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Interest Rate Pass-through in Uganda

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ABSTRACT

This study examines the interest rate pass-through using biavariate cointegration regression method following Engel and Granger, 1987. The paper finds that the pass-through coefficient of the 7-day interbank rate to the lending rate is 0.43 in the entire sample, statistically not different from zero in the period before the adoption of the ITL framework and 0.30 in the period after the adoption of the ITL framework. The pass-through of the 7-day interbank rates to time deposit rates are higher than those of the lending rates, ranging from 0.56 – 0.60. that is, the interest rate transmission process is existent but incomplete. The paper also finds that after the implementation of the ITL framework, the 7-day interbank rate becomes more effective across all rates save for 91-day Treasury bill rates. It is also apparent that the 7-day interbank money market rate has outperformed the overnight interbank rates in terms of their influence on other rates.

JEL Classification: E43; E52; E58; G21

KEYWORDS: interest rate pass-through; bank interest rates; wholesale interest rates; retail interest rate, transmission mechanism of monetary policy; Uganda

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1. INTRODUCTION

Since the adoption of the Reserve Money Program (RMP) in 1993, Bank of Uganda has introduced a series of reforms to its monetary policy framework. In 2009, the Bank of Uganda reformed the RMP with the aim of making it more flexible, emphasizing the use of daily liquidity management instead of the orthodox deviations of reserve money from its "optimal" path. Still in July 2011, Bank of Uganda replaced the monetary targeting framework with some form of transitional framework called inflation targeting *lite* to pave way for the eventual adoption of a fully pledged inflation targeting (IT) framework in the future. The main argument advanced by the Bank of Uganda for adopting the ITL relates to its efficacy; its efficiency is undermined by lack of stability in the money demand function. The RMP is also not well suited to the discretionary fine tuning of monetary policy in order to respond to exogenous shocks.

The ITL has been implemented through the use of a policy controlled short-term interest rate called the central bank rate. The central bank rate is used to steer short-term interbank money market rates using the issuance of repurchase agreements to regulate the amount of liquidity in the financial system. It is expected that the short-term interest rate in turn would affect other interest rates in the economy, subsequently determining the monetary policy transmission into real variables.

The use of short-term policy controlled interest rate requires an effective interest rate pass-through to both wholesale and retail rates because interest rate pass-through is an encompassing component of the transmission mechanism of monetary policy. In the monetary policy transmission mechanism studies, the question often relates to how a change in a nominal variable such as the policy rate, is translated into changes in output, prices and employment. Thus, there are two fundamental stages in the monetary transmission mechanism: the first stage sometimes referred to as the reaction function is derived under optimization conditions given the optimal growth and inflation path. After setting this policy rate, the next question relates to how the changes in this rate are passed through to the rest of the rates in the economy. The second stage traces how changes in these (retail) interest rates are passed-through to output, prices and employment. This study does not address the second stage of the monetary policy transmission mechanism.

This study examines the extent to which monetary policy induced changes to the short-term rates are transmitted to other rates in the economy. We conduct an assessment of the effectiveness of pass-through from the 7-day interbank rates relative to the overnight interbank rates. We also investigate whether the introduction of the ITL framework has improved the interest rate

transmission. This is done by comparing the magnitude of pass-through over the entire sample (January 2005 - May 2014) with sub-samples, which are July 2005 - June 2011 and July 2011 - May 2014.

The paper uses biavariate cointegration regression method following Engel and Granger, 1987. The study finds the following: The pass-through coefficient of the 7-day interbank rate to the lending rate is 0.43 in the entire sample, statistically not different from zero in the period before the adoption of the ITL framework and 0.30 in the period after the adoption of the ITL framework. That is, 100 basis points increase in the policy rate causes the lending rate to increase just 43% in the entire sample and 30 percent after the implementation of the ITL. The pass-through of the 7-day interbank rates to time deposit rates are higher than that to the lending rates, ranging from 0.56 – 0.60. The interest rate transmission process is thus existing but incomplete for both lending rates and deposit rates.

After the implementation of the ITL framework (2011M7 – 2014M05), the 7-day interbank rate becomes more effective across all rates save for 91-day Treasury bill rates. It is apparent that the 7-day interbank money market rate has tended to outperform the overnight rates, especially in terms of the magnitude of the pass-through coefficients and in terms of the existence of long-run relationships.

