



## **DETERMINANTS OF ACCESS TO INTERBANK MARKET LIQUIDITY IN KENYA**

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### **Abstract**

*Bank's access to liquidity is the fulcrum which guarantees their continued existence. However, some banks experience difficulty getting enough liquidity from the interbank market to resolve their problems of money which can lead to their reduced levels of profitability, downsizing or even closure. This study evaluates the influence that macroeconomic and bank-specific factors have on access to interbank market liquidity in Kenya. Secondary data on macroeconomic and bank-specific factors are obtained from the Kenya national bureau of statistics (KNBS) and Central bank of Kenya annual bank supervision and from each of the 40 individual bank's annual financial and balance sheet reports for the period 2009 to 2018. Data is analyzed using multiple regression models. The findings of the study show that the level of credit risk, cost of funds and the level of economic activity have a negative influence on access to interbank market liquidity while the level of money supply, bank profitability and the size of the bank have a positive*

*influence on access to interbank market liquidity. The study recommends that bank managers should constantly monitor key bank-specific factors to ensure adherence and compliance to prudential guidelines on bank liquidity management and that policymakers should put in place policies which encourage banks to lend liquidity to each other to avoid bank collapse.*

*Keywords: Bank liquidity, Interbank market, Access to liquidity, Interbank ratio, Emerging money markets*

## **INTRODUCTION**

Since the collapse of the three Kenyan banks in 2015 and early 2016, small and medium commercial banks continue to experience access to liquidity problem due to massive transfer of customer deposits from banks perceived to be "small" to banks perceived as "big". Smaller banks experience liquidity problems partially because the larger banks that control more than 66.8% of market liquidity are reluctant to give them money (CBK, 2017). Evidence shows that some banks have been reporting declining levels of profitability, are not able to give loans to their customers and risk being sanctioned by the regulator for operating below the statutory levels required for bank liquidity (CBK, 2016).

Evidence suggests that the level of access to liquidity from the interbank market varies greatly from one region to another and from one interbank market to another (Vodova, 2015). The variation on the level of access to interbank market liquidity is attributed to the levels of development of the interbank markets which is reflected by the ease in which banks trading in a particular interbank market are able to access many products at better terms, more volumes of interbank market liquidity (Cocco, et al., 2009). However, the situation seems to favour larger banks while smaller commercial banks encounter difficulties getting a bank that is willing to give it funds when it has problems of liquidity (Vodova, 2015). It is argued that smaller banks experience access to interbank liquidity difficulties such as; being allowed less amounts of money than requested, being charged higher interest rates for access to liquidity than the larger banks, being allowed repayment periods which are shorter as compared to the period allowed to larger banks, being subjected to tough conditions or even outright denial of liquidity among others (Business Daily, Tuesday 10th October, 2017; Allen & Gale, 2004; Cocco et al., 2009;

### **Access to Interbank Market Liquidity**

Access to interbank market liquidity is crucial for survival of any commercial banking entity (CBK, 2013). However, evidence suggests that the level of access to liquidity from the interbank

market varies greatly from one region to another and from one interbank market to another (Vodova, 2015). The variation on the level of access to interbank market liquidity is mainly attributed to the levels of development of the interbank markets which is usually reflected by the ease in which banks trading in a particular market are able to access many products at better terms and allows access to more volumes of interbank market money (Cocco, et al., 2009).

Banks operating in emerging money markets are seen to not only experience low levels of access to interbank market liquidity but also high levels of volatility and poor flow of financial information as compared to commercial banks operating in more developed money markets (Rooyen & Claassen, 2012). However, the situation seems to favor larger banks while smaller commercial banks have been seen to encounter difficulties getting a bank that is willing to give it money when it has problems of liquidity (Vodova, 2015). It is argued that smaller banks experience access to interbank liquidity difficulties such as being allowed less amounts of money than requested, being charged higher interest rates for access to liquidity than the larger banks, being allowed repayment periods which are shorter as compared to the period allowed to larger banks, being subjected to tough conditions or even outright denial of money among others (Business Daily, Tuesday 10<sup>th</sup> October, 2017; Allen & Gale, 2004; Cocco et al., 2009; Sichei et al., 2012).

Evidence from the more developed money markets show that it is easier for smaller banks to get money from the interbank market than it is for smaller banks operating in emerging money markets to get money from other bank within their interbank markets. Cocco et al. (2009) notes that the interbank market in the United States of American (USA) for example offers diverse interbank loan products including overnight loans which are not secured. However, studies have shown that banks tend to prefer to give money to other banks with whom they have an established banking relationship thus banks outside these networks have difficulty getting money from the interbank market (Cocco et al., 2009).

Kim (2014), observed the interbank market in Europe as being relatively well developed and by extension providing variety of unsecured short-term interbank loans to its partners. However, commercial banks' access to interbank market money within the Eurozone local banks was seen to be discriminative to cross border borrower banks in terms of interbank rates, varying levels of access to money, volumes and overall pricing of the interbank loans (Vodova, 2015). Further, bank's access to money from the Germany interbank market was to a larger extent influenced by the size of the bank (Kim, 2014). Observations have been made that smaller banks are discriminated against whenever they want to borrow money from larger banks within the Germany interbank market (Fecht, Nyborg, & Rocholl, 2015). Sharma and Singh (2016) observed that despite India having liquidity adjustment facility which was given out to

commercial banks facing liquidity problems, banks in India still experience difficulty getting money from the Mumbai interbank market. Studies show that access to interbank market money was discriminatory based on bank ownership and that larger public sector banks had better access to money from the interbank market than foreign owned banks (Afonso et al., 2014; Sharma & Singh, 2016).

