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1 Introduction

In this chapter, first we learn about the risks associated with banking. Then we will discuss about the Asset Liability Management (ALM) a solution over the risk associated with banking and ALM for banks. Then we will discuss about project objectives and problem statement. Then a glance over banking standards and the literature survey.

1.1 Risks Associated with Banking

The term risk can be defined in association with banking as the exposure of to loss. The several risks associated with banking are viz.,
Operational risk, Credit risk, Market risk, Liquidity risk, Interest rate risk, Foreign exchange risk and Information risk.

1.1.1 Operational Risk

It is defined as the loss occurred due to failure of peoples or system. It is faced in the various departments as department of Information Technology, department of Credit, department of Investment.

1.1.2 Credit Risk

It is defined as the loss occurred due to failure of the borrower to repay to bank on the acknowledged terms. There is uncertainty about the repayment of dues and in the repayment in the agreed time frame. It happens due to borrowers lack of income, failure of business or reluctance to repay and lack of underwriting frameworks.

1.1.3 Market risk

It is defined as the loss occurred due to fluctuation in the market prices. It's components are as follows:

1.1.3.1 Equity risk: Probable failure to generate profit due to fluctuation in stock prices.

1.1.3.2 Foreign exchange risk: Probable failure to generate profit due to fluctuation of exchange rates as bank does transaction in multiple currencies.

1.1.3.2 Interest rate risk: Probable failure to generate profit due to fluctuation of interest rates.

1.1.3.2 Commodity risk: Probable failure to generate profit due to change in commodity prices as metals (as gold, silver, platinum), Energy (oil and gas) and Agricultures (as wheat,

cotton, coffee, tea,etc.). The change in these prices occurs due to variation in demand and supply.

1.1.4 Liquidity risk

It is defined as the inability of the bank to finance its day to day transactions or the situation where bank runs out of cash. Failure in managing the liquidity risk can lead to destruction of the banks reputation and losing its trust among customers.

As the banks are exposed to these various risks and as the risks is also increasing with the liberalisation and growing integration of domestic markets with external markets. Now banks are operating in a deregulated environment and are required to determine the interests rates on various products with need to maintain balance among spread, profitability and long term viability. Due to all these reasons we need to perform Asset Liability management.

1.2 Asset Liability Management (ALM)

Asset is a valuable entity/resource that a person/organization owns for generating the income. And the liability is a valuable entity/resource that a person/organization needs to pay for. At any given point of time total assets must be greater than the total liability. To balance the equation the concept of asset liability management had emerged.
In ALM we perform periodic monitoring of risk exposures involving collecting and analysing the information in order to have the ability to anticipate, forecast and act so as to structure banks business to profit. ALM also involves altering the asset and liability portfolio in a dynamic way to manage the risks which involves judgement and decision making.
ALM involves the planning, directing and controlling the cash flow and yield of the consolidated funds of the bank for all assets and liabilities of a bank by rate, amount and maturity. It assesses the various asset mixes, funding combinations, price volume relations and their implication on liquidity, income and capital ratio.

1.3 ALM for Banks

As the business of banking involves lot of risks, the main problem of banking becomes risk management and the procedure to do so is ALM. The three pillars on which ALM resides are

- ALM Information System
  - Management Information Systems
  - Information availability, accuracy, adequacy and expediency
- ALM Organization
  - Structure and responsibilities
  - Level of top management involvement
- ALM Processes
  - Risk parameters

- ➢ Risk identification
- ➢ Risk measurement
- ➢ Risk management
- ➢ Risk policies and tolerance levels.

1.3.1 ALM Information System

The risk policies and tolerance limits needs to be specified by ALM information system. Information is the key to ALM process which is now available due to the computerization of all banks and its respective branches. It also includes the performing experimentation in a branch and studying its effects. If the results are positive then replicating the changes to other branches.

1.3.2 ALM Organization

For risk management to be successful the need is of the strong commitment of the senior management to take strategic decisions and integrate the basic operations. The Asset Liability Committee (ALCO) is formed for performing the above mentioned tasks. It includes the CEO and the senior management of the bank, and their task is to decide business strategies with respect to banks budget and decide risk management objectives according to assets and liabilities.

1.3.3 ALM Processes

The following problems fall under ALM processes:

- Liquidity risk management
- Management of market risks
- Trading risk management
- Funding and capital planning
- Profit planning and growth projection

This ALM cycle works in the maturity buckets of time viz.,

1) Next day
2) 2 to 14 days
3) 15 to 28 days
4) 29 days and upto 3 months
5) Over 3 months and upto 6 months
6) Over 6 months and upto 1 year
7) Over 1 year and upto 3 years
8) Over 3 years and upto 5 years
9) Over 5 years and upto 7 years
10) Over 7 years and upto 10 years

11) Over 10 years.

