

**RISK MANAGEMENT PRACTICES FOR
EFFECTIVE CAPITAL ALLOCATION IN INDIAN BANKING SECTOR**
(SPECIAL REFERENCE TO HISTORICAL AND MONTE CARLO SIMULATION): A STUDY

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ABSTRACT

Risk management practices in the banking industry focus on managing an institution's exposure to losses or risk and to protect the value of its assets. On the other hand, Non-performing assets (NPAs) is considered as one of the biggest problems for the entire Indian banking industry as the profitability of many banks is adversely affected by the increasing level of NPAs. It is very important to understand and evaluate current risk management practices to determine excess capital/excess loss that can be attributed to an asset class. Risk management techniques help in effective capital allocation by banks; thereby helping in increase in profitability of banks and controlling the increasing NPAs to acceptable levels.

KEYWORDS: *Historical Simulation, Monte Carlo Simulation, Risk Management, Non-performing Assets.*

Introduction

Indian Banks are currently facing a lot of issues in handling NPAs and they have to do provisioning by keeping aside capital to provide for increasing NPAs. To maintain capital adequacy, Banks are usually looking for means to raise Capital as Govt. is not able to provide sufficient capital in these tough situations. The key challenge going forward for Indian banks is to expand credit portfolio and effectively manage NPAs while maintaining profitability. Asset quality continues to be the basic function and also the biggest challenge for banks in the present dynamic environment. In order to overcome the perceived risks, there is an urgent need for banks to have well-structured and effective credit appraisal and monitoring system in place coupled with appropriate business models which can be powered by Risk Management strategies to effectively manage all the current issues revolving around recovery in stressed assets and thereby help in reduction of NPAs across all banks.

Literature Review

A large number of researchers have studied the issue of NPA in banking industry but only a few studies have shown how Risk Management strategies can be used in banking sector. A review of the relevant literature has been described:

- **Glen, J. and Mondragón-Vélez, C. (2011)** studied the effect of changing business cycles on performance of banks in emerging economies from the period 1996 to 2008. They concluded that the two main factors influencing loan performance are economic growth, followed by interest rates. Higher loan defaults are attributed to poor loan asset quality, supervision, limited area penetration and low capital of banks.

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- **Sabharwal, M. (2014)**, opined that only a few private sector banks in India are using AI (Artificial Intelligence) technologies and its usage is also very limited to some common operations related work.
- **Baruah, A.(2018)** studied the applications of AI (Artificial Intelligence) in top 4 Indian banks and concluded that data analytics and customer service create the opportunity for customized, personalized and faster customer experiences, significantly resulting in better insights, and automation /synchronization of back-end workflow systems.
- **Boudriga, A., Boulila, N. and Jellouli, S. (2009)** studied data of 59 countries from 2002-2006 and concluded that higher capital adequacy ratio and strict provisioning norms reduce the level of loan defaults. NPA reduction is possible with strengthening legal system and increasing transparency among institutions.
- According to **Hasan, I. & Wall, L.D. (2004)**, a bank's reported earnings and capital depends on how they account for its bad loans (NPAs). Studies were made on US banks which share a lot of similarities with banks across the globe when it comes to measuring loan loss reserve ratio.
- **Thiagarajan, S., Ayyappan, S. & Ramachandran, A. (2011)** studied the NPA level of 22 public sector banks and 15 private sector banks. The study found that both macro-economic and bank-level factors are responsible for rise in NPAs. Even though NPA level in India had decreased from maximum in 1990s to minimum in 2008, the gradual increase of NPA during last few years has caused concerns for everyone. The study suggested that banks must have prudent credit policies to restrict bad effects of credit risk.
- According to **Meenakshi, R. & Mahesh, H.P. (2012)**, NPA is the main cause of the global financial crisis that we saw recently. NPA issue has been given attention after the liberalisation of financial sector in India. NPA in the priority sector advances is higher than that of the non-priority sector. The SSI (Small Scale Industries) are worst performing under Priority Sector advances. The study suggested use of Self-Help Group model to some of the sectors to help the borrower's access loans and ensure loan repayment to the banks.

