THE ROLE OF BANK RELATIONSHIPS IN INTERBANK LIQUIDITY DISTRIBUTION AND PRICING IN MALAWI

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Abstract

Interbank markets are classified as unique markets because, unlike in other financial markets, trading in these markets depends heavily on the trust that market players have for one another. Consequently, interbank markets are associated with strong relationships between banks. Such relationships are expected to affect pricing of liquidity in these markets. Along these lines, this study aimed to investigate price determination in interbank market by precisely paying attention to the role played by bank relationships. The strength of relationships is proxied by the frequency of borrowing and lending by specific banks in this market. The study investigates how relationships affect the rate at which such loans are provided. The study uses the structure of the Malawi interbank market as a case study for interbank markets in low-income countries. It applies quarterly bank-level data spanning from 2010:1 to 2024:4. Results of the study show that building borrowing relationships (where a bank is a borrower) is associated with higher borrowing costs. Unlike frequent borrowers, who are punished by borrowing at higher rates, the study finds out that this market favours frequent lenders. Precisely, frequent lenders get higher rates when lending liquidity in this market. In addition, in line with outstanding literature on interbank markets, it is found that risky banks are charged higher rates when borrowing from the interbank market, confirming the market disciplining role of this market. However, risky banks also demand higher rates when lending liquidity in this market. It is therefore concluded that interbank market relationships affect pricing of banking system liquidity. This implies that such relationships could hinder the effectiveness of monetary policy by limiting the impact of central banks' efforts aiming at managing the market-wide interbank rates. The results of this study, therefore, provide guidance to central banks, especially in low-income countries, in their interbank monitoring role, especially in line with the assessment of the transmission of monetary policy.

Key Words: *Interbank markets, liquidity, interbank rate, market discipline, monetary policy transmission*

JEL: G21, G28, E52, E58

1.0 Introduction

Interbank markets are markets that take care of banks' short-term liquidity needs. Understanding the behaviour of interbank markets is important because behaviour of interbank markets affects market mechanisms which can make liquidity distribution difficult and monetary policy transmission to be less effective. This is important especially in this era where most economies have moved from monetary aggregate targeting in favour of either interest rate targeting or inflation targeting in their conduct of monetary policy. This is because signals from a well-functioning interbank market, through the interest rate and credit channels, provide an effective way of discovering prices in other money markets. Being the only well-established market where the overnight rate is determined, the interbank market provides the shortest end of the yield curve and guides other market rates that affect the key macroeconomic variables of the economy. A well-functioning interbank market, therefore, is an important guide for the pricing of financial products such as loans, mortgages, futures, options and swaps. Additionally, interbank rates provide a good reflection of the stance of monetary policy since they are highly and quickly affected by both adjustments to policy rates and central banks' liquidity management efforts.

Further, due to its liquidity redistribution nature, the interbank market helps to restore financial stability by closing undesirable liquidity gaps even before the central bank takes action. Moreover, since interbank markets are associated with strong disciplining mechanisms among its participants[1], these markets offer an additional hand to central banks' macro-prudential regulation which continues to be challenged by sophistications in the banking industry, information asymmetry, weak legal frameworks and government intervention. An active interbank market, therefore, can expose some of the hidden risks in the banking system and assist central banks to take necessary actions and be able, therefore, to avoid potential crises. Further, banks' intermediation role with the real economy could be a challenge if liquidity is not well-channeled through the banking system.

The interbank market has been classified as a unique type of money market because most loans in interbank markets are both overnight and unsecured. Consequently, trading in these markets is based on the trust that the players build between each other over time. Interbank markets, therefore, are associated with close relationships between participants. This implies that

[1] Liquidity is provided/denied and priced according to the riskiness of counterparts.

interbank markets demand formulation of specific policies, especially policies concerning the way in which liquidity is distributed and funded. While interbank relationships can play an important role in transmitting serious losses, especially during crises (Xu, 2016), such relationships are found to reduce asymmetric information problems (counterparty risk) and to affect the pricing and availability of liquidity (Brauning and Fecht, 2017). Interbank relationships for specific markets, therefore, need to be studied and understood so that they can be monitored carefully to ensure that the promotive effects of having a relationship prevail and that the negative effects of such relationships are minimized.

The documentation of the effects of the US subprime mortgage crisis of 2007 and the collapse of Lehman Brothers in 2008 on global financial markets has raised awareness on the crucial role played by interbank markets across economies. Among other things, much attention has been directed towards the direct financial linkages between banks and how such linkages are considered to have played an important role in transmitting serious losses during the crisis (Xu, 2016). Consequently, interbank markets have been identified to be markets with strong interlinkages of that nature and some forms of relationships in these markets are associated with creation of contagion in times of distress. Interbank markets, therefore, have quickly become one of the key gauges of market tensions and expectations in many economies.

The important role played by interbank market in allocating liquidity around the financial system has exposed interbank markets as a private lender of last resort for short term liquidity needs. There has been a realization, therefore, that inadequate liquidity in interbank markets has the potential to impair other financial markets and the real sector of the economy. This has forced central banks around the globe to continue to change their modus operandi (Bech and Monnet 2013), including prudently exploring alternatives for conducting monetary policy, putting monetary policy of some economies at a crossroads, in some cases.

For Malawi, efforts to improve the framework for conduct of monetary policy involve the transition from monetary aggregate targeting to interest rate targeting, then to inflation targeting framework. This, among other things, is done by making sure that liquidity levels and the interbank rate are within certain prescribed ranges. In line with this, the central bank influences banking system's liquidity levels through its Open Markets Operations (OMOs). As highlighted by Kanyumbu (2021) therefore, effective monetary policy in Malawi rests on the central bank's ability to influence the interbank market rate. Any interbank market behaviour that affects availability and pricing of liquidity is therefore important within the central bank's

efforts to make monetary policy effective. Building relationships is one of the important behaviours of the interbank market that needs to be studied, especially in line with implementation of monetary policy. This is especially in line with existing literature that has reviewed that interbank relationships have an impact on the interbank market rate, implying that such relationships have a role to play on the effectiveness of monetary policy.

2.0 Objectives and Motivation of the Study

2.1 Objectives of the Study

This study aims to analyze the effect of interbank relationships on pricing of interbank loans. The focus of this study is on Malawi, where the interbank market is still developing but has not been sufficiently studied. Precisely, the study aims to:

1. Analyze the effect of interbank relationships on interbank borrowing rates.

2. Analyze the effect of interbank relationships on interbank lending rates.

The study, therefore, attempts to answer the following questions:

1. Do interbank relationships affect the rates at which banks borrow liquidity from the interbank market?

2. Do interbank relationships affect the rates at which banks lend liquidity in the interbank market?

In line with the highlighted objectives, the study presents the following null hypotheses:

1. Interbank relationships do not affect the rate at which banks borrow liquidity from the interbank market.
2. Interbank relationships do not affect the rate at which banks lend liquidity in the interbank market.

