Determinants of interest rate in emerging markets
A study of banking financial institutions in Uganda

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Abstract

Purpose – The purpose of this paper is to investigate the determinants of interest rate in emerging markets, focusing on banking financial institutions in Uganda.

Design/methodology/approach – Using the net interest margin model, interest rate was estimated by applying a panel random effects regression method on 24 banks, while controlling for bank-specific factors, industry and macroeconomic indicators. Data were drawn from annual reports provided by Bank of Uganda Depository Corporation survey from 2008 to 2016.

Findings – The results indicate that liquidity, equity capital, market power and reserve requirement have a positive effect on interest rate. The study further finds that operational efficiency, lending out ratio, concentration, public sector borrowing and private sector credit have a negative effect on interest rate. However, credit risk does not influence interest rate.

Research limitations/implications – Studied banks are grouped in one panel data set; future studies would focus on the differences in banks and establish how these differences affect interest rate. Future study would also focus on how the determinants of interest rate in Uganda are compared with those of other banks in other emerging market countries.

Practical implications – Bank managers need to take interest in equity mobilization because it is a reliable and cheaper source of funding bank operations. Banks should emphasize efficient operations to reduce on the cost of doing business. Government should utilize funds borrowed from banks in efficient ways to improve economic growth. The central bank should minimize the use of reserve requirement as a means of controlling money in circulation.

Originality/value – This is the first paper that uses annual report data from several banks and periods to investigate the determinants of interest rate in an emerging country.

Keywords Interest rate, Macroeconomic indicators, Bank-specific factors, Industry-level factors

Paper type Research paper

1. Introduction

In the last few decades, the banking sector in Uganda has experienced high interest rates which have endangered economic growth and development. High interest rates limit financing for potential borrowers (Ndung'u and Ngugi, 2000), affect economic visibility in terms of an "equity trap" and create harmful notion that investment is a high risk business (Folawewo and Tennant, 2008a). This is detrimental to the return on savings and investment by entrepreneurs and individual households thereby damaging private equity. Loss of capital by entrepreneurs who fail to meet their financial obligations means that there is minimal capital multiplier effect from past investment; this hinders economic growth and development.

As a response to the devastating consequences of continued high interest rates charged by banking financial institutions (BFIs), considerable effort has progressively been devoted to set down remedies aimed at managing such high rates. For example, since 1990 to to-date, the Government of Uganda has started pursuing structural adjustment programs (SAPs) with the aim of improving efficiency in the economy including the banking sector. The SAPs interventions undertaken included liberalization of the monetary sector to create sound macroeconomic environment, removal of controls on interest rate determination by BFIs and elimination of all foreign exchange controls (Kuteesa *et al.*, 2010). These interventions have caused economic stability, increase in the number of banks and their branches, increase in total bank assets, profitability and has enabled cheap sources of funds available for lending as low as 8 percent and increase in the number of banks. Despite these positive factors, interest rate charged by BFIs in Uganda has remained high above 23 percent.

Earlier studies on interest rate have focused on macroeconomic indicators (Folawewo and Tennant, 2008b), their findings are inconclusive. As Were and Wambua (2015) indicated, not all macroeconomic indicators have a transmission and spillover effect on interest rate. Furthermore, prior studies have ignored the effect of industry-specific factors on interest rate (Osei-Assibey and Asenso, 2015), while other studies by and Beck and Hess (2006) focused of industry-specific factors but ignore bank internal factors on interest rate Almarzoqi and Naceur (2015). Although there is empirical work linking bank-specific factor, industry-specific factors and macroeconomic indicators to interest rate, they have concentrated on country comparison using time series while others focused on macroeconomic indicators. The studies by Anamika and Kumar (2016) and Almarzoqi and Naceur (2015) focused on macroeconomic and bank factors alone, while the study by Ahokpossi (2013) concentrated on the determinants of bank interest margins in Sub-Saharan Africa. Central to the observations by previous scholars, the focus of their studies was on country-level comparisons using nationwide data and time series and studying a few variables. Thus, this study is not a duplication of the earlier studies, but rather aims at establishing the determinants of interest rate at the bank level using panel data and by taking into account the three variables (bank-specific factors, industry-specific factors and spillover effects of macroeconomic indicators). This study introduces new dimensions in bank-specific factors (liquidity, operational efficiency, credit risk, capitalization and lending out ratio); industry-specific factors (concentration and market power) and spillover macroeconomic indicators (public sector borrowing, reserve requirement and private sector credit) that have not been studied as a whole and how they influence interest rate in a given country.

The study results are expected to enable scholars, policy makers and practitioners have a more definite and direct understanding of the impact of bank-specific factors, industry-specific-level factors and macroeconomic indicators on interest rate in BFIs. This will probably guide decision makers on the optimal interest rate for the maximum maximize utility of resources borrowed by the individual and private sector for economic growth and development.

The rest of the paper is organized as follows. Section 2 presents empirical literature. Section 3 describes the data. Results and discussion are presented in Section 4, while Section 5 concludes as well as provides policy implications and areas for further research.

2. Literature review
2.1 Theoretical literature review
This study is guided informed by the theory of interest rate (Fisher, 1930) which provides that interest rate is a deviation from the price of the present money in terms of future money due to expected inflation. A common linear representation, $i = r + \pi$ (where i is interest rate, r is *ex ante* real interest rate and π is expected rate of change in price level), is a result of productivity of capital, labor and investor time preference in an economy. The theory

establishes theoretical and practical connections. For example, if capital worth $100 today will exchange for $105 to be received one year later, the premium on present money in terms of future money is $5 or the rate of interest is 5 percent. Therefore, the price of today's money (capital) in terms of next year's money (income) is 5 percent above par, referred to as interest rate. According to Cooray (2003), interest rate is a result of the factors within a bank, the external factors that relate to the industry of operation and macroeconomic environment indicators in which banks operate brought about by expected inflation.

Furthermore, Cooray (2003) indicated that the rate of interest is a matter of every individual's degree of waiting arising from risk, one's investment opportunity rate and the economic environment in which the investment takes place. Fisher (1930) further added that interest rate is nothing else but uncertainty in operations and the appreciation or depreciation of money due to macroeconomic changes in an economy. Cooray (2003) concurred with Fisher (1930) by stating that interest rates vary due to the uncertain nature of the borrowers arising from waiting, economic friction, the level of bank efficiency and the length of time the loan has to run. Thus, Fisher's effect corresponds to the hypothesis that the rate of interest is non-stationary, so that under rational expectations, variations arising from the specific bank operations, competition within the industry and macroeconomic environment play a crucial role.

2.2 Empirical literature review

2.2.1 Bank-specific factors. According to Navajas and Thegeya (2012), bank-specific factors comprise a set of factors that quantify the health of a bank's financial system and in principle, these indicators, if inadequate, indicate the potential vulnerabilities of the bank. Brock and Franken (2003) argue that bank characteristics are often tightly correlated with interest rate making them more relevant to the interest rate determination. In line with the recent studies, the measures of bank-specific factors include: liquidity (Anamika and Kumar, 2016); operational efficiency (Almarzoqi and Naceur, 2015); credit risk (Poghosyan, 2012); equity capital and lending out ratio (Curak *et al.*, 2012).

Liquidity. Liquidity is widely used in profit-making organization which in recent literature according to Vodova (2013) is the ability of a bank to fund or meet its short-term obligations as and when they fall due without incurring unacceptable losses. The situation where a bank is unable to meet its short-term obligations especially from the depositors when they demand for their deposits and or borrowers for short- and long-term loans creates a liquidity risk. Liquidity risk arises from the fundamental role of banks in the maturity transformation of short-term deposits into short-, medium- and long-term loans. Etienne and Graham (2010) define liquidity based on the transformation gap or "LT gap" as (liquid liabilities−liquid assets)/total assets and consider all loans with maturity of one year or less, cash, balances with central banks and other banks, debt securities issued by governments and similar securities or reverse repo trades belonging to liquid assets. For bank stability (Goddard *et al*, 2011), they need to focus on such liquidity ratio for their stability.