Significance of Study

Most of the research and studies are being done on causes, impact and management aspects of NPAs but there is a huge time gap existing for the comprehensive research on quality aspects of NPAs, practical issues being faced by bankers on daily basis and how risk management strategies can be used to resolve the issue of surmounting NPAs. This study therefore, seeks to fill this gap by establishing the link between NPAs and how AI technologies along with Big Data Analytics resolve the issue of NPA Management.

Research Objective

Keeping the above Literature review in mind, the objectives of the Research are given below:

- To study the current management practices of handling NPAs in Indian Banking Sector.
- To study how Risk Management strategies can help in proper capital allocation to provide for provisioning of Non-performing assets in Indian Banking Sector.

Data Collection

Secondary Data is collected through online data websites like Yahoo Finance, NSE and BSE websites where the historical movement data of stocks is available. The idea is to understand where the Banks have invested their capital and how Risk management techniques can help in minimizing problem of Excess Capital invested and excess loss expected out of a portfolio.

We have taken figures of a stock XYZ whose historical figures are taken from NSE website, as given below (It is assumed that Bank has allocated capital in this stock XYZ):

Sr. No.	Historical Dates	Stock Prices of XYZ in which Bank has capital investment
1	01-01-2018	2103.75
2	02-01-2018	2032.2
3	03-01-2018	1998.35
4	04-01-2018	2015.5

5	05-01-2018	1982
6	06-01-2018	1952.05
7	07-01-2018	1931.1
8	10-01-2018	1932.9
9	11-01-2018	1934.05
And so on		

Data Interpretation

Historical simulation and Monte Carlo simulation methods have been used to carry out Value at Risk (VaR) estimation for efficient capital allocation in Stock XYZ. The idea is to find out if any excess capital is allocated; the same should not remain uninvested and be allocated to provide for NPA management.

- #### Historical Simulation

Under this method, stock prices data from 1st Jan. 2018 is taken and continuously compounded returns are calculated. We, then calculate Percentile at 95% VaR to estimate expected loss/gain out of the portfolio.

- #### Monte Carlo Simulation

Under this method, stock prices data from 1st Jan. 2018 is taken, continuously compounded returns are calculated and further we simulate Future Stock Prices for 252 days and calculate expected Profit/Loss returns. On the basis of P/L data, we then calculate Percentile at 95% VaR to estimate expected loss/gain out of the portfolio.

The results of using the above 2 approaches can be shown as below:

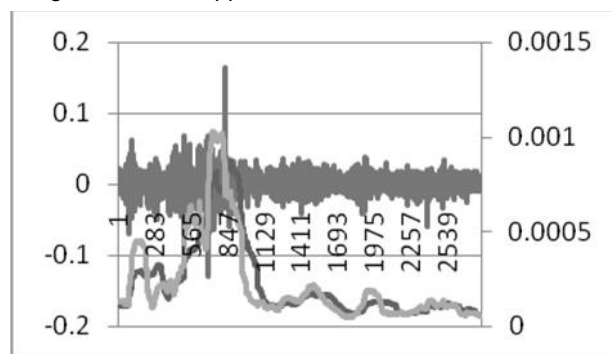


Fig.: Historical Simulation (red line) and Monte Carlo Simulation (green line)

As can be seen from above, Monte Carlo Simulation is a better enabler of volatility and hence can be used as a measure to predict Excess Capital allocated, in case of better portfolio returns. Artificial Intelligence models can be used to estimate VaR on a daily basis so that banks can allocate capital effectively, thereby, keeping more capital for allocation towards NPA Management and maintaining profitability of the bank.

Role of Artificial Intelligence & Risk Management in NPA Reduction

We will now see how existing technologies of AI & Big Data Analytics along with Risk management strategies can resolve the NPA problem:

Credit Scoring

Credit scoring tools use the concept of “machine learning” which is designed to speed up lending decisions, while taking care of perceived risks associated with each credit decision. As many credit agencies are present like CRISIL, CARE, ICRA etc., the AI powered technologies will help in Data Integration, which will further help the bankers to rely on credit scores to make lending decisions for individuals and firms. Data on transactions and payment history from financial institutions serve as the foundation of most credit scoring models. These models use tools such as regression, top-down decision trees, and statistical analysis to generate credit scores using limited amounts of structured data.