2.2.Motivation of the Study

Interbank markets in low-income countries, like Malawi, are different from the ones in developed countries in several ways. For instance, due to poor institutional environment, the size of the formal financial sector is small, and the existence of informal financial sector is evident in these countries (Mishra, 2010). In the informal financial sector, intermediation involves transactions between related parties and there is high reliance on specialized money

lenders and the use of informal credit cooperatives is common. Since some forms of financial intermediation are carried out outside of the formal financial sector in these countries, the role played by interbank markets is limited. For instance, unlike in developed countries, the effectiveness of interbank market on the transmission mechanism of monetary policy may be limited in these countries because reactions to liquidity adjustments are not taken by the whole market. Further, unlike with developed countries, most central banks in low-income countries are not independent and government interventions are common. Consequently, central bank actions may deviate from expected market practice and reactions may not always be according to market fundamentals. This results in serious forecasting errors on the part of market participants. Moreover, due to political instability, poor accounting and disclosure standards, weak property rights, limited government accountability, weak regulatory framework, poorly functioning legal system and prevalence of corruption (Mishra 2010), among other things, most low-income countries are associated with high cost of intermediation. This makes financial markets in low-income countries markedly different from those in developed countries. For instance, absence of bank transparency, coupled with a weak regulatory and supervisory structure and inability to enforce contracts in most of these countries discourages banks from trading liquidity among each other.

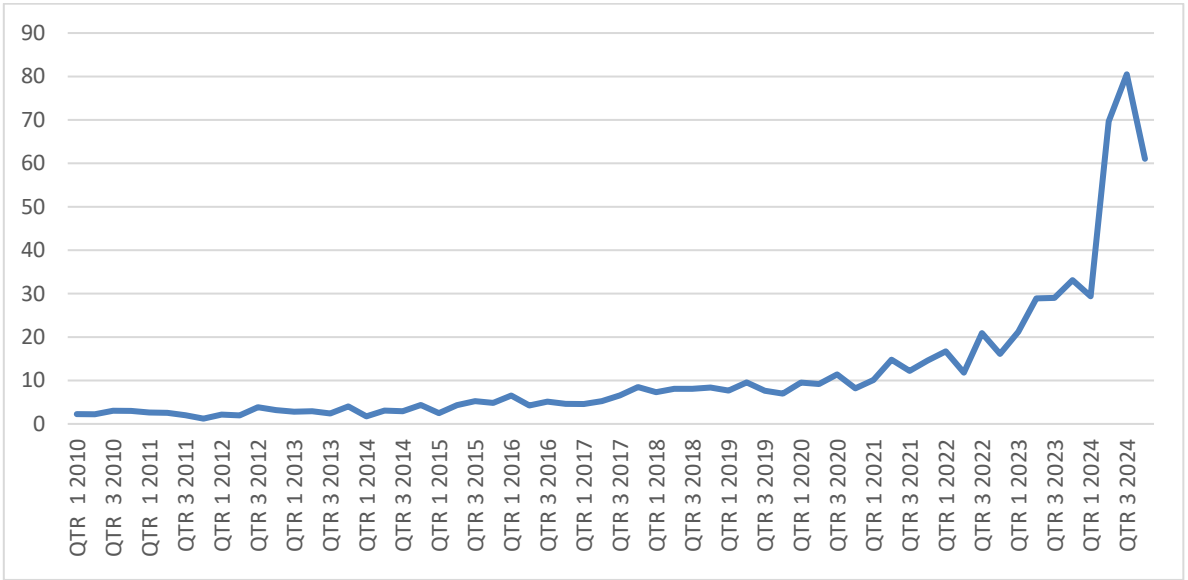
Moreover, interbank markets in most developing countries are associated with chronic excess reserves which may not be explained by the standard theories of liquidity management. This is because lending to the non-banking sector is an expensive business in these countries. This could imply that central banks' transmission mechanisms for monetary policy could be rendered less effective since the banking system liquidity is trapped on the balance sheets of some banks instead of lubricating the flow of credit in the whole banking system. In addition, due to increased levels of corruption and government intervention in low-income countries, banks that do not meet central bank's minimum macro prudential limits may not necessarily be closed as they may be covered by the government or other entities in the economy. This affects the way in which banks screen each other on the interbank market. Compared to banks operating in developed markets, therefore, banks in low-income countries are likely to seek more information about their trading peers' risk since some risks could be hidden in such markets. Consequently, availability and pricing of liquidity are likely to be heavily affected by relationships that are built among banks since such relationships are based on trust. This has implications for the conduct of monetary policy in these countries which, sometimes, is taken

for granted. Investigations of the interbank market relationships in low-income countries like Malawi are, therefore, both necessary and interesting.

The Malawi Interbank Market

The interbank market in Malawi started its operations in 2001 and by regulation, participants of the interbank market are both banks and discount houses[2]. Although there are 7-day, 14-day and 21-day interbank transactions, majority of the interbank market transactions (over 90%) are overnight. The study therefore concentrates on the overnight market. The number of market participants has been changing over time due to entry and exit of different banks from time to time. As at December 2024, the number of participants stood at nine. Although the level of participation at the interbank market varies among the banks, there is evidence that all the banks participate in this market. Further, although the interbank market in Malawi is relatively small in terms of number of participants, over time, the traded volumes portray an active and growing market (Chart 1). This implies that the central bank, the Reserve Bank of Malawi (RBM), can rely on this market for the effectiveness of its operations.

Chart 1: Daily Average Interbank Traded Volumes (MK' Billion) during 2010-2024



Source: RBM Data

Malawi's interbank market offers a good case study for interbank markets in low-income countries since the market has several characteristics that mimic markets in low-income countries, including those in the Southern Africa Development Committee (SADC) and

[2] There is currently one discount house.

Common Market for Eastern and Southern Africa (COMESA) regions. Like Malawi, for instance, most financial markets in these regions are dominated by commercial banks and interbank transactions in these markets are dominated by overnight trades. Further, trades in these interbank markets are on both a secured and unsecured basis and in most cases, despite interbank markets being characterized by ample liquidity, banks continue to rely on central bank standing liquidity facilities for their daily liquidity needs.

Until recently, the Malawi interbank market has also been associated with persistent deviation of the overnight interbank rate from the monetary policy rate, making implementation of monetary policy difficult. Additionally, there had been periods when the overnight interbank rate counterintuitively responds to changes in liquidity conditions as opposed to the traditional inverse relationship observed in efficient interbank markets in developed countries. While this could signify presence of structural rigidities in this market, this could also point towards the role played by lending/borrowing relationships in this market, warranting a thorough understanding of the existing relationships in this market and how such relationships affect the functioning of this market and hence the conduct and effectiveness of monetary policy.

