Determinants of Commercial Banks Liquidity in Botswana

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Abstract:
The paper empirically analyzes the determinants of the liquidity of commercial banks in Botswana using a multiple linear regression model between 2009 and 2016. On the basis of two indicators of liquidity risk, the research paper estimates the same group of determinants that co-create microeconomic factors (capital adequacy, size of the bank, spread, and non-performing loans) and macroeconomic factors (Gross Domestic Product and inflation). Findings indicated that significant factors that determine the liquidity of the commercial banks in Botswana are the size of the bank, non-performing loans and spread (the difference between interest rate loans and interest rates on deposits). Size of the bank and spread have a negative impact on bank liquidity whereas non-performing loans have a positive impact. The implication of these findings is that Bank of Botswana should devise legal requirements that give benchmarks of the above ratios to ensure sustainable liquidity of the commercial banks. This will help create a stable banking and financial sector and provides a conducive environment for sustainable economic growth and development.

Keywords: Liquidity risk, Bank size, Spread, Non-performing loans, MLRM, Botswana

1.0 Introduction
According to the Bank for International Settlement (2009), during the global financial crisis, many banks struggled to maintain adequate liquidity. In order to sustain the financial system, unprecedented levels of liquidity support were required from central banks. Even with such extensive support, a number of banks failed were forced into mergers or required resolution (Teply 2011). The crisis showed the importance of adequate liquidity risk measurement and management. The aim of this paper is to identify determinants of liquidity of commercial banks in Botswana from the year 2009 to 2016.

A robust financial system enables an economy to be more productive as it allows investors with few resources to use savings from those with few prospects of investing. Moreover, with regard to liquidity, the fundamental role of banks in the maturity transformation of short-term deposits into long-term loans makes banks inherently vulnerable to liquidity risk, both of an institution-specific nature and that which affects markets as a whole. Liquidity creation itself is seen as the primary source of economic welfare contribution by banks but also as their primary source of risk. Therefore, virtually every financial transaction has implications for a bank’s liquidity.

In recent years, the world economy has experienced a number of financial crises. Often, at the center of these crises are issues of liquidity provision by the banking sector and a financial market. For example, when crises are likely to arrive, banks seem less willing to lend and hold more liquidity due to the low level of liquidity in the market for external finance (Acharya et al., 2011). Berger and Bouwman (2009) found the connection between financial crises and bank liquidity creation: the subprime lending crisis was preceded by a dramatic build-up of positive abnormal liquidity creation, which implies that “too much” liquidity creation may also lead to financial fragility. Acharya and Naqvi (2010) are also successful in explaining how the seeds of a crisis may be sown when banks are flush with liquidity. Hence, bank liquidity management is important for both bank managers and policymakers in safeguarding overall financial stability.

The Botswana financial sector is largely bank-based as the secondary market is still not established in the country. Banks dominate the financial sector in Botswana and as such, the process of financial intermediation in the country depends heavily on banks. Hence, keeping their optimal liquidity for banks in Botswana is very important to meet the demand by their present and potential customers.

Of note, in Botswana studies in relation to determinants of the banking industry’s liquidity considering both bank-specific and macroeconomic factors are very scanty. In general, the lack of sufficient research on the determinants of bank liquidity in the context of Botswana and the existence of a knowledge gap in the area initiated this paper. Therefore, this paper seeks to fill the gap by providing information about the bank-specific and macroeconomic factors that affect
Botswana commercial banks’ liquidity. Therefore, the objective of this study is to investigate the determinants of bank’s liquidity in commercial banks in Botswana for the period 2009 to 2016.

The scope of the study is restricted to the assessment of the bank-specific and macroeconomic factors affecting bank liquidity of all commercial banks that are listed on the Botswana Stock Exchange from the year 2009 to 2016. The banks that are the researcher’s main focus are Barclays Bank of Botswana Limited, First National Bank of Botswana and Standard Chartered Bank of Botswana Limited as these are the only banks listed on Botswana Stock Exchange over that period.

2.0 Literature Review

According to Bessis (2009), bank liquidity is the ability of the bank to fund increasing assets and meet obligations when due, without incurring unacceptable losses. Failure by banks to manage liquidity brings about liquidity risk. Liquidity always comes first; without it, a bank does not open its doors, and with it a bank may have time to solve its basic problems (Hutchison, 2007). Liquidity management is a crucial element in the management of an institution; it is, therefore, important for management of any banking institution to not only measure liquidity on an ongoing basis but also examine ways of how to fund liquidity requirements during distress (Vodova, 2012).

