The Relationship and effect of Credit and Liquidity Risk on Bank Default Risk among Deposit Money Banks in Nigeria

Ndifon Ejoh[1]* Inah Okpa[1]* Ebong Inyang[2]

1. Department of Accountancy, Cross River University of Technology, Calabar, Cross River State, Nigeria
2. Department of Accountancy, Federal university Wukari, Taraba State, Nigeria
   *E-mail of corresponding author: Email: ndifon.ejoh@yahoo.com and ndifonejoh@gmail.com
   *E-mail of co-author: inahokpa@yahoo.co.uk and inahokpa@gmail.com

Abstract

This paper on the relationship and effect of Credit and Liquidity Risk and on Bank Default Risk among Deposit Money Banks in Nigeria is aimed at assessing the extent to which the relationship between credit risk and liquidity risk influence the probability of bank defaults among deposit money banks, a study of First bank of Nigeria Plc. The study adopted experimental research design where questionnaires were administered to a sample size of eighty (80) respondents. The data obtained were presented in tables and analyzed using simple percentages. The formulated hypotheses were tested using the Pearson product moment correlation and chi-square statistical tool. The results of the study revealed that there is a positive relationship between liquidity risk and credit risk. This is based on the fact that an increase in credit risk (bad loan), the loan (asset) portfolio of such a bank is negatively affected causing an increase in bank illiquidity. Also, liquidity risk and credit risk jointly contribute to bank default risk. Based on the findings, it was recommended that internal loan and credit monitoring strategies should be implemented in full to ensure that loans and credit granted to customers are collected in full plus interest thereon and deposit money banks should not maintain excess liquidity simply because they want to effectively manage their liquidity position.

1. Introduction

The impact of liquidity in the management of financial institutions such as deposit money banks remained fascinating and intriguing, though very elusive in the process of an investment analysis visa-visa bank portfolio management. There appears to be an interminable argument in the literature over the years on the roles meaning and determinants of liquidity and credit management. The Nigeria financial environment has noticed increase in credit which has become a problem to the country. Banks have traditionally provided liquidity on demand both to borrowers with open lines of credit and un-drawn loan commitments and to depositors in the form of checking and other transactions account. In fact the combination of these two products in a single firm constitutes working definition of a bank. The liquidity insurance role of banks however exposes them to the risk that they will have insufficient cash to meet random demands from their depositors and borrowers.

 There is a large theoretical literature that attempts to understand banks role in liquidity production. This literature initially emphasized this risk associated with demand deposits that expose banks to the possibility of a catastrophic run. Diamond and Dybig (1983) explain the structure of banks by arguing that by pooling their funds in an intermediary, agents can insure against idiosyncratic liquidity shocks while still investing most of their wealth in high-return but illiquid projects. This structure however, leads to the potential for a self-fulfilling bank run and sets up a policy rationale for deposit insurance. More recent theoretical and empirical studies have focused on liquidity risk coming from the asset side of the bank's balance sheet. Banks that make commitments to lend are exposed to the risk of unexpected liquidity demands from their borrowers.

 Credit control is described to maximize the value of the firm by achieving a trade off. The purpose of credit control is to maximize sales while minimizing the risk of bad debt as far as possible. In fact the firm should manage its credit in such a way that sales are expanded to an extent to which risk remain within an acceptable limit. These costs include the credit administration expenses, bad debt losses and opportunity cost of the fund tied up in receivables. The aim of liquidity management should be to regulate and control these cost that cannot be eliminated together.

1.1 Objective of the study

Given the increased range of banks client (depositors and loan customers) and volume of credit transactions in the Nigerian economy, it is expedient for banks to have a full fledged Cash monitoring policy in order to remain in business. The cash credit monitoring will enable the bank grant credit to customers and sectors applying for loans at an agreed interest rate which is an income to boost the profit level of banks and at the same time ensuring the availability of adequate cash and liquid assets to meets it financial obligation.