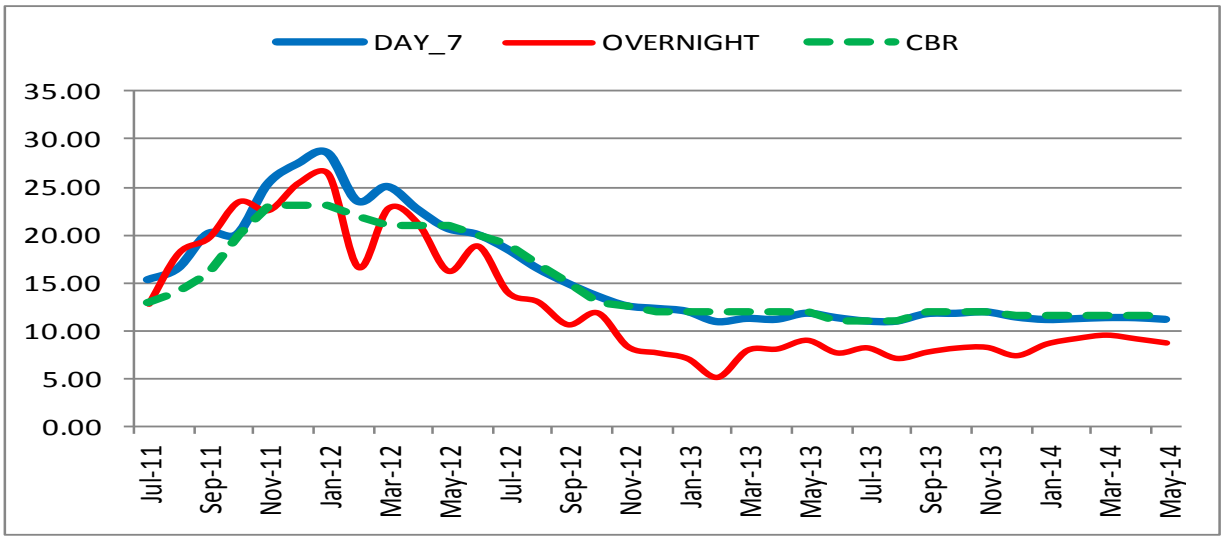
2. MONETARY POLICY IN UGANDA

The Bank of Uganda implemented the Reserve Monetary Program (RMP) between 1993 and 2011. In the RMP, base money was used as the operating target, with broad money as the intermediate target. As discussed in Apaa & Opolot (2010), the adoption of the RMP was motivated by three reasons: “first, information on the real economy was limited, and was only available with a considerable lag. With the RMP, the data on base money and other monetary aggregates was readily available with a shorter lag. Second, there existed underlying economic relationships between monetary aggregates, output and inflation and this was backed by empirical evidence at the time (Apaa & Opolot, 2010).

However, the RMP is limited by its efficacy which is undermined by lack of stability in the money demand function and is also not well suited to the discretionary fine tuning of monetary policy in cases of exogenous shocks. Because of this limitation, in July 2011, Bank of Uganda replaced the monetary targeting framework with some form of transitional framework called inflation targeting *lite* to pave way for the eventual adoption of a fully pledged inflation targeting (IT) framework in

the future. Under the ITL the policy rate is called the central bank rate (CBR). The central bank rate is used to steer short-term interbank money market rates. That is, the operating target of monetary policy is the 7-day interbank money market rates. It is expected that the short-term rates would affect interest rates in the economy, which should subsequently determine the monetary policy transmission into real variables such as prices and output. Since the onset of the ITL framework, the interbank money market rates (7-day rates and overnight rates) have tended to track (**Figure 1**) the evolution of the CBR.