3.0 Literature Review

One of the earliest literatures on interbank markets is the seminal work of Poole (1968). Generally, interbank markets are associated with relationship-driven behavior. Theoretically, relationship lending in the interbank market is explained by either the search theory and directed search theory. The search theory, as highlighted by Afonso and Lagos (2012), highlights that banks can trade over multiple rounds with randomly selected counterparts in the interbank market and that individual trades can occur at different rates. The directed search theory of Bech and Monnet (2013), on the other hand, stipulates that banks use directed search to find counterparts in the way that resembles a brokered market. According to the directed search theory, therefore, banks trading in interbank markets make sure that they are trading with reliable counterparties. This emanates from the realization that there is a possibility that some banks in the interbank market can default on their loans and hence there is need to screen each other when trading liquidity in this market. This could explain why, given the same market situation, some banks are denied liquidity from the interbank market while some are able to access the liquidity. This, for instance, would bring in situations where some banks borrow

from the central bank at punitive rates[3] even if the interbank market has enough liquidity. In some instances, risky banks are able to access interbank liquidity, but their risk levels are reflected in the pricing of such liquidity. This implies that in trying to price risks of borrowing banks, interbank rates may be high even if the overall market is liquid. This, among other things, could be a limiting factor to the effectiveness of monetary policy. For monetary policy to be effective, the interbank rates need to reflect the prevailing liquidity levels.

Literature on interbank market relationships aligns with the general literature on trust in financial institutions. While trust in banks is considered essential for an effective financial system in general (Fungáčová et al. 2019), trust among banks contributes to financial inclusion and financial stability and it therefore helps to foster economic growth and development. This is why the decline in trust among banks during the onset of the 2007/08 financial crisis, as highlighted by Carbo-Valverde et al (2013), became a serious concern. Rebuilding trust, therefore, appears to be one of the top priorities within the banking system in modern days. Given the screening aspects of the interbank market, trading in the interbank market offers a good indication of performance of trust-related issues of the financial system. While regulatory and supervisory roles are performed by central banks, the disciplining mechanism offered by the interbank market provides an additional screening mechanism for banks. This study is in line with bank-to-bank type of trust as reflected in the relationships that are built in the interbank market.

Trust is an important aspect of the interbank market, acting as a crucial mechanism to mitigate risk, enable liquidity flow, and manage partner selection during both stable and crisis periods. With high levels of trust, banks not only increase lending volumes to their peers but they also reduce the cost of borrowing. Low trust, on the other hand, leads to market fragmentation, higher risk premiums, and potential bank runs. Trust, therefore, mitigates counterparty credit risk and in times of crisis, banks rely on trust-based networks to ensure continued access to liquidity at affordable rates (Rad, 2017). Trust also influences how interbank market players choose trading partners, often prioritizing long-term, stable, and socially reinforced relationships over purely economic transactions (ibid). Further, stronger trust reduces the risk of adverse selection, facilitating smoother lending, especially in the unsecured segment of the interbank market. Trust in interbank markets is associated with reciprocity and stability. When there is increased trust, banks both borrow from and lend to each other. Trust-based

[3] Usually, the interest rate at which commercial banks borrow from the central bank (Discount rate or Lombard rate) is higher than the interbank rate

relationships are also stable, long-standing, and crucial for managing performance via communication rather than solely relying on contractual controls. However, it is also noted that long-term lending relationships, particularly in the overnight interbank market, while allowing for high transaction volumes, can sometimes lead to lenders charging higher premiums to borrowers, thus, exploiting their knowledge of the borrower (Rad, 2017).

Empirical literature supports the existence of relationship-driven behaviour among players in the interbank market. Earlier papers like that of Petersen and Rajan (1994), for instance, show that interbank borrowers benefit by maintaining a relationship with a single or small number of trading peers. The existence of lending relationships in the interbank market is also found to be evident in the US Federal Funds market (Furfine, 1999). Such relationships are found to have important effects on borrowing costs (Furfine, 2001). To be precise, longer relationships are found to decrease the interest rate in the US Federal Funds market. For the Portuguese interbank market, however, Cocco et al. (2009), showed that small banks, acting as borrowers, are more likely to rely on the lending relationships than larger banks. They further established that both borrowers and lenders benefit from the existence of strong relationships with peers. The existence of stable interbank relationships is also found in the Italian interbank market (Affinito, 2012). Further, such relationships are found to remain strong during the financial crisis, pointing towards the increased need for trust in uncertain times. For the Dutch interbank market, Liedorp et al. (2010) found that while larger dependence on the interbank market increases banks risks, banks can reduce such risk by borrowing from stable peers. In the German interbank market, Brauning and Fecht (2012) showed that lenders were charging lower rates to their close borrowers when the sub-prime crisis kicked in. This confirms the peer monitoring role of the interbank market. Using data from the e-MID market for Europe and USA, Temizsoy et al. (2015) found that both borrowing and lending banks benefit from having relationships with other interbank market players. To be precise, while borrowers were found have to a discount on interest rates, lenders were found to have favourable rates in times when there was a high preference for a counterparty.

Some literature confirms, however, that interbank market relationships do not always have a positive impact on counterparties. For instance, an empirical study by Brauning and Fecht (2017) on the German interbank market reviews that while relationship lending has a positive effect on access to liquidity, relationship lending has a negative effect on the bilateral interest rates. Precisely, interbank borrowers were found be charged higher rates from borrowing liquidity through built relationships. These results are also supported by Afonso et al. (2013)

using data on the federal funds market in the USA. Further, a more recent study by Teruyoshi and Takaguchi (2018) used time-stamped data on interbank transactions conducted in the Italian online interbank market (e-MID) between September 2000 and December 2015 to analyze the impact of relation lending in the Italian interbank market. The study established a number of important properties that distinguish relationship lending from other transactional lending. On average, for instance, the duration of interbank loans was found to be longer for banks in a continuing relationship than that of a non-significant relationship. Further, the study established that in times of financial distress banks that are in need of liquidity rely much on banks to which they are connected by significant ties. Further, the study established that this reliance is even done at the cost of high interest rates. Precisely, it was found that borrowers were paying higher rates by sticking to the same set of lenders, supporting the fact that interbank relationships can distort both the distribution and pricing of liquidity.

The review of the literature indicates, therefore, that interbank relationships are important determinants of availability of liquidity to specific banks, ability to access the interbank market as well as the price of liquidity. This could imply that interbank lending/borrowing relationships have potential to limit or intensify the impact of monetary policy decisions aimed at controlling interest rates and inflation. Interbank relationships, therefore, could affect the effectiveness of monetary policy and they need, therefore, to be carefully scrutinized.

