

Interest Rate Pass Through and the Lessons for the Conduct of Monetary Policy in Tanzania

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ABSTRACT

The aim of this paper is to analyse interest rate pass through of the money market anchor rate to retail bank lending and deposit rates in Tanzania. The Treasury bill rates were used as money market anchor rates. The paper used the monthly time series data for the period of 2008 to 2014. Vector autoregressive model was used to estimate variant models on the interest rate pass through from the money market anchor rate to the retail bank deposit and lending rates. The estimation results revealed that money market anchor rate was passed through to the three and twelve month interest rate in the same period. The size of interest rate pass through for the 364 treasury bills rate was comparable to those of other studies in developing countries. Nonetheless, there was limited pass through from the money market anchor rate to the lending rates. This suggests that limited transmission of the monetary policy to retail lending interest rate due to structural rigidities in the financial markets. Thus, it is recommended that the monetary authority should enhance financial deepening and widening in order to develop new products and enhance competition in the financial markets and monetary transmission mechanism.

Keywords: Monetary policy, treasury bill rates, lending rates, deposit rates, liquidity

INTRODUCTION

This paper analyses the size and speed (time) of the pass through of the Bank of Tanzania (BoT) anchor money market rate to the commercial banks retail interest rates using monthly data in the 2008 to 2014 period. Interest rate pass through is defined as the degree and speed at which the changes of policy or market rate are transmitted to the bank retail lending or deposit rates (Ur Rehman, 2009). As part of its functions, the Bank of Tanzania has been intervening in the financial market through the conduct of monetary policy in order to influence the trend of monetary aggregates and communicate with the public.

BoT is conducting the monetary policy through adjusting price of financial variables, that is, anchor money market rates and quantitative variables. In particular, the conduct of monetary policy has focused on controlling the monetary aggregates, which include reserve requirements, credit growth money supply (M2 and M3), exchange rate movements and short term market interest rates (BoT, 2014). The conduct of monetary policy is done through the use of the open

market operations for government securities, sale and purchase of the foreign currency and through interbank foreign exchange market. The discount window and Lombard facility repurchase agreement (repos) are used to manage short term liquidity. The purpose of such intervention is to influence aggregate demand, through bank interest rates and inflation controls.

In managing liquidity consistent with the growth of output, the Bank of Tanzania uses money market rates as the anchor interest rate (BoT, 2009). The effect of the anchor rate is expected to be observed through the size; speed, strength, and degree of the interest pass through to the commercial bank retail deposit and lending rates. In theory, it is expected that the effects of the changes in the monetary policy rates are transmitted in the short term market rates. The changes in interest rates are important, especially given the efforts of the government to promote private sector involvement in the economy.

In order to enhance the conduct of the monetary policy and the efficiency of the financial markets, the Government of Tanzania has undertaken a number of financial and legal

reforms. They include financial sector reforms of 1990 that were followed by the amendment of Financial and Banking Act of 1991 which was later replaced by the Act of 2006. Other legal provisions are provided in the Foreign Exchange Act of 1994 and Capital and Security Market Act of 1999. The legal instruments together with reforms aimed at enhancing the competitiveness and efficiency of the financial markets among other things.

The second generation of financial sector reforms were initiated in 2010. They were preceded by the enactment of the Mortgage Financing Act 2008 and establishment of Tanzania Mortgage Refinancing Facility. The outcomes of which were the introduction of lease and long term mortgage financing among other things. These have contributed to further financial deepening and widening in the economy. They are also expected to enhance the performance of financial markets and the conduct of monetary policy.

The reforms and legal changes have led to the establishment of private banks and the introduction of new financial products. The number of banks has also increased from two in 1992 to 54 in 2014. The types and number of the bank products have also increased. Tanzania has also witnessed the growth of the capital and security market, following the establishment of Dar es Salaam Stock Exchange Market in 2000. The number of companies that had been registered at the capital and security market stands at 15. Similarly, the participation of individuals in the capital and security market has increased to about 200,000 people in 2015. In particular, the financial markets offer a number of short