Figure 1: Central Bank Rate and interbank money market rates



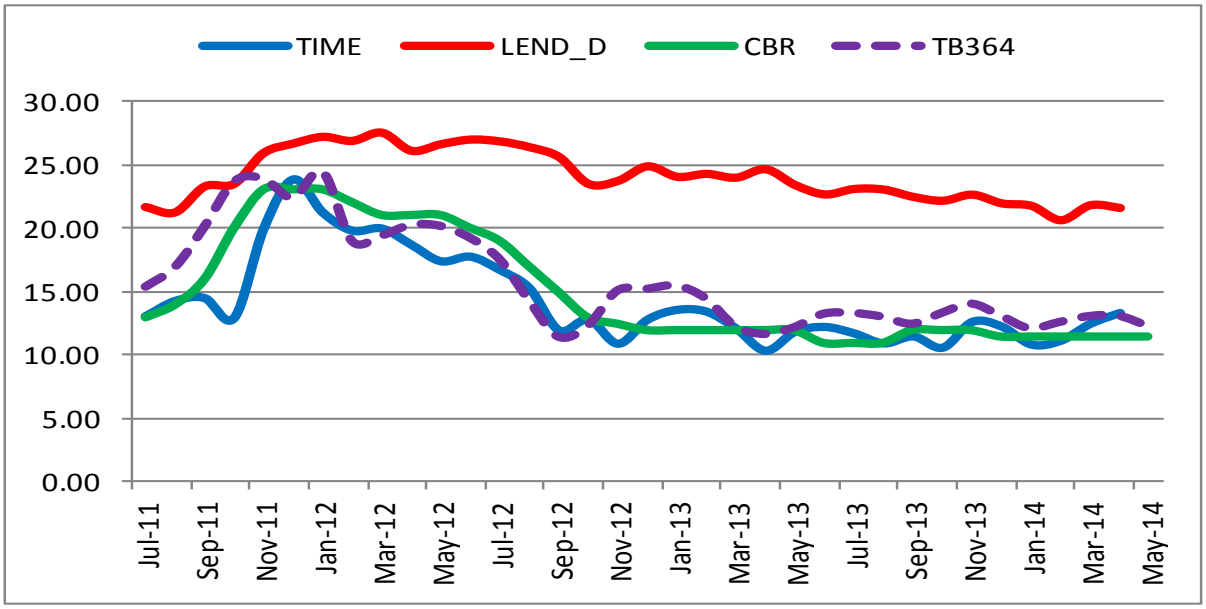
Source: Bank of Uganda

The above graph shows that the ITL seemed successful so far. As shown further in **Figure 2,** in the first half of 2012, the Ugandan economy was hit by high inflationary pressures, with headline inflation peaking at 30.5 percent in October 2011. The Bank of Uganda responded by tightening monetary policy, raising the policy rate from 13 percent in July 2011 to 23 percent in November 2011. Other rates increased subsequently. The tight monetary policy stance affected commercial banks' lending reflected higher lending rates. The growth in credit to the private sector fell from a 40.5 percent in January and December 2011 to 14.6 percent in the corresponding period in 2012. The growth of monetary aggregates decelerated markedly, with the annual growth of M1, M2 and M3 averaging 6.2 percent, 1.2 percent and 0.5 percent, respectively between January and December 2012 relative to 28.9 percent, 25.5 percent and 26.9 percent in the same period in 2011.

The exchange rate, which was in the region of Shs. 2,814/US$ in September 2011 strengthened, as the relatively high interest rates attracted portfolio flows. Headline inflation subsequently decelerated, falling to an average of 4.4 percent in the first eight months of 2013 from an average of

18.6 percent in 2011. With inflation established on a downward trajectory, the Bank of Uganda began to implement a cautious easing of monetary policy in February 2012, reducing the central bank rate by 11 percentage points. It's expected that through the monetary policy transmission process, this accommodative policy would stimulate economic growth. Despite the reduction of the policy of rate, interest rates especially lending rates have responded sluggishly to the reduction in the CBR (see **Figure 2**).

Figure 2: Central bank rate and other interest rates



Source: Bank of Uganda

3. LITERATURE ON INTEREST RATE PASS-THROUGH

Policy controlled short-term interest is expected to influence the money market interest rate and the banks' retail interest rates. The money market interest rate influences the way banks source funds in the interbank money market and so the interbank money market rate should affect the behavior of banks in the retail market. If this relationship holds, then one would expect that there is a long-run equilibrium relationship between the policy interest rate, interbank money market rates and the retail rates (such as lending and deposit rates).

In most studies of the interest rate transmission, a common finding is that the pass-through is incomplete, implying that changes in the interbank rate do not however completely get transmitted to retail rates. Thus, the retail rates adjust sluggishly to changes in the interbank money market rates and sometimes to a lesser degree than the initial changes in the interbank rates. Numerous theoretical explanations have been advanced for the stickiness and asymmetry in pass-through to

the retail rates. They are market power and concentration among banks and non-bank financial institutions (Hannan & Berger, 1991; Neumark & Skarpe, 1992), asymmetric information - adverse selection and moral hazard problems – (Stiglitz and Weiss, 1981), adjustment costs (Cottarelli & Kourelis, 1994). Others focused on the consumer side: they are switching costs hypothesis (Klemperer, 1987), search costs (Calem & Mester, 1995), and the risk sharing hypothesis (Fried & Howitt, 1980).

Empirically, most studies of the interest rate pass-through have focused on stickiness and asymmetry in the interest rate pass-through in individual countries and on cross-country comparisons. For example, Hannan and Berger (1991) and Neumark and Sharpe (1992) focused on the US; Scholnick (1999) on Canada and the US; Lim (2001) on Australia; Chionis and Leon (2006) on Greece; BIS (1994) on various countries; Bondt (2005) on the euro area. Studies that focused on cross-country comparisons are Cottarelli and Kourelis (1994) who show a significant difference in the degree in both impact and long run multipliers across European Monetary Union (EMU) countries. A similar view is obtained from the studies of Borio and Fritz (1995), Donnay and Degryse (2001), Kleimeier and Sander (2000) and Toolsema et al. (2001). In these studies, issues of asymmetric propagation seem to arise, depending on whether there is a positive or negative change on the policy rate (see, inter alia, Borio & Fritz, 1995; De Bondt, 2002; Mojon, 2000) or whether the rates are below or above their equilibrium level (Kleimeier & Sander, 2000).

Another element that features prominently in studies of interest rate pass-through is the relationship between interest rate stickiness and the financial system. For instance, despite the adoption of the common currency in the EMU area, Mojon (2000) found significant differences across EMU countries in their financial system. These differences have been attributed to heavy investments in brand names which are country specific, networks of branches and different marketing policies (Gual, 1999), and the difference in the institutional setting and legal expertise (Cecchetti, 1999).