According to Etienne and Graham (2010), liquidity ratio gives information about the general liquidity shock absorption capacity of a bank. Although holding liquid assets is an important phenomenon, Vodova (2013) argues that liquid assets yield lower income whose creation is a result of high rate especially on deposits which banks transfer to borrowers by way of increasing interest rate. As a result, the more the liquid assets a bank can hold, the more the liquidity risk a bank bears before the suppliers of that liquidity (depositors and equity holders) especially if it is not loaned out. Etienne and Graham (2010), further assert that higher share of liquid assets in total assets increases the capacity of a bank to absorb liquidity shock. Nevertheless, high value of this ratio may also be interpreted as inefficiency since liquid assets yield lower income and liquidity bears high opportunity costs for the bank.

Operational efficiency. According to Almarzoqi and Naceur (2015), operation efficiency is a cost of servicing and monitoring transactions, and is measured by the ratio of noninterest costs to interest incomes. Less efficient banks experience larger operating costs and tend to require high interest rate to cover up the high costs incurred. Thus, productivity and efficiency in banks is mostly based on the cost to income ratio, also known as efficiency ratio.

Management efficiency is a considerable degree of consensus that quality of management makes the difference between sound and unsound banks. As this variable is measured by noninterest costs to interest revenues, an increase in this ratio means deterioration of management efficiency and results in an increase in interest rate. Sarpong *et al.* (2013) maintain that variations in noninterest costs are reflected in variations in bank lending rates as banks pass on their operating costs to lenders. Curak *et al.* (2012) indicate that high costs, which are mainly due to labor costs, and other operating costs are the major bank-specific factors that contribute significantly to wider interest rate.

The discussion about productivity and efficiency in banks is mostly based on the cost to income ratio, also known as efficiency ratio. Even though the predication power of the cost to income ratio is not clear, this ratio is widely regarded as a yardstick when comparing efficiency of banks and more so in computing interest rate (Sherman and Zhu, 2006). The commonly held notion states that low cost to income ratio is equivalent to high efficiency and low interest rate (Almarzoqi and Naceur, 2015). Cok and Kosak (2008) find a negative and highly significant relationship between the two, which is fairly common throughout pre-crisis literature. Curak *et al.* (2012) measure operational efficiency as well, and find that operational expenses have the most important effect on interest rate and conclude that banks should focus on managing such expenses as opposed to gaining market share.

Credit risk. Credit risk, also known as loan loss provision, is an influencing factor of asset quality that measures the anticipated credit risk of debt customers (Greenidge and Grosvenor, 2010). Accordingly, specific loan loss provisions are made when, in the judgment of management, the recovery of outstanding balance on a loan is in serious doubt. The amount of the specific provision is intended to cover the difference between the balance outstanding on the loan or advance and the estimated recoverable amount. General provisions are also made to cover loans which are impaired at balance sheet date, and while not specifically identified, are known from experience to be present in any portfolio of bank advances. The bank holds general provisions at a level deemed appropriate by management, taking into account a number of factors including: the credit grading profiles and movements within credit grades; historic loan loss rates; local and international economic climates; and portfolio sector profiles/industry conditions.

The level of credit risk poses a serious problem affecting the banking sector as huge funds are tied up in nonproductive use. This slowly leads to systemic problems in the banking sector and has a contagion effect on other sectors of the economy (Kasturirangan, 2012). Based on the literature from several Sub-Saharan African countries, Folawewo and Tennant (2008a) attributes credit risk on high loan loss provision to the undiversified nature of some African economies. The result shows that economic growth, real exchange rate appreciation and the real interest rate are significant determinants of nonperforming loans and not loan loss provisions in these countries.

According to Poghosyan (2012) other literature widely accepts that the percentage of nonperforming loans and not loan loss provision is often associated with bank failures and financial crises in the developing and developed countries. However, Anamika and Kumar (2016) in India and Almarzoqi and Naceur (2015) in Central Asian countries found out that high loan loss provision is the major factor in increasing interest rates. More so, Were and Wambua (2015) in Kenya indicate that financial intermediation spread is narrower for a risk-averse bank than for a risk-neutral one because risk aversion increases the banks interest rates. Even though banks

try to overcome this risk by making provisions to counter nonperforming loans, using evidence from Kenya, Waweru and Kalani (2009) provide that such provisions may not be adequate to protect against default risk when loan loss provisions are very high.

Equity capitalization. According to Demirguc-Kunt and Huizinga (1998), well-capitalized banks have higher net interest margins and are more profitable. This is consistent with the view that banks with higher equity capital ratios tend to face lower costs of funding due to lower prospective bankruptcy costs. In addition, a bank with higher equity capital simply needs to borrow less to support a given level of assets. Furthermore, Vodova (2013) indicates that availability of equity capital increases banks risk absorbing capacity and liquidity creation capability. Curak *et al.* (2012) highlight that capital adequacy of a bank contributes to liquidity creation and increases the lending portfolio. Thus, too little or too much equity capital can have implication for a bank's performance outcomes and interest rate.

Furthermore, Curak *et al.* (2012) indicate that a bank with more equity capital relative to total assets implies that there is pressure to pay dividends to shareholders; this forces banks to raise interest rate. On the other hand, banks with less equity capital relative to total assets mean that they will depend on customer deposits and other external sources of funding to meet any demand; and irrespective of their cost, it will impact on interest rate. According to Growe *et al.* (2014), more capital means less need for external funding and a lower cost of capital when it is sought. Bankruptcy risk costs will be less due to the larger safety net in case of negative developments, while high levels of capital implies low levels of leverage and risk are implied.

Lending out ratio. The amount of deposits by bank customers is a lifeline of the banking business and most of the banking operations are run through deposits (Arif and Anees, 2012). If the depositors who save with the bank start withdrawing their deposits from the bank, it will create a liquidity problem for the bank forcing it to borrow funds from the interbank market or the central bank at higher rates. However, when a bank has more deposits such problems are avoided. According to Ho and Saunders (1981), banks are viewed as risk-adverse intermediaries between demanders and suppliers of funds. When banks are fixing interest rate, they are faced with an important uncertainty because deposit supply inflows arrive at different moments in time from loan demand outflows. This difference in maturity creates exposure to interest rate risk and such risk will be faced whenever the financial institution has unmatched portfolio of deposits and demand for loans at the end of the decision period and the money market rate changes. Banks tend to transfer these financial costs, which arise from the uncertainty in the provision of deposits and loan operations to the borrowers and consequently, each bank participates in the market by setting a loan and deposit interest rate that depends on the financial costs it is likely to incur (Golin and Delhaise, 2013).

2.2.2 Industry-specific factors. Industry-specific factor refers to the structure, market power and the competitive nature in which banks operate (Hichem and Kachtouli, 2014). Furthermore, analyzing the competitive environment in which banks operate is very important because it helps them develop a business strategy for effective and efficient operations (Weill, 2011). Industry analysis takes into account two approaches: first, the structural approach based on the paradigm of structure-conduct-performance which establishes a causal relation from the structure of the market (concentration) to the performance of the industry. In such a case, each bank is required to analyze its competitive environment through its level of concentration and market power to examine its strength before other players.

Concentration. According to Growe *et al.* (2014), concentration is the degree to which the industry in a market is served by few or many banks. A more concentrated market implies that customers have fewer choices, competition is less and the market power of individual

banks is greater. As a consequence, the lending rates of a bank from such a concentrated market are high because of monopolistic tendencies (Cetorelli, 2003). On the other hand, concentration may offer competitive advantages and lending rate is not increased, especially if the benefits expended by management are pursuing a "quiet life" in the form of a more relaxed environment in which costs are allowed to rise and revenue-enhancing opportunities are foregone (Berger and Humphrey, 1997). Thus, concentration may lead to greater revenues as a result of low lending rates, but these will be offset by greater expenses incurred by banks in more concentrated markets, such that the effect of concentration on lending rate is negligible. In addition, any correlation between concentration and lending rate may be spurious because increased managerial efficiency can lead to both increased market share and lower lending rates.