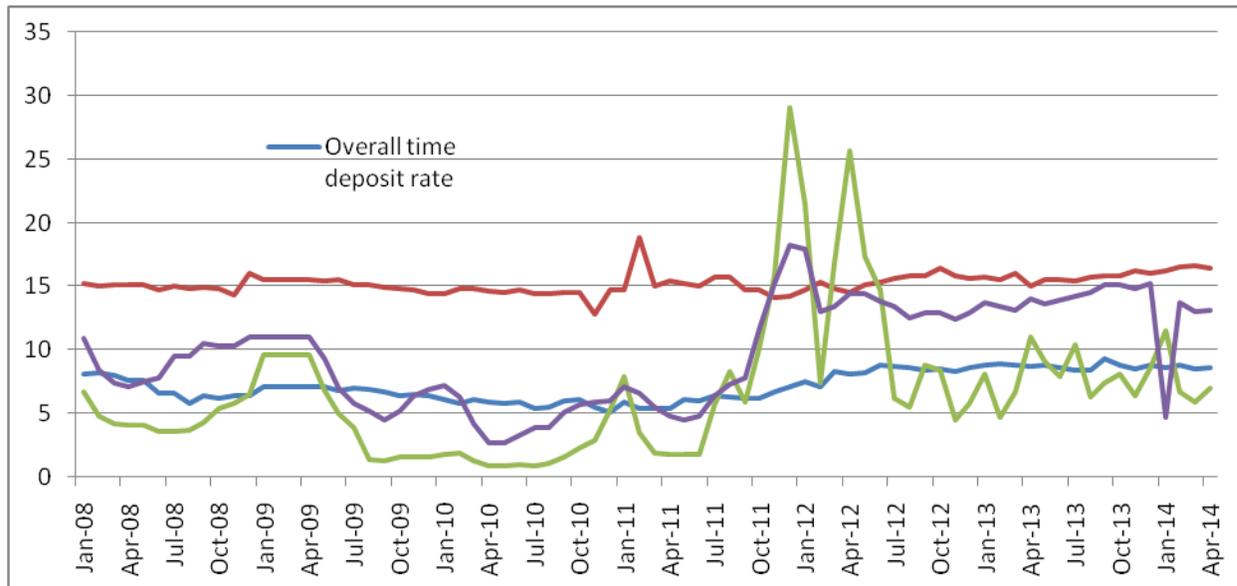
and long term financial products, which were not there, prior to reforms.

Furthermore, the commercial banks have partnered with the telecommunication firms in delivering a number of financial services using mobile phones. The telecommunication firms facilitate banks to deliver a number of services efficiently and inclusively. The services offered include savings, the transfer of funds and settling of financial obligations using mobile phones. The banks also offer a wider range of financial services to customers through the outreach retail outlets (BoT, 2014).

The conduct of the monetary policy and its effect on the interest rate pass through is observed through the pattern on the trends of the anchor money market rates, interbank interest rate, as well as lending and deposits rates. In particular, both deposits and lending interest have not been adjusting as expected, following the changes in money market anchor rates.

Figure 1 shows monthly trends on the selected financial market variables. The trend reveals that there is a wide spread between lending and deposit rates in Tanzania. The spread has ranged between 5 and 10 percent per month. In addition, there had been a narrow spread between the Treasury bill rates and deposit rates during the January 2008 to July 2011 period. However, a wide gap between interest rates and Treasury bill rates were observed between April 2008 and July 2009. Further wide spread between lending and deposit rates was also observed between July 2011 and January 2014.

Figure 1: The monthly trends in the treasury bill rate, deposit rates, lending rates and interbank rate in Tanzania in 2008-2014



Furthermore, Figure 1 show wide spread between the overall bank lending rate and overall treasury bill rates between January 2008 and July 2011. Between October 2011 and January 2012, the Treasury bill rate was above the bank lending rates. Thereafter, the gap between the two narrowed down. The gap widened between January and April 2014. The trends in gaps between lending and deposit rates could be associated with the stickiness in the funding costs, non-repayment of loans by the crop authorities, which have borrowed funds to purchase crops. Other factors may include structural rigidities in the financial markets, the conduct of monetary policy and global financial crisis of 2008.

Moreover, the bank lending rates have been persistently above the interbank market rates in the 2008 to 2014 period. The only exception is the period of October 2011 to July 2012, where a wide fluctuation interbank market rates was observed, and was above the bank lending and deposits rates. This suggests that the conduct of monetary policy had influenced the trend in the intermediate money market rates but not the bank retail interest rates. The policy action by BoT could not influence the financial market actors.

The interbank market lending rates and the treasury bill rates have been moving together in the January 2008 to July 2011, with modest spread among the two. A wide spread between the interbank money market is observed in the July 2012 to January 2014 period. This could be due to liquidity constraints and global economic trends among other things.

Economic literature suggests that following the changes in the policy rate, monetary transmission mechanisms is observed in the financial market by the changes in the interbank interest rate (intermediate variables) and bank retail interest rates (final variables) among other things. It is also revealed by the changes in the exchange rate in a small open economy. However, there are limited evidences on the effect of the conduct of the monetary policy on the lending and deposit interest rate in Tanzania, given the use of the price and monetary aggregates as policy tools.

As pointed out before, the developments in the money and capital markets suggest an increased financial deepening and widening in Tanzania. The developments provide an ideal condition for the effective conduct of monetary policy, specifically for speedy effect

of the policy on the monetary variables and aggregate demand. The condition is ideal for implementing market based approach monetary policy that involve targeting to influence short term interest rates and inflation.

Nonetheless, the Bank of Tanzania has not been successful in influencing the retail bank interest rates and inflation rate. This is shown by among other things a persistent wide gap between the banks deposit and lending rates, notwithstanding the decline from about 6.3 per cent in the 2008 to 9.66 per cent in 2014. The gap is still wide despite the financial reforms and innovation that have already been undertaken.

Furthermore, in comparison to other East African Countries of Kenya and Uganda, it has been observed that it is difficult to determine the exact market reaction to a particular monetary decision in Tanzania (Nation Media Group 2013; Davoodi, Dixity and Pinter, 2013). Little is known about the reasons for such observed outcomes.