Empirical findings of most studies of interest rate pass-through are mixed: First, a high degree of stickiness of retail lending rates. For example, in the EMU area, only 30% of the change on a given market rate is passed to the lending rates within a month. Second, strong empirical evidence for significant differences among EMU area have been documented. Third, the average full adjustment of the retail rates to market rates varies between 3 and 10 months (De Bondt, 2002). Fourth, the final pass-through of market retail rates is typically complete or, in some cases (Cottarelli & Kourelis, 1994) even more than complete, reaching 110% and the speed at which the market rates are completely transmitted to retail rates can vary between 3 months and 2 years.

Most empirical studies of interest rate pass-through for sub-Saharan African countries find evidence of very low, incomplete and asymmetric pass-through. For instance, using an autoregressive distributed lag (ADRL) model, Samba & Yu Yan (2010) finds evidence of a very low and incomplete long-run pass-through from the policy rate to the deposit rate. Yu Yan (2010) also showed that there is evidence of an interest rate cycle asymmetry. Aziakpono & Kasyoka (2010) found that the speed of adjustment of market interest rates varies across rates, with the highest speed occurring for lending rate. They also find that asymmetric adjustment in commercial banks rates and that commercial banks are becoming increasingly more rigid in adjusting their lending rates upward in response to a positive shock in the official rate, supporting the negative customer reaction hypothesis.

Studies of interest rate pass through have been predominated by single equation modeling [see Chionis and Leon (2006)] and Autoregressive Distributed Lag models. In this study, we rely on biavariate cointegration regression method (Engel and Granger, 1987) and the associated error correction methodology to estimate the interest rate pass-through.

4. METHODOLOGY

4.1 Data

We use monthly data for the period 2005:01 – 2014:05 for the following interest rates: interbank money market rates and lending interest rates, deposit rates, 91-day and 364-day Treasury bill rates. All the interest rates are expressed in per annum basis. This period is selected to coincide with the period when most reforms to the financial sector have gained credence and the financial markets started to function vibrantly. In this study, we have selected the interbank rates (both 7-day and overnight rates) to represent the policy rate based on the correlation coefficients of the 7-day and overnight interbank rates with the central bank rates, which are 97.1% and 91% respectively. All the data were obtained from the Bank of Uganda.

4.2 Methodology

This paper uses biavariate conintegration method and the associated error correction model (ECM) for the estimation of parameters. The cointegration method has been used to study relationships between different interest rates see (Scholnick (1999) and Ozdemir). This paper follows Scholnick (1999), Kleimeir and Sander (2000) and Heffernan (1997) cointegration and error correction models in studying the relationships between the policy rate and lending and deposit rates for

Uganda. The use of cointegration as a technique helps to test hypotheses in circumstances where variables of interest are deemed to be nonstationary. If cointegration exists among two nonstationary variables, then a long-run relationship between these variables exists. This implies that in the short-run disequilibria can occur however in the long-run the variables will return to equilibrium state.

Dionysios and Costas (2005) postulation of a relationship between lending or deposit rate and policy rate is as follows:

$$i_t = \delta_0 + \delta_1 \text{ interbank} + \varepsilon_t \qquad 1$$

Where i_t is lending rate or deposit rate, interbank is the policy rate, δ_0 is a markup and δ_1 measures the sensitivity of either the deposit or lending rates to policy rates.

To account for the presence of lags, Dionysius and Costas (2005) assumed one lag in the adjustment of lending or deposit rates to change in policy, and consequently we could specify the following model:

$$i_t = \varphi + \beta_1 i_{t-1} + \alpha_1 \text{interbank}_t + \alpha_2 \text{interbank}_{t-1} + \varepsilon_t \qquad 2$$

Theoretically it is known that most economic variables such as interest rates are non-stationary and as such the estimation of the above equation may be problematic. An estimable version of the above equation may be obtained using ECM form. As stipulated in the Granger representation theorem (Granger, 1983; Engle and Granger, 1987) if a set of variables are cointegrated, then one can employ an error-correction method. Therefore equation (2) can be reparameterized as:

$$\Delta i_t = \varphi + a_1 \Delta \text{interbank}_t + (a_1 + a_2)\text{interbank}_{t-1} - (1 - \beta_1) i_{t-i} + \varepsilon_t \qquad 3$$

where the ecm term is $(a_1 + a_2)\text{interbank}_{t-1} - (1 - \beta_1) i_{t-i}$.

$$\Delta i_t = \varphi + \Theta_1 \Delta \text{interbank}_{t-1} + \gamma \text{ecm}_{t-1} + \varepsilon_t \qquad 4$$

where i_t is lending rate or deposit rate, repos is the policy rate and ecm is the error correction term estimated from respective co-integration regressions. The error term is assumed to be normally distributed and not serially correlated. In the model we introduce a lagged error correction term (ecm_{t-1}) which captures the deviation from the long run equilibrium. The speed of adjustment parameter is γ and measures the adjustment to a shock. From equation (1), δ_0 and δ_1 are long run

parameters to be estimated from the long-run model. And from equation (3), the ecm equation, the long run parameters is computed as $\frac{\varphi}{1-\beta_1}$ and $\frac{a_1+a_2}{1-\beta_1}$.