Challenges in getting access to enough interbank market liquidity by commercial banks appear to be replicated across most emerging money markets in Africa. In South Africa for example, four of the top banks control 80% of the market liquidity while evidence shows that 12 small banks have collapsed since 1990 due to inability to access enough interbank market money to resolve their problems of liquidity (Bloomberg, Monday, 12th March, 2018). Further, it is observed that the Nigerian interbank market has been experiencing liquidity problems since 2010. Moreover, getting money from the Nigerian interbank market has been a challenge to smaller banks because the 6 top banks control over 70% of the total liquidity but evidence suggests that smaller banks experiencing liquidity problems have been forced to either merge or put in more capital in order for them to survive because the larger banks are reluctant to give them interbank money (Daily Monitor, Friday, 20th January, 2017).

Further, in the last three years the Central bank of Tanzania (BOT) has withdrawn the licenses of five small banks and forced three others to merge due to low capitalization and access to money problems. This even after the bank had reduced discount window rate from 16% to 9% and minimum statutory reserve requirement from 10% to 8% in its effort to ease access to money by commercial banks. M-bank of Tanzania is the most recent bank to be placed under receivership owing to lack of access to immediate liquidity to enable it meet its maturing obligations (BOT, 2017). Moreover, Crane bank which was the fourth largest bank in Uganda collapsed in 2017 due to high levels of nonperforming loans which ate into the capital levels of the bank. However, the bank was denied access to money by other banks thus plugging into more liquidity problems and was finally put under receivership by the Central bank of Uganda (Business Daily, 2nd Thursday, 2018; Daily Monitor, Friday 20th January, 2017).

Studies on the interbank market in Kenya show that smaller banks face difficulty and restrictions when they want to access liquidity from larger banks. Arguably, there exist access discrimination where larger banks offer big proportion and better terms for access to their funds to their counterparts in the large banks' segment than they do to small and medium banks (Sichei et al., 2012; Green et al., 2016). According to the Kenya Financial Sector Stability Report (2017), failure by the smaller bank to get enough money from the interbank market has forced a majority of them to reduce their levels of business activity especially in giving out of loans to their borrowing customers due to liquidity constraints. Moreover, others have been

forced to either merge, downsize by closing some of their branches or undertaking staff layoffs due to declining bank profitability and shrinking shareholder value.

It is not clear what makes some banks access liquidity more easily while others face difficulty getting liquidity from the bank's market. There seem to be factors that determine access to interbank market liquidity. Some of these factors are known like the size of the bank while others are not clear especially in most emerging money markets such as Kenya. There existed a need for a study to help address this problem of access to interbank market liquidity, particularly by smaller banks. Identification of the factors that banks prioritize in allowing access to their money by another bank will help commercial banks to position themselves strategically to be able to get liquidity from the interbank market every time they experience sudden need for money hence preventing banks from collapsing or reducing their levels of operations (Green et al., 2016). This study fills this gap by evaluating the influence of macro-economic and bank-specific factors in determining access to interbank market liquidity in Kenya

## LITERATURE REVIEW

This section reviews the literature with specific focus to the various factors identified as having a significant influence on access to interbank market liquidity in various money markets which support the current study. However, there have been suggestions that studies on the interbank market are few and insufficient both in developed and emerging money markets in comparison to studies on foreign exchange, bond or equity markets (Furfine 1999). Past studies have looked at both macroeconomic and bank-specific factors either separately or by studying them together while evaluating their influence to various parameters related to access to money by commercial banking institutions (Vodova, 2013; Trenca, 2015; Fecht et al., 2011; Sharma & Singh, 2016; Eichengreen & Gupta, 2013).

Moreover, various studies have looked at macroeconomic factors as those variables which affect the entire economy and are external to the bank. Notably, the bank managers have no control over these factors despite their likely significant influence on the banks' ability to get money from the interbank market (Lee et al., 2013; Hovarth et al., 2012; Vodova, 2011). The levels of money supply, for instance, has been cited to influence the amount of liquidity available in the market and consequently has been seen to affect the ease in which banks can get money from each other in the interbank market (Lovin, 2013). Studies have shown that when there is more money in circulation there is usually an increase in liquidity levels within the economy while on the other hand, an increase in cost of funds has been cited to lower the liquidity available in the market which ultimately influences pricing of loans and all the other monetary instruments that are traded within the money market (Vodova, 2015). However, the situation

could appear to be different when just a few large banks are holding a bigger percentage of the available liquidity and thus dictating who can get money from them based on their qualifying criteria (Ongore & Kusa, 2013; Oduor et al., 2014; Muriithi & Osoro, 2016).

Vodova (2013) noted that the level of business activity influenced availability and the ease of access to interbank market money and that an increase in the total goods and services produced within emerging markets increased the money available in the market while a decline in the level of business activity affected demand for assets leading to decline in the demand for loans consequently leaving banks with idle money. Sharma and Singh (2016) noted that a business environment which was unstable for example, affected bank customers who were repaying their loans and were not able to return the borrowed money whenever it was expected to be repaid which would ultimately lead to a decline in bank liquidity and consequently the bank was forced to restrict access to its money by other banks. Vodova (2013) observed an increase in the level of access to money with increased levels of growth in gross domestic product. It is argued that this is the reason why banks tend to lend more money in seasons of high economic activity.