In addition to lending relationships, some studies have come up with some factors that bring in the cross-sectional dispersion in the borrowing rates of banks in the interbank market. Such factors guide the study in the choice of control variables. For instance, a study by Angelini et al (2011) found that bigger banks have access to more favourable funding conditions than smaller banks in the European interbank market. Similarly, Furfine (2001) showed that interest rates in the US Federal Funds market favoured bigger banks compared to smaller banks. The work of Gabrieli (2011, 2012) with the e-Mid transactions data indicated that foreign banks borrowed at higher rates than Italian banks during the period following Lehman's bankruptcy, confirming the role of bank ownership on the pricing of interbank loans.

As can be noted from the review of the literature, most of the studies on interbank markets focus on markets in developed nations. Research results on the progress, performance and challenges encountered by interbank markets in developing countries remain scarce. In many low-income countries, interbank markets are in early stages of development. While some countries like Kenya, Uganda, Malawi and Zambia have managed to increase interbank activity

up to 30% of GDP in the last decade (Raga and Tyson, 2021), interbank transactions have remained small in most economies. Further, compared to developed countries, interbank markets in most low-income counties are associated with high counterparty risk. Consequently, banks are motivated to resort to liquidity hoarding as an alternative way of managing their balance sheets. Moreover, banks are motivated to charge high borrowing rates whenever they are able to lend their liquidity to their counterparties. Given that the interbank rate acts an anchor for the long-term structure of other interest rates in the financial system, such high interbank rates can spillover to rates charged by banks when lending to the rest of the economy. This could, therefore, limit the amount of credit that banks extend to economy and hence limiting the role played by the banking sector.

While Green et al. (2018) have set the pace in studying the interbank market in Kenya, compared to most interbank markets in developing countries, Kenya has a well-established and relatively liquid interbank market. Moreover, unlike other low-income countries like Malawi, Kenya has a wider money market that provides an alternative secured source of funds for banks that are short of liquidity and an additional outlet for banks with excess liquidity. Consequently, findings based on studies done for Kenya may not be applied to most low-income countries especially in the sub-Saharan African region. Kanyumbu (2020) studied the interbank network for Malawi but paid much attention on the network structure and how the network structure affects distribution of liquidity and contagion around the banking system. Further work was also done by Kanyumbu (2021) on the interbank market and its effectiveness of monetary policy in Malawi. However, there are still research gaps on the impact of bank relationships, especially on the pricing of liquidity in undeveloped markets. This study is aligned to such research initiatives.

4.0 Data and Methodology

This study aims at assessing the role of interbank relationships on pricing of interbank loans. The study applies interbank relationship variables to analyses how interbank relationship affect the behaviour of banks in the interbank market in terms of pricing of interbank loans.

4.1 Data and Data Sources

The study uses data on interbank trades capturing number of borrowing and lending transactions, the traded volume and the interest rate for each specific trade between any two banks in a given

period. Such data is not publicly available and was provided by the Reserve Bank of Malawi on anonymity basis.[4] The data is converted into quarterly data to capture cumulative volumes in terms of borrowings and lendings and to calculate the weighted average rates for corresponding trades for a given quarter. The data used in the study spans from 2009:1 to 2024:4. At the time of writing this research paper, the Malawi interbank market had 9 players; 8 banks and 1 discount house. For the study period, however, the market had a total of 14 market players but some players entered while some exited the market at different periods. For consistency and continuity in the analysis, the study concentrated on 7 players who have been trading in this market for the whole period under study. The interbank players that have been in Malawi for the period under review are shown in Table 1.

Table 1: Malawi Interbank Market Players from 2009 to 2024

Name of Institution	**Largest shareholder**	**Ownership Classification**	**Current Status**
CDH Investment Bank (CDHIB)	Continental Holdings Limited	Domestic	Still in operation
Ecobank Malawi Limited	Ecobank Transnational Incorporated Company	Foreign	Still in operation
First Discount House (FDH)	FDH Financial Holdings Limited	Domestic	Still in operation
FDH Bank	FDH Financial Holdings Limited	Domestic	Still in operation
First Merchant Bank (FMB)	FMB Capital Holdings Plc	Foreign	Changed to First Capital Bank
International Commercial Bank Malawi (ICB)	ICB Financial Group Holdings	Foreign	Exited the market
INDE Bank	Malawi Government	Domestic	Exited the market
Malawi Savings Bank (MSB)	Malawi Government	Domestic	Exited the market
National Bank of Malawi (NBM)	Press Corporation Limited	Domestic	Still in operation
NBS Bank Limited	Nico Holdings Limited	Domestic	Still in operation

[4] This is also why the study is limited to Malawi

Nedbank Malawi Limited	NedGroup Investments Africa	Foreign	Exited the market
New Finance Bank Malawi Limited	MyBucks and Finsbury Investments Limited	Foreign	Exited the market
Opportunity Bank of Malawi (OIBM)	Opportunity International	Foreign	Exited the market
Standard Bank Malawi Limited	Stanbic Africa Holdings Limited	Foreign	Still in operation

4.2 Methodology

The Econometric Model

The study is guided by the literature that has demonstrated that both lenders and borrowers can benefit from interbank relationships. Along this line, the study investigates the role of borrowing relationships from two perspectives; whether frequent borrowing benefits or punishes a borrowing bank[5] and whether frequent lending benefits or punishes a lending bank. The assumption is that banks that borrow frequently from interbank market establish relationships that may favour them to get good rates when borrowing from the market. Similarly, frequent lenders establish trading partners and such partnership may help them to get good lending rates. The precise questions are, therefore, twofold:

a) Does the interbank borrowing rate depend on frequency of borrowing?
   Does the interbank lending rate depend on frequency of lending?

To investigate the effect of relationships on interbank borrowing rate, a regression is conducted as presented in Equation 1.

$$BorrowingRate_{it} = \beta_0 + \beta_1 Relationship_{it} + \beta_2 Controls_{it} + \mu_{it} \quad (1)$$

Where $BorrowingRate_{i,t}$ is the weighted average interbank borrowing rate for bank *i* in a given period, *t.* *Relationship* is the interbank relationship variable for a given bank in a given period, measured as the number of borrowings within the period, $Controls_{i,t}$ are the control variables

[5] Through building relationships

included in the model to capture other factors that affect the interbank borrowing rate. $\mu_{ij,t}$ is the error term.

Similarly, to investigate the effect of relationships on interbank lending rate, a regression is conducted as presented in Equation 2.

$$LendingRate_{it} = \beta_0 + \beta_1 Relationship_{it} + \beta_2 Controls_{it} + \mu_{it} \quad (2)$$

Where $LendingRate_{i,t}$ is the weighted average interbank lending rate for bank *i* in a given period, *t.* *Relationship* is the interbank relationship variable for a given bank in a given period, measured as the number of lendings by bank *i* within a given period*, t.* $Controls_{i,t}$ are the control variables included in the model to capture other factors that affect the interbank lending rate. $\mu_{ij,t}$ is the error term.