According to Chirwa and Mlachila (2004), the increasing concentration and consequently interest rate across the globe are attributed to the failure of financial intermediation to converge to operate business independently; they are instead driven by the industry in which they operate. The market environment determinants of commercial bank interest rate typically include lack of adequate competition in the banking sector and subsequent market power of commercial banks (Folawewo and Tennant, 2008a).

Market power. Market power is considered as the capacity of a company to sell products over the marginal cost (Hichem and Kachtouli, 2014). Accordingly, market power is the difference between the marginal costs (operating + financial) and the prices, in this case interest rate charged through which revenues are generated. Efficiency market hypothesis provided by Panzar and Rosse (1987) and the Lerner index indicate that high efficiency is a prompt factor in increasing market share. The market power hypothesis states that firms with higher market power yield monopoly profits because of higher rates charged, while the efficient-structure hypothesis states that larger banks are more efficient because they own a substantial portion of the market total assets, they are expected to be more efficient and charge a low cost on the products they offer. Cross-country studies by Demirguc-Kunt and Huizinga (1998) established that interest rate variations tend to fall as market power and concentration improve.

According to Jayaraman and Sharma (2003), interest rate variation has a close link to industrial factors. For example, studies carried out on Small Island Developing State note that interest rates are widened by small diseconomies due to the small size of the market. Other scholars such as Barth *et al.* (1997) while studying 19 developed countries found out that variation in bank market power do not significantly affect interest rates. However, Hichem and Kachtouli (2014) pointed out that the industry characterized by low market power face high competition and banks need to invest more in information gathering if they are to manage competitive prices offered by other industry players. Dietrich and Wanzenried (2011) concluded that market power is a significant positive determinant when the industry exercises perfect competitive behavior.

2.2.3 Macroeconomic indicators. Macroeconomic factors have been shown to explain significant variation in commercial bank interest rate spread (Folawewo and Tennant, 2008a). Brock and Franken (2003) indicate that macroeconomic factors are certainly among the most influential sources for variations in the lending rates. Chirwa and Mlachila (2004) concur and assert that macroeconomic instability and the policy environment have an important impact on the pricing behavior of commercial banks. They note that macroeconomic variables typically thought to be determinants of spread include inflation, growth of output and money market real interest rates. Brock and Franken (2003) include interest spread uncertainty and exchange rate volatility, and also includes the share of commercial bank public sector loans as a major determinant of interest rates in the Caribbean.

Also, Tymoigne (2006) introduced the issue of the relationship between lending rate and inflation. The finding indicated that the effect of inflation is captured in the lending rate by

affecting the bank operating costs. Thus, the question on how bank estimations are so that future inflation is accurately forecasted and captured to enable banks manage their costs and fix interest rate is missing. Furthermore, the internal effect in which managers provide for inflation, Tymoigne (2006) indicated that external shocks such as use of public sector borrowing as well as increasing reserves by central bank to individual operating banks would demonstrate the extent of inflation. An inflation rate fully anticipated by the bank management implies that banks can appropriately adjust interest rates in order to increase their revenues faster than their costs, reserves and public sector borrowing and thus acquire higher economic profits.

Though macroeconomic factors such as inflation have been indicated to influence interest rate spreads, their indirect impact on interest rate to an individual bank is scarce. For example, Estrada *et al.* (2006) state that because of the nature of macroeconomic variables, they are general factors not necessarily meant for interest rate fixing but play a general role in shaping the economic environment in which banks operate. As such, their direct inclusion in the determination of individual bank interest rate creates a double effect since changes in the former is always captured in changes in bank-specific factors and industry-specific factors. According to Tymoigne (2006), banks should be more concerned with how inflation translates to affect their operations other than the entire macroeconomic factors which in part are balance of payment mechanisms that do not necessarily affect bank interest rate. This suggests that much of the debate on macroeconomic policies and management may not be highly relevant to banking sector operations except on how inflation translates to affect interest rate. For instance, as whilst exchange rate volatility among others may impact on country's export and balance of payment, there is no evidence of the transmission mechanism by which this effect is translated into widening of interest rate (Folawewo and Tennant, 2008b).

In light of the above, the measures for macroeconomic indicators that are conceptualized as conforming to the transmission mechanism that affect interest rate in the banking sector include public sector borrowing (Eita and Jordaan, 2012), reserve requirement and private sector credit (Al-Muharrami, 2015).

Macroeconomic indicators according to Folawewo and Tennant (2008a) shape the economic environment in which banks operate and the industry in which they are located. They are nationwide factors brought about by growth in an economy, price changes and growth in exports. According to Estrada *et al.* (2006), the nationwide factors do not directly affect BFIs and their interest rate but rather have a spillover effect. This suggests that the direct inclusion of such macroeconomic indicators creates a double effect since changes in the former are always captured in the changes in bank- and industry-specific factors. Therefore, what is important how the nationwide factors spillover to a bank to affect interest rate (Tymoigne, 2006). Based on Estrada *et al.* (2006) and Tymoigne (2006), this paper provides that the spillover macroeconomic indicators that are manifested in interest rate determination include the extent to which public sector borrowing competes with the private sector for the available liquidity (Brock and Franken, 2003), reserves requirement that reduces the available cash for a bank to lend (Crowley, 2007) and private sector credit (Eita and Jordaan, 2012).

Macroeconomic indicators are conceptualized as conforming to the external economic factors that affect the economic viability in which BFIs operate. Accordingly, when banks experience economic financial distress, economic growth is impeded. Fluctuations in bank interest rate can thus be linked to financial instability. Crowley (2007) posits that the financial sector continues to seek stable economic environment so as to build their internal operating structure as well as external economic stability for their customer base if they are to perform better and create value. Thus, stability of the macroeconomic environment improves the income per capita and the savings rate of the population which improves liquidity.

3. Model specification, data and estimation procedures

3.1 Theoretical framework

The theoretical model of net interest margin developed by Ho and Saunders (1981) and its extension by Maudos and Fernández de Guevara (2004) are espoused. Banks in the framework are viewed as risk-averse dealers in the credit market and act as intermediaries between demanders and suppliers of funds, providing immediate services for flows of funds. Banks accept deposits from savers and provide funds when there is demand for loans. A risk-averse bank usually faces asymmetric arrival of demand for loans and deposits and need to smoothen its operation by bearing the risk of short- and long-term interest rates derived from the deposits and loan rates. Deposit and loan interest rates which form a major basis for credit creation can be expressed as:

$$r_D = r - a$$

$$r_L = r + b \tag{1}$$

where r_D is the deposit rate, r_L is the loan rate and r is the risk-free rate in the money market. Both "a" and "b" are rates relative to risk-free rates on deposits and loans, respectively.