Thus, the objectives of this paper include but not limited to the following:

 a. To assess to what extent credit risk and liquidity risk influence the probability of bank defaults.

b.   To establish the relationship between credit risk and liquidity risk in deposit money banks

1.2   Research Hypotheses
Hypothesis I
Ho: There is no positive relationship between liquidity risk and credit risk in deposit money banks.
Hi: There is a positive relationship between liquidity risk and credit risk in deposit money banks.
Hypothesis II
Ho: Liquidity risk and credit risk do not jointly contribute to bank probability of default.
 Hi: Liquidity risk and credit risk jointly contribute to bank probability of default.

1.3   Organisation of the study
The rest of the paper is organized in four sections. The literature review is contained in section 2. Research methodology is found in section 3. Section 4 contains data presentation, analysis and discussion of findings, while conclusion and recommendations are stated in section 5.

2.   Review of Related Literature
Credit risk is a serious threat to the performance of banks which when unchecked would lead to the total collapse of banks. Liquidity risk also act as a snare to banks with an unsound risk assessment and control policy. In the face of current events in the banking sector, these two risks cannot be ignored as they have considerable bearing on the performance and survival of banks (Coyle, 2000). In order to reduce the combined effect of these risks on the overall default risk of banks, there is need for efficient credit and liquidity management policies to be formulated and fully implemented in banks.

Credit management policy is a comprehensive process that deals with identifying the target markets, credit extension; credit monitoring and identifying the proceeds. Credit management policy entails the mechanisms, standards and parameters that guide the bank officers in granting loans and managing the loan portfolio under the banking discipline. It is a set of guidelines designed to maximize cost associated with credit while maximizing benefits from it (McNaughton, 1996). Marsh (2008) further added that credit management policy assist financial institutions' credit department in the extension of credit privileges governed by rules and guidelines established by top management.

According to Jhingan (2010), a bank needs a high degree of liquidity in its assets portfolio. The liquidity of assets refers to the ease and certainty with which it can be turned into cash. The bank must hold a sufficient large proportion of its assets in the form of cash and liquid assets for the purpose of profitability. If the bank keeps liquidity the uppermost, its profit will be low. In the other hand, if it ignores liquidity and aims at earning more, it will be disastrous for it. This in managing is investment portfolio a bank must strike a balance between the objectives of liquidity and profitability. This balance must be achieved with a relatively high degree of safety.

According to Graham (1990), profitability is always associated with performance and productivity, therefore true pure profit is the increase in wealth that an investor gets out making an investment taking into consideration all costs associated with it including the opportunity cost of capital. In the banking industry, every credit granted attracts an interest to the bank. Hence bank lending operations are risky but very profitability. In order to minimize these risks inherent in banking activities, there is need for efficient, effective and strategic credit and liquidity management, which will in turn accelerate the tempo of profits.

2.1 The relationship between liquidity risk and credit risk
What is the relationship between liquidity risk and credit risk in financial institutions? Classical theories of macroeconomics of banking support the view that liquidity risk and credit risk are closely linked. Both industrial organization models of banking such as the Monti-Klein framework and the financial intermediation perspective in Bryant(1980) and Diamond and Dybig (1983), suggest that a bank asset and liquidity structure are closely connected, especially with regards to borrowers default and fund withdrawals.

Over the past 50 to 60 years, a tremendous amount of literature has dealt with banks' liquidity and credit risks. The financial intermediation models view banks as pools of liquidity which provide both depositors and borrowers with the ready availability of cash, thereby enhancing economic welfare and internalizing economic liquidity risk while the industrial organization approach models view banks as profit maximizing price takers in oligopolistic loan and deposit markets; on the asset side, banks generate returns through loan interest rates on the liabilities side bank face costs through deposit interest rate. The models of both stands of literature suggest that at least in theory there is a relationship between liquidity and credit risk. A liquidity risk is seen as a profit lowering cost, a loan default increases this liquidity risk because of the lowered cash inflow and depreciation it triggers.

