

AN EMPIRICAL PROOF FOR THE MEASUREMENT OF LIQUIDITY RISK IN COMMERCIAL BANKS

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ABSTRACT

Risk in commercial banks is mainly because they fund themselves with liabilities that have very short contractual maturity such as demand deposit and checking of accounts. In such a situation the bank's choices are simplified into three categories namely borrow money from other banks, sell some of the loans possibly at deeply discounted prices or default to the customers and go out of business. For which a derived mathematical formula for the real time data in the specified bank shall be applied for measurement of liquidity risk in two stages of expected funded requirements and unusual funding requirements.

Key words- *Liquidity risk, mathematical formula, borrow money, sell loans, default customers, expected fund, unusual fund*

1.1 INTRODUCTION

The banking sector is considered to be an important source of financing. Among the various risk, the important risk prevailing in the commercial banks is liquidity risk. This risk is the outcome from the disparity involving the maturities of the two sides of the balance sheet. This disparity either results in an excess of cash that wishes to be invested or result in a deficiency of cash that wishes to be funded. Liquidity risk in general arises from the possibilities of the bank's losing money by being locked into a position that is losing value. The risk of defaulting or being forced to sell at a loss is called liquidity risk or cash-crisis risk.(Chris Marrison-2001). On application of the various mathematical formulas and reviewing the balance sheet in brief, the commercial banks identifies the current liquidity position and the associated probabilities of default, modification about the current position shall be proceeded as such - Firstly Borrowing long-term funds in the inter-bank market or issue bonds and then use the proceeds to buy liquidity assets, such as government bonds to be sold or pledged in times of crisis. Secondly establish contingent standby lines of credit with other commercial banks, whereby the bank providing the line of credit, guarantees to give funds in a time of crisis. But this method is expensive and therefore this can be followed when the bank is facing severe liquidity risk. Thirdly, the amount of funds lent for long maturities in the interbank market shall be limited. It shall be used only in the overnight market for lending the proceeds from demand deposit accounts such as checking. By practicing this method though it gives a relatively low yield, still would perfectly match the contractual cash flows and eliminate liquidity risk. Fourthly, the commercial banks shall reduce the liquidity of the bank's liabilities by promoting fixed deposit instead of saving accounts and encourage customers with short-term fixed deposits to move to longer-term fixed deposits by offering them higher inter rates for more illiquid products. The commercial banks can also reduce the value of the customer's option for early withdrawal be adding early-with-drawl penalties and thereby increasing the exercise price.

1.2 REVIEW OF LITERATURE

The following reviews are done to identify the gaps in the literature

Governor Randall S. Kroszner(2008) stated that banks need to carefully manage their own exposure to liquidity risks by evaluating and addressed on an enterprise-wide basis, and should be tightly integrated with capital planning.

Lev Ratnovski (2007) studies the options for bank's liquidity risk management by suggesting that both liquidity and transparency are important hedges and be combined in risk management. It was found out that more liquid banks will be resilient to small shocks, while more transparent banks able to withstand large shocks as well.

Yoram Landskroner and Jacob Paroush(2008) in their study constructed a stylized model of bank management with asset and liabilities liquidity structure for determining the bank's exposure to liquidity risk and found that increased competition in credit market will increase the liquidity shortage while increasing competition in deposit market will reduce the liquidity shortage.

Jian Cai and Anjan V. Thakor (2008) examines the impact of inter-bank competition on the liquidity risk and credit risk and identified that greater inter-bank competition increases loan liquidity and reduces each bank's overall risk, which includes credit and liquidity risks.

Gianfranco A. Vento and Pasquale La Ganga (2008) highlight the features for an effective liquidity risk management to achieve a more integrated supervisory framework for global markets and found out the most important lessons concerning liquidity management from recent financial crisis.

Evan Gatev, Til Schuermann Philip E. Strahan(2009) presents a systematic analysis and reduction of bank liquidity risk by combining deposit taking and commitment lending and found out that liquidity risks are offsetting rather than reinforcing i.e. the combining deposits and commitment lending provide liquidity risk hedge for banks.

Muhammad Farhan Akhtar, Khizer Ali, Shama Sadaqat Hailey(2011) analysed in his study that the liquidity risk is associated with the solvency of a financial institution and concluded that Capital adequacy ratio in conventional banks and return on assets is found to be positive and significant.