The assets and liabilities of a bank involves following:

Liabilities	Assets
• Capital • Reserve & Surplus • Deposits • Borrowings	• Cash & Balances with RBI • Bal. With Banks & Money at Call and Short Notices • Investments • Fixed Assets

Fig 1: Components of Banks Balance Sheet

The ALM cycle of a bank is as follows:

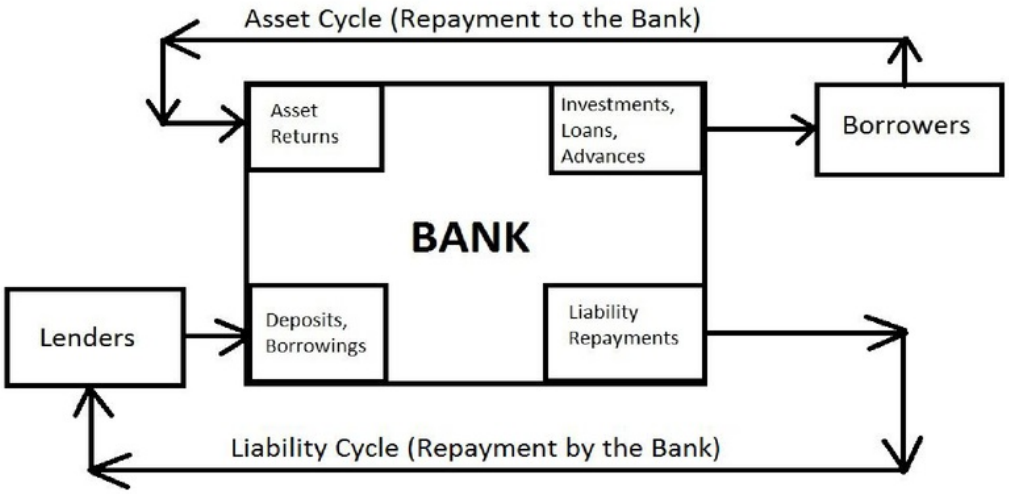

Fig 2: ALM Cycle of a Bank

Throughout the cycle of the ALM the mismatch in asset and liabilities (negative gap) should not exceed 20% of the cash outflow during 2-14 days and 15-28 days tiem bucket.

1.4 Project Objective

Creation of strategies to stabilize financial networks i.e. banks and to improve profitability of them from various risks.

1.5 Problem Statement

The two problems that have been tried to solve are as follows:

1.5.1 Liquidity Risk Management

In the single objective cash flow optimization for ALM we have proposed a model of Linear Programming Problem (LPP) which ensures Liquidity and Profitability. Liquidity Risk is managed by considering flow approach and profitability is ensured by taking the objectives function to maximise the profit of a bank.
We have also studied and analysed a 1999 Czech Financial dataset in search for the assets for the bank.

1.5.2 Stock Market Price Prediction

The Stock Market Price Prediction is a typical problem of time series and we propose a deep learning based solution for future price prediction.

1.6 Literature Survey

For first problem the literature survey done is : Hongxi Li et al. (2017) assess for both positive and negative duration gap to increase net value of bank when interest rates fluctuates favourably [1]. Nalan Gülpinar et al. (2013) uses Vector Autoregressive process to model the time varying investment opportunities [2]. Teng Fan et al. (2011) studied the interest rate risk of Chinese life insurers' liability [3]. Mounika, P et al. (2011) have addressed the problem of single objective optimization for maximization of wealth [4]. Chaudhury, Rahul et al. (2014) created fuzzy rule based asset liability optimization model [5].

For second problem the literature survey done is: Ashish Vaswani et al. (2017) proposed attention mechanism for machine translation. Yao Qin et al. (2017) proposed a DA-RNN. It serves the purpose of attention to time series and encoding information of long sequences. Jian Liu et al. (2017) assesses the correlation between stock price movement with relevance to events happening in world. Hao Li et al. (2018) proposed the MI-LSTM using attention which filters noise and extracts information. Huicheng Liu (2018) used attention based RNN for leveraging the news to predict stock price.

1.7 Conclusion

In this chapter we have discussed about basics of ALM and components of banks balance sheet. We have gone through the problem definition and literature survey.

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