Allen and Gale (2004) observed that the cost of funds was significantly influenced by the amount of money in circulation and that an increase in the quantity of money in circulation causes an increase in access to money by commercial banks. However, an increase in interest rates has been cited to erode liquidity leading to an increase in the cost of accessing money for both loans and all the other monetary instruments that are traded within the money market. Lower cost of funds eases money distribution and allows easy access to money while increased cost of funds tends to tighten the available liquidity in favor of large banks and consequently, less access to money by smaller banks who have to borrow at higher rates in order for them to survive (Sichei et al., 2012; Vodova, 2011; Mousa, 2015; Business Daily, Tuesday, 27th February 2018; Vodova, 2015).

Vodova (2015) observed that some commercial banks seemed to be influenced by uncertainties in interest regimes to either give money or deny other banks money. Notably, large banks preferred to hold on to their money for fear that interest rates may change in a way that could affect their liquidity position in a negative way. Moreover, banks seemed to deny others money in case they suspected that the other bank might have made bad lending decisions which could be reflected in the high number of their loans which are not being repaid on time and thus foresee that the borrowing bank could incur huge loan provisions and therefore fear that their money may not be repaid on time (Ongore & Kusa, 2013). Moreover, other macroeconomic factors that have been suggested to influence access to interbank market liquidity include presence of financial disturbances such as shocks like interest capping,

collapse of banks which may cause liquidity hoarding by banks with liquidity surplus (Hovarth et al., 2012), the interest rate of monetary policy usually represented by the central bank rate (Vodova, 2015), bid-ask spread effect both by lenders and borrowers, when they acted as quoters rather than as aggressors (Gabbi et al., 2012; Beck & Fuchs, 2004), business cycle either during time of expansion or recession of the economy and price of liquidity. It is however not clear how they influence access to liquidity from the interbank market in an emerging money market like Kenya.

Kim (2014) observed that the size of a commercial banking institution seemed to influence banks' capacity to attract and access money from the interbank market in Germany. Notably, bank size reflects the potential lenders the bank's internal strength or muscles which it has developed over time to be able to withstand any form of distress in the event of diverse forms of liquidity problems. Moreover, it is argued that the bank size showed how its assets were generating revenue and thus the much-needed liquidity for servicing of its borrowed funds. Nevertheless, it is not clear how the size influences banks decision when allowing access to its liquidity because some smaller banks also do access money from the interbank market (Sichei et al., 2012; Green et al., 2016; Lee et al. 2013; Murinde et al., 2016; Xie et al., 2016; Bhavani & Mehta, 2017).

Studies have suggested various bank-specific factors that are likely to influence access to money from the interbank market such as creditworthiness (Cocco et al., 2009; Allen & Gale, 2004), nature of bank ownership and more specifically whether fully owned by the indigenous people or has traces of foreign ownership (Cocco et al., 2009; Green et al., 2012), Bank Reputation (Green et al., 2012; Sichei et al., 2012), Bank reserve holding at the Central bank (Cocco et al., 2009) Ability to provide a collateral for the borrowing like treasury bills and bonds (Cocco et al., (2009; Sichei et al., 2012), Proximity to the bank in need of liquidity or the financial services provider (Beck, 2015) Credit ratings of the borrower by rating bodies (Lee et al. 2013) Capital ratios such as return on assets or return on equity, earnings per share (Lee et al., 2013). It is however not clear which one of these factors influences banks decision to give another bank money the most. This study evaluates the influence that some of the macroeconomic and bank-specific factors that have been identified in literature have on access to interbank market liquidity in Kenya.

## **OPERATIONALIZATION AND MEASUREMENT OF VARIABLES**

This section identifies the key variables of the study. The operationalization is based on how the variables have been used in previous studies as per the reviewed literature. The following are



the variables which the study analyzes and highlights other studies which have used similar measurement.

Table 1: Operationalization and Measurement of Variables

<b>Variables</b>	<b>Measurement</b>	<b>Author/Citation</b>
1.Bank Size	Logarithm of total assets	(Allen & Gale 1990; Allen & Saunders 1992; Sichei et al., 2012; Green et al., 2016; Cocco et al., 2009; Lee et al. 2013; Hovarth et al., 2012; Xie et al., 2016; Murinde et al., 2016).
2.Level of Credit Risk	Portfolio at Risk	Cocco et al., 2009; Sichei et al., 2012; Allen & Saunders, 1992; Furfine 2001).
3.Bank Profitability	Return on Assets/	(Allen & Saunders, 1992; Bhavani & Mehta, 2017; Angelini et al., 2011; Lee et al. 2013; Hovarth et al. 2012; Rauch et al., 2010).
4.Money Supply	M2	Nikolaou, 2009; Ongore & Kusa, 2013; Oduor et al., 2014; Muriithi & Osoro, 2016)
5. Cost of Funds	Central bank rate	(Cocco et al., 2009; Sichei et al., 2012; Vodova, 2011; Ongore & Kusa, 2013; Mousa, 2015; Business Daily, Tuesday, 27 <sup>th</sup> February 2018; Vodova ,2015).
6.Level of Economic Activity	Economic growth rate	(Vodova, 2011; Vodora 2013; Sharma & Singh 2016).
7.Access to Liquidity	Interbank Ratio (ratio between due to bank and due from bank)	(Vento &Ganga, 2009; Vodova 2015; Lovin, 2013).

## CONCEPTUAL FRAMEWORK

The study conceptualizes a linear relationship between the independent variable represented by the macroeconomic and bank specific variables and the dependent variable represented by access to interbank market liquidity. The choice of variables for the study is informed by other studies done on interbank markets and the variables included in this proposed study have been identified as having significant influence on access to interbank market liquidity (Lovin, 2013; Sharma & Singh, 2016) as per Figure 1.