The Bank Relationship Variable

The variable for interbank relationships is constructed in terms of concentration of lending and borrowing activity. The number of interbank transactions for a specific bank is used as a proxy for strength of built relationships between the bank and the rest of the banks in the market. This approach is guided by Temizsoy et al. (2015), where instead of using the volume of interbank trades to construct the relationship variables, as commonly done by most authors, the number of interbank transactions[6] is used to construct the relationship variable. By using the number of transactions rather than traded volumes, the bias toward large banks (that trade large volumes with each other simply because of their size) is avoided. For the borrowing rate equation, number of interbank borrowings within a given period is used while number of interbank lendings within a period is used for the lending rate equation.

Control Variables

Building from literature, an explanatory variable, *RISK* that captures the riskiness of banks is included in the model. From a market discipline point of view, lenders in the (unsecured) interbank market are supposed to put in place mechanisms to monitor their counterparties since, in most interbank trades, there is no collateral to hedge counterparty risk. Consequently, when the interbank market is effective, riskier banks are expected to be charged higher prices in the interbank market (Furfine, 2001; King, 2008 and Sarmiento, 2016). Compared to less risky

[6] Thus, the frequency of trading between banks

banks, therefore, more risky banks are either denied liquidity in the interbank market or can only manage to borrow liquidity at higher rates. Non-performing Loans (NPL) are used to measure bank's credit risk in this study. In line with interbank market discipline, banks with huge NPLs are perceived to be risky banks. This is because increased NPLs eventually erode banks' capital and may disqualify banks from some agreed trading limits. Banks with high levels of NPLs are therefore expected to have challenges to access liquidity in the interbank market. Where liquidity is provided for such banks, it is expected that such banks will borrow liquidity at a relatively higher rate than most of the banks in the market.

Further, a variable, SIZE, is included to capture the impact of bank size on the pricing of interbank loans from both the lender's and borrower's side. Most literature, especially before the 2007/08 Global Financial Crisis supports the "too-big-to-fail" argument. This is where an increase in bank size is not only associated with greater probability to access liquidity but also ability to access liquidity at lower rates, compared to smaller banks. In most literatures, it is argued that large banks are advantaged players in the interbank market since they are associated with more diversified portfolios. Consequently, compared to small banks, large banks are less likely to have serious liquidity shocks (Kashyap et al, 2002)**.** Moreover, large banks are associated with a larger network of regular counterparties and, compared to small banks, large banks have a wider range of collateral to assist them to secure liquidity easily and at a better price. Further, in some markets, bank size may also imply possession of market power associated with being a leader when it comes to pricing interbank loans. On the other hand, however, compared to small banks, large banks could be associated with greater complexity in their operations and may tend to be less transparent. Given that reliable, timely and granular information disclosure is highly regarded in the banking sector, such opacity in large banks could contribute to a general mispricing of risk (Zer, 2015). This could imply that bigger banks could also be perceived as riskier than smaller ones and could face worse borrowing conditions when borrowing from the interbank market. Bank size (SIZE) is measured by logarithm of bank assets in this study.

A variable, LOCAL, is also included in the model to capture the impact of bank ownership on the pricing of interbank loans. LOCAL is a dummy variable, taking value 1 if a bank is a domestic bank and 0 if it is a foreign-owned bank. It is expected that more information is readily available from domestic banks compared to foreign banks whose decisions, in most cases, are made by their headquarters which are located outside the economy (Chen et al., 2017). Consequently,

compared to foreign banks, domestic banks can be perceived as less risky banks. In line with the interbank market discipline literature, therefore, domestically owned banks are expected to be offered better borrowing terms when lending and borrowing from the interbank market. A lagged interbank borrowing rate and a lagged interbank lending rate are also included in the Borrowing rate model and the Lending rate model, respectively to assess the persistence of banks' pricing behaviour. The lagged values assess if the borrowing rate and lending rate in previous periods do affect the borrowing rate and lending rate in the current periods. The empirical interbank borrowing rate and interbank lending rate models are presented as equations 3 and 4, respectively.

$$BorrowingRate_{i,t} = \beta_0 + \beta_1 Borrowings_{it} + \beta_2 RISK_{it} + \beta_3 SIZE_{it} + \beta_4 LOCAL_{it} + \beta_5 BorrowingRate_{it-1} + \mu_{ij,t} \quad (3)$$

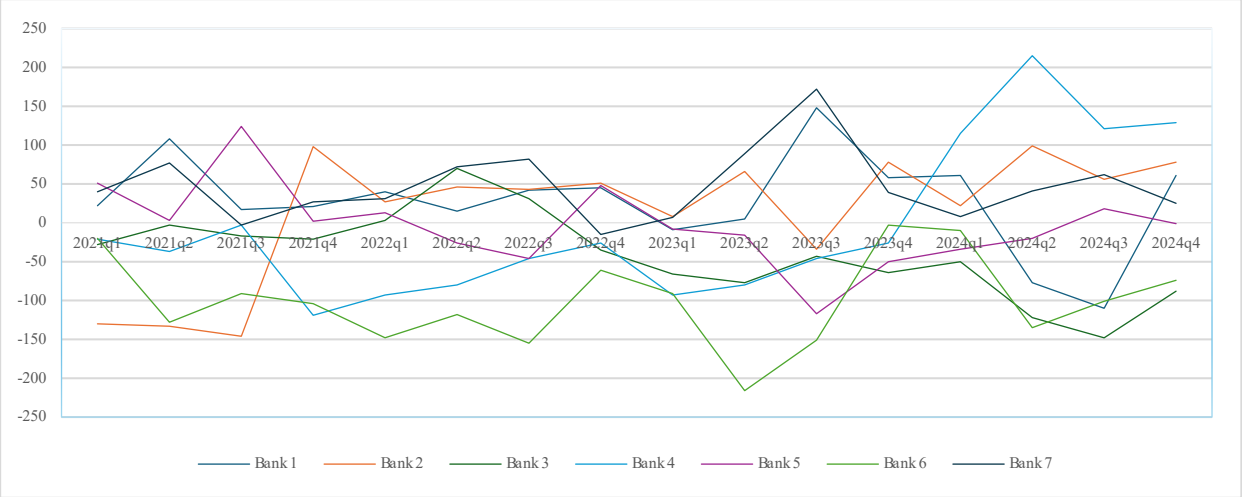
$$LendingRate_{i,t} = \beta_0 + \beta_1 Lendings_{it} + \beta_2 RISK_{it} + \beta_3 SIZE_{it} + \beta_4 LOCAL_{it} + \beta_5 LendingRate_{it-1} + \mu_{ij,t} \quad (4)$$

5.0 Results and Discussions

5.1 Preliminary Results

A preliminary analysis of the data reveals that all the 7 banks under analysis have been borrowing and lending liquidity for the past 4 years, indicated by the net lending position (number of times a bank lends minus the number of times a bank borrows in a quarter). However, the net lending position for different banks varied from time to time. It is important to note, however, that some banks were net lenders most of the time and others were net borrowers most of the time (Chart 2).