5. ESTIMATION RESULTS

5.1 Unit Root and Cointegration Analysis

We examine the dynamic properties of the interest rate series by testing for unit roots. We do this using the Augmented Dickey & Fuller, 1979 tests with several combinations of constants and constants with time trends. The Augmented Dickey & Fuller test is very sensitive to the deterministic components (constant and trend) and variation in lag length. We used the Modified Akaike Information Criteria (AIC) to determine the optimal lag length. Unit root test statistics are presented in **Table 1** below. Our findings indicate that all the series are non-stationary governed by one unit root process, and in some cases with a drift. These results then provide a necessary condition for cointegration analysis in a bivariate context.

Table 1: Augmented Dickey–Fuller test statistic statistics at 5 % confidence level

Variable	Levels (lag)	P-value	included	Inference
7-day interbank rates	-2.887425	0.2402	Intercept	I(1)
Overnight interbank rates	-3.466248	0.0653	Intercept & trend	I(1)
Lending rates	-2.887665	0.2516	Intercept	I(1)
Time deposit rate	-2.881665	0.1488	Intercept	I(1)
91-day TB rates	-3.452764	0.1109	Intercept & trend	I(1)
364-day Treasury bill rates	-3.453179	0.0723	Intercept & trend	I(1)

Lag length of the ADF was selected according to the Modified Akaike Information Criterion. Critical values were derived using MacKinnon (1991).

We investigate the existence of a long-run relationship between interbank money market rates and lending rates, time deposit rates, 91-day and 364-day Treasury bill rates. The existence of cointegration between each rate and the interbank rates would indicate that, in the long-run, the two interest rates joined together are stationary; they have a long-run relationship. Using the Engle-Granger two step cointegration test procedure [Engle and Granger (1987)], we obtain the tau-statistics and z-statistics for the whole sample (2005M01 – 2014M05) as presented in **Table 2**.

Table 2: Engle-Granger cointegration (2005M01 – 2014M05)

7-day interbank rate and lending rate

	Value	Prob.*
Engle-Granger tau-statistic	-3.708542	0.0224
Engle-Granger z-statistic	-24.50251	0.0156

7-day interbank rate and time deposit rates

	Value	Prob.*
Engle-Granger tau-statistic	-4.416871	0.0028
Engle-Granger z-statistic	-48.50983	0.0000

7-day interbank rate and 364-day TB rates

	Value	Prob.*
Engle-Granger tau-statistic	-2.593373	0.2478
Engle-Granger z-statistic	-25.56759	0.0117

7-day interbank rate and 91-day TB rates

	Value	Prob.*
Engle-Granger tau-statistic	-5.975940	0.0000
Engle-Granger z-statistic	-54.17740	0.0000

Overnight interbank rate and lending rates

	Value	Prob.*
Engle-Granger tau-statistic	-3.520811	0.0381
Engle-Granger z-statistic	-20.63401	0.0360

Overnight interbank rate and time deposit rates

	Value	Prob.*
Engle-Granger tau-statistic	-3.942033	0.0128
Engle-Granger z-statistic	-36.64121	0.0005

Overnight interbank rate and 364-day TB rates

	Value	Prob.*
Engle-Granger tau-statistic	-2.252631	0.4028
Engle-Granger z-statistic	-20.00565	0.0408

Overnight interbank rate and 91-day TB rates

	Value	Prob.*
Engle-Granger tau-statistic	-3.266461	0.0697
Engle-Granger z-statistic	-170.6815	0.0000

As shown in Table 2, except for 7-day interbank rates and 364-day Treasury bill rates, overnight interbank rates and 364-day Treasury bill rates, and overnight interbank interest rates and 91-day Treasury bill rates, all the Engle-Granger tau-statistic statistics reject the null hypothesis of no cointegration. This implies that both the 7-day interbank interest rates and overnight rates have a long-run relationship with other rates in the economy, except the 364-day and 91-day TB rates. These findings point to the existence of heterogeneity in the relationships between the policy rates and other rates in Uganda.

5.2 Estimates of interest rate pass-through

Figures in the **Appendix** display the interest rate series used in the conintegration regressions. The charts show that all the interest rates tend to move in tandem with the policy rate, except for lending rates, which have tended to be relatively elevated. The lending rates have tended to respond faster to the increase in the policy rates, but sluggishly to the reduction in the policy rates, particularly after March 2012. **Table 3** presents estimates of the interest rate pass-through. The estimates of the pass-through are estimated using the Engle and Granger two step procedure.

As shown in Table 3, the long-run relationship between the 7-day interbank and lending rates on the local currency denominated lending is consistent throughout the entire sample. After the implementation of the ITL framework (2011M7 – 2014M05), the 7-day interbank rate becomes more effective across all rates save for 91-day Treasury bill rates. This is probably because ITL enables the central bank to provide a clear signal to the public about the stance of monetary policy. By setting interest rate, the public is made to better understand what the central bank intends to achieve with its monetary policy stance. This was not possible under the monetary targeting framework where the intentions of the central bank or stance of monetary policy could not be fully understood by the public, since the relationship between monetary aggregates and real economic variables were not obvious known.