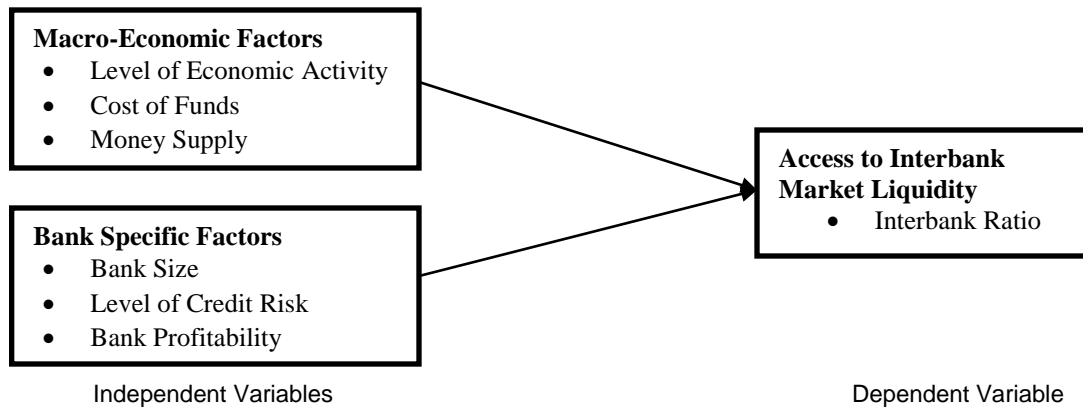


Figure 1: Conceptual Framework

Source: Adapted from (Lovin, 2013)

## METHODOLOGY

The study uses descriptive survey research design and collects data from all the 40 commercial banks which operated in Kenya between 2009 and 2018. This period is significant because many commercial banks experienced liquidity challenges leading to reduced extension of credit facilities to their clients, reduced bank profitability, staff layoffs, mergers and bank collapse. The study collects secondary data from the Kenya bureau of statistics, the Central bank of Kenya reports and from the individual bank's annual financial reports. The study then performs multiple regression analysis on the macroeconomic variables using model (1.5.1) to identify the influence that cost of funds, level of money supply and the level of economic activity has on access to interbank market liquidity.

$$Y = \beta_{0it} + \beta_{1it}X_1 + \beta_{2it}X_2 + \beta_{3it}X_3 + \epsilon_{it} \quad (1.5.1)$$

Where;

Y = Access to Liquidity

X<sub>1</sub> = Cost of Funds

X<sub>2</sub> = Level of Economic Activity

X<sub>3</sub> = Level of Money Supply

$\beta_{0it}$  = The intercept

$\beta_{1it}$ ,  $\beta_{2it}$ ,  $\beta_{3it}$  = Coefficients of the Macroeconomic Factors

$\epsilon_{it}$  = Error term

The study further uses model (1.6.1) to isolate the relationship between bank-specific variables and access to interbank market liquidity.

$$Y = \beta_{0it} + \beta_{4it}X_4 + \beta_{5it}X_5 + \beta_{6it}X_6 + \epsilon_{it} \quad (1.6.1)$$

Where;

$Y$  = Access to Liquidity

$X_4$  = Level of Credit Risk

$X_5$  = Bank Size

$X_6$  = Bank Profitability

$\beta_{0it}$  = The intercept

$\beta_{1it}, \beta_{2it}, \beta_{3it}$  = Coefficients of the Bank Specific Variables

$\epsilon_{it}$  = Error term

Lastly, the study performs a robustness test by running multivariate regression analysis between macroeconomic, bank specific variables and access to interbank market liquidity using the overall model (1.7.1) below;

$$Y = \beta_{0it} + \beta_{1it}X_1 + \beta_{2it}X_2 + \beta_{3it}X_3 + \beta_{4it}X_4 + \beta_{5it}X_5 + \beta_{6it}X_6 + \beta_{7it}X_7 + \epsilon_{it} \quad (1.7.1)$$

Where;

$Y$  = Access to Liquidity

$X_1$  = Cost of Funds

$X_2$  = Level of Economic Activity

$X_3$  = Level of Money Supply

$X_4$  = Level of Credit Risk

$X_5$  = Bank Size

$X_6$  = Bank Profitability

$\beta_{0it}$  = The intercept

$\beta_{1it}, \beta_{2it}, \dots, \beta_{8it}$  = Coefficients of the Variables

$\epsilon_{it}$  = Error term

## ANALYSIS AND DISCUSSIONS OF RESULTS

In this section, the study describes the estimation procedure followed and presents discussion of the main findings.

### Descriptive Statistics for the Study Variables

Descriptive Statistics for Access to liquidity, macroeconomic and bank Specific variables were analyzed and the results presented below.

Table 2: Descriptive Statistics for Study Variables

Variable	Mean	SD	Min.	Max.
Access to Liquidity	0.73	0.94	0.54	2.50
Level of Economic Activity	5.04	1.04	2.60	6.30
Cost of Funds	10.10	3.18	6.00	18.00
Money Supply	1,714,018	552,207	902,847	2,543,736
Bank Size	282,244	106,391	125,834	439,584
Level of Credit Risk	2.96	1.93	0.53	5.86
Bank Profitability	5.25	0.55	4.57	6.01

Table 2 shows that access to liquidity has a mean 73% and ranged between a minimum of 54% and a maximum of 250%. A mean of 73% which is less than 100% implies that majority of the banks in Kenya had less access to interbank market liquidity during the period of the study. The results in table 4.2 show that economic growth rate has a mean of 5.04%, and ranged between a minimum of 2.60% and a maximum of 6.30%. Higher economic growth rates indicate an improved level of economic activity. The mean of the central bank of Kenya rate was 10.10% and ranged between a minimum of 6.0% and a maximum of 18%.