Banks and other lenders are also increasingly turning to additional, unstructured and semi-structured data sources, including social media activity, mobile phone use and text message activity, to capture a more detailed view of creditworthiness, and improve the rating accuracy of loans. Applying machine learning algorithms to the abundance of new data has enabled assessment of qualitative factors such as consumption behaviour, willingness to pay, payment history terms etc.

Chatbots – Reminders for Faster Recovery of Loan Installment/ Overdues

Chatbots are virtual assistants that can help customers to transact, solve their problems instantly and remind them about their repayment due dates from time to time. These automated programmes use NLP (Natural Language Processing) to interact with clients in natural language (by text or voice), and use machine learning algorithms to improve over time. Chatbots are being introduced by a range of financial services firms, often in their mobile apps or social media.

Risk Management

Banks are considering machine learning to make sense of large, unstructured and semi-structured datasets and to police the outputs of primary models. Back-testing is important because it is traditionally used to evaluate how well banks' risk models are performing. In the last years, US and European regulators focused on back-testing and validation used by banks by providing guidance on model risk management. This will help in proper evaluation of credit proposals, based on risk rating and hence prevent accounts from conversion into NPAs.

Data Quality Assurance and KYC-AML Monitoring

AI and machine learning methods help to improve surveillance by automating data quality assurance. A series of new reporting requirements across jurisdictions has led to a greater transparency, volume and frequency of reported data, as well as greater resources required from financial institutions to complete reporting on time.

Monitoring of Liquidity Stress and Volatility

Machine learning can be applied to systemic risk identification, assessment and propagation channels. Specifically, NLP tools may help authorities to detect, measure, predict, and anticipate, among other things, market volatility, liquidity risks, financial stress, housing prices, and unemployment. Till now, the most speedy measure of Recovery is OTS (One time settlement) done by the Borrower with the Bank but that results in a huge sacrifice done by banks, that directly affects their profitability. However, SARFAESI Actions (13(2) and 13(4) notices) have proven to be effective recently but not as per what the current situation demands. AI and machine learning can be used for risk management through earlier and more accurate estimation of risks. For example, to the extent that AI and machine learning enable decision-making based on past correlations among prices of various assets, financial institutions could better manage these risks. Tools that mitigate unavoidable risks could be especially beneficial for the overall system. Also, AI and machine learning could be used for anticipating and detecting fraud, suspicious transactions, default, and the risk of cyber-attacks, which could result in better risk management.

Conclusion

While the concept of Artificial Intelligence has been around for decades, it is only recently that the AI execution has started to turn into reality. Many of the technology pieces are already in place, in varying stages of maturity. In global context, many banks have already started using AI and Data Analytics for Risk management and Fraud detection, which has not only reduced the level of rising NPAs but also improved identification of creditworthy customers to create a foundation of a good loan profile. While the technology's evolution is both rapid and impressive, banks should ground their adoption strategies and expectations in reality. Similarly, such data can help assess risks for selling and pricing insurance policies. Finally, client interactions may increasingly be carried out by AI interfaces with so-called 'chatbots,' or virtual assistance programs that interact with users in natural language. Applications of AI and machine learning may enhance the interconnectedness of financial markets and institutions in unexpected ways. Institutions' ability to make use of big data from new sources may lead to greater dependencies on previously unrelated macroeconomic variables and financial market prices, including from various non-financial corporate sectors (e-commerce, sharing economy, etc.). As institutions find algorithms that generate uncorrelated profits or returns, there is a risk these will be exploited on a sufficiently wide scale that correlations actually increase. These potentially unforeseen interconnections will only become clear as technologies are actually adopted.

Monte Carlo Simulation is a better estimate of volatility and hence can be used as a measure to predict Excess Capital allocated/Excess Loss estimated. It can help banks to allocate capital effectively, thereby, keep more capital for allocation towards NPA Management and maintain profitability of the bank. The current study is relevant and will be vital to many groups however; following groups will stand to benefit from the study exceptionally:

- Data Analysts
- Bank Employees
- Academicians / Research Scholars
- Govt. Policymakers
- Financial/IT/Stock Market Analysts
- Technology providers, Start-up companies and Fin-Tech companies
- Students

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