In this regard, it is worth examining the size and speed of the transmission of monetary signals in the money markets, as outcome of the conduct of monetary policy using the money market anchor rates, given that the money multiplier and velocity have been found to be unstable in the long run. Thus, the objective of this paper is to examine the size and speed of interest pass through of the anchor money market to bank retail interest rates. In Tanzania, an insight into the issue shall not only assist in improving the conduct of monetary policy but also inform the Government of Tanzanian on the prerequisites on the joining the East African Monetary Union. The underlying assumptions are (i) the conduct of the monetary policy has immediate impact on both the money and capital markets (ii) banks and other financial institutions adjust interest rate according to cost of funds and opportunity costs that are reflected in the market rates

A number of previous studies on interest rate pass through, on Tanzania, have focused on analysing the monetary transmission mechanisms by changing quantitative monetary aggregates (Berg et. al. 2013, Davoodi, Dixity and Pinter, 2013, Buigut, 2009). In contrast to previous studies, this paper focused on analysing the effect of the short term money market rates on the retail lending and deposit rates.

A number of theories have been used to explain the interest rate pass through and determination of the interest rate in both developed and developing countries (Soreqne and Werner, 2006). They are cost of fund theory, structure conduct hypothesis and efficient structure paradigm. The adoption of various theories has been dictated by the context of particular economy or study and availability of data, economic events, such as economic shocks and the developments in econometric methods.

Cost of fund theory

The cost of fund theory stipulates that banks set interest rate according to the marginal or opportunity costs of funds (Mishra, and Montiel, 2012). In this regard, in determining the interest rates, banks equate their interest rates to those of other financial institutions which have comparable maturity rates. The interest rates of comparable maturity reflect the cost of funds to the banks and opportunity costs as well. The information on the rate could be obtained by observing the money market rate in a given economy.

Specifically, the interest rates set by the monetary authority inform the banks and the public about cost of funds. In the case of Tanzania, the conduct of monetary policy by the Bank of Tanzania, targeting the short term interest rate is done through using the money market rates, by the use of the money market anchor rates (BoT, 2009). The money market anchor rates are expected to lead banks in determining the retail lending and deposit interest rates, while considering the interest rate of comparable financial instruments of

similar maturities (Chilese et al., 2014). In addition, banks in setting the interest rate do add the mark up to compensate for opportunity costs and credit risks.

The underlying assumptions of the cost of fund theory include the existence of the competition in banking and non-banking financial markets. It is also assumed that there exist well-functioning financial markets with minimal rigidities and shocks.

In Tanzania, the existence of a large number of banks suggests the existence of the competition in the financial markets. Nonetheless, there are banks of different size and number of branches. For example, in the capital markets, there is limited competition, given the limited number of actors. In addition, as pointed out before, in the country only 200,000 Tanzanians own shares in companies or firms. Even the number of firms participating in the Dar es Salaam Stock Exchange Market is limited. At the moment only 15 companies are participating in the Stock Exchange Market. Thus, while in the money market competition may be vivid, there is limited competition in the capital markets in Tanzania. This may have an effect on the efficacy of the monetary policy. Nonetheless, in this study, non-bank retail products are not considered, because of lack of data.

Given the importance of the structure of the financial markets in determining interest rates and the conduct of monetary policy a number, governments in developing countries had initiated financial sector reforms for the purpose of improving the market structure and competition. This has involved reforms that aim at financial deepening and widening.

The Government of Tanzania has also adopted financial sector reforms. The reforms had increased the number of financial institutions, an ideal situation for enhancing competition in the financial and non-financial markets. The reforms had also led to the introduction of new financial products, such as shares and securities. Notwithstanding reforms

undertaken, interest rate stickiness is still observed (BoT, 2012, 2013).

Structure Conduit Hypothesis

Apart from the cost of fund theory, the structure conduit hypothesis has also been used as a framework for examining interest rate pass through in a number of studies (Mangwende, 2011, Polius and Samuel 2000, Peltzman, 2000). The hypothesis emphasizes the importance of the banking industry structure on the conduct of the monetary policy and the interest rate transmission mechanism (Mangwende, Chiuzara and Nel, 2011). The hypothesis points out that the degree of competition and market power of banks impact on the speed of adjustment by which banks change the interest rate as results of the market rate changes.

In particular, in an economy characterised by lack of competitiveness in the banking industry, slow adjustment of interest rates as a result of monetary policy rate changes is expected. This limits lending to risk borrowers among other things. In particular, uncompetitive banking industry limits the monetary policy transmission mechanism.

In contrast to the above contention, in a competitive environment banks tend to lend even to risk borrowers, in order to enhance their market shares (Peltzman, 2000). In such a situation, banks tend to be more relaxed in market rationing, leading to speedy pass through of the market interest rates. In this regard, there is an association between credit risks and interest rate adjustments (Peltzman, 2000).