The results show that the average level of money supply was Kenya shillings 1,714,018 trillion and ranged between a minimum of Kenya shillings 902,847 billion and a maximum of Kenya shillings 2,543,736 trillion in 2018. The results show that gross non-performing loans measured by portfolio at risk had a mean of 2.96% and ranged between a minimum of 0.53% and a maximum of 5.86% indicating that the level of non-performing loans had been increasing gradually during the study period. High PAR increases loan book provisions which in turn eats into banks profitability. The average bank profitability measured by return on assets was 5.25% and ranged between a minimum of 4.60% to a maximum of 6.02% while average bank assets were 283,244 and ranged between 125,834 and 439,584. The results show that Kenyan banks had consistently been growing their total assets throughout the study period.

### Correlation Analysis

Pearson correlation analysis was performed to examine the relationship between macroeconomic, bank specific, bank concentration variables and access to interbank market

liquidity. Correlation coefficients are able to provide a numerical overview of the direction and strength of the linear relationship between the variables and access to interbank market liquidity. According to Thompson et al., (2017), Pearson correlation coefficients ( $r$ ) lies within the range  $[-1,+1]$  for the indication of negative or positive correlation respectively while the size of the absolute value formulates information on the strength of the relationship. The findings of the correlations between the study variables and access to interbank market liquidity are summarized and presented in Table 3.

Table 3: Correlation Values Between Study Variables and Interbank Ratio

	Access to Liquidity	Level of Economic Activity	Cost of Funds	Money supply	Bank size	Level of Credit Risk	Bank Profitability
Access to Liquidity	1.00						
Level of Economic Activity	0.40	1.00					
Cost of Funds	-0.03	-0.16	1.00				
Money Supply	-0.26	0.67	-0.03	1.00			
Bank Size	0.28	0.70	-0.02	0.92	1.00		
Level of Credit Risk	-0.31	0.50	-0.27	0.91	0.90	1.00	
Bank Profitability	0.32	0.21	-0.11	-0.16	-0.18	-0.33	1.00

The results show that the study variables have correlation coefficients ranging from a negative correlation coefficient of negative 0.03 to a positive correlation coefficient of 0.92. The results show a negative coefficient value of 0.03 between access to liquidity and cost of funds implying that as the central bank rate declines, banks experience more access to interbank market liquidity. A negative correlation coefficient of 0.26 with money supply was also observed implying that increased money supply reduced access to interbank market liquidity in Kenya during the period of the study. The results further show a negative coefficient of 0.31 between the level of credit risk and access to bank liquidity implying that an increase in the level of the portfolio at risk reduces banks level of access to liquidity.

Table 3 shows a positive coefficient of 0.40 for the level of economic activity, 0.28 for banks size, 0.32 for bank profitability and access to interbank liquidity. The results indicate that an increase in the level of economic activity, bank size and bank profitability will cause a bank to access more liquidity from the interbank market. The results support the argument by credit access theorists that banks profile and monitor each other to mitigate on risks associated with their would-be borrowers. The results resonate with the findings by Allen and Gale (2004) who observed that an increase in the cost of funds decreased access to interbank market liquidity.

The results in Table 3 further support the argument that increased cost of funds tends to tighten the available liquidity in favour of large banks and consequently, less access to money by smaller banks who have to borrow at higher rates in order for them to survive (Ongore & Kusa, 2013; Mousa, 2015; Business Daily, Tuesday, 27th February 2018; Xie et al.,2016). The results are also consistent with the findings by Lovin, (2013) who observed that cost of funds, the level of business activity, the levels of money supply and the prevailing business environment influenced how banks got money from the interbank market.

On the other hand, the results disagree with Kim (2014) who observed that smaller banks experienced higher liquidity cost as compared to larger banks. The results also differ with those of Sharma & Singh (2016) who found an insignificant influence of cost of funds, money supply and bank profitability to a banks access to interbank market liquidity. The study observed that when the cost of funds increased, banks would move to liquidate their more liquid assets instead of wanting to access liquidity from the interbank market.

### Multicollinearity Test

The study checks for the presence of multicollinearity using the variance inflation factor (VIF) and tolerance. The rule of the thumb is that the tolerance lies between zero and 1 while if a VIF of a variable exceeds 10, which will happen if multiple correlation coefficient for jth variable  $R_j^2$  exceeds 0.90, that variable is said to be highly collinear (Daoud et al.2017). Multicollinearity analysis from this study resulted in VIF and tolerance values shown in Table 4 below.

Table 4: Variance Inflation Factors and Tolerance Values

Variables	VIF	Tolerance
1. Access to Liquidity	1.778	0.5624
2. Level of Economic Activity	1.714	0.5834
3. Cost of Funds	1.249	0.8006

4.	Money Supply	4.360	0.2293
5.	Bank Size	9.003	0.1110
6.	Level of Credit Risk	5.501	0.1817
7.	Bank Profitability	2.225	0.4494

Results in Table 4 show that the VIF value for access to liquidity is 1.778, level of economic activity has a VIF of 1.714, cost of funds has a VIF of 1.249 while money supply has a VIF of 4.360, bank size has a VIF of 9.003 while the level of credit risk and bank profitability have a VIF of 5.501 and 2.225 respectively and thus all the variables were within the acceptable range of not less than one and not more than 10 (Thompson et al., 2017).

