show. The sign and significance of the ECM is in accordance with theoretical expectations.

**Table 8 : Model 2 Long Run Results : Dependent Variable is ln(I/Y)**

$\Delta \ln(I/Y)$	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]
$\Delta \ln(d - \pi)$	0.7795	0.6300	1.24	0.226	-2.0663	0.5071
$\Delta \ln r$	0.7009	.4860	1.44	0.160	-0.2915	1.6935
ECM(-1)	-0.2153	0.1110	-3.72	0.3531	-0.3313	0.1219

ARDL(4,1,4,3,3)  
 Sample: 1974 - 2010  
 Number of obs = 37  
 R-squared = 0.322  
 Adj R-squared = 0.1986  
 Log likelihood = 37.8006  
 Root MSE = 0.06967

The estimation results support the complementarity hypothesis because our main test lies on the response of money demand to investment which is positive and significant (0.7840 in Table 7) and the responsiveness of investment to the real interest rate which is also positive and significant (0.7795 in Table 8).

**5.4 Innovation Accounting**

**5.4.1 Variance Decomposition results**

The results reported in Table 9 indicates that shocks to the real interest rate are the most important in explaining demand for real money balances followed by the real return on capital at about 30 and 18 percent respectively. Taken together, shocks to interest rates account for close to 50 percent to variations in demand for real balances. This is in support of the financial repression theory which emphasizes interest rate liberalization. Own shocks of real money balances influence is the least, at most 8 percent in the fourth horizon. Regarding the investment ratio, it exerts 13 percent of the shocks on the demand for money balances.

**Table 9: Variance Decomposition of (M/P)**

	I/Y	$(d - \pi)$	$r$	y	(M/P)
(M/P)-2	13.4	30.1	17.8	10.3	86.7
(M/P)-4	4.7	44.3	10.4	9.3	8.2
(M/P)-6	3.4	32.1	9.3	8.5	6.9
(M/P)-8	2.7	12.3	7.5	6.4	5.9

Notes: The number following the dash is the horizon. Entries show the percentage of the forecast variable of (M/P) at different horizons attributable to innovations in column variable

Table 10 displays the shocks of the real deposit rate, the real interest rate, real income and investment rate own shocks. Similar to the case of real money balances, interest rates substantially explain investment (16.5 percent for real interest rate and 26.5 percent for real return on capital). Banks depend on savings deposits as a source of loanable funds and hence the real deposit rate

influences willingness to save as would the real interest rate. Real income shocks also influence investment substantially and ranks second after the real deposit rate.

**Table 10: Variance Decomposition of (I/Y)**

	$r$	$(d - \pi)$	$y$	(I/Y)
(I/Y)-2	26.5	16.5	17.3	72.7
(I/Y)-4	14.6	13.2	15.7	9.8
(I/Y)-6	16.3	12.8	9.3	3.5
(I/Y)-8	4.2	5.5	2.5	1.2

Notes: The number following the dash is the horizon. Entries show the percentage of the forecast variable of (I/Y) at different horizons attributable to innovations in column variable

**Table 11: Variance Decomposition of ( $r$ )**

	$r$	$(d - \pi)$	$y$	(I/Y)
(I/Y)-2	62.5	10.5	7.5	5.9
(I/Y)-4	6.7	44.3	8.9	2.8
(I/Y)-6	17.4	18.8	19.4	1.8
(I/Y)-8	0.89	3.5	2.8	1.6

**Table 12: Variance Decomposition of ( $d - \pi$ )**

	$r$	$(d - \pi)$	$y$	(I/Y)
(I/Y)-2	46.5	76.5	17.3	12.7
(I/Y)-4	24.6	13.2	15.7	9.9
(I/Y)-6	6.3	12.8	9.3	4.5
(I/Y)-8	5.5	5.57	5.3	11.3

**Table 13: Variance Decomposition of ( $y$ )**

	$r$	$(d - \pi)$	$y$	(I/Y)
(I/Y)-2	16.2	11.6	15.4	12.7
(I/Y)-4	7.8	3.2	7.2	9.8
(I/Y)-6	3.4	11.8	9.7	5.3
(I/Y)-8	0.9	3.9	7.5	0.8

#### **5.4.2 Impulse Response Function Results**

While variance decomposition shows the response of the dependent variables from shocks on the rest of variables, it is unable to show whether the shock is positive or negative. The impulse response graph enables us to see the sign of the shock by observing whether the function falls below zero along the horizontal axis or not.