Agency Theory reiterates that agency problem are an important determinant of corporate liquidity. The theory suggests that corporations in countries where shareholders’ rights are not well-protected hold up to twice as much cash as corporations in countries with good shareholder protection. In addition, when shareholder protection is a poor, factor that generally drives the need for liquidity, such as investment opportunities and symmetric information, actually becomes less important. Managers actually hold larger liquid assets when it is easier to access capital markets (Dittmar et al., 2002 and Wojcik-Mazur, 2012).

Reserve management theory focuses on a bank’s funding or liquidity risk to manage liquidity challenges and in deciding how much cash and other liquid assets they should hold. Banks internalize the fact that they can withdraw funds either from the interbank market or the central bank in case of unexpected contingencies (Agenor et al., 2004).

According to Repullo (2004) the elasticity theory can be used to measure the relationship between non-performing loans at a bank and the liquidity risk at a bank. Normal goods have positive performing loans and high elasticity of demands, that is when the banks improve on their collection periods and strategies, hence an increase in bank liquidity.

Most countries set a minimum liquid asset reserve requirement to strengthen their monetary policy. The depository institutions are therefore required to hold minimum ratios of liquid assets to deposits and this allows the central bank to gain greater control over the growth of deposits (Wooldridge, 2012). Therefore most banks may wish to maintain a low level of liquidity in order to create credit. The regulators would also wish to improve solvency and reduce vulnerability of financial institutions to systematic liquidity shocks. Figure 1 below fully explains both internal and external liquidity risk determinants:

**Figure1: Taxonomy of Liquidity Risk**
Funding liquidity risk relates to a situation where the bank is unable, in a given time perspective, to meet its obligations when they fall due. Drehmann and Nikolaou (2009) indicate, in particular, that funding liquidity risk includes two elements: future (random) money inflows and outflows, and future (random) prices of various sources that provide funding liquidity. Brunnermeier (2009) noticed that in certain circumstances market and funding liquidity risk can reinforce each other. That may create a phenomenon called a liquidity spiral, especially in the presence of systematic risk.

A bank may be forced to sell some of its assets in case it is not able to roll over its liabilities. Unfortunately, such a fire sale causes the depreciation of asset prices. If the assets of the bank are marked-to-market, they will be shrinking, which makes the raising of funds even more difficult (Nikolaou 2009). Therefore the difficulties of one bank may have an extreme impact on other banks and even the entire economy. The significance of this risk relates to the fact that the probability of liquidity shocks is low, yet they can create severe negative effects, so in prosperous times this risk is often underestimated (Bonfim and Kim 2012). Such an exemplification is the financial crisis in 2007/8.

Aspachs and Tiesset (2005)’s study of English banks assumed that the liquidity ratio as a measure of liquidity should be dependent on the following factors, (with estimated influence on bank liquidity in parenthesis), probability of obtaining the support from lender of last resort, which should lower the incentive for holding liquid assets (-); interest margin as a measure of opportunity costs of holding liquid assets (-); bank profitability, which is according to finance theory

negatively correlated with liquidity (-): loan growth, where higher loan growth signals increase in illiquid assets (-); size of bank (?); gross domestic product as an indicator of business cycle (-); short term interest rate, which should capture the monetary policy effect (-).

A research was done by Fielding (2005) on Egypt commercial banks considered the determinants of liquidity to be the level of economic output (+); discount rate (+); reserve requirements (?); cash to deposit ratio (-); Rate of depreciation of the black market exchange rate (+); impact of economic reform (-); and violent political incidence (+). The approach was entirely unique because it took into consideration political risk as an important factor in explaining the liquidity of the bank.

Lucchetta (2007) researched European countries and showed that liquidity should be influenced by behaviour of the bank on the interbank market and a positive relationship attained. The more liquid the bank is, the more it lends in the Intermarket. The interbank rate was included as an explanatory variable as a measure of incentives of banks to hold liquidity. The monetary policy interest rate was included as a measure of bank’s ability to provide loans to customers. Share of loans on total assets and share of loan loss provisions on net interest revenues were taken both as a measure of risk-taking behaviour. Bank size was measured by logarithm of total bank assets.

Valverde and Fernández (2007) examined the determinants of bank margins in seven European countries. As a proxy for liquidity risk, they used the ratio liquid assets / short term funding. Liquidity risk, according to their analysis, is significantly and positively affected by the spread.