In regard to tolerance, the results in table 4 show that Access to liquidity has a tolerance of 0.5624, level of economic activity has a tolerance of 0.5834, cost of funds has a tolerance of 0.8006 while money supply has a tolerance of 0.2293, bank size has a tolerance of 0.1110 while level of credit risk and bank profitability have tolerance of 0.1817 and 0.4494 respectively and thus all variables are within the acceptable range of not less than zero and not more than one thus the regression analysis can be performed (Daoud et al., 2017).

### Macroeconomic Factors and Access to Interbank Liquidity

The study first investigates the influence that macroeconomic factors have on access to interbank market liquidity in Kenya by using model (1.5.1). The results of the multiple regression analysis between macroeconomic factors and access to interbank liquidity are presented on Table 5 below.

Table 5: Multiple Regression Analysis Output

	Coefficient	Std. Error	t value	Pr(> t )
(Intercept)	44.8500	8.3800	5.306	0.0033 **
Level of Economic Activity	-2.6360	0.6827	-3.861	0.0205 **
Cost of Funds	-0.7714	0.1947	-3.962	0.0287 **
Money Supply	0.0022	0.00078	2.84	0.0307 **

Residual standard error: 1.052 on 3 degrees of freedom

Multiple R-squared: 0.4395, Adjusted R-squared: 0.3751

F-statistic: 6.34 on 2 and 3 DF, p-value: 0.0643\*

Note: Significance. codes: \*\*\* 1%, \*\* 5%, \* 10%

The results in Table 5 show an  $R^2$  of 0.3751 implying that only 37.51% of the variance of access to interbank market liquidity could be explained by the given set of macroeconomic variables; the cost of funds, money supply and the level of economic activity. The results show a corresponding p-value of 0.643 and significance at 10% level of significance. Multiple regression results show that economic growth rate had a corresponding p-value of 0.0205, was significant at 5% level of significance and had a negative beta coefficient value of  $-2.6360$  implying that there exists an inverse relationship between the level of economic activity and access to interbank market liquidity. The results indicate that an increase in the level of economic activity reduces access to interbank market liquidity by commercial banks in Kenya. This indicates that during seasons of increased levels of economic activity, banks can get more volumes of money from their customers who want to save as a result of boom activities and as such do not need to borrow liquidity from other banks.

The results in Table 5 support proponents of loanable funds theory argument that access to liquidity depended on available funds which the market was able to offer based on the prevailing level of economic growth. The study noted that when the level of economic growth was high, people were willing to save their cash to benefit from the high-interest rate returns due to an increased level of economic activity. This led to a gradual build-up of bank liquidity. Once the number of customers who wanted to take their money to the bank increased, banks received more money which improved the bank's liquidity position. This improved liquidity position enabled banks to invest more in loan assets leading to increased access to liquidity by other banks experiencing liquidity shortage or who had investment opportunities which they wanted to maximize on (Nikolaou, 2009; Singh & Sharma, 2016; Eichengreen & Gupta, 2013).

Moussa (2015) found a negative influence of the level of economic activity on access to interbank market liquidity in Tunisia. The results in Table 1.5 are further consistent with the study by Vodova (2013) who observed that the level of business activity influenced availability and the ease of access to interbank market money and that an increase in the total goods and services produced within emerging markets increased the money available in the market while a decline in the level of business activity affected demand for assets leading to decline in the demand for loans consequently leaving banks with idle money. Vodova (2013) observed that the level of business activity influenced availability and the ease of access to liquidity and that an increase in the total goods and services produced within an emerging market increased the money available in the market while a decline in the level of business activity within an economy affects demand for assets leading to decline in the demand for loans consequently leaving banks with idle liquidity. However, Sharma & Singh (2016) noted that a business environment which was unstable affected bank customers who were repaying their loans and were not able



to return the borrowed money whenever it was expected to be repaid. This would ultimately lead to a decline in bank liquidity and consequently, the bank was forced to restrict access to its money by other banks.

The results in Table 5 show that the cost of funds had a corresponding p-value of 0.0287 and is significant at 5% level of significance and has a negative beta coefficient value of  $-0.7714$ . The results reflect an inverse relationship between the cost of funds and access to interbank market liquidity. The results indicate that a one-unit increase in the cost of funds would cause 0.7714 decline in access to interbank liquidity and vice versa. The results imply that when the cost of money is high, banks borrow less while when the cost of money reduces, banks will want to borrow more to capitalize on the low-interest rates to grow their assets or maximize on investment opportunities. The results support the argument by liquidity preference theorists that people demand compensation because of parting with their money and that the compensation demanded increases as the period of getting the money back increases (Bibow J., 1995).

Allen and Gale (2004) observed that an increase in the cost of funds erodes liquidity leading to an increase in the cost of accessing money for both loans and all the other monetary instruments that are traded within the money market. The study observed that lower cost of funds eases money distribution and allows easy access to money while increased cost of funds tends to tighten the available liquidity in favor of large banks and consequently, less access to money by smaller banks who have to borrow at higher rates in order for them to survive (Sichei et al., 2012; Vodova, 2011; Ongore & Kusa, 2013; Mousa, 2015). The study observed that when the cost of funds increased, banks would move to liquidate their more liquid assets instead of wanting to access liquidity from the interbank market.