Maudos and Fernández de Guevara (2004) extend Ho and Saunders' (1981) net interest margin model by adding credit risk premium and operating costs. This credit risk arises due to uncertainty in the economy that may cause the borrower fail to honor his/her obligation of loan repayment while operating costs arise when banks incur costs in deposit solicitation (viewed as liabilities) and loan (viewed as assets) management before and during the period in which the loan runs. Under the framework of Maudos and Fernández de Guevara (2004) model, the bank's objective function is to maximize expected utility of final wealth derived from interest rate charged at the end of the decision horizon. Initial wealth (W_0) is determined by the difference between total assets and total liabilities. Assets include loans (L_0) and position in the money or interbank market (M_0). Liabilities are deposits (D_0). Thus, initial wealth is determined by:

$$W_0 = L_0 - D_0 + M_0 = 1_0 + M_0 \tag{2}$$

Let $1_0 = L_0 - D_0$ are net loan amount. Final wealth is determined by:

$$W_T = 1_0(1 + r_1 + Z_1) + M_0(l + r + Z_M) - C(1_0)$$

$$= W_0(l + r_W) + 1_0 Z_1 + M_0 Z_M - C(1_0) \tag{3}$$

where W_T is wealth at the end of time period, r_1 is expected return of net loan amount; $r_w = r_1 (1_0/W_0) + r(M_0/W_0)$ is average return of initial wealth; $C(1_0)$ is operating cost, which is related to D and L; and $Z_1 = Z_L(L_0/1_0) + Z_D(D_0/1_0)$ is average risk of the net loan amount.

According to Taylor's expansion expression, around the expected wealth from net interest margin, the expected wealth, "W" may be eroded by inflation that Fisher termed as a one-to-one relationship, the expected utility of final wealth is determined by:

$$EU(W) = U(W) + U'(W)E(W - W) + \frac{1}{2}U''(W)E(W - W)^2 \tag{4}$$

The utility function is twice continuously differentiable and $U' > 0$ and $U'' < 0$ are consistent with the risk-aversion assumption. Furthermore, we assumed that the arrivals of loan demand and deposit supply are random and follow a Poisson process.

The probability of loan demand arrival (P_L) and the probability of deposit supply arrival (P_D) are both linear functions of the interest rate spread (a or b):

$$P_D = \alpha_D - \beta_D a$$

$$P_L = \alpha_L - \beta_L b \qquad (5)$$

where α and β are parameters. To maximize the expected utility of final wealth, the first-order condition could determine the optimal values of "a" and "b."

Maudos and Fernández de Guevara (2004), further expanded the Ho and Saunders model to take into account concentration (the Lerner index) in addition to the degree of market power (Herfindahl index). The optimal equation becomes:

$$S = (a+b) = \frac{\alpha}{\beta} + \frac{1}{2} R \sigma_1^2 Q \qquad (6)$$

where α/β represents the net interest rate (lending rate minus deposit rate) required by a risk-neutral bank, given competitive conditions (α and β are the intercept and slope of the symmetric deposit and loan arrival functions). R corresponds to the bank's management coefficient of risk aversion, σ_1^2 is the variance of the interest rate on deposits and loans, Q is the bank transaction size. The model shows that the optimal rate between lending and deposits is a function of bank risk aversion, degree of competition in the industry, interest rate risk and average transaction size. The model shows that the optimal rate between lending and deposits is a function of three factors: the degree of internal bank operations; the degree of competition in the market; and the interest rate risk arising from the macroeconomic environment that shapes the stability of economic agents of the bank.

Based on the theory of interest rate and the models developed by Ho and Saunders and Maudos and Fernández de Guevara, the general functional form of net interest margin is expressed as follows.

Combining these extensions (Equations (1)-(6)), the optimal interest rate model is given as follows:

$$S = \frac{1}{2}\left(\frac{\alpha D}{\beta D} + \frac{\alpha L}{\beta L}\right) + \frac{1}{2}\left(\frac{C(L)}{L} + \frac{C(D)}{D}\right) + \frac{1}{4}\frac{U}{U} + \frac{(W)}{(W)}[L + 2L0)\sigma L2$$

$$+ (L+D)\beta \sigma M2 + 2(M0 - L)\sigma L] \qquad (7)$$

where S is interest rate; α/β is a proxy of market power and concentration; L are loans; D are deposits; C is the operating costs; $U''(W)/U'(W)$ is the absolute risk-free rate arising from the macroeconomic environment that creates a risk-averse element to banks; σ_L^2 is credit risk associated with the uncertainty of loan return generated from debtor default; σ_M^2 is volatility in the money market interest rate; $L + 2L0$ is the total volume of loans; $L + D$ is the sum of loans and deposits which reflect the size of operations.

Basing on Equation (7) which is a combination of Ho and Saunders (1981) and Maudos and Fernández de Guevara (2004) models, a further adjustment is provided to incorporate equity capital and the transmission mechanism arising from the macroeconomic environment by incorporating the market imperfections and variations in the economy that affect banks differently and their interest rate. Thus, our input and contribution in their model is the inclusion of equity capitalization and the spillover effects of spillover macroeconomic indicators that have all been ignored in theory and literature. According to Folawewo and Tennant (2008b) inflation, a macroeconomic indicator, does not have a direct effect on the banking sector. This suggests that much of the debate on inflation rate may not be highly relevant to the banking sector entirely but through the spillover (transmission mechanism)

and affects banks differently as far as fixing interest rate is concerned. As such, a further contribution to theory (theory of interest rate) and models (Ho and Saunders and Maudos and Fernández de Guevara) is provided by incorporating public sector borrowing, reserve requirement and private sector credit.

The required reserves and excess reserves that BFIs hold at the central bank bear interests lower than money market interest rates, or even bear zero interest. Also, public sector borrowing, a manifestation of inflation, increases competition for funds between government and the private players, this increase in demand by government increases interest rate on one side while it lowers the loan rate on the other side in the long run. This also has a contagion effect on private sector credit.

For bank-specific factors, an additional factor in the model as far as influencing interest rate is concerned is equity capital. Equity capital reflects how well banks are financed; well-capitalized banks are too big to fall and provide sufficient liquidity for financing bank demand as well as providing tangible assets for equitable bank operations.

Therefore, the measures of interest rate are: bank-specific factors (*Bsf*) that comprises of (liquidity, operational efficiency, credit risk, equity capital and lending out ratio); industry-specific factors (*Isf*) that comprises of (concentration and market power); and spillover effect of macroeconomic indicators (Mei) that comprise of public sector borrowing and reserve requirement and private sector credit, a manifestation of GDP growth.

Though the model provides for the absolute risk-free rate uniformly affecting all banks, our addition provides that banks consider the spillover effect of macroeconomic indicators in which they operate. For example, opportunity cost of holding reserves, degree of public sector borrowing and private sector credit which are macroeconomic indicator are manifested differently across bank. The required reserves and excess reserves that BFIs hold at the central bank bear interest lower than money market interest rate, or even bear zero interest. Also, public sector borrowing, a manifestation of inflation, increases competition for funds between government and private players, this increase in demand by government increases interest rate in the short run while it lowers the loan rate in the long run. This has a contagion effect on private sector credit. Another additional factor in the model is capitalization of banks which reflects how well banks are financed.

Thus, the interest rate function is given as follows:

$$IR = f(Bsf, Isf, Mei) \tag{8}$$

where *IR* is bank interest rate, *Bsf* is bank-specific factors comprising of liquidity, operational efficiency, credit risk, capitalization and lending out ratio; *Isf* is industry-specific factor that includes concentration and market power; *Mei* is spillover macroeconomic indicator that comprises of public sector borrowing, reserve requirement and private sector credit.

3.2 Description of the variables and model estimation

3.2.1 Interest rate (IR). Interest rate (IR) is the dependent variable defined as the amount charged, expressed as a percentage of the principal, by a lender to the borrower for the use of borrowed funds. It is provided as follows:

$$\text{Rate} = \frac{\text{Total interest income received on loans and advances}}{\text{Average stock of net loans and advances to customers}} \times 100$$

$$\text{Average stock of net loans} = \frac{\text{Opening stock of loans} + \text{closing stock of loans and advances}}{2}$$

3.2.2 Liquidity (liq). Liquidity is the ability of a bank to meet its short-term obligations as and when they fall due without incurring unacceptable losses. It is computed in percent as a

ratio based on liquid assets to total assets According to Vodova (2013), liquid assets yield lower income whose creation is as a result of high rate especially on deposits which banks transfer to borrowers by way of increasing interest rate. Thus, we conclude that the cost of liquidity has a positive effect on interest rate.