Bunda and Desquilbert (2008) investigated the determinants of liquidity risk of banks from emerging economies. The liquidity ratio as a measure of banks’ liquidity was assumed to be dependent on total assets as a measure of the size of the bank (-); the ratio of equity to assets as a measure of capital adequacy (+); the presence of prudential regulation, which means the obligation for banks to be asset liquid enough (+); the lending interest rate as a measure of lending profitability (-); the share of public expenditures on gross domestic product as a measure of supply of relatively liquid assets (-); the rate of inflation, which increases the vulnerability of banks to nominal values of loans provided to customers (-); the realization of a financial crisis which could be caused by poor bank liquidity (-) and the exchange rate regime, where banks in countries with extreme regimes were more liquid than in countries with intermediate regimes.

Vodova (2011) looked at commercial bank liquidity for the republic of Czech. In this study both bank-specific variables and macroeconomic variables were used as explanatory variables and are share of own capital on total assets of the bank (+); share of non-performing loans on total volume of loans provided by the bank (-); return on equity: the share of net profit on own capital of the bank (-); logarithm of total assets of the bank (+/-); dummy variable for realization of financial crisis(-); growth rate of gross domestic product (-); inflation rate (+); interest rate on loans (-); interest rates on interbank transactions (-); difference between interest rates on loans and interest rates on deposits (-); monetary policy interest rates (-) and unemployment rate (-).

Based on the aforementioned literature, one can conclude that countable studies that have been reviewed above show that commercial banks’ liquidity is determined by both bank-specific factors (e.g. profitability, size of the bank, capital adequacy, risk of the bank), macroeconomic factors (such as gross domestic product, different types of interest rates, change in regulation and political incidents.) and supervisory (e.g. government regulation, reserve requirements ratio, official supervisory power index and private monitoring index). After reviewing the literature it is apparent that the previous studies have not performed a principal study, which could be considered strength in this kind of investigation especially for developing countries like Botswana.

3.0 Methodology
There are various models of bank behaviour in economic literature. From them all, we use models of Freixas and Rochet (1999), Diamond (2007) and Ismal (2010). Diamond (2007) described a bank’s liquidity condition model where deposits were placed in short-term tenors and bank loans were placed in long term tenors. An illustration of two types of investors who might terminate their deposits at time T=1 and time T=2 of three investment periods (T= 0; 1; 2). On the other hand, there was a demand for liquidity from entrepreneurs at time T=1, to be consumed at time T=2. The bank could provide more liquid assets by offering demand deposits to execute the investment to provide for liquidity from entrepreneurs, and

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at the same time, investing in illiquid assets (Diamond, 2007). More appealing has been the model developed by Freixas and Rochet (1999). The main focus was on the bank’s liquidity on the asset and liability sides. There are four assumptions to their model relating to competitive banking deposits, which are (i) banks are risk-neutral, (ii) banks are price takers (iii) banks maximize profit as a motive to balance liquidity on asset and liability, and (iv) there is full information.

Based on the theoretical construction of the liquidity risk models, a panel regression model was employed to investigate the determinants, both microeconomics and macroeconomics, of bank liquidity in commercial banks in Botswana. Observations from three commercial banks (Baclays, FNBB and Standard Chartered) in Botswana overtime periods from 2009 to 2016 were regressed using Ordinary least squares (OLS) regression approach. In assumption the model has linear explanatory variables to the dependent variable and is also linear in parameters. This would ensure an effective adaptation of the ordinary least squares (OLS) approach. The model is modified with respect to data availability and Botswana context following Vodova (2011):

\[ LQR_{it} = c_i + \beta_1 \text{CAD}_{it} + \beta_2 \text{SIZE}_{it} + \beta_3 \text{SPREAD}_{it} + \beta_4 \text{NPL}_{it} + \beta_5 \text{GDP}_{it} + \beta_6 \text{INFL}_{it} + \varepsilon_i \]

Where:

- \( LQR_{it} \) is the liquidity risk at bank \( i \) at time \( t \)
- \( \text{CAD}_{it} \) is the capital adequacy ratio at the bank \( i \) at time \( t \)
- \( \text{SIZE}_{it} \) is the natural logarithm of total assets at the bank \( i \) at time \( t \)
- \( \text{SPREAD}_{it} \) is the difference between interest rate loans and interest rates on deposits at bank \( i \) at time \( t \)
- \( \text{NPL}_{it} \) is non-performing loans at the bank \( i \) at time \( t \)
- \( \text{GDP}_{it} \) is the domestic credit provided by the banking sector to GDP (gross domestic product)
- \( \text{INFL}_{it} \) is the inflation of a country

\( t = 2009 \) to \( 2011 \), (yearly data)

- \( c_i \) is the constant for each bank (fixed effects).
- \( \beta \) represents bank-specific factors coefficients.