In Tanzania, there is a large number of banks with several branches and outlets (BoT, 2014). Also, there exist a large number of similar products which banks offer. In this regard, the bank industry is increasingly becoming competitive. Nonetheless, in the country notwithstanding, increasing competitions, banks tend to opt for least risk lending (Mangwende, Chiuzara and Nel, 2011). Thus, they tend to lend the government or a

particular segment of the customers who are less risk. In this regard, there is limited opportunity for banks to exercise market power. Thus, the applicability of the structural theory in context of Tanzania may be limited.

Efficient structure paradigm

Efficiency structure paradigm also explains the effect of the conduct of monetary policy and interest pass through in the economies. The paradigm postulates that the relationship between market structure and the performance of any firm is dictated by the efficiency of the firms (Polius and Samuel, 2000). It is argued that for firms that are relative efficiency, they can make profit by either maintaining their sizes or pricing strategy or expanding operations. In this regard, the paradigm highlights the relationship between profit and market share.

The firms' decisions to expand operations may result in gaining market shares with the ultimate outcome of improving efficiency. Thus, the firms that are efficient have the ability to gain market shares and power. In this regard, according to the efficient structure paradigm, banks that have a large market share that may limit the contact of the monetary policy and interest rate pass through in an economy. In such a situation, a slow response of the market rate to the policy rate is expected.

The efficient structure paradigm is a critique to the Structure Conduit Hypothesis. It highlights the shortcoming of paradigm in explaining interest rate pass through. It emphasizes the importance of economies of scale to banks, the feature that enables them to realise profits and market power. However, this may not always be true because the presence of economies of scale market features differs across the countries.

In Tanzania, there are 54 banks with more than 200 branches all over the country not mentioning the outreach outlets (BOT, 2014). The development of ICT and mobile banking has made the financial markets and banking industry in particular to be very competitive.

In addition, the performance of banks in terms of profits is determined by not only the size but also the years of the bank existence. Banks that have been established recently are the ones that are making losses compared to those which were established long time ago.

Following the discussions above and the nature of the financial market in Tanzania, the cost of funds theory is ideal for analysing the interest rate pass through. The reason is that the structural conduit hypothesis and efficiency paradigm assume that only banks are the main actors in the financial markets. In Tanzania, there are bank and non-bank financial institutions that also play a role as conducts of the monetary policy. The non-banks financial institutions offer products that bank also make reference in determining interest rates.

Empirical Studies

In regard to empirical studies, a number of scholars have examined the interest pass through and channels of monetary policy transmission mechanisms (John and Pokhariyal, 2013, Mangwende, Chiuzara and Nel, 2011 Polius and Samuel, 2000; Peltzman, 2000). Monetary transmission mechanisms refer to either the size or degree or magnitude at which the change in monetary rate is transmitted to the bank interest rates in the long run. Whereas the speed of pass through refers to the length of time required for the adjustment to occur (John and Pokhariyal, 2013). In the case of Tanzania, it is the response of the retail bank interest rate to the anchor market rates.

In regard to the monetary policy transmission mechanisms, a number of channels have been identified (John and Pokhariyal, 2013). They include interest rate, exchange rate, as well as credit and asset price transmission mechanisms. The effect of the particular channel of the transmission mechanisms depends on the development of the financial markets, that is financial deepening and widening, in a country. In this respect different empirical studies have adopted various

approaches depending on the nature of development of the financial market and prevalence of the particular transmission mechanisms.

In analysing interest pass through, scholars have focused on different financial market variables. Some scholars have examined the characteristics of interest pass-through, that is, whether the pass through is complete or not. Others have examined the pass through in the context of the banking sector in different monetary policy regimes (Sorene and Werner, 2006). The market structure, time periods and developments in econometric methods account for those variations.

Studies on interest pass through are grouped into cross country and specific country studies. Most of the country studies are those in Europe and Asia (Cottareli and Kourelis, 1994, De Bondt, 2002; Revena and Walsh; 2006, John and Pokhariyal, 2013). There are also country studies which include those on Chile, Ghana, South Africa and Kenya to mention a few (Davoodi Dixity and Pinter, 2013). The findings from empirical studies have revealed variation in the interest rate pass through in different economies. In particular, following the changes in monetary policy rate, the interest rates have either changed in different magnitude or remained sticky (De Bondt; 2002, Revena and Walsh, 2006; John and Pokhariyal, 2013; Kovenan, 2011; Kobayashi 2007).

In addition, in various studies different retail interest rates have been used. They include rates for lending rates, time deposits and overnight saving rates, as well as saving deposit rates. Given the use of different interest rates, empirical studies have revealed varying outcomes in interest rate pass through as a result of the changes in the policy rates.

Mojon (2000) examined the interest rate pass through to the lending and deposit rate in five European countries of Belgium, Germany, France Netherlands and Spain. The author found that there was asymmetry in the degree of pass through. It was observed that pass

through to lending rate was larger when money market rates increased, than when it decreased. For the deposit rate, it was found that deposit interest rate pass through was larger when market rate was declining than when it was increasing. Diversity of the results is linked to the difference in the specific features of the banking system, the variation of the financial market structure, and differences in bank soundness, credit risks and the slope of the yield curve. This suggests that microeconomic structure of the bank is an important issue to be considered in implementing monetary policy in developing countries.