3.2.3 Operational efficiency (effic). Operational efficiency is the management of costs for servicing and monitoring transactions in relation to revenues generated during the course of bank operations. It is computed as a percentage ratio of noninterest costs to net operating income. According to Almarzoqi and Naceur (2015), proper management of costs indicates how efficient a bank is being run. Cok and Kosak (2008) found a negative and highly significant effect between efficiency and interest rate. Banks that manage costs and experience more revenues are efficient and tend to require lower lending rates. A negative coefficient is expected.

3.2.4 Credit risk (crisk). Credit risk, a measure of credit quality, is computed as a percent of loan loss provisions to total gross loans. A higher ratio is associated with lower credit quality and high credit risk. Banks are expected to require higher interest rate to compensate for funding riskier projects as well as individuals to maintain adequate loan reserves (Poghosyan 2012). If banks operate in a more risky environment and lack the expertise to control their lending operations, a higher loan loss provision ratio is expected to cover this risk (Kasturirangan, 2012). Since risk is transferred to customers to compensate for the likely default, the ratio is expected to have a positive effect on interest rate.

3.2.5 Equity capitalization (capital). Equity capitalization is measured as a percentage of equity to total assets. Higher equity to total asset means that a bank is well capitalized and has fewer insolvency costs and is able to cover any expected risk. On the other hand, lower equity ratio implies that the bank is less capitalized and more risky. If bank equity and loan rates do not diverge to each other, a high equity ratio can enhance the bank's efficiency and ability in a productive way Growe *et al.* (2014). Therefore, a positive effect between equity capitalization and interest rate is suggested.

3.2.6 Lending out ratio (lendout). Lending out ratio is the proportion of gross loans to customer deposits. According to Golin and Delhaise (2013), more customer deposits are a sign of a stable bank capable of meeting any demand as and when it falls due. A figure in the 70-90 percent range is seen as optimal with higher numbers being on the risky side and below this range is conservative. Alexiou and Sofoklis (2009) found a significantly negative relationship for Greek banks. This suggests that lending out ratio is expected to have a negative effect on interest rate.

3.2.7 Concentration (Concer). According to the Herfindahl-Hirschman index, concentration is the sum of the squares of all market shares and ranges between 0 and100 percent. A higher concentration close to 100 percent means the bank can communicate and collude with others and reduce competitive pricing. This result in monopolistic tendencies that is associated with high interest rate. Trujillo-Ponce (2013) find a significant positive causation between concentration and lending rate. Thus, concentration is expected to have a significant positive effect on interest rate.

3.2.8 Market power (mpower). According to Maudos and Fernández de Guevara (2004), the Lerner index is a direct measure of market power through the distance between interest rate and the operating costs incurred. The Lerner index will result in either 0 for a perfectly competitive bank or 1 for a monopolist bank. A Lerner index of 1 indicates the weakness of competition at the price level and that the financial institution exercises a market power. Dietrich and Wanzenried (2011) conclude that market power is only a positive determinant when the industry exercises perfect competitive behavior. Additionally, Trujillo-Ponce (2013) find a clear positive and significant effect. Thus, a significant positive effect is expected.

3.2.9 Public sector borrowing (Psb). Public sector borrowing is a percent measure of government securities to gross loans, indicating the extent to which government depends on the domestic credit to finance its fiscal deficit as well controlling inflation. An increase in government expenditure in the absence of any change in the money supply raises output, income and transaction demand for money. Given a constant money supply, increase in transaction demand for money and increase in supply of debt in the market and competition for funds push interest rate upward (Eita and Jordaan, 2012). Thus, a significant positive effect is expected.

3.2.10 Reserve requirement (reserve). Reserve requirements measured by reserves to total deposits are the amount of cash a bank deposits with the central bank, this reflects a burden associated with operating a bank. Chirwa and Mlachila (2004) explain by noting that the opportunity cost of holding reserves at the central bank, where they earn no or little interest, increases the economic cost of funds above the recorded interest expenses that banks tend to shift to borrowers. Also, high reserve requirements allow for financing of high fiscal deficits, thereby creating an environment of high inflation and high lending rates. Thus, a significant positive effect is expected.

3.2.11 Private sector credit (Pcredit). Private sector credit, a measure of gross loans to GDP, is the degree to which entrepreneurs borrow to finance business growth for national development. A growing private sector causes economies of scale and more competition. The higher this measure is, the higher the financing is to the private sector and the greater opportunity and space for the private sector to develop and grow. Therefore, the higher proportion of bank loans to private sector, the greater importance it plays on the economic growth and development of a country. Thus, increase in private sector credit should be considered a positive development and should portray a significant negative effect on interest rate.

3.3 Model estimation

The estimated model is adopted and modified from the earlier models provided by Ho and Saunders (1981), Maudos and Fernández de Guevara (2004) and Fishers theory empirical literature together with our contribution as follows:

$$\text{IR}_{it} = \beta_0 + \beta_1 \text{liq}_{it} + \beta_2 \text{effic}_{it} + \beta_3 \text{crisk}_{it} + \beta_4 \text{capital}_{it} + \beta_5 \text{lendout}_{it}$$

$$+ \beta_6 \text{concer}_{it} + \beta_7 \text{mpower}_{it} + \beta_8 \text{psb}_{it} + \beta_9 \text{reserve}_{it} + \beta_{10} \text{pcredit}_{it} + e_{it} \qquad (9)$$

where β_0 is the constant; $\beta_1, \beta_3, \beta_4, \beta_6, \beta_7, \beta_8, \beta_9 > 0$; and $\beta_2, \beta_5, \beta_{10} < 0$.

IR_{it} is interest rate for bank i in time period t, β_{1-10} is the slope (coefficient or parameter estimate), it is bank i in time period t; Liq_{it} is liquidity, Effic_{it} is the operational efficiency, Crisk_{it} in the credit risk, Capital_{it} is equity capital and Lendout_{it} is the lending out ratio; Concer_{it} is concentration and Mpower_{it} is market power; Psb_{it} is public sector borrowing; Reserve_{it} is reserve requirement, Pcredit_{it} is the private sector credit and e is the error term.

The summary for the study variables and their description are provided in Table I.

3.4 Data type and source

This study considered a longitudinal balanced panel of 24 BFIs in Uganda at different moments in time pertaining to the period 2008-2016 representing 216 bank-year observations. Banks with incomplete or inconsistent data were excluded. Quantitative secondary data for the variables were extracted from BFIs' annual reports (income statement, balance sheet and notes accompanying accounts) made available by Bank of Uganda Depository survey (2016).

Variables	Description	Expected sign
Dependent variable		
Interest rate	IR = total interest income received on loans × 100%/average stock of net loans to customers	−/+
Independent variables		
Bank-specific factors		
Liquidity	Liquidity = liquid assets × 100%/total assets	+
Operational efficiency	Cost to income = noninterest expenses × 100%/total net interest income	−
Credit risk	Credit risk = impairment charge × 100%/gross loans and advances to customers	+
Equity capitalization	Equity capitalization = total equity × 100%/total assets	+
Demand	Lending ratio = gross loans × 100%/customer deposits	−
Industry-specific factors		
Concentration	Concentration = bank assets × 100%/total sector banking assets	+
Market power	Market power = distance between interest rate and marginal cost	+
Spillover effects of macroeconomic indicators		
Public sector borrowing	PSB = government securities × 100/gross loans to annual GDP in Ugx	+
Reserve requirement	Reserve ratio = bank reserves with BoU × 100/total sector deposits to GDP	+
Private sector credit	Depth = gross loans for a bank × 100%/annual GDP in Ugx	−

Table I.
Determinants of
interest rate

4. Empirical results and discussion

4.1 Descriptive analysis

Aggregate descriptive statistics on the determinants of interest rate are provided in Table II. Means, standard deviations, minimums and maximums were generated so as to summarize the observed data. The main purpose of the descriptive analysis was to establish whether the statistical means and standard deviation were a good fit of the observed data.