Diamond and Rajan (2005) opined that there is a positive relationship between liquidity risk and credit risk. This model is based on the premise that banks obtain money from unskilled depositors which is used for lending. Problems arise if too many economic projects funded with loans yield insufficient funds (or even defaults) and the bank cannot meet depositors' demands. Due to this asset deterioration, more and more depositors will claim back their money. The bank will call in all loans and thereby reduce aggregate liquidity. The result is therefore that higher credit risk accompanies higher liquidity risk through depositors demand. According to Acharya (2011), financial firms raise debts which have to be rolled over constantly and which is used to finance assets and as such more debt in the banking system yields a higher "bank-run" risk. In times of crisis when assets prices deteriorate, banks find it more difficult to roll over debt, this becomes a liquidity problem.

Having established the relationship between liquidity and credit risk from a theoretical perspective, the logical follow-up question then is how are banks affected by this relationship in their overall risk structure? Gatev and Strahan (2009), said that banks' default risks is mainly driven by low capitalization, low earnings, over exposure to certain categories of loans and excessive loan default. To him, excessive investment banking activities, bad macroeconomic conditions in the banks immediate vicinity, low equity and heavy concentrations in real estate loans substantially increase bank probability of default.

From the theoretical evidence presented above, and the anecdotal evidence of bank failure during the recent crisis in Nigeria, it can be an indication that the joint occurrence of liquidity risk and credit risk might have played a role in causing banks default and institutionalized collapse of deposit money banks in the Nigerian financial environment.

2.1.1 The Influence of Liquidity Risk and Credit Risk on Bank Default Probability

From a theoretical perspective, the relationship between liquidity risks and credit risks therefore seems to be clearly established. The logical follow-up question then is: how are banks affected by this relationship in their overall risk structure? To derive a testable hypothesis for this question, we draw on the literature explaining bank defaults. After all, the ultimate risk a bank faces is the risk of going out of business. A thorough understanding of bank risk should therefore focus on bank default reasons. There is a vast body of empirical literature testing the influence a wide variety of accounting-, market- and general economic factors have on banks' PDs. Papers such as Meyer and Pfifer (1970), Martin (1977), Whalen and Thomson (1988), Espahbodi (1991), Thomson (1991, 1992), Cole and Fenn (1995), Cole and Gunther (1995, 1998), and Kolari, Glennon, Shin and Caputo (2002) show that banks'default risk is mainly driven by low capitalization, low earnings, over-exposure to certain categories of loans, and excessive loan defaults. Aubuchon and Wheelock (2010), Ng and Roychowdhury (2011), Cole and White (2012), Berger and Bouwman (2013), and DeYoung and Torna (2013) are especially relevant to our work because they focus on bank defaults during the recent financial crisis. Generally, they find that excessive investment banking activities, bad macroeconomic conditions in the banks' immediate vicinity, low equity, and heavy concentrations in real estate loans substantially increased banks' PDs during the recent crisis. Interestingly, all these studies provide clear evidence that credit risk plays a vital part for the overall stability condition of a bank, but largely ignore liquidity risk. Although some studies include proxies for liquidity, they mostly focus on the CAMEL-based6 asset-side liquidity (i.e. the relationship of short-term to long-term assets) or the general funding liquidity (such as the ratio of short-term to long-term deposits). Maturity transformation risks are therefore largely ignored, just as the relationship between liquidity risks and credit risks.