The pass-through coefficient of the 7-day interbank rate and lending rate is 0.43 in the entire sample, statistically not different from zero in the period before the adoption of the ITL framework, but rises to 0.30 in the period after the adoption of the ITL framework. These findings indicate that the pass-through from the 7-day interbank rate to the lending rate is existing but incomplete (just 0.43). Thus 100 basis points increase in the policy rate causes the lending rate to increase just 43% (entire sample) and 30 percent (after ITL). The interest rate transmission process is thus incomplete for lending rates.

The coefficients of adjustments on the lending rate is very small, ranging from 0.19 to 0.22, implying that it takes longer for lending rates to move towards its steady state after a shock arising from a change in the 7-day interbank money market rates.

The pass-through of the 7-day interbank rates to time deposit rates are higher than those of the lending rates, ranging from 0.56 – 0.60. Prior to the adoption of the ITL (January 2005 – June 2011), the long-run relationship between both the 7-day interbank rate and overnight rates and time deposit rates was non-existent. This can be attributed to the lack of clear understanding by the public of the intensions of the central bank's monetary policy in the momentary targeting regime.

Table 3: Pass-through of the interbank interest rates to other rates (2005M01 – 2014M05)

	2005M01 – 2015 M05		**2005M01 – 2011M06**		**2011M07-2014M05**	
	7-day interbank rates					
	coefficient	ecm	coefficient	ecm	coefficient	ecm
Lending rate	0.430*	-0.221*	-0.017	-350	0.301*	-0.188*
Time deposit rate	0.568*	-0.551*	nr	nr	0.595*	-0.621*
364-day TB rate	nr	nr	nr	nr	0.653*	-0.702*
91-day TB rate	0.741*	-0.484*	0.764*	-0.346*	nr	nr
	Overnight interbank rates					
	coefficient	ecm	coefficient	ecm	coefficient	ecm
Lending rate	0.451*	-0.237*	0.062	-0.363*	nr	nr
Time deposit rate	0.617	-0.819	nr	nr	nr	nr
364-day TB rate	nr	nr	nr	nr	0.344*	0.069
91-day TB rate	nr	nr	nr	nr	0.472*	-0.085*

Note: nr stands for "no long-run relationship", implying that in the absence of a long-run relationship between interest rates, any regression results would be spurious. Estimation would therefore not be required. * represents statistical significance at the 5% level.

6. CONCLUSION AND POLICY IMPLICATIONS

The extent to which the bank interest rates adjust to shocks to the monetary policy is an important policy issue in monetary policy formulation and implementation. This study examines the following questions in the interest rate pass-through: the extent to which changes in the short-term rates are transmitted to other rates in the economy. The study assesses the effectiveness of pass-through from the 7-day interbank rates relative to the overnight interbank rates. The paper also investigates whether the introduction of the ITL framework has improved the interest rate transmission. The followings are the findings:

The long-run relationship between the 7-day interbank and lending rates on the local currency denominated lending is existing and consistent throughout the entire sample. After the

implementation of the ITL framework (2011M7 – 2014M05), the 7-day interbank rate becomes more effective, influencing all other rates save for 91-day Treasury bill rates.

The pass-through coefficient of the 7-day interbank rate and lending rate is 0.43 in the entire sample, statistically not different from zero in the period before the adoption of the ITL framework and 0.30 in the period after the adoption of the ITL framework. Thus 100 basis points increase in the policy rate causes the lending rate to increase just 43% in the entire sample and 30 percent after ITL. The interest rate transmission process is existing but incomplete for lending rates.

The pass-through of the 7-day interbank rates to time deposit rates are higher than those of the lending rates, ranging from 0.56 – 0.60. Prior to the adoption of the ITL, the long-run relationship between both the 7-day interbank rate and overnight rates and time deposit rates was non-existent.

It is apparent that the 7-day interbank money market rate has tended to outperform the overnight rates, especially in terms of the pass-through coefficients and the existence of long-run relationships. The 7-day rates could be made more effective by the central bank ensuring that the domestic banking sector is in perpetual structural liquidity deficit. When the financial system is awash with excess reserves or structural liquidity overhang, agents tend to trade on the shorter end of the market, typically because of the lower costs of fine-tuning their liquidity needs as they expect to recover from their liquidity deficits in the very near future instead of locking for longer dated moneys which often carry additional risk premiums. Commercial banks tend to borrow in the long-term particularly in periods when liquidity conditions are tight.

The slow speed of adjustment of lending rates to changes in the policy rates and the incomplete pass-through of policy interest rate to other rates could reflect the lack of sufficient degree of competition in the banking sector in Uganda. Designing an appropriate competition policy can be a challenging task, given the special nature of the financial sector, with emphasis being placed on stability. While the Ugandan authorities have put in place an effective regulatory framework, a further enhancement of regulation to ensure that it is moving at the same speed as innovations and growth in the financial sector would be desirable.