There is also a number of empirical studies in developing countries. Espinosa-Vega and Rebucci (2003) did a study on interest pass through in Chile. The authors found that interest rate pass through was not different in comparison to those of New Zealand and European countries. It was also found that the size and speed of the interest rate pass through declined as the maturity of the bank instruments used in the study increased. This is consistent with the yield curve theories.

Moreover, Kovanen (2011) examined interest pass through in Ghana in both the whole and retail money markets. The author observed that the whole sale markets responded to the prime rate in a short term period within a lag of one month. It was also found that the long term policy response in the wholesale interbank rate was prolonged. Such a situation weakened the implementation of the monetary policy in Ghana. This suggests that the limitation in the efficacy of monetary policy rate and limited effect of the conduct of monetary policy to communicate with the public.

Interest rate pass through before and after the financial crisis has been an issue of concern to policy makers and scholars. The issue is important because the insights show the level of governments' control of financial market and ability to stabilise the economies. In this regard, Tai, Sek and Har (2012) analysed the

effect of the interest rate pass through of the market rate on the retail bank interest rate in several Asian economies before and after the financial crisis of 1998. The study focused on the countries that experienced financial crisis. The purpose of the study was to examine the effectiveness of the conduct of the monetary policy in the Asian economies.

The authors did a study on interest rate pass through of the monetary policy rate using the lending and deposit rates in the short and long term. They observed that the deposit rate were marginal higher than the lending rate. Nonetheless, the difference was not high during the two periods. The overall observation was that monetary policy changes had more effect on the deposit rate.

Tai, Sek and Har (2012) also observed that the interest pass through from the money market to retail interest rate varied widely across the study countries in the pre- and post-crisis period in the short and long run. In Malaysia and Hong Kong, both the deposit and lending interest rate showed large difference in both pre and post crisis. In Malaysia the deposit interest rate increased prior to crisis but after the crisis. In the case of Hong Kong, the interest rate increased in the long run in the pre and post crisis period. The results reveal weak monetary policy and limited integration of the financial markets and interest rate stickiness.

Moreover, O'connel (2013) did a study on modernising the monetary policy framework in Tanzania. He examined possibility of adopting alternative monetary policy approach, since the monetary transmission mechanism is not well established. The author also highlighted that structural factors that limited the speed of interest rate pass through. The structural factors included shallowness of the financial markets, as well as economic shocks. The speed of the interest rate pass through could also be associated with the approaches in the conduct of monetary policy. Tanzania has been largely using quantitative approach in the conduct of monetary policy. Given that money demand and velocity which

may be characterised by instability, the current practice of the conduct of monetary policy shall have limited effects in monetary transmission mechanism.

In sum, a number of empirical studies have identified factors associated with interest rate pass through in both developed and developing countries. In Tanzania, the monetary authority has been initiating a number of measures to enhance financial market competition and overcome structural rigidities. However, interest rate has been observed either to change marginally or to be sticky. This also suggests limited dissipation of interest rate in the economy through monetary transmission mechanism.

In this regard, this study seeks to analyse the determinant of interest rate pass through in Tanzania, and implication in the conduct of monetary policy. The study uses the cost of fund as a theoretical framework to analyse interest rate pass through in Tanzania. Monthly data for the period of 2004 to 2014 are used to analyse interest rate pass through in Tanzania.

The paper is organised as follows; after this introduction, section two is on methodology and section three on about results and followed by conclusion and recommendations.

METHODOLOGY

In empirical studies various approaches have been adopted to examine interest rate pass through or interest rate stickiness (Molares and Raei, 2013; de Bondt, 2005; Ncube and Ndou 2012; Soqrensen and Werner, 2006). The adoption of particular approach has been necessitated by the availability of data, advancement in econometric methods and the objectives of a particular study (Soqrensen, and Werner 2006). Authors have also used micro data employing panel and time series data to examine interest rate pass through in developing and developed countries.

In addition, variant models have been used to analyse interest pass through and interest rate stickiness. They include threshold autoregressive, as well as error correction

models and mean adjustment models (Msati, Nyamongo, Kamau, 2003). Others are bivariate error correction and general to specific model as suggested by Koraginous, Pangonithous and Vlamis (2010). The models have been used in both country and cross section studies.

The strength of error correction model, as well as threshold autoregressive models is the presence of systematic and linear adjustment process. It is also asserted that the model provide consistent estimation of the parameters (Morales and Raiei, 2013). However, some scholars argue that because of the non stationarity inherent in interest rates variables, unit root and cointegration have lower power. Such a situation limits the plausibility and the usefulness of the results from the empirical studies using such models.

Karagiannis, Panagopoluous, and Vlamis (2010), recommend the use of Hendry General Specific Model. The authors argue that the model has features that help to overcome the above mentioned shortcomings. The model is able to test jointly and simultaneously long run and short run rigidities as well as the interest rates pass through. It can also be used to test symmetric and asymmetric transmission behaviours of the variables. However, the adoption of the particular model depends on the objectives of the study and availability of data. The monetary policy framework a particular country has adopted also dictates the choices of the model.