The financing gap ratio is used as the proxy for liquidity ratio (LQR). The financing gap ratio is the ratio of financing gap to total assets. It is the difference between bank’s loans and customer deposits (Shen, 2009).

Bank specific variable includes capital adequacy ratio (CAD), size of the bank (BSIZE), difference between interest rates on loans and interest rates on deposits (SPREADS), non-performing loans (NPL), and macroeconomic variables include gross domestic product (GDP) and inflation (INFL). The error term (\( \varepsilon \)) is important for it captures the influence of all independent or exogenous variables that are excluded in the model.

### 4.0 Results analysis

The gathered data on evaluating the determinants of liquidity risk in Botswana was obtained from and was analyzed using E-Views. The following table shows descriptive statistics of the data:

#### Table 1: Descriptive statistics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Observations</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIQ</td>
<td>24</td>
<td>73.4533</td>
<td>14.46959</td>
</tr>
<tr>
<td>CAD</td>
<td>24</td>
<td>9.9217</td>
<td>2.24436</td>
</tr>
<tr>
<td>BSIZE</td>
<td>24</td>
<td>7.1088</td>
<td>0.10314</td>
</tr>
<tr>
<td>SPREAD</td>
<td>24</td>
<td>11.6808</td>
<td>4.54586</td>
</tr>
<tr>
<td>NPL</td>
<td>24</td>
<td>3.3175</td>
<td>2.05025</td>
</tr>
<tr>
<td>GDP</td>
<td>24</td>
<td>14.2212</td>
<td>1.77760</td>
</tr>
<tr>
<td>INFL</td>
<td>24</td>
<td>5.8888</td>
<td>2.11723</td>
</tr>
</tbody>
</table>

Source: Author’s computation

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Mean and the standard deviation of the variables under study are shown. The mean of bank liquidity is 73.5%. A higher mean liquidity rate indicates that Botswana banks have got too much liquidity lying idle instead of making money for the bank. Therefore most banks may wish to maintain a low level of bank liquidity in order to create credit. The capital adequacy mean is 9.92%. This implies that banks have very low capital adequacy reserves. Baumol and Blinder (1988) cited in Vodova (2011) observed that if the required reserve ratio is some fraction R, an injection of 1$ of excess reserve in to the bank will result in the creation of 1/r in new money. Marshall (2014), denotes that banks will want to squeeze the maximum possible money supply out of any given amount of capital adequacy by keeping their reserve at a minimum when the demand for bank loans is buoyant, profits are high and many investments suddenly start to look profitable. Nevertheless banks are to hold portfolios that are not too risky as to jeopardize their operations in the long run.

Bank size mean statistical ratio is 7.11%. The size of the firm is depicted by the value of the assets and the size of its annual revenues that is the bank size. Moore (2010) report that large firms with greater access to the capital markets and those with high credit ratings tend to hold lower liquid assets. They also argue that there could be economies of scale in cash management that are related to firm size. Mureithi (2003) finds evidence that provides strong support for the hypothesis that growth options, size and cash flows of firms exert a positive impact on firms’ liquidity holding decisions and that firms with other liquid assets tend to hold less cash.

The mean of non-performing loans is 3.32%; this implies that the banks are maximizing on debt collections and there is enough liquidity to offer loans. The average gross domestic product is 14.2% and a low inflation rate of 5.89% which is favorable for banks' liquidity. The following table denotes the correlation matrix results.

**Table 2: Correlation matrix results**

<table>
<thead>
<tr>
<th>Variables</th>
<th>LIQ</th>
<th>CAD</th>
<th>BSIZE</th>
<th>SPREAD</th>
<th>NPLs</th>
<th>GDP</th>
<th>INFL</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIQ</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAD</td>
<td>0.589</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BSIZE</td>
<td>0.312</td>
<td>0.505</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPREAD</td>
<td>-0.713</td>
<td>-0.265</td>
<td>-0.440</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPLs</td>
<td>-0.046</td>
<td>0.501</td>
<td>0.263</td>
<td>0.533</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>0.705</td>
<td>0.617</td>
<td>0.354</td>
<td>-0.730</td>
<td>-0.159</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>INFL</td>
<td>-0.590</td>
<td>-0.279</td>
<td>-0.668</td>
<td>0.675</td>
<td>0.068</td>
<td>-0.395</td>
<td>1.000</td>
</tr>
</tbody>
</table>