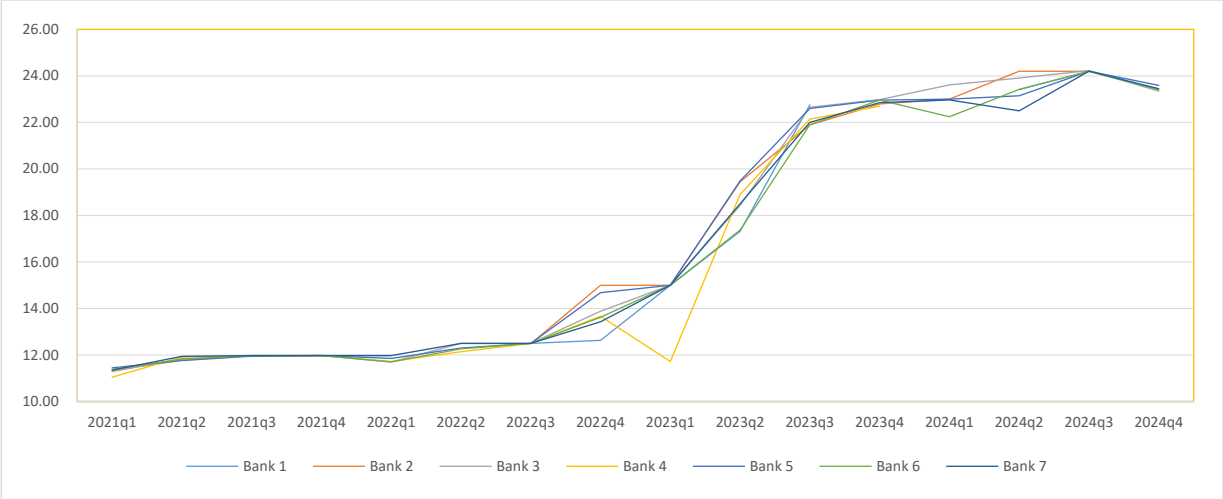
Chart 2: Net lending Positions of 7 Banks (2021-2024)



Source: Author's own computation from RBM data

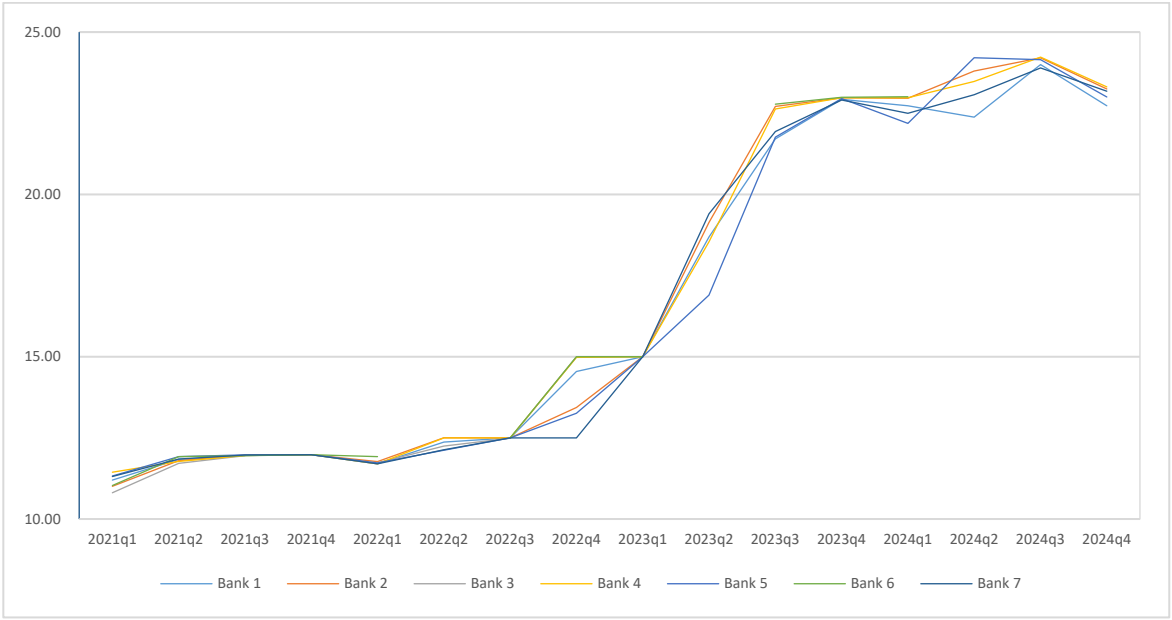
It is further noted that, within a given period, banks borrow liquidity from the interbank market at significantly different rates (Chart 3). It is also noted that banks lend liquidity to each other at different rates (Chart 4). Although the borrowing and lending interbank rates for different banks could be affected by other factors, such spreads could also be affected by the nature of lending and borrowing relationships that banks build over time. This prompts the study to carry out further investigations.

Chart 3: Interbank Borrowing Rates across Banks (2021-2024)



Source: Author's own computation from RBM data

Chart 4: Interbank Lending Rates across Banks (2021-2024)



Source: Author's own computation from RBM data

5.2 Descriptive Statistics

The descriptive statistics of the variables used for analysis are presented in Table 2.

Table 2: Descriptive Statistics of Variables used in the Study

Variable	Mean	Std Dev.	Min	Max	Obs
BorrowingRate	15.4266	7.1210	11.0100	30.4343	391
LendingRate	15.4266	7.1210	11.0100	30.4343	391
Borrowings	45.9130	43.7635	0	228	391
Lendings	40.6368	39.1245	0.	228	391
NPL	12.7801	17.1540	-0.2000	66.99558	391
SIZE	5.2191	0.5689	3.485594	6.123789	321
LOCAL	0.7159	0.45150	0	1	447

It is observed that there is a significant diversity in both the interbank borrowing rate and the interbank lending rate. For instance, it is observed in Table 2, that while the interbank borrowing rate averaged about 15.43% during the study period, it is dispersed between 11.01% and 30.43% during the study period. While a significant part of the dispersion is attributed to adjustments in the monetary policy rate over the period, this is consistent with what the study hypothesized that both interbank borrowing rates and interbank lending rates for different banks are different. Such differences could be attributed to differences in the banks' lending and borrowing relationships.