Moreover, in different studies various variables have been used to examine interest rate pass through and stickiness. In the studies on the interest pass through, mortgage, and

consumer loan , short-term loan to enterprises rates as well as long-term loan to enterprise rates, current account deposits, time deposit and saving deposits have been used as variables in various studies (Davoodi Dixity and Pinter 2013; Cheleshe, et. al., 2013). The use of the variables has been dictated by the availability of data, the comprehensiveness of the studies and nature of the financial and capital market development in specific country. In this study similar variables shall be used.

Since the objective of this paper is to examine the effect of the central bank money anchor rate on the retail bank interest rates, the cost of fund theory provides a framework for examining interest rate pass through and interest rate stickiness. The theory asserts that retail interest rate adjust interest rate according to market interest rate.

In the context of Tanzania, banks are expected to adjust the deposits and lending rate in response to the treasury bill rates by comparing with the prevailing market rates. In this respect, the banks and other financial institutions shall be responding to the monetary policy action of the central bank, through observing the treasury bill rates.

In order to achieve the objective of the paper, estimates of the size and magnitude of the interest pass through are done using monthly time series data. The relationship between the monetary policy rate and the bank interest rate is presented as simple Auto Regressive distributed lag model. The model has been used by Molares and Raei (2013) to analyse interest rate pass through in East African Community countries. The model used is presented as:

$$y_t = \alpha_0 + \alpha_1 x_t + \alpha_2 y_{t-1} + \alpha_3 x_{t-1} + \alpha_4 \dots \dots \dots (1)$$

Where y = bank interest rate (deposit or lending rate)

x = money market rate

t = time trend

Thus , in this paper the relationships between BoT money market anchor rate and retail bank interest is presented as follows:

$$brr = f(tbr, gdp, inf, exr).....(2)$$

Where:

brr = the bank retail lending rate (short or long term rate)

tbr = money market rates

exr = exchange rates

infl= inflation

gdp = gross domestic product

The relationship between the monetary policy rate and the bank interest rate is presented as simple auto regressive distributed lag model. The model has earlier been used by Molares and Raei (2013). It is presented as follows:

$$brr_t = \alpha_0 + \alpha_{1t} + \alpha_{2t}br_t + \alpha_3brr_{t-1} + \alpha_4gdp_{t-1} + \alpha_5 inf_{t-1} + u.....(3)$$

As one of the required procedures in examining the interest rate pass through, unit root test is conducted. The reason is that time series data on interest rate are usually non stationary. Furthermore, granger causality test is also undertaken. This aims to ascertain the long run relationship among the variables used in the model. The test results and the estimation models are presented in Section 5 of this paper.

Data and variables

This study uses the monthly time series data for the period of 2008 to 2014. The data series are on the Treasury bill rates, bank deposits and lending rates, interbank interest rate, GDP, inflation rate and exchange rate. They were obtained from the Bank of Tanzania Monetary Policy Statements issued by the BoT from 2008 to 2014.

RESULTS AND DISCUSSIONS

Descriptive statistics

Table 1 shows the summary of descriptive statistics for variables used in the study. The values of mean and median standard deviation, except for the lending rates, exhibit wide variation. between mean and absolute values. Moreover, the values for minimum and maximum show wide variations, implying instability in the series over the study period.

Table 1: Summary of descriptive statistics

Variable	Mean	Median	Standard deviation	Minimum	Maximum
Overall deposit rate	2.594	2.33	1.05	1.12	4.69
3 Months deposit rate	2.49	2.26	1.26	0.09	5.12
12 Months deposit rate	2.89	2.48	1.39	1.03	7.83
Overall lending rate	15.27	15.17	0.72	12.84	16.75
3 Months lending rate	15.27	15.32	1.22	10.26	17.22
12 Months lending rate	15.03	14.99	1.62	10.99	18.08
Interbank money market rates	6.91	6.08	5.29	0.87	29.11
Overall treasury bill rate	10.27	11.29	4.03	2.68	18.2
91 days treasury bill rate	8.94	10.57	3.83	1.77	13.83
364 days treasury bill rate	11.55	12.79	3.47	4.86	18.66
Exchange rate USD/TSH	1.69	0.98	4.77	-10.74	12.98
Inflation	10.35	9.65	4.08	4.2	19.8
GDP	6.64	6.7	1.65	3.5	10.1

Unit root test results

In estimating the error correction model, one of the requirements is to have data that are stationary. In order to test for stationarity, Augmented Dickey Fuller Test method was

used. The test revealed that data at levels were non stationary. However, upon differencing twice, the data became stationary. Table 2 shows the unit root test results for the series of the variables. It indicates that all the variables are stationary at 1 per cent significance levels.