Deeper insight into the matter is only provided by two papers. An empirical study of Acharya and Mora (2013) explains the role of banks as liquidity providers during financial crises. In doing so, they provide evidence that failed banks during the recent financial crisis suffered from liquidity shortages just before the actual default. Apparently, distressed banks faced severe liquidity issues, especially in comparison to healthy banks. They document this by showing that failed or near-failed banks scramble for (retail) deposits by offering high CD rates in aggressive marketing campaigns. Indirectly, their results point to the fact that the joint occurrence of liquidity and credit risk might push banks into default. A more direct channel of how liquidity and credit risk can jointly cause default is theoretically shown by He and Xiong (2012b). They analyze the relationship between liquidity and credit risk from a company's wholesale funding perspective. The channel they identify which connects liquidity risk to credit risk and ultimately with default risk is debt rollover risk. The results of the paper show that investors demand higher illiquidity premia for corporate bonds due to liquidity risk in the market for corporate bonds. Upon rolling over their companies' debt in illiquid bond markets and in order to avoid default, equity holders of the issuing firms must pay for the difference between the lower liquidity premia in matured bonds and the higher illiquidity premia in newly issued bonds.

As a consequence of having to absorb these losses on behalf of the debt holders, equity holders might therefore choose to default earlier. An illiquidity shock in corporate debt markets can therefore lead to higher default rates. Although the presented model encompasses corporate debt in general, they specifically relate their results to financial institutions. The findings of He and Xiong (2012b) are especially relevant in light of recent research showing that companies, especially financial institutions, are prone to very shortterm debt structures (Brunnermeier and Oehmke, 2013), which increase the frequency of debt rollovers.

3. Research Methodology

A cross sectional study design was used where data was collected to ascertain the relationship between the independent variables (x) and the dependent variables (y). The research design used in this study is the experimental research design which was used by the researcher to test the formulated hypotheses in order to teach a valid conclusion about the relationship between the variables that are being tested.

The unit of analysis for the questionnaire is organization. All responses pertaining to both dependent and independent variables are measured on six-point Likert scale. The data collected were analyzed by Pearson correlation test and chi- square test.

In testing hypothesis one with correlation, the responses of the respondents are ranked in order of strength;

Strongly Agree (SA)   -5

Agree (A)   -4

Undecided (U)   -3

Disagree (D)   -2

Strongly Disagree (SD)   -1

The ranked responses are called the "X" variables while the number of respondents to a given response is the "Y" variables. Using the Pearson product moment correlation, the degree of relationship of the variables is expressed as:

$$r = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{\{[N\sum (X)^2 - (\sum X)^2][N\sum (y)^2 - (\sum y)^2]\}}}$$

Where:

r = Correlation result (coefficient)

N = Number of Items

$\sum$ = Summation

Decision Rule:

a.   If r =0.0 – 0.3 there is negligible relationship, hence, accept Ho (the null hypothesis)

b.   If r = 0.3 -0.5, there is a low relationship, Hence accept Ho.

c.   If r = 0.5-0.8, these is a substantial relationship. Hence, reject Ho and accept Hi

d.   If r = 0.9-1.0, There is a very high relationship hence, reject Ho and accept Hi.

In testing the hypotheses with the chi-square, the tabulated data obtained from respondents is referred to as the observed frequency. To obtain the expected frequencies contingency table, the frequencies in the cells are computed thus

Frequency = RT × CT ÷ GT

Where:

RT   = Row Total

CT   = Column Total

GT   = Grand Total

      Having obtained the expected frequency table, the computed chi-square table is drawn to obtain the computed X^2 value with the formula expressed as;

$$X^2 = \sum \frac{(Fo - Fe)^2}{Fe}$$

X^2 = Chi-square

Fo   = Observed Frequency

Fe   = Expected Frequency

The tabulated chi-square (X^2) value is computed using a degree freedom of (C-1) (R-1) at 0.05 level of significance

Decision Rule: If the calculated chi-square is greater than the tabulated chi-square, reject the null hypothesis (Ho) and accept the alternative hypothesis (Hi). If otherwise, the reverse is the case.

4. Data Analysis and Test of Hypotheses

4.1 Data analysis

Table 1: There is a positive relationship between credit risk and liquidity risk in banks

Reponses	Male	Female	Total	Percentage (%)
SA	20	15	35	44
A	10	10	20	25
U	10	0	10	12
D	0	0	0	0
SD	10	5	15	19
Total	50	30	80	100

Source: Field Survey 2014.