5.3 Estimation Results

A test for presence of multicollinearity reviews that there is no serious multicollinearity among the independent variables. Table 3 shows that the highest correlation coefficient among the independent variables is 0.2536 and is between BorrowingRate and NPL. It is noted, however, that there is a positive correlation between BorrowingRate and LendingRate, warranting further investigations through econometric techniques.

Table 3: Correlation Matrix among the Variables

	BorrowingRate	LendingRate	Borrowings	Lendings	NLP	SIZE	LOCAL
BorrowingRate	1.0000						
LendingRate	0.6589	1.0000					
Borrowings	0.1910	0.0089	1.0000				
Lendings	-0.0667	0.1160	-0.3179	1.000			
NPL	0.2536	0.2493	-0.1287	0.0468	1.0000		
SIZE	0.1363	0.2048	-0.2092	0.0483	0.1054	1.0000	
LOCAL	0.0103	-0.0490	0.0559	0.2698	0.2795	-0.0477	1.0000

This study aims to investigate how interbank relationships affect the rates at which banks borrow and lend liquidity to each other. The study uses panel data analysis. Since panel data models are associated with cross-sectional and time effects, several tests are carried out to arrive at the appropriate specific models for the panel data. The cross-sectional and time effects associated with panel data models could be fixed or random. For fixed effects, individuals or time have different intercepts in the regression equation. For random effects, the individual group or time have different disturbances. Unlike random and fixed effect models, pooled Ordinary Least Square (OLS) models do not make any difference between period and cross-sectional effects. It therefore assumes a constant intercept and slopes regardless of groups and time periods.

To test the existence of fixed effects, an F-test is carried out in the study. The F-test compares a fixed effect model with a (pooled) OLS model to see by how much the fixed effect model can improve the goodness of fit. From the results of the F-test, the null hypothesis of no individual specific effects was rejected in the interbank borrowing rate model. However, results of the F-test reveal that the null hypothesis of no individual specific effects could not be rejected in the interbank lending rate model. Further, the existence of random effects is examined using the Breusch and Pagan's (1980) Lagrange Multiplier (LM) test that contrasts a random effect model with (pooled) OLS model. The null hypothesis of no random effects could not be rejected for both models. This implies that a fixed effects model is preferable for the interbank borrowing rate model, but a pooled OLS model is preferable for the interbank lending rate model.

Consequently, the interbank borrowing rate model is estimated as a fixed effects model[7] while the interbank lending rate model had to be estimated as an OLS model. The parameter estimates of the two regression models are shown in Table 4 and Table 5.

5.3.1 Interbank Borrowing Rate and Bank Relationships

Table 4: Estimation Results of the Interbank Borrowing Rate Model

Dependent variable is BorrowingRate	
Constant	-14.6821 [7.7174]
Borrowings	0.2521** [0.0131]
NPL	0.0763** [0.0394]
SIZE	4.3635*** [1.6507]
LOCAL	Omitted
BorrowingRate(-1)	0.4487*** [0.0361]

Overall R-Squared	0.3519	
F-Test	2.21	(0.0553)
BP LM Test	0.00	(1.0000)
F (4, 172)	28.66	(0.0000)

****, **, * denote significance at 1%, 5% and 10% level, respectively. Figures in brackets are standard errors*

It is noted from Table 4 that the Coefficient of *Borrowings* is positive and statistically significant in the interbank borrowing rate model. This implies that, while banks build relationships over time, frequent borrowing from the interbank market leads to punitive measures from trading peers. Precisely, compared to ad hoc borrowing, frequent borrowing from the Malawi interbank market increases the rate at which a bank borrows liquidity, implying that relationships that banks build over time do not assist them to get liquidity cheaply when in need of it. Given the interbank

[7] The variable LOCAL, being a dummy variable, was omitted in the estimation output.

market discipling mechanism, where more risky banks are either denied liquidity or provided with liquidity at higher rates than less risky banks, increased reliance on the interbank market could signal continuous liquidity shortages which has potential to trigger lender caution. Such lender caution pauses risks to a borrowing bank's risk profile, resulting in increased costs of borrowing. These results support results by Brauning and Fecht (2017), indicating that while interbank relationships have a positive effect on banks' access to liquidity, such relationships have negative effect on bilateral interest rates. The results are also in line with the results of Teruyoshi and Takaguchi (2018) and those of Brauning and Fecht (2017).

However, the results refute the results of the study by Temizsoy et al. (2015) where interbank borrowers were found to have to a discount on interest rates in Europe and the USA interbank markets, thus, benefiting from interbank relationships (benefitting from being a consistent borrower). These findings also refute the findings by Furfine (2001) who concluded that longer relationships decrease the interbank borrowing rate in the US Federal Funds market. The findings are also not in tandem with those of Petersen and Rajan (1994) where interbank borrowers were found to benefit from maintaining a relationship with a single or small number of trading peers. The difference in the results portrays different issues in specific interbank markets and warrants further studies in the area.

The coefficient of NPL (RISK) is positive and significant in the interbank borrowing rate model, implying that, compared to banks that are perceived to be less risky, banks that are perceived to be riskier borrow liquidity from the interbank market at higher rates. This confirms existence of market discipline in the Malawi interbank market where riskier banks are charged with a risk premium, supporting findings by Furfine (2001) and Sarmiento (2016). The coefficient of SIZE is also positive and significant, implying that, compared to smaller banks, bigger banks borrow liquidity at higher rates. This implies that the Malawi interbank market is different from other markets like the U.S., German, Portuguese and the Colombian interbank markets where smaller banks lend to big banks at lower rates due to "too-big-to-fail" considerations (Furfine, 2001; Cocco et al, 2009; Gorton and Metrick, 2012; Abbasi et al, 2013). This could further imply that the moral hazard risks linked to "too-big-to-fail" attitude that was associated with cheaper funding cost from large U.S. banks during the financial crisis of 2008 (Angelini et al, 2011) can be avoided in the Malawi interbank market. This could also be in support of evidence in literature suggesting that bigger banks may be riskier than smaller banks since bigger banks may be less transparent and may have more complex business models compared to smaller banks (Laeven et

al, 2014). The results also portray persistence in the interbank borrowing rate as indicated by the coefficient of the lagged borrowing rate, which is positive and highly significant. This implies that past values of interbank borrowing rates affect current pricing of liquidity, signifying persistent lender memory of borrower's characteristics that affecting pricing of liquidity.