*Source: Author’s computations*

The correlation matrix table above outlines that there are no highly correlated variables exceeding 0.8. This suggests that is no existence of perfect square among some variable included in the regression model. The highest correlation figure is 0.705, and the lowest is -0.730. Therefore the researcher did not reject H0 since there are no variables with perfect linear relationship and concluded that there is absence of multicollinearity. The following table shows the regression analysis results:

**Table 3: Summary of regression Results**

<table>
<thead>
<tr>
<th>Model</th>
<th>B</th>
<th>Std.Error</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>c</td>
<td>668.415</td>
<td>174.096</td>
<td>3.839</td>
<td>0.001</td>
</tr>
<tr>
<td>CAD</td>
<td>2.219</td>
<td>1.398</td>
<td>1.588</td>
<td>0.131</td>
</tr>
<tr>
<td>BSIZE*</td>
<td>-80.922</td>
<td>23.239</td>
<td>-3.482</td>
<td>0.003</td>
</tr>
<tr>
<td>SPREAD*</td>
<td>-3.090</td>
<td>1.067</td>
<td>-2.896</td>
<td>0.010</td>
</tr>
<tr>
<td>NPLs ***</td>
<td>3.255</td>
<td>1.801</td>
<td>1.807</td>
<td>0.088</td>
</tr>
<tr>
<td>GDP</td>
<td>-0.382</td>
<td>1.742</td>
<td>-0.219</td>
<td>0.829</td>
</tr>
<tr>
<td>INFL</td>
<td>-1.869</td>
<td>1.298</td>
<td>-1.440</td>
<td>0.168</td>
</tr>
</tbody>
</table>

*Significant at 1%, **significant at 5%, ***significant 10%*

The researcher substituted the coefficients from the summary of regression results on the table and obtained the following equations:

\[
LIQ = 668.415 + 2.219CAD - 80.922BSIZE - 3.090SPREAD + 3.255NPLs - 0.382GDP - 1.869INF
\]

The summary regression results show that three out of six variables were found to be significant. The significant variables are bank size (BSIZE), Spread (SPREAD), and non-performing loans (NPLs). The rule of thumb states that t-statistic should be greater than 2 for a variable to be significant and p-value (sig) has to be within (1%-10%). Based on output coefficients the obtained value of p-values (sig) the p-value of all variables is more than 0.05, which is p>0.05, it can be concluded that there is no heteroscedasticity problem.
If bank size adds an additional unit on its portfolio, the bank liquidity tends to decrease by approximately -80.9%. An additional unit increase of spread will decrease the bank liquidity by 3.09%. A unit increase in the non-performing loan will increase the bank liquidity by 3.26%. The findings of this study seem to be consistent with those of Bunda and Desquilbert (2008).

The results of the study found, bank size (FSIZE), the difference between interest rate loans and interest rates on deposits (SPREAD), and non-performing loans (NPLs) to be statistically significant. The difference between interest rate loans and interest rates on deposits (SPREAD), and non-performing loans (NPLs) are both negatively correlated to bank liquidity. The results proved to be in line with the findings of previous researchers Vodova (2011) and Bunda and Desquilbert (2008).

5.0 Conclusions and recommendation
This study was premised on examining both microeconomics and macroeconomic determinants of commercial banks’ liquidity in Botswana. This was done with the purpose of establishing which among identified determinants affects banks’ liquidity mostly. The study was based on quarterly data covering the period 2009 to 2016. The results reveal that non-performing loans are the main determinant of commercial bank’s liquidity in Botswana and this relationship was positive as well as statistically significant. This suggests that bank size and spread enhances the commercial bank’s ability to generate sufficient liquidity at a given time period.

The policy implications arising from this research relate to the question of whether there is a need to focus on the ensuring that there is enough liquidity in the commercial banks to ensure an effective and efficiency cash holding and intermediation function of banks. Therefore the paper recommends the need for commercial banks to hold enough cash reserves to facilitate profitability and stability of the financial institutions. Also, the Central Bank of Botswana needs to lower its legal reserve requirement ratio and strict supervisory especially in liquidity of the commercial banks. This will go hand in hand in ensuring that commercial banks remain liquid, accept deposits from savers and lend those deposits to potential investors to ensure a sound and stable banking industry for sustainable economic development.

References