We are interested in determining how a dependent variable reacts to the shocks that attack other variables. We estimate the impulse response function to determine demand for real balances and investment against the shocks of the investment ratio, the real deposit rate and real income. These are the variables of main interest in our analysis. Looking at the Impulse Response Graphs in

Appendix 1, it is seen that a one Standard Deviation shock (innovation) to real interest rates increase real money balances, while one Standard Deviation shock of the investment rate, and real income increase demand for real balances both in the short and long run.

The response of a Standard Deviation shock of the real interest rate, the real deposit rate and real income on the investment ratio is positive in the short and long run. This is in support of McKinnon's complementarity hypothesis which emphasizes the role of deposits in encouraging self-financed investment. A rise in the deposit rate stimulates demand for capital by making savings accumulation more rewarding and by increasing the amount of internally financed investment.

## **6. Conclusion**

The essential message of the McKinnon complementarity hypothesis is that a low or negative real rate of interest discourages savings and hence reduces the availability of loanable funds, constrains investment, and in turn lowers the rate of economic growth. Our empirical evidence reveals that under disequilibrium interest rates conditions higher real interest rates raise capital formation via the increase in real money balances. The positive influence of real interest rates on investment in terms of the self-financed physical capital proves to be a credible sign of the complementarity between the accumulation of money balances and physical capital in Tanzania during the period under study. Policy of maintaining positive and market-determined real interest rate may induce the savers to save more, which will enable more investment to take place and exert a positive effect on investment.

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Appendix 1

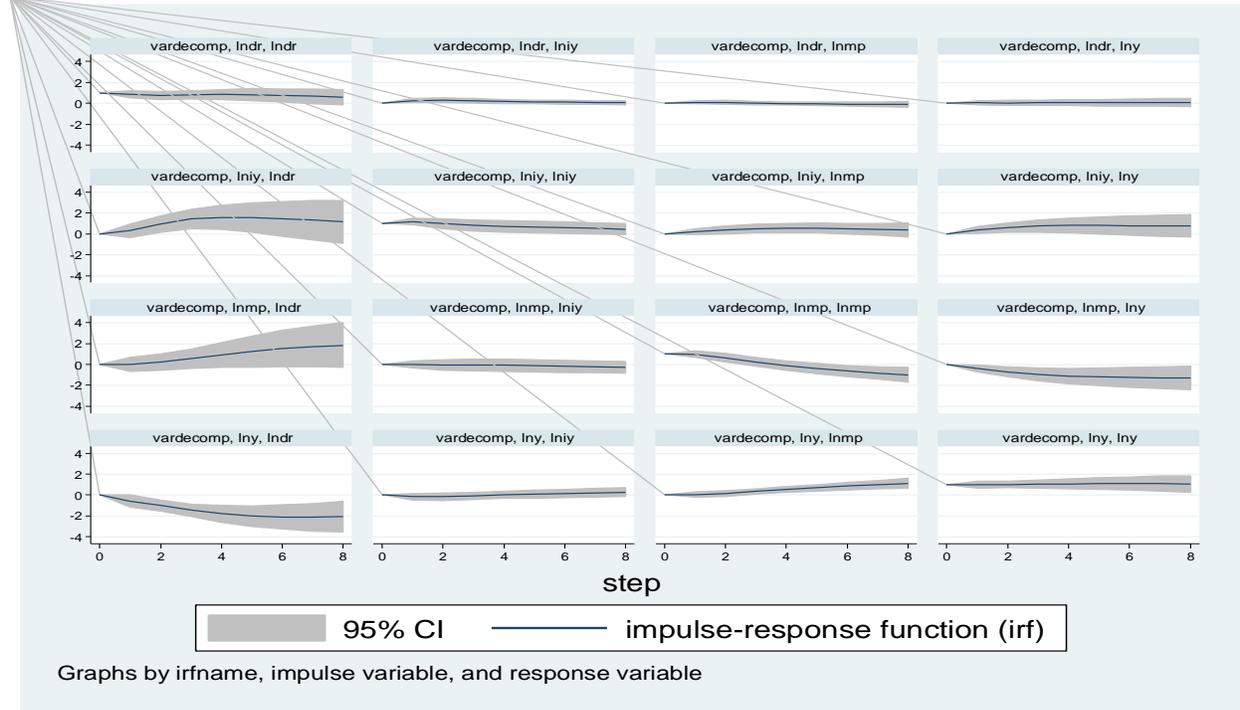


Figure 3: Impulse Response Function