Table 2: Liquidity risk and credit risk jointly affect bank probability of default

Reponses	Male	Female	Total	Percentage (%)
SA	35	5	35	44
A	10	10	20	25
U	10	0	10	13
D	0	5	5	5
SD	0	10	10	13
Total	50	30	80	100

Source: Field Survey 2014.

Table 3: The level of bank liquidity affects the investment portfolio performance of banks

Reponses	Male	Female	Total	Percentage (%)
SA	40	20	60	75
A	10	5	15	19
U	0	5	5	6
D	0	0	0	0
SD	0	0	0	0
Total	50	30	80	100

Source: Field Survey 2014.

Table 4: Banks are aware of the increasing effect of credit and liquidity risks on bank performance

Reponses	Male	Female	Total	Percentage (%)
SA	19	8	27	34
A	16	4	20	25
U	4	3	7	9
D	11	10	21	26
SD	0	5	5	6
Total	50	30	80	100

Source: Field Survey 2014

In table 1, 44% strongly agreed, 12% agreed, 0% were undecided, 19% disagreed and 0% strongly disagreed that there is a positive relationship between liquidity risk and credit risk.

In table 2, 44% strongly agreed, 25% agreed, 13% were undecided, 5% disagreed and 13% strongly disagreed that liquidity and credit risk jointly affects bank probability of default.

In table 3, 75% strongly agreed, 19% agreed, 6% were undecided, that liquidity affects the investment portfolio performance of banks.

In table 4, 34% strongly agreed, 25% agreed, 9% were undecided, 26% disagreed and 6% strongly disagreed that banks are aware of the increasing effect of credit and liquidity risks.

4.2 Test of Hypotheses

Hypothesis I

Ho: There is no significant relationship between liquidity risk and credit risk in deposit banks.

H_1:   There is a significant relationship between liquidity risk and credit risk in deposit banks.

Table 5: Response from question 1

Responses	Total From males and females (frequency)
SA	35
A	20
U	10
D	0
SD	15
Total	80

Source: Field Survey, 2014

Table 6: Pearson product moment correlation of the relationship between liquidity risk and credit risk in deposit banks

Responses (X)	Frequency (y)	X^2	Y^2	XY
5	35	25	1225	175
4	20	16	400	80
3	10	9	100	30
2	0	4	0	0
1	15	1	225	15
$\sum X=15$	$\sum Y=80$	$\sum X^2=55$	$\sum y^2=1950$	$\sum XY=300$

Source: Computation from table 5

$$r = \frac{N\sum XY - (\sum x)(\sum y)}{\sqrt{[N\sum(X)^2 - (\sum X)^2][N\sum(Y)^2 - (\sum Y)^2]}}$$

$$r = \frac{5(300) - (15)(80)}{\sqrt{[5(55) - (15)^2][5(1950) - (80)^2]}}$$

$$r = \frac{1500-1200}{\sqrt{50 \times 3350}}$$

$$r = 300/409.3 = 0.73$$

Decision: The correlation coefficient (r = 0.73) means that there is a very high relationship between the variables tested. We therefore reject Ho and accept Hi which states that there is a positive relationship between liquidity risk and credit risk in deposit banks.

Hypothesis II

Ho: Liquidity Risk and credit risk do not jointly contribute to bank default risk.
Hi: Liquidity Risk and credit risk do jointly contribute to bank default risk.