In particular, the authorities should ensure that: entry or exit rules allow for contestable markets in terms of financial institutions and products; a level playing field across financial services providers and financial products such that there is effective competition within the sector; and ensure that the institutional environment such as payments system, credit reference bureaus is as well contestable.

The asymmetric response of lending rates to changes in the monetary policy rates can also be attributed to higher risk premiums in commercial banks. Before the 2011/12 crisis when inflation and interest rates skyrocketed, the asset quality of commercial banks as measured by the ratio of nonperforming loans to total loans averaged about 1.6 percent. Currently the asset quality of commercial banks has deteriorated significantly. The ratio of non-performing loans to total loans has increased significantly from a low of 1.6 per cent in June 2011 to 6.2 per cent at end March 2014. In addition, there are structural rigidities in the financial sector, which have contributed to high overhead costs for banks, which are definitely passed-on to borrowers in form of higher lending interest rates

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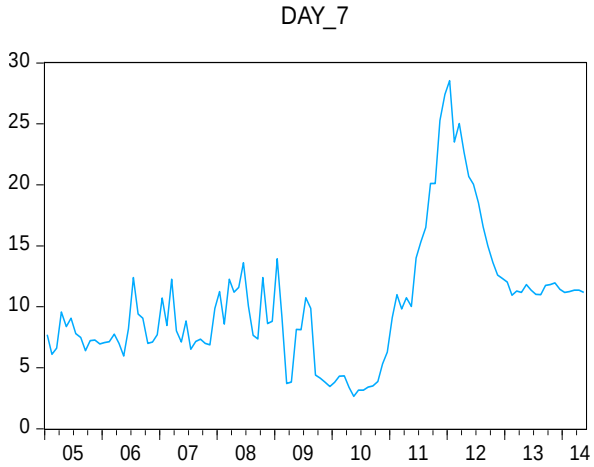
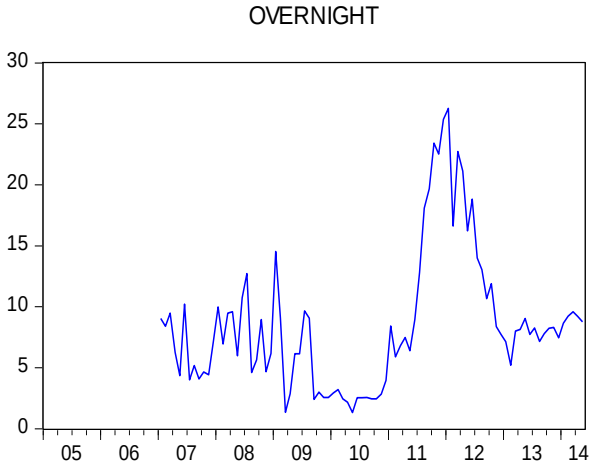
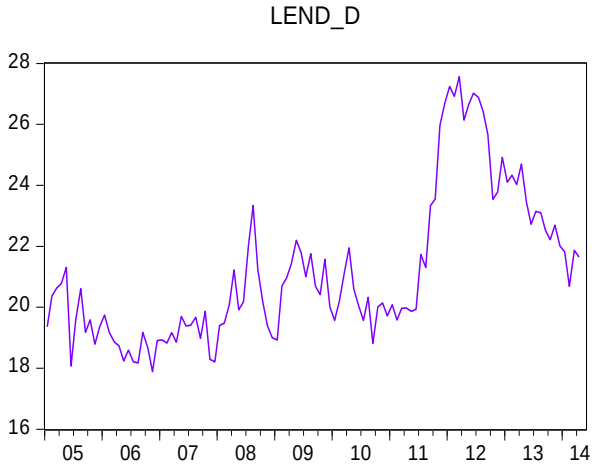
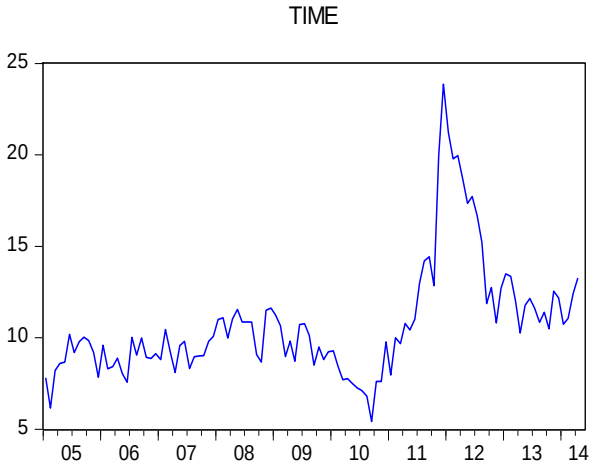
8. APPENDIX