Table 2: The Augmented Dickey Fuller unit root test results

Variable	Test statistic	1% critical value	p-value	Order of Integration
Overall time deposit	-4.885	3.549	0.000	I ₀
3 month time deposit	-5.718	-3.549	0.000	I ₀
12 month time deposit	-7.414	-3.549	0.000	I ₀
Overall lending rate	-7.276	-3.549	0.000	I ₀
Short-term lending rate	-6.687	-3.549	0.000	I ₀
Long-term lending rate	-5.399	-3.549	0.000	I ₀
Overall interbank rate	-5.975	-3.549	0.000	I ₀
Overall treasury bills	-5.104	-3.549	0.000	I ₀
91 days treasury bills	-4.487	-3.548	0.000	I ₀
364 days treasury bills	-4.461	-3.549	0.000	I ₀
Treasury bond rate	-3.192	-2.910	0.000	I ₀
Exchange rate	-5.365	-3.549	0.000	I ₀
Inflation rate	-4.453	-3.549	0.000	I ₀
GDP growth rate	-4.655	-3.555	0.000	I ₀

Co-integration test results

It was necessary to do a co-integration test to ascertain the longterm relationship among the variables. Table 3 shows the cointegration test results. The results reveal that there is no long

run relationship among the time series variables. Thus, error correction model cannot be used to analyse the interest rate pass through from the money market rate to retail bank interest rates. In this respect, unrestricted vector autoregressive model is used.

Table 3: Johansen cointegration test results

Variable	ADF Results	p-value
Overall time deposit	56.037	68.52
3 month time deposit	82.748	94.15
12 month time deposit	79.084	94.16
Overall lending rate	90.025	94.15
3 month lending rate	82.62	94.15
12 month lending rate	60.695	94.15
Overall interbank rate	3.324	3.546
Overall treasury bills	49.3708	94.15
91 days treasury bills	-1.817	3.546
364 days treasury bills	89.405	94.15
Exchange rate	1.131	-3.346
Inflation rate	-1.037	-3.546
GDP growth rate	-2.482	-3.552

Vector autoregressive models estimation results

A number of unrestricted vector autoregressive models were estimated to analyse the effect of the treasury bill rate, on the deposit interest rates. The estimation was done to ascertain the impact of the 91 and 364 days treasury bill rates on the three and twelve months deposit rates. Table 4 shows the estimation results for the respective models. It shows that there is short run causality running from the independent variables to the dependent variables in all the four models.

In regard to the three month deposit model (1), the results reveal that 91 treasury bill rate significantly affected the bank deposit rates in the short run (in the same period). Similarly,

the previous period three months interest rate affected the ruling market three month rates. The interbank market rate, inflation, and GDP growth had no effect on the three months interest rate.

Model (2) also shows that the 364 treasury bill rate and the previous three months period interest rates, significantly affected the three months deposit rates. Also, the GDP has an impact on the three months interest rate. The inflation rate has no significant effect on the three months interest rate.

Table 4: Estimation results for vector autoregressive model results-deposit rate

Independent variables/ Dependent variables	TDR3Months (1)	TDR3Months (2)	TDR12Months (3)	TDR12Months (4)
TBR91Days	0.05901** (0.05511) ⁺ [0.010] ⁺⁺			
TBR364Days		0.22096* (0.05774) [0.000]	0.22096* (0.05774) [0.000]	0.20957* (0.05774) [0.000]
TDR3M _{t-1}	0.21256*** (0.11681) [0.069]	0.21256*** (0.11681) [0.069]		
TDR12M _{t-1}			0.21256*** (0.11681) [0.069]	0.21265 (0.1168) [0.016]
IBMR _{t-1}	-0.02302 (0.15860) [0.146]			-0.037*** (0.01493) [0.013]
EXR _{t-1}				-0.000483 (0.00143) [0.736]
Infl _{t-1}	0.047026 (0.6307) [0.436]	-0.01196 (0.4335) [0.783]	-0.01196 (0.4335) [0.783]	-0.011964 (0.4335) [0.783]
GDP _{t-1}	0.1711 (0.2125) [0.421]	-0.4733** (0.1520) [0.002]	-0.4733** (0.1520) [0.002]	-0.4733** (0.1520) [0.002]
Cons	-2.5955 (1.8357) [0.157]	-2.2428 (1.2301) [0.000]	-2.2428 (1.2301) [0.000]	-2.2428 (1.2303) [0.068]

Key

* the coefficient is significant at 1 percent level

**the coefficient is significant at 5 per cent level

*** the coefficient is significant at 10 per cent level

+Figure in brackets are standard error

++Figures in parentheses are p-values

Table 4 also shows the results for estimating the impact of the Treasury bill rates on the bank twelve months deposit rates. Model (3) shows that the 364 days treasury bill rate significantly affected the bank retail deposits rates in the same time period. In addition, the previous period interest rate has an effect on the bank retail deposits rates. The variable for the GDP was significant but negative.

The table also shows the results for model (4). As for model (3), the 364 days Treasury bill rate and the previous period interest rate significantly influences the interest rates in the same period. However, although the variables for GDP and interbank money market rate were significant, they were negative. The exchange rate and the inflation rate coefficients were insignificant.