The results in Table 5 are also consistent with the findings by Lovin (2013) that access to robust liquidity is important for the banking sector to function well and provide credit to the real sector of the economy. Lovin (2013) found that the cost of funds, the level of business activity, the levels of money supply and the prevailing business environment influenced how banks got money from the interbank market. On the contrary, Kim (2014) observed that smaller banks experienced higher liquidity cost as compared to larger banks. This observation, however, differs with Singh & Sharma (2016) who found an insignificant influence of cost of funds on access to interbank market liquidity.

In respect to the influence of money supply on access to interbank market liquidity, the results in Table 5 show that money supply had a corresponding p-value of 0.0307, was significant at 5% level of significance and had a positive beta coefficient value of 0.0022 implying a positive influence of money supply to the level of access to interbank market liquidity

by commercial banks. The results indicate that an increase in the quantity of money in circulation will cause an increase in the level of access to interbank market liquidity by banks (Hryckiewicz & Kozlowski, 2016).

These results in Table 5 support the arguments by the proponents of loanable funds theory that once the number of customers who want to take their money to the bank increase, banks receive more funds which improves their liquidity position and hence they invest more in loan assets leading to increased access to liquidity by other banks (Nikolaou, 2009; Sharma & Singh, 2016; Xie et al., 2016; Eichengreen & Gupta, 2013). These results conform to the findings by Lovin (2013) who studied determinants of access to liquidity within the Romanian interbank deposits market and found evidence that the level of business activity showed a positive effect on access to bank liquidity and that cost of funds, the level of business activity, the levels of money supply and the prevailing business environment influenced how banks got money from the interbank market.

### Bank Specific Factors and Access to Interbank Market Liquidity

The study further examines the influence of bank-specific factors on access to interbank market liquidity in Kenya employing model (1.6.1). The results of regression analysis between bank-specific variables and access to interbank market liquidity are presented in Table 6 below.

Table 6: Multiple Regression Results for Bank Specific Variables

	Coefficient	Std. Error	t value	Pr(> t )
(Intercept)	15.8500	10.3800	7.306	0.0053 **
Bank Size	0.0201	0.00002	5.197	0.0138 **
Level of Credit Risk	-3.1970	0.8103	-3.945	0.0290 **
Bank Profitability	4.9820	0.9704	-5.134	0.0143 **

Residual standard error: 1.189 on 3 degrees of freedom

Multiple R-squared: 0.6795, Adjusted R-squared: 0.6273

F-statistic: 8.39 on 3 and 2 DF, p-value: 0.0533\*

Note: Significance. codes: \*\*\* 1%, \*\* 5%, \* 10%

The results in Table 6 show an  $R^2$  of 0.6273 implying that 62.73% of the variance of access to interbank market liquidity was accounted for by bank-specific variables; the level of credit risk,

bank size and bank profitability with a corresponding p-value of 0.0533 which indicated significance at 10% level of significance.

The results in Table 6 show that bank size has a corresponding p-value of 0.0138, is significant at 5% level of significance and has a positive beta coefficient value of 0.0201. The results imply that as banks in Kenya grow their total assets, they gain more access to interbank market liquidity. The results resonate with the theory of financial intermediation as fronted by Leland & Pyle (1977) who saw financial intermediation as a coalition of financial institutions that dealt with information distribution as authorized agents for savers and argued that they thrived on scale economies. It appears that more profitable banks portray an image of stability hence their potential lenders are assured that they can service their interbank liability because they have many and diversified revenue-generating assets.

The results in Table 6 are in agreement to the findings by Sichei et al. (2012) that Kenya's interbank market was segmented by size into small, medium and large banks and that size influenced the level of access to funds by the Kenyan banks. The results are further consistent with the findings by Trenca et al., (2015) that size of the bank, its creditworthiness, reputation and ownership influences its level of access to liquidity and that banks which have larger total assets are seen as being more stable and have better access to liquidity than lowly capitalized banks while banks with high levels of profitability, earnings and low market risk have better access to liquidity (Murinde et al., 2016).

Kim (2014) observed that the size of a commercial banking institution influenced its capacity to attract and access money from the interbank market in Germany. According to Kim (2014), bank size created an impression to the potential lenders that the bank had strong internal muscles which it has developed over time to be able to withstand any form of distress in the event of diverse forms of liquidity problems (Green et al., 2016; Lee et al., 2013; Hovarth et al., 2012; Xie et al., 2016; Murinde et al., 2016; Bhavani & Mehta, 2017). Tiriongo and Kanyumbu (2016) found that size gave banks the possibility of diversifying and taking up more riskier investments which yielded higher returns. This relationship is also similar to the findings by the study by Sigmund & Siebenbrunner (2017) as well as by Assfaw, (2019) who found a significant influence of bank size on access to interbank market liquidity. However, this relationship contradicts the findings by Distinguin et al., (2013); Vodova, (2013) and Lee et al., (2013) who observed an inverse relationship between bank size and access to interbank market liquidity. Moussa (2015) did not, however, observe any significant influence of bank size on access to interbank market liquidity.

Bank profitability has a corresponding p-value of 0.0143, is significant at 5% level of significance and has a positive beta coefficient value of 4.9820. The results show a positive

relationship between access to interbank market liquidity and bank profitability. The results imply that more profitable banks have better access to interbank market liquidity in Kenya. The results support the argument by the proponents of financial intermediation theory who saw commercial banking as a coalition of the depositors that ensured that those who had money could come together and share the risks that could affect their state of liquidity and in the process also share the cost of protecting their savings (Diamond & Dybvig, 1983). Leland & Pyle (1977) saw financial intermediation as a coalition that dealt with information distribution as authorized agents for savers and argued that they thrived on scale economies.