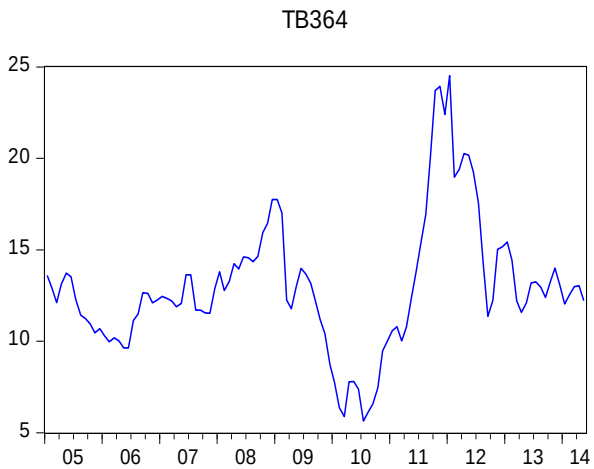
Appendix 1: Interest variables

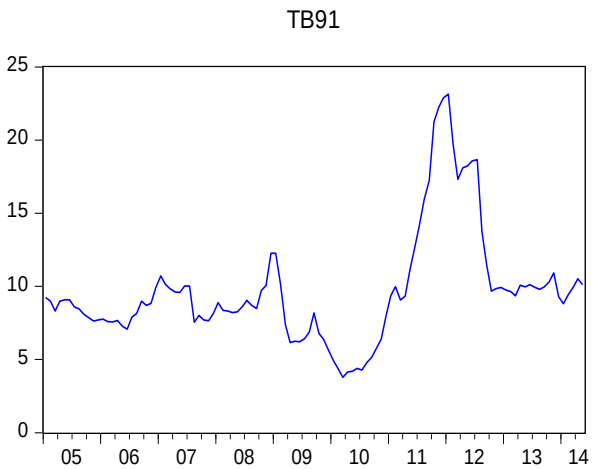












Appendix 2: Engle-Granger cointegration (2005M01-2011M06)

7-day interbank rate and lending rate on local currency lending

	Value	Prob.*
Engle-Granger tau-statistic	-4.014108	0.0108
Engle-Granger z-statistic	-26.91242	0.0069

7-day interbank rate and time deposit rates

	Value	Prob.*
Engle-Granger tau-statistic	-2.909304	0.1459
Engle-Granger z-statistic	-18.02605	0.0631

7-day interbank rate and 364-day TB rates

	Value	Prob.*
Engle-Granger tau-statistic	-3.195248	0.0820
Engle-Granger z-statistic	-18.21365	0.0611

7-day interbank rate and 91-day TB rates

	Value	Prob.*
Engle-Granger tau-statistic	-3.962468	0.0125
Engle-Granger z-statistic	-26.65665	0.0074

Overnight interbank rate and lending rates on local currency lending

	Value	Prob.*
Engle-Granger tau-statistic	-3.457509	0.0496
Engle-Granger z-statistic	-19.25316	0.0406

Overnight interbank rate and time deposit rates

	Value	Prob.*
Engle-Granger tau-statistic	-1.981314	0.5426
Engle-Granger z-statistic	-12.95044	0.1773

Overnight interbank rate and 364-day TB rates

	Value	Prob.*
Engle-Granger tau-statistic	-1.916360	0.5756
Engle-Granger z-statistic	-21.40575	0.0206

Overnight interbank rate and 91-day TB rates

	Value	Prob.*
Engle-Granger tau-statistic	-2.198303	0.4330
Engle-Granger z-statistic	-17.96945	0.0546

Appendix 3: Engle-Granger cointegration (2011M07-2014M05)

7-day interbank rate and lending rate on local currency lending

	Value	Prob.*
Engle-Granger tau-statistic	-2.004031	0.5335
Engle-Granger z-statistic	-6.200678	0.6042

7-day interbank rate and time deposit rates

	Value	Prob.*
Engle-Granger tau-statistic	-3.746786	0.0325
Engle-Granger z-statistic	-50.52171	0.0000

7-day interbank rate and 364-day TB rates

	Value	Prob.*
Engle-Granger tau-statistic	-4.471209	0.0059
Engle-Granger z-statistic	-42.52597	0.0000

7-day interbank rate and 91-day TB rates

	Value	Prob.*
Engle-Granger tau-statistic	-0.959450	0.9098
Engle-Granger z-statistic	-2.942010	0.8785

Overnight interbank rate and lending rates on local currency lending

	Value	Prob.*
Engle-Granger tau-statistic	-2.051097	0.5099
Engle-Granger z-statistic	-7.153811	0.5196

Overnight interbank rate and time deposit rates

	Value	Prob.*
Engle-Granger tau-statistic	-2.047313	0.5129
Engle-Granger z-statistic	-15.75347	0.0700

Overnight interbank rate and 364-day TB rates

	Value	Prob.*
Engle-Granger tau-statistic	-4.298738	0.0094
Engle-Granger z-statistic	109.4944	0.9999

Overnight interbank rate and 91-day TB rates

	Value	Prob.*
Engle-Granger tau-statistic	-4.562346	0.0050
Engle-Granger z-statistic	84.99711	0.9999