Ahmed Arif, Ahmed Nauman Anees, (2012) expressed liquidity risk in banks and its effect on banks' profitability and concluded that multiple regressions shall be applied to show that liquidity risk affects bank profitability significantly.

1.3 GAPS IN THE LITERATURE

After reviewing national and international literature, it is found that no one has clearly derived the application of mathematical expression in measuring the liquidity risk in Banks. The literature reviews also revealed that no research work has done conspicuously on the causes of liquidity risk. Therefore, the present paper unravels mathematical application for measurement of liquidity risk in two stages of expected funded requirements and unusual funding requirements.

1.4 OBJECTIVES OF THE STUDY

- ❖ To derive a mathematical formula for measurement of liquidity risk
- ❖ To apply the derived mathematical formula for the real time data in the specified bank

1.5 METHODOLOGY

The following methodology is adopted to derive the mathematical formula for the measurement of liquidity risk

It is measured in two stages namely expected funding requirements and unusual funding requirements. Expected funding requirements depend upon usually expected occurrences in the banking system whereas unusual funding requirements depending upon the probability of occurrences. Since the method depends upon the probability, the researcher uses normal distribution at 95% confidence level to measure the probability of occurrence of unusual event. In the unusual funding requirements, banks occurring events majorly depends upon schedule and unscheduled, semi discretionary and discretionary payments. The scheduled payments depends upon the transaction between previously agreed counter parties in the banking system. Similarly the unscheduled payments completely

depend upon the behaviour of customers. Semi discretionary payments are completely part of the normal trading banking operations. The discretionary transactions are carried out by the bank to balance the net cash flow.

2. ANALYSIS AND DISCUSION

In this paper the researcher adopts the situation of unusual funding requirements causing liquidity risk based on the following formula.

Let inflow of discretionary funds be

(F_D) = scheduled, unscheduled and semi discretionary outflows – the scheduled, unscheduled and semi discretionary inflows.

$$(F_D) = (O_S + O_U + O_{SD}) - (I_S + I_U + I_{SD}) \text{ ----- (1)}$$

Since the formula contains unscheduled and semi discretionary flows that would occur on the basis of arbitrary behaviour of customers. Let the arbitrary behaviour considered as a random number (R) where $R = (O_U + O_{SD}) - (I_U + I_{SD})$ ----- (2)

Substituting equation (2) in equation (1) we get

$$\begin{aligned} (F_D) &= (O_S + O_U + O_{SD}) - (I_S + I_U + I_{SD}) \\ &= (O_S - I_S) + [(O_U + O_{SD}) - (I_U + I_{SD})] \\ &= (O_S - I_S) + R \\ &= \underline{(O_S - I_S)} + \check{R} + 2\sigma_R. \end{aligned}$$

Hence, the formula for liquidity risk for a day in a bank due to unusual funding requirement is

$$\underline{\text{Liquidity risk for a day}} = \underline{(O_S - I_S)} + \check{R} + 2\sigma_R.$$

Therefore the abbreviation for the above formula are :

F_D = Liquidity risk due to unusual funding requirements.

O_S = scheduled out flow, O_U Unscheduled outflow, O_{SD} = semi discretionary out flows.

I_S = scheduled inflows, I_U unscheduled inflows, I_{SD} semi discretionary inflows.

\check{R} = Random term

Σ = sigma

3. FINDINGS AND CONCLUSIONS

The results revealed that a liquidity risk of a bank can be measured through the formula

$$\text{Liquidity risk for a day} = (O_S - I_S) + \check{R} + 2\sigma_R.$$

A typical example for calculation of liquidity risk can be done through assuming the following real time data.

O_S = loan disbursement for the day

O_U = Unscheduled with draw per day

O_{SD} = Semi –discretionary purchase of securities by the bank

I_S = Customers payment to the bank in a day

I_Y = Unscheduled payments due to fixed deposit maturities

I_{SD} = Semi discretionary payments like scale of normal trading securities.

Therefore it is concluded that the banks should plan the optional liquidation of the balance sheet frequently at times of crisis. The funding department should have a crisis-response plan prepared in advance to know all the possibilities through which the bank can reduce their requirements for cash, get cash back if it has been lent or pledged or increase cash inflow. The plan for generating cash inflow should list the order in which securities will be sold to minimize the amount of discount required.

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