Table 7: Contingency values of hypothesis II

Responses	Male	Female	Total
SA	30 (21.9)	5 (13.1)	35
A	10 (12.5)	10 (7.5)	20
U	10 (6.3)	0 (3.7)	10
D	0 (3.1)	5 (1.9)	5
SD	0 (6.3)	10 (3.7)	10
Total	50 (50)	30 (30)	80

Source: (Response to question 2)

Table 8: Calculated Chi-square value of the contribution of credit and liquidity risks on bank default risk

Responses	Respondents	Fo	Fe	Fo-fe	(Fo-fe)²	(Fo-Fe)²/Fe
SA	M	30	21.9	8.1	65.61	3.00
	F	5	13.1	-8.1	65.61	5.01
A	M	10	12.5	-2.5	6.25	0.50
	F	10	7.5	2.5	6.25	0.83
U	M	0	6.3	3.7	13.69	2.17
	F	0	3.7	-3.7	13.69	3.70
D	M	5	3.1	-3.1	9.61	3.10
	F	0	1.9	3.1	9.61	5.06
SD	M	10	6.3	-6.3	39.69	6.30
	F		3.7	6.3	39.69	10.73
Total						$\sum = 40.40$

Source: Researcher's computation

The critical chi-square value is computed as

DF = (C-1) (R-1) = (5-1) (2-1) = 4 x 1 =4

The level of significance = 0.05

Hence tabulated X^2 =4df @0.05 =9.488

Decision: Since the computed chi-square value of 40.40 is greater than the critical chi-square value of 9.488 we reject the null hypothesis and accept the alternative which states that liquidity risk and credit risk jointly contribute to bank default risk.

4.3 Discussion of findings

From the presentation of data, analysis of tabulated data and the test of hypotheses, it is evident that the survival of deposit banks is anchored on the strategies formulated and implemented to manage both credit risk and liquidity risk. From the tested hypotheses, the following were observed;

a. There is a positive relationship between liquidity risk and credit risk. This is based on the fact that an increase in credit risk (bad loan), the loan (asset) portfolio of such a bank is negatively affected causing increase in bank illiquidity. Meaning that an increase in credit risk brings a corresponding increase in liquidity risk and vice versa. This finding agrees with the findings of Diamond and Rajan (2005) that advances the existence of a positive relationship between credit risk and liquidity risk.

b. Liquidity risk and credit risk jointly contribute to bank default risk. Default risk is the potentiality of a bank not being able to provide cash for customers' withdrawal and credit application. When a bank's loan in the hands of customers cannot be accounted for by the bank (i.e. cannot be received), the liquidity of the bank becomes reduced, and, in the face of this liquidity dilemma the banks are exposed to runs. Thus, with these combined risks, the bank has a higher probability of default. This finding is further validated by the findings of Gatev and Strahan (2009) who opined that over exposure to certain categories of loan and excessive loan default substantially increase bank probability of default.

5. Conclusion and Recommendations

Deposit money banks that have experienced institutionalized distress and unintentional collapse over the years had loopholes in risk assessment and control policies. Both credit risk and liquidity risks were not adequately and efficiently managed, and this in turn affected the profitability and overall performance of these banks. The increase in loss of profit (accumulated losses) reduced the liquidity of these banks, which eventually led to their liquidation. Credit risks and liquidity risks are positively related, that is to say that there is a direct relationship between credit risk and liquidity risk. If credit risk increases, liquidity risk increases in same proportion, and if credit risk falls, liquidity risk also falls. They also jointly contribute to banks probability of default. If these risks are not properly managed and controlled, banks will have an increasing potential of default in meeting their financial obligations as they fall due.

In conclusion, the result of this study suggests that a joint management of liquidity risk and credit risk in a bank could reduce uncertainties and substantially increase bank stability. This result support and underpins recent regulatory efforts like the Basel III framework and the Dodd frank Act of 1983 which put stronger emphasis on the importance of liquidity risk management in conjunction with the asset quality and credit risk of a bank.

It can thus be recommended that, internal loan and credit monitoring strategies should be implemented in full to ensure that loans and credit granted to customers are collected in full plus interest thereon and banks should not maintain excess liquidity simply because they want to effectively manage their liquidity position. This would help reduce the incidence of cash sterility in the asset of banks.

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