Table 5: Estimation Results for Vector Autoregressive Model Results-Lending rates

Independent variables/ Dependent variables	LR3Months (1)	LR3Months (2)	LR12Months (3)	LR12Months (4)
TBR91Days	0.0292 (0.0626) [0.641]			
TBR364Days		-0.067706 (0.06357) [0.291]	0.0924*** (0.0924) [0.0910]	0.03116 (0.0811) [0.701]
LR3M _{t-1}	0.5370* (0.12015) [0.000]	0.0345** (0.1161) [0.009]		
LR12M _{t-1}			0.5373* (0.1232) [0.000]	0.5246* (0.1241) [0.000]
IBMR _{t-1}		0.0016** (0.19149) [0.082]	-0.00615 (0.2450) [0.802]	-0.02247 (-0.0241) [0.351]
EXR _{t-1}				0.00311 (0.00255) [0.22]
Infl _{t-1}	-0.01605 (0.073156) [0.860]	-0.02546 (0.06214) [0.682]	-0.00448 (0.7518) [0.952]	0.01242 (0.07477) [0.868]
GDP _{t-1}	0.4493 (0.2561) [0.079]	-0.0885 (0.20774) [0.682]	-0.4236 (0.2608) [0.164]	0.3752 (0.2581) [0.166]
Cons	-3.0474 (2.224) [0.171]	-2.2428 (1.2301) [0.000]	-2.2428 (1.2301) [0.000]	2.309 (2.2263) [0.297]

Key

* the coefficient is significant at 1 percent level

**the coefficient is significant at 5 per cent level

*** the coefficient is significant at 10 per cent level

Figure in brackets are standard error

Figures in parentheses are p-values

Table 5 presents results for estimating short run coefficients for the vector autoregressive model for the lending rates. The table shows the results for the four models that had the 91 and 364 days treasury bill rate, as money market anchor rates. The four models also show that short run causality running from the independent variables to the dependent variables. In particular, the estimated results for model (1) reveal that the 91 days treasury bill rate has no significant effect on the 3 months lending rate. Only the previous period interest rate and the GDP significantly influenced the lending rate.

Model (2) was estimated with the 364 days treasury bill rate as the money market anchor rate. The estimation result revealed that money market rate, inflation rate and GDP had no significant effect on the three months lending rate. However, the previous period interest rate and interbank money market rate had significant effect on the three month lending rate.

Table 5 also presents the estimation results for the 12 months lending rates as a depended variable and 364 days interest rate as the

money market anchor rate, among the dependent variables (Model 3). The estimated coefficients show that 364 day Treasury bill rate and the previous period interest rates significantly influence the lending rates. In model (4) only the previous period interest rate was significant, while all other variables were insignificant.

The estimation results for interest rate pass through show that short run coefficients for three- months treasury bills is significant and positive. However, the value of the coefficient is below that of other similar studies in development countries, which were observed to be between 0.1 and 0.37 (Chileshe et al. 2014, Mishra et al., 2010). In addition, estimated coefficient for the 364 days treasury bills, revealed that three (3) and twelve (12) months interest rate has impact on the retail bank interest rate in the same time period.

However, the values of short run coefficients were similar to those in other studies in developing countries (Chileshe et al., 2014, Mishra et al., 2010). The result suggests that banks adjust immediately the retail deposits lending rates, conforming to the findings of Hristov et al., (2014). Banks could be adjusting the deposit rates according to market conditions in order to attract customers. This suggests that the conduct of the monetary policy has had an impact on the retail bank interest rates.

In contrast to the deposit rates, the impact of 91 and 364 days on the treasury bill rate on retail bank lending rates has been negligible. The estimation results show that except for the twelve months interest rates, for all retail lending models, the money market anchor rates have no effect on the retail bank lending rates in the same period. This contrasts the findings of Chileshe et al. (2014) and Hristov et. al. (2014).

The finding could be explaining the reasons for the interest stickiness and wide spread between the lending and deposits rates in Tanzania. The limited effect of the Treasury

bill rates on the lending rates could be associated with structural features that had effects on the monetary policy transmission mechanism. Specifically, the observed findings could be an outcome of the financial crisis and other economic shocks the country had experienced.

In addition, the limited effect of interest rate pass through from the money market anchor rate to the retail bank lending rates could be associated with unwillingness of the banks to change immediately the interest rates (Mishra and Montiel, 2012). It has been observed that during and after economic crisis banks do not adjust immediately the rates for loans. The reason is that after the economic crisis banks maintain high risk premiums. Thus, this could be the practice in Tanzania as well.

CONCLUSION AND RECOMMENDATIONS

This paper has analysed the interest rate pass through of the money market anchor rates to bank retail interest rates using the time series data for the period of 2008 to 2014. The vector autoregressive model was adopted to examine the outcome of the money market anchor rate to retail bank deposit and lending rates. The result has revealed that money market rate impacts on the retail deposit rates for the three months and twelve months interest rates in the same period.

In contrast to deposit rate, the money market anchor rates had no significant impact on the retail bank interest rate. This may be due to the structural rigidities that limit monetary policy transmission mechanism to the retail bank interest rates. Moreover, it could be associated with banks behaviour of maintaining high risk premiums. Such a situation is probably a reason for the wide spread between the deposit and lending rates. Thus, it is recommended that the monetary authority should enhance financial widening and deepening so as to facilitate efficient conduct of the monetary policy. In addition, it is recommended that the monetary authority should further promote competition in the financial market in order to improve efficiency and efficacy of the monetary policy in Tanzania.

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