The results show small standard deviations compared to mean value. Thus, with data being close to the means, the calculated means highly represent the observed data and are therefore a good replica of reality.

Observing the mean, minimum, maximum and standard deviations values, results indicate that there was highest variability in liquidity, operating costs, lending out ratio and public sector borrowing. Modest variability in equity capital, concentration, market power,

	Mean	SD	Min.	Max.
Interest rate (%)	24.13	4.3	15.8	41.3
Liquidity (%)	64.4	11.8	35.8	88.4
Operational efficiency (%)	68.4	12.7	44.0	84.0
Credit risk (%)	1.4	1.1	0.45	4.1
Equity capitalization (%)	18.5	8.4	8.6	37.6
Lending ratio (%)	65.7	11.1	37.3	87.5
Concentration (%)	23.2	12.6	9.7	38.4
Market power (%)	0.3	0.1	0.14	1.00
Public sector (%)	33.2	10.4	10.9	55.5
Reserve requirement (%)	15.9	4.3	6.3	25.4
Private sector credit (%)	0.6	0.2	0.22	1.95
Source: Panel estimates (2008-2016)				

Table II.
Descriptive statistics
of the determinants of
interest rate

levels of reserve requirement and private sector credit and low levels of credit risk. This reflects what is happening in the BFIs over the study period. Higher level of variability in operation among banks is an indication of high costs incurred in meeting operating costs such as staff and welfare costs and branch maintenance costs. High deposits compared to demand could be arising from risk-averse savers who prefer to keep their savings in banks than investing in unpredictable business due to variability in the economic environment; this also discourages them from borrowing. Modest variability in equity capital is an indication that a good number of banks are listed on the stock exchange through which equity capital is raised. On the other hand, higher variability in public sector borrowing could be a reflection of high levels of inflation in the country. Low levels of variability in credit risk among banks could be attributed to banks' recovering an insurance cover to every borrower whether risky or not, majority lending to risky free borrowers and high-level scrutiny by bank officials before dispensing a loan as well high-valued collateral.

4.2 Diagnostic tests

4.2.1 Normality test. A one-sample Kolmogorov-Smirnov test on interest rate was carried out to ascertain whether the collected data were normally distributed. The results are presented in Figure 1.

The result depicts a fairly symmetrical bell-shaped distribution of data pertaining to the dependent variable (interest rate) indicating that data were normally distributed. As a result, the application of parametric tests is appropriate for the study.

4.2.2 Multi-collinearity test. The variance inflation factor (VIF) was used to test whether multi-collinearity is high prior to model estimation. The threshold for any individual variable should not exceed 10 (Neter *et al.*, 1990) and the average VIF for all variables should not exceed 5 (Ender, 2010). The VIF results are provided in Table III.

The VIF for the variables ranges between 1.06 and the highest 3.16 with the average VIF of 1.78. These results demonstrate that the variables do not possess higher order multi-collinearity since the value is less than 10. This further suggests that there is no serious multi-collinearity problem in the variables and the error term. In addition, the tolerance for all the variables is greater than 0.1, an indication of non-collinearity. Therefore, each of the independent variables is considered a nonlinear combination of other independent variables in the regression model.
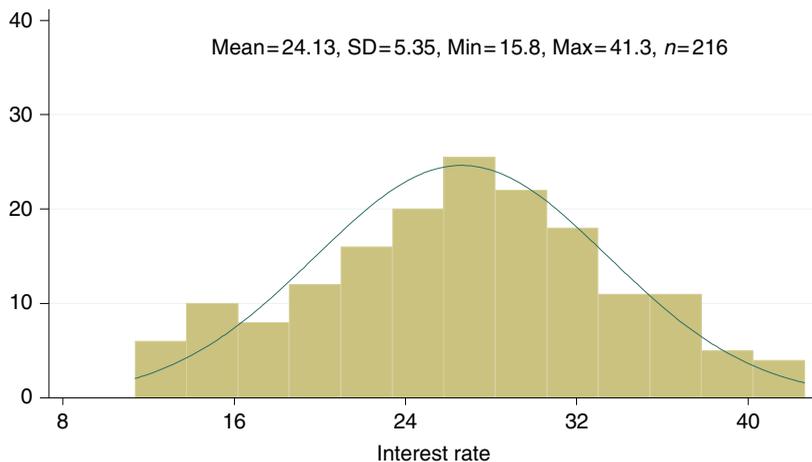

Mean$=24.13$, SD$=5.35$, Min$=15.8$, Max$=41.3$, $n=216$

Interest rate

Figure 1.
Kolmogorov-Smirnov test for interest rate

Variable	Variable inflation factor (VIF)	Tolerance 1/VIF
Market power	3.16	0.3167
Operational efficiency	2.93	0.3416
Public sector borrowing	2.08	0.4809
Concentration	2.01	0.4997
Capitalization	1.51	0.6632
Private sector credit	1.32	0.7591
Credit risk	1.30	0.7683
Lending out ratio	1.26	0.7907
Reserve requirement	1.17	0.8538
Liquidity	1.06	0.9476
Mean VIF	1.78	
Source: Panel data estimation (2008-2016)		

Table III.
VIF for the
independent variables

4.2.3 Hausman test. The Hausman test was performed to decide on the appropriate model between fixed and random effects. Although the econometric theory recommends random effect estimation for balanced panels among different units, a confirmatory test by use of the Hausman specification test was carried out to evaluate the efficiency between fixed effects and random effects estimation methods. The null hypothesis is that the unique errors are correlated with the regressors ($p < 0.05$). The test evaluates the consistency of an estimator when compared to an alternative, efficient estimator which is already known to be consistent. The p-value being more than 0.05, the acceptance of random effects regression model over fixed effects estimates was confirmed. See Table IV for the summary results.

The Hausman test statistics indicates a non-significant effect at 5 percent level (Prob $= 0.3297 > 0.05$) with a χ^2 value of 12.47. Thus, the null hypothesis (H_0) was rejected in favor of the alternate and states that there are some variations across BFIs that are assumed to be random and uncorrelated with the independent variables included in the model. This affirms that the random effects model is more efficient and the specific individual effects are uncorrelated with the independent variables.

4.2.4 Robustness test. In order to ascertain whether the variables, if monitored over a specific time, as is the case of longitudinal panel data, are non-consistent, a Breusch-Pagan Langrage Multiplier (LM) test was carried out to test for heteroskedasticity in the regression model. The results are presented in Table V.

Test summary	χ^2 statistics	χ^2 df	Prob.
Cross-section random	12.47	10	0.3297
Source: Panel computation using bank annual report data estimates (2008-2016)			

Table IV.
Hausman test
summary

	Variance	SD $=$ square root of variance
Interest rate (IR)	28.87242	5.373306
E	10.12491	3.181966
U	4.985475	2.232818
Notes: Test: Var $(u) = 0; \chi^2$ (01) $= 29.83$; Prob $> \chi^2 = 0.000$		
Source: Panel computation using bank annual report data estimation (2008-2016)		

Table V.
Breusch and
Pagan Lagrangian
multiplier test

The result show that heteroskedasticity of the error term exists as indicated by the LM test that gives the Prob $> \chi^2 = 0.000$. The null hypothesis is rejected, the error term is homoscedastic. To solve the heteroskedasticity, the instrumental variable, robust, is applied in the random effects regression model to reduce the expected risk because it is an efficient estimator of panel data models. It provides consistent estimates, addresses the endogenity problem and allows for efficient estimation in the presence of heteroskedasticity (Baum *et al.*, 2003).

4.3 Regression results
The random effect regression was run to establish the effect of the independent variables on the dependent variable and the results are provided in (column (4)) Table VI.

