

LIST OF TABLES

Table 1-1 India's Rank in World in terms of per cent NPA to Advances	37
Table 1-2 Gross Advance and Gross NPA from 2005 to 2018 in Rs. Bn.....	38
Table 1-3-Bank-Wise Gross Non-Performing Assets, Gross Advances and Gross NPA Ratios of Scheduled Commercial Banks 2018.....	38
Table 1-4 NPAs of Scheduled Commercial Banks Recovered through Various Channels	46
Table 1-5 NPA Recovery Rate (%) through various channels for Commercial Banks.....	47
Table 1-6:Outcomes under the Code: Status of applications filed (as of December 2020)	50
Table 1-7: Rescue of distressed assets (as of Dec 2020)	51
Table 1-8: Classification of Special Mention Accounts (SMA)	53
Table 1-9 Suit Filed Accounts-Wilful Defaulters as on 31-March-18 - Summary	57
Table 1-10 Suit Filed Accounts-Wilful Defaulters as on 31-March-17-Summary	58
Table 3-1 Evaluation of Bankruptcy Prediction Models-Multivariate Discriminant Analysis (MDA), Logistic Regression (LR), Artificial Neural Network(ANN) and Decision Tree (DT).....	93
Table 3-2 Compilation of Bankruptcy Prediction Models based on Accuracy rate (%)	99
Table 3-3 Country-wise Bankruptcy Model Evaluations	104
Table 3-4 Variable wise Bankruptcy Prediction Model Evaluation.....	105
Table 3-5 Most Accuracy in various Bankruptcy Prediction models.....	106
Table 4-1 List of Ratios	115
Table 4-2 Details of Data for the research.....	119
Table 5-1 Altman Results	125
Table 5-2 Altman's Z-score classification of Prediction Results.....	126
Table 5-3 List of companies not predicted by Altman Z-score.....	126
Table 5-4 Altman's Z-score year wise under various zones and Increase/Decrease in Cash Flow from Loan Funds of number of companies	127
Table 5-5 Ohlson's O-score classification of Prediction Results.....	128
Table 5-6 List of companies not predicted by Ohlson's O-score	128
Table 5-7 O-score from 2000 to 2017 and Increase/Decrease of Cash flow from Loan Funds of number of companies	130
Table 5-8 Sector wise data on instances of <i>increase in loan funds and the number of times a high probability of bankruptcy was predictable</i> according to the Z-score	131
Table 5-9 Disbursement and Risk Anomaly at various consecutive instances	132
Table 5-10 Company years of Wilful Default and Non-Default companies.....	134
Table 5-11 List of Ratios	134
Table 5-12 Correlation Matrix	137
Table 5-13 Case Processing Summary	141
Table 5-14 Classification Table-Step 0	141
Table 5-15 Iteration History-Log Likelihood-Fitness for Constant Coefficients.....	142
Table 5-16 Step 0- Variables in the Equation	142
Table 5-17 Forward Stepwise (Likelihood Ratio).....	142
Table 5-18 Variables in the Equation-Step Forward Logistic Regression.....	145

Table 5-19 Variables not in the Equation-Step Wise-Forward Likelihood	147
Table 5-20 Omnibus Tests of Model Coefficients	150
Table 5-21 R square- Model Summary	151
Table 5-22 Analysis Case Processing Summary.....	152
Table 5-23 Eigenvalues	153
Table 5-24 Wilks' Lambda.....	153
Table 5-25 Standardized Canonical Discriminant Function Coefficients	154
Table 5-26 Functions at Group Centroids.....	155
Table 5-27 Classification Results.....	155
Table 5-28 Case Processing Summary	156
Table 5-29 Network Information	156
Table 5-30 Model Summary	157
Table 5-31 Classification.....	158
Table 5-32 Independent Variable Importance.....	158
Table 5-33 Model Summary	161
Table 5-34 Risk	162
Table 5-35 Tree Table	166
Table 5-36 Prediction and Observed Classification	169
Table 5-37 Summary-Accuracy wise Ranking	169
Table 5-38 Significant variables from all the techniques	170
Table 5-39 Summary of Significant Variables amongst all Models.....	171

LIST OF FIGURES

Figure 1-1: Bank Credit and Depsoit from 1951 ti 2018 in India	27
Figure 1-2 Gross Advances and Gross NPA from 2005-2017.....	28
Figure 1-3 Classification of Banks with the total banks in each category (as on January 2021)	31
Figure 1-4 World Rank Non-Performing Loans as percent of All Bank Loans, 2019	37
Figure 1-5: GNPA Ratio as per cent of Total Advances of Selected Sectors	40
Figure 1-6 Stress Assets to Gross Advances in Selected sectors	41
Figure 1-7 Credit Appraisal Cycle	43
Figure 1-8-Recovery from Lok Adalat, DRT, SARFAESI and IBC channels	52
Figure 2-1 Process Flow of Wilful Default.....	64
Figure 5-1 Normalized Importance-Artificial Neural Network	159
Figure 5-2 Artificial Neural Network 1 layer structure	160
Figure 5-3- Decision Tree Analysis (Part A)	164
Figure 5-4 Decision Tree Analysis (Part B).....	165

Explanation of Terms

1. Wilful Default- Borrower who has the Capacity to repay but does not pay, diverted the funds for other purposes other than specified in the loan terms, siphoned off the funds and/or disposed or removed the movable fixed assets or immovable property given by him or it for the purpose of securing a term loan without the knowledge of the bank/lender.
2. NPA/NPL-Non Performing Assets/Non Performing Liabilities-Non repayment of loan for more than 90 days to the financial institution or banks.
3. RBI-Reserve Bank of India, a statutory body which governs the monetary policy, foreign exchange and regulates banks in India.
4. CIC-Credit Information Companies are the authorized companies by RBI to capture loan non-repayment details which thereafter is made available to all banks
5. LR-Logistic Regression- Logistic Regression is a statistical technique which uses logistic function for dichotomous dependent variables. It is mainly used where the outcome is binary; 0 or 1 and in this case default or not, buy or not, etc. The logistic regression computes the probability that the binary response is as a function of a set of predictor variables and regression coefficients.
6. ANN-Artificial Neural Network- Artificial Neural Network is an attempt to replicate the brain's neural network. It has been used extensively for programming of Artificial Intelligence Software.
7. DT-Decision Tree- Decisions Tree creates classification and helps in better identifying groups, discover relationships between groups and predict future events. Visual diagrams enables to present categorical results in an intuitive manner; it can clearly explain the results to non-technical audiences. The trees explore results and visually determine model flows. Visual results can help to find specific subgroups and relationships that might not uncover using more traditional statistics. Because classification trees break the data down into branches and nodes, one can easily see where a group splits and terminates.
8. MDA-Multivariate Discriminant Analysis- Discriminant Analysis searches a set of prediction equations; it helps to classify individuals into groups through independent variables. It helps in better understanding of the relationship amongst the variables. It helps to find relationship through mathematical expressions. Discriminant analysis is

used to determine the minimum number of dimensions needed to describe these differences. A distinction is sometimes made between descriptive discriminant analysis and predictive discriminant analysis.

9. BSE-Bombay Stock Exchange, oldest stock exchange in India for listing of companies
10. NSE-National Stock Exchange, largest stock exchange in terms of turnover in India for list of companies.
11. CRICL- Central Repository of Information on Large Credits – Responsible to collect the data of large loan of Rs. 5 Crore and above time to time.