Robustness Check

Given that not all banks participate in the interbank market in a specific period, what is observed are the borrowing rates of the banks that participated in borrowing in the interbank market in respective quarters. This, however, does not mean zero rates for banks that did not participate in the market. If a bank's decision to participate in the market is non-random, the estimated coefficients would be inconsistent if estimation is done using the ordinary methods. To make sure that this sample selection problem has not affected the results, the Heckman's two-step estimation procedure is employed to provide results while accounting for this non-random nature of the sample. Some literatures have confirmed the presence of selection bias in the interbank market and has suggested the use of Heckman-type models to overcome the problem (King, 2008; Sarmiento, 2016; Andrievskaya and Semenova, 2013). Precisely, the model combines a selection mechanism for participating in the interbank market together with a regression model to explain the determinants of the interbank borrowing rate for those that do participate. First a participation equation using a random effects panel probit model is estimated. With the Mills ratios obtained from this equation, a panel data estimation for the main model is carried out, adding the Mills Ratio as an independent variable to the model. The participation equation has as dependent variable an indicator of a bank's involvement on the borrowing side in the interbank market (a dummy variable named *Borrow*) equal to 0 when a bank has no interbank borrowing, and 1 when volume of interbank borrowing is positive. For the identification of the coefficients in both the selection and interbank rate equations, it is required to have at least one extra independent (instrumental) variable in the selection equation. Apart from the four main independent variables included in the main equation, therefore, the regression included Excess Reserves (ER) and the previous period's number of borrowings (LagBorrowings) to the selection model, as additional regressors. The results are presented in Appendix 1 and do not change the initial results and conclusions from the Fixed effects model. In addition, it is noted that the coefficient of LOCAL is positive but not significant, implying that bank ownership (whether local or foreign) does not affect the rate at which banks borrow liquidity from each other.

5.3.2 Interbank Lending Rate and Bank Relationships

Table 5: Estimation Results of the Lending Rate Model

Dependent variable is LendingRate		
Constant	0.6609	
	[4.9668]	
Lendings	0.0272**	
	[0.0119]	
NPL	0.0600**	
	[0.0291]	
SIZE	1.3745	
	[1.0110]	
LOCAL	-1.8024	
	[1.1048]	
LendingRate (-1)	0.4781***	
	[0.0651]	
R-Squared (overall)	*0.3103*	
F-Test	*0.6500*	*(0.6647)*
BP LM Test	*0.0000*	*(1.0000)*
F (5, 175)	17.19	(0.0000)

****, **, * denote significance at 1%, 5% and 10% level, respectively. Figures in brackets are standard errors*

For the interbank lending rate model, (Table 5), it is noted that the coefficient of *Lendings* is positive and statistically significant, implying that frequently lending at the interbank market favours lenders by providing them with higher returns on their lendings, compared to rare lenders. This implies that unlike other markets where relationships favour both borrowers and lenders, the interbank relationships built in the Malawi interbank market punishes borrowers but favours lenders. The coefficient of NPL (RISK) is also positive and significant, implying that risky banks, while paying higher rates for liquidity when borrowing, they also charge higher rates when lending liquidity to fellow market players. This may reflect presence of a "tit for tat" behaviour in the Malawi interbank market.

However, the coefficients of both SIZE and LOCAL are not significant, implying that both size and ownership of banks do not affect the lending rate that banks get from this market. The results show persistence in the lending rate, indicated by the high significance of the coefficient of the lag of lending rate.

6.0 Conclusions, Implications and Policy Recommendations

Interbank markets are classified as unique type of financial markets due to the uncollaterized nature of most of the loans in this market. Consequently, these markets are associated with building trust and market disciplining behaviour among the market players. Due to this nature of the interbank markets, banks are encouraged to build relationships amongst themselves to assist each other well in times of liquidity needs. These relationships are expected to have an impact on the price of liquidity as well as the ability of banks to access liquidity. While most studies on the subject have been conducted in developed countries, not enough work has been done on low-income countries. This study attempted to fill this gap by using bank-level data to uncover an important role played by the interbank relationships in the pricing of interbank liquidity and used the Malawi interbank market as a case study.

The interbank borrowing rate regression results reveal binding effect of borrowing relationships on the rate at which liquidity is accessed. It can be concluded from the results that building borrowing relationships increases the rate at which banks borrow liquidity from the interbank market. Precisely, frequent borrowing from the interbank market increases the rate at which banks borrow liquidity from this market. On the other hand, however, it is noted that frequent lending in this market favours the lenders. Banks that are frequent lenders of liquidity in this market get higher lending rates, compared to rare lenders.

Overall, these findings point towards the importance of the interbank market as a source of liquidity for banks, how sensitive the interbank market is to counterparty risks and how relationships in this market affect pricing of liquidity. The results reveal some of the possible sources of disruptions in the pricing of liquidity in the Malawi interbank market. The role played by interbank relationships implies that transmission of monetary policy could be interrupted by the relationships. While central banks attempt to implement the necessary Open Market Operations (OMOs) aiming at either injecting or withdrawing liquidity from the banking system, pricing of liquidity may still be affected by interbank relationships. Consequently, the (overall) market interbank rate may not be in tandem with the overall liquidity levels. These results,

therefore, provide guidance to central banks in their interbank monitoring role, especially in line with the assessment of the transmission of monetary policy. The results further support the importance of central bank regulatory requirements in the enhancement of market discipline and effective monetary policy transmission.

Given that the conduct of monetary policy aims at cementing the path of inflation at the target rate, channeling of liquidity properly through the interbank market remains a crucial priority for a central bank. From policy perspective, therefore, the interbank market should be designed in a way that makes sure that it assists monetary policy to be effective. A well-functioning interbank market should aim at supporting liquidity channeling rather than impairing the flow of liquidity. From central bank perspective, there is need to carefully monitor the behaviour of the interbank market, especially in line with the impact of relationships. Among other things, regulators should aim to promote the positive effects of interbank market relationships and make sure that such relationships do not bring negative effects on the transmission of monetary policy.

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Appendices

APPENDIX 1: Results of a Heckman Selection Model for the Interbank Borrowing Rate

Variable	**Coefficient [Standard Error]**	**Variable**	**Coefficient [Standard Error]**
Regression Model (Dependent variable is Borrowing Rate)		*Selection Model (Dependent variable is Borrow)*	
Borrowings	0.0503*** [0.0001]	Borrowings	0.3297*** [0.0306]
NPL	0.0832 ** [0.0342]	NPL	-0.0506*** [0.0117]
SIZE	2.7457** [1.4744]	SIZE	1.9813* ** [0.2665]
LOCAL	0.0489 [1.3857]	LOCAL	0.2836 [0.2165]
		ER	-0.2001*** [0.0012]
		LagBorrow	0.1385*** [0.0939]
Number of obs =	128	lambda =	-6.4451
Censored obs =	119	rho =	-1.7400
Uncensored obs =	9	sigma =	6.4461
Wald Chi2 =	562763		
Prob > Chi2 =	0.0000		
Log Likelihood =	-397.75		

****, **, * denote significance at 1%, 5% and 10% level, respectively. Figures in brackets are standard errors*

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