The random effect estimates (Table VI) indicate that liquidity, equity capitalization, market power and reserve requirement have demonstrate a significant positive effect on interest rate, whereas the impact of operational efficiency, lending out ratio, concentration, public sector borrowing and private sector on interest rate is significant and negative. The results further indicate that credit risk does not affect interest rate. Overall, the model demonstrates that the determinants of interest rate independent variables account for 85.1 percent of the variation in interest rate (R^2 is 0.851, Prob $> \chi^2$, Sig. $= 0.000$).

5. Discussion
5.1 Bank-specific factors
The result indicates that liquidity has a significant positive effect on interest rate, implying that an increase in liquidity by 1 percent increases interest rate by about 0.036 percent. Banks create liquidity when they transform liquid liabilities such as deposits to finance the

	(1) IR	(2) IR	(3) IR	(4) IR
Bank-specific variables				
Liq	0.046** (0.024)	–	–	0.036** (0.021)
Effic	−0.004** (0.016)	–	–	−0.068*** (0.009)
Credit risk	0.423 (0.101)	–	–	0.274 (0.310)
Capital	0.113*** (0.005)	–	–	0.097*** (0.005)
Lendout	−0.072*** (0.010)	–	–	−0.061** (0.015)
Industry-specific factors				
Concer	–	−0.262** (0.017)	–	−0.172** (0.024)
Mpower	–	0.128** (0.015)	–	0.132** (0.015)
Spillover macroeconomic indicators				
Psb	–	–	−0.057** (0.043)	−0.071** (0.029)
Reserve	–	–	0.210*** (0.003)	0.206*** (0.008)
Pcredit	–	–	−1.984*** (0.001)	−2.519** (0.031)
Cons	23.049*** (0.000)	22.746 (0.000)	23.959 (0.000)	24.91*** (0.000)
Obser	216	216	216	216
Banks	24	24	24	24
Wald χ^2	18.62	23.49	17.32	89.58
Prob $> \chi$	0.000	0.000	0.000	0.000
R^2	0.404	0.5316	0.4368	0.851
Sigma_u	3.342	3.093	7.415	2.185
Sigma_e	3.249	3.326	8.533	3.171
ρ	0.514	0.464	0.430	0.322

Table VI.
Estimated determinants of interest rate in banks random analysis

Notes: The significance parameters are indicated with **$p < 0.05$ and 0.10 and ***$p < 0.01$, respectively
Source: Panel data estimates from bank annual reports (2008-2016)

demanders' request. The rate offered to suppliers of liquidity (depositors) is factored in the interest rate paid by the borrowers which should increase interest rate. Thus, interest rate is offered by banks to suppliers of liquidity to compensate for the opportunity cost if savers (depositors) were to invest money in their private businesses as well as the degree of waiting. Considering the two, opportunity cost and waiting increase interest rate. For example, if the liquidity levels of a bank are running low and there is a growing demand for loans, bank appeal to the general public for deposits by providing an attractive rate. Willing depositors would be attracted to save and forego other opportunities because of the guaranteed risk-free rate expected from their savings. This rate offered to attract deposits and create liquidity creates a cost that is shifted to the borrowers in the form of high interest rate. This finding is consistent with Vodova (2013) who indicate that the marginal cost of holding liquid assets is a cost to a bank; if the return on liquid assets for demand and time deposits is high, the rate of interest will be high too.

The result for operational efficiency showed a significant negative effect on interest rate, implying that an increase in operational efficiency by 1 percent should lead to a reduction in interest rate by 0.068 percent. The result implies that proper management of noninterest costs through perfect internal processes and stable revenues should lead to low interest rate. Such internal processes would include smooth running operations characterized by order, discipline, technology use; economies of scale would result in cost advantage arising from low costs incurred in achieving high sales. This would also be evidenced through committed workforce (time bound, teamwork, reliable and taking on extra roles without additional pay). Resulting from managed noninterest costs, efficiency improves and the banks should pass on this efficiency by reducing on interest rate. This suggests that noninterest costs (operational and employee costs) play a significant role in interest rate determination. The use of standardized systems and improved technology increases efficiency and reduces on employee and operational costs. The finding is consistent with Almarzoqi and Naceur (2015) who indicated that reducing operating costs and lending rates is achieved through improved system and intense competition among competing banks.

Equity capitalization has a significant positive effect on interest rate. An increase in equity capitalization by 1 percent should cause a 0.097 percent positive change on interest rate. Holding equity capital at a bank is remunerated at a cost to compensate the shareholders for the use of their capital, waiting and opportunity cost. The cost to compensate shareholders capital is transferred to borrowers by way of increasing interest rate. This result is consistent with the findings reported by Anamika and Kumar (2016) and Curak *et al.* (2012). Anamika and Kumar (2016) indicated that high levels of capital permits more liquidity creation to fund loan demand as well as providing caution against unprecedented customer demand. In addition, Curak *et al.* (2012) indicated that well-capitalized banks are too big to fall, absorb any risk arising from depositors and provide cheap financing to customers. Therefore, this study supports the idea that high equity capital is important because it provides stability to a bank, helps the bank to finance long-term projects such as the agricultural and the private sector unlike deposits which are short term and can be withdrawn any time.

The result shows that lending out ratio has a significant negative effect on interest rate. An increase in lending out ratio by 1 percent should lead to a reduction in interest rate by about 0.061 percent. The ability of a bank to attract more deposits and create liquidity to finance demand should reduce interest rate. Indeed, as more depositors save with the bank, banks will have sufficient liquidity to offer the demanders of credit; excess liquidity created against a certain level of demand which will never exceed supply should be lent out at a low rate. This result is consistent with Golin and Delhaise (2013) and Arif and Anees (2012) who indicate that demand for loans and supply of deposits arrive at different moments in time. This creates exposure to interest rate risk especially for time deposits which stay longer

compared to demand for term loans. As a result, banks should cut the cost of lending to overcome this exposure to interest rate risk and offset the huge time deposits that have an interest rate laden.

Surprisingly, the result indicates that credit risk does not affect interest rate. This is because a largest portion of borrowers (75 percent) are categorized as less risky, for example, government, its employees, statutory corporations and other large companies. Government uses tax payers' money to pay back the borrowed funds with easy. Employees of government statutory and large corporations are guaranteed of monthly salary through which banks deduct the installments directly. Other borrowers who are risky are subjected to high-level creditworthiness checks using 7Cs in addition to providing collateral that is twice as much as what is borrowed. Such strict measures ensure good loan quality. This result contradicts the findings of Almarzoqi and Naceur (2015), that found a significant positive effect on interest rate and concluded that the level of loan loss provision and nonperforming loans ties up huge funds in nonproductive use causing competition for what has remained. Similarly, Collins and Wanjau (2011) indicated that the association between credit risk and interest rate is influenced by the costs incurred in assessing the risk profile of borrowers, monitoring the various projects for which the loan have been advanced and reaching out to borrowers. Contrary to these scholars, in this study, we state that the costs of monitoring and assessing the borrower's creditworthiness are part of the operating costs covered in operational efficiency.

5.2 Industry-specific factors

The results indicate that concentration has a significant negative effect on interest rate, implying that increase in competition dilutes concentration to a less concentrated banking sector; this has an effect on efficiency, and should lead to reduction in interest rate; an indication that the banking sector is experiencing some level of less concentration and perfect competition. This suggests that as the number of banks and their branch network increases, competition and efficiency among banks emerge so as to win over the prospective bankable population and serve them better. Strong competition among banks for customer deposits and lending can promote new product development, new ideas and economies of scale among banks that lead to reduced operational costs (administrative and staff costs) for efficiency gains, which all should significantly reduce the interest rate. However, this finding contradicts the earlier view held by Weill (2011). Who indicated that concentration is associated with financial fragility and high lending rates. In addition, Dietrich and Wanzenried (2011) noted that the higher the concentration, the more likely banks are to communicate, collude and increase lending rates. Less concentrated banking sector creates competition, improves information gathering and the tendency of banks colluding in fixing interest rates is avoided. This has a perfect match with lowering interest rate. This result supports the observation made by Anzoategui *et al.* (2010), who indicated that the development of the banking sector heightens competition among banks and the public benefits immensely through favorable interest rate.