The results in Table 6 are consistent with the findings of the study by Singh & Sharma (2016) who found a positive relationship between bank profitability and the banks' ability to access liquidity from the interbank market. Moreover, studies have observed that banking institutions which have been able to consistently grow their levels of profitability are stable and as such are allowed access to money more easily than loss-making or lower profitability banks which are considered shaky (Lee et al., 2013; Hovarth et al., 2012). The results, however, differ with findings of similar studies by Leontitsis et al. (2015) and Bhavani & Mehta (2017) who found a negative influence of profitability on access to interbank market liquidity and argued that profitability could be misleading because it could fail to reflect the actual health status of a financial institution.

Table 6 shows that the level of credit risk had a corresponding p-value of 0.0290 and was significant at 5% level of significance and that it had a negative beta coefficient value of -3.1970. The results show that there existed an inverse relationship between the level of credit risk and access to interbank market liquidity. The results indicate that a unit increase in the level of credit risk would reduce the level of access to interbank market liquidity by 3.197. The results imply that banks with high levels of loans which are not being repaid as they fall due to get less access to liquidity from other banks. These results agree with the proponents of credit access theory argument that banks continuously gather and profile their borrowers' private information which they then use to decide whom to give money and who not to give money because the banks are not only keen on earning interest from the money they give out but also on the risk associated with each of their potential borrowers.

The results in Table 6 are consistent with the findings by Assfaw (2019) who found a significant influence of the level of credit risk on access to interbank market liquidity. The study observed that many non-performing loans reflected by high levels of gross non-performing loans led to loan loss provisions which affected the bank's cash flow projections hence impacting negatively on the banks' ability to honour its maturing financial obligations. Cocco et al. (2009) and Sichei et al. (2012) observed that banks scrutinize each other's quality of loan book and

would deny access to their liquidity to banks which had high levels of non-performing loans for fear of default in payment of its interbank loans (Furfine, 2001). However, other studies have argued that banks lend in the interbank market for a return and have to balance between risk of default and expected return and hence it cannot wholly be said that banks with high levels of credit risk cannot get money from the interbank market since there are banks who see it as an opportunity to earn more returns by charging higher rates (Cocco et al., 2009; Sichei et al., 2012). The results, however, contradict the findings by Mousa (2015) who observed that non-performing loans and the cost of funds were statistically insignificant in determining access to interbank market liquidity in the Ethiopian interbank market.

### Robustness Test

The study performs a robustness test by running a multivariate regression analysis between macroeconomic, bank-specific variables and access to interbank market liquidity using the overall model (1.7.1). The results of this regression analysis are presented below;

Table 7: Multiple Regression Results for Macroeconomic, Bank Specific and Access to Liquidity

	Coefficient	Std. Error	t value	Pr(> t )
(Intercept)	70.1734	12.3800	5.306	0.0155 **
Level of Economic Activity	-2.3360	0.5826	-3.361	0.0209 **
Cost of Funds	-0.5714	0.0942	-2.962	0.0386 **
Money Supply	0.1411	0.00178	2.841	0.0408 **
Bank Size	0.1553	0.00102	5.1970	0.0125 **
Level of Credit Risk	-2.0274	0.8133	-3.949	0.0192 **
Bank Profitability	4.9820	0.7704	-5.134	0.0152 **

Residual standard error: 1.169 on 7 degrees of freedom

Multiple R-squared: 0.8896, Adjusted R-squared: 0.8313

F-statistic: 8.27 on 7 and 3 DF, p-value: 0.0635\*

Note: Significance. codes: \*\*\* 1%, \*\* 5%, \* 10%

Table 7 shows that the combined model has an  $R^2$  of 0.8313 which implies that 83.13% of the variance of access to interbank market liquidity is accounted for by macroeconomic factors and bank-specific factors with a corresponding p-value of 0.0635 which indicated significance at 10% level of significance.

The results in Table 7 show that the level of economic activity has a corresponding p-value of 0.0209 and is significant at 5% level of significance. The results show that the cost of funds has a corresponding p-value of 0.0386 and is significant at 5% level of significance while money supply has a corresponding p-value of 0.0408 and is significant at 5% level of significance. Results in Table 7 further show that banks size has a corresponding p-value of 0.0125 and is significant at 5% level of significance. The results show that the level of credit risk has a corresponding p-value of 0.0192 and is significant at 5% level of significance while bank profitability has a corresponding p-value of 0.0152 and is significant at 5% level of significance. These results indicate that the level of economic activity and the size of the bank have more influence on the level of access to liquidity from the interbank market in Kenya.

## CONCLUSION AND RECOMMENDATIONS

In conclusion, the study observes that macroeconomic factors do indeed influence access to interbank market liquidity by commercial banks in Kenya. However, the study notes that the level of economic activity is more significant and has more influence on access to interbank market liquidity than the other macroeconomic factors considered in the study. Further, the study observes that bank-specific factors also influence access to interbank market liquidity and that size of the bank has more influence on access to interbank market liquidity than the other bank-specific variables considered in the study. This perhaps explains the reasons behind the flight to safety by customers of smaller banks to banks perceived to be large in 2015 and 2016. Lastly, the results of robustness test support the earlier observations by the study which found a significant influence of the level of economic activity and size of the bank on access to liquidity from the interbank market in Kenya.

The study recommends that bank managers should constantly monitor key macroeconomic and bank-specific factors to ensure adherence and compliance to prudential guidelines on bank liquidity management. The study further recommends that policymakers should put in place policies which encourage banks to lend liquidity to each other in order to minimize incidences of bank collapse.

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