Market power has a significant positive effect on interest rate. Market power represents the difference between revenues generated and the total marginal costs incurred by the bank. This finding (Table VI) suggests the presence of market power and high marginal costs. Augmenting this finding with that in Table II for the descriptive statistics (mean value of 0.3) confirms weak market power (oligopolistic tendency) of the banking sector, compared with the recommended 0 for a perfect competitive. Such a market structure associated with few banks can manipulate prices (interest rate charged) to their advantage because they can easily enter into a cartel to influence the final rate charged on their services. The higher market power represents the weakness within the industry as demonstrated by the Lerner index. As a consequence, each bank can operate on its own,

fix its mark-up costs (administrative and personnel) that increases the operating as well as interest expenses which positively impacts on interest rate to fill the gap created by the expenses incurred. The results of this study are also consistent with Almarzoqi and Naceur (2015) in Indian banks, Hichem and Kachtouli (2014) in Southeastern Asian banks and Maudos and Fernández de Guevara (2004) in commercial banks of Spain. Almarzoqi and Naceur (2015) revealed that banks operating in highly inflated economies tend to experience high market power which compels them to charge higher lending rates and offer lower deposit rates. Similarly, Hichem and Kachtouli (2014) and Maudos and Fernández de Guevara (2004) also indicated that higher operational and staff costs as input costs have a direct bearing on the output price, in this case lending rate. In as far as this study in concerned, when marginal costs increase, banks increase the price charged their service. This finding is supported by Hichem and Kachtouli (2014) who observed that increase in competition raises market power of banks, causes high demand for bank products, brings perfect competitive behavior to the market and banks have no market power over prices. This renders banks to fix their own marginal costs, mark-ups as well as the deposits rate which has a positive effect on interest rate.

5.3 Spillover effects of macroeconomic indicators
Public sector borrowing has a significant negative effect on interest rate; thus, the result does not support the earlier set hypothesis. This suggests that public sector (government) borrowing from banks should cause a reduction in interest rate. This is because of the three filaments; first, government borrowing is perceived as a risk-free borrower, banks lend huge sums of money at a low cost because of the less risk associated with such a borrower who faces no risk and monitoring costs. Second, government borrows to finance budget deficit and invests in public expenditure through infrastructure financing. The return on investment that accrues from such financed infrastructure benefits the private sector. In the long run, this increases the amount of money in circulation that ends up in banks and increases liquidity. For example, construction of roads and hydro power plants boosts productive capacity and increases economic growth arising from increased employment, savings derived from use of such public facility and income levels. Third, government borrowing mitigates the high tax burden that would have been levied on entrepreneurs. These two situations (financing infrastructure and tax benefit) create more money and savings that increase bank liquidity which banks ought to lend at low rate. This is beneficial to the economy and generates additional surplus if public debt stream is being controlled efficiently. Contrary to the result, previous scholars such as Folawewo and Tennant (2008a) indicated that government reliance on domestic banks for deficit financing increases competition for funds available to the private sector and causes interest rate to rise. Therefore, while public borrowing is inevitable and not a reprehensible phenomenon of economic stability, it is a way to stimulate economic growth by injecting money from among those who have more than they can use at the moment to those who lack assets for developing economic initiative or other needs that are beneficial to money multiplier.

Furthermore, the result indicates that with the probability of 0.008, reserve requirement significantly and positively affects interest rate. Reserve requirement is contractionary and increases the amount of funds kept at central bank where banks earn no interest. This limits funds available for borrowing and heightens interest rate to the household and private sector, limits consumption and investment, reduces money multiplier and slows down economic activity. Similar results were found from studies by Eita and Jordaan (2012) and Chirwa and Mlachila (2004). Eita and Jordaan (2012) indicated that the opportunity cost of holding reserves at the central bank where they earn no interest increases the economic cost of funds above the recorded interest expenses that banks tend to shift to

borrowers' customers. Chirwa and Mlachila (2004) stated that the large pool of resources created by high reserve requirements allows for the financing of high fiscal deficit and creates an environment of high inflation and persistently high interest rate.

The results on the impact of private sector credit and interest rate are significant and negative. This finding implies that a decrease in interest rate encourages the private sector to take credit. This will increase business undertaking, productivity, output, employment, income levels and savings that in turn should lead to a reduction in interest rate. As observed from the annual report and the computed ratios over nine years, the results demonstrate that when the level of loans increases, deposits increase; an indication that the borrowed and invested loans influence the overall business cycle and savings. This suggests that an increase in entrepreneurial borrowing increases investment, consumption and economic activity. In the long run, the private sector experiences increases in cash inflows, employment and saving that boosts bank deposits that should bring down interest rate. Similar result by Bader and Magableh (2009) indicates that private sector investment enhanced by long-term bank credit increases economic activity and lowers interest rate. Khan and Senhadji (2000) further stated that economic growth results from increased private sector involvement that creates employment, high per capita and economic growth. The result of this study suggests that increase in private sector credit should cause a reduction in interest rate.

6. Conclusions, implications and suggestions

6.1 Conclusions
The study has significant implications for bankers, policy makers and consumers. Interest rate trends show that it is significantly affected by the impact of liquidity, operational efficiency, equity capitalization, lending out ratio, concentration, market power, public sector borrowing and private sector credit. The ability of the banks to have stable and sufficient equity capital increases liquidity to finance medium- and long-term demands and also provides enough capital to finance modern technology for efficient gains. Increases in branch networks increase competition within the banking sector and information sharing that should lower the interest rate. While public sector borrowing could increase competition for funds with the private sector, it boosts infrastructure development and distributes incomes from those with enough to those who lack. Finally, liquidity, equity capital, concentration and reserve requirement have a significant positive effect on interest rate while operational efficiency, capitalization, lending out ratio, market power low concentration, public sector borrowing and private sector credit have been found to be engines in the reduction of interest rate in BFIs.

6.2 Policy implications
The policy implications drawn from this study is that bank authorities should emphasize efficiency in bank operations. This can be done through improving internal processes, investment in improved technology such as internet and mobile banking, emphasizing committed workforce who are time bound, work in teams, reliable and taking on extra roles upgrade their operational efficiency through investment in high technology and standardized so as to bring down overhead costs. Second, the management of banks should take passionate interest in equity capital mobilization to raise sufficient and cheap capital to meet medium- and long-term needs of borrowers. Third, although competition in the banking sector has increased over time, it still needs to be further enhanced and supported by policies that encourage and foster competition in the financial sector. In addition, financial deepening requires the support and development of micro-credit institutions, which have the potential to be competitive, apart from the main BFIs. Third, the fact that public sector borrowing is significant suggests that government should use the

borrowed funds optimally and efficiently to provide services that would be otherwise difficult to be provided by the private sector as other non-traditional ways of raising funds domestically to support the budget. Finally, central bank should minimize the use of reserve requirement to avoid the use of it as a means of controlling the money in circulation, as, if not otherwise directed, this is a potentially straightforward mechanism through which governments can precipitate in the reductions in the banking sector interest rate.

6.3 Limitations and areas for further research
In the final analysis, this study opens up areas for further research:

- The study has grouped all BFIs into one category. Future study would analyze the differences in BFIs in regard to their size and establish how these differences affect interest rate.

- The study concentrated on BFIs in Uganda. Future study would focus on how the determinants of interest rate in Uganda are compared with those of other banks in other emerging market countries.

- Other studies may be carried out comparing local and foreign banks to determine whether or not similar results on interest rate drivers may be found.

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