CREDIT SCORING MODELS OF CUSTOMERS IN BANKS

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Abstract

Main goal of all commercial banks is collecting savings of persons and entities and allocating them as banking facilities to industrial, service and productive companies. Not refunding facilities by customers, put banks in many troubles such as not being able to refund Central Bank loans, more facilities compare to customers refund and not being capable of to give more facilities. The importance of this matter and its role in economic growth and increase job opportunities led to various models for investigating customer's credits who want to get facilities.

In order to evaluate credit risk, companies are sorted based on risk bank face. For measuring credit risk, each ranking gain a default probability.

In this research we try to express different models of customers' credit ranking in Banks.

Key words: Credit ranking, default, credit scoring models

Introduction:

Nowadays, loans play an important role in Bank industry, as most part of the revenue of the banks includes loan payments to personals and entities. Thus, according to demand increase for loans and existing risk in these operations, a method for loan management is necessary. Although risk is the potential part of bank operations but according to limitations of finances, evaluation of customers' ability in refunding loans before payment is one of the most challenging fields in country bank systems.

One of the quantification methods and evaluating credit risk or in other word proper management is using Credit Scoring. In this method characteristics and performances of previous loans are simulated based on quality and quantity benchmarks to predict the performance of future loans with similar conditions.

If a suitable scoring system exists, amount of unpaid refunds will decrease, the granting facilities will promote credit risk and consequently bank expanses will reduce significantly.

Credit Scoring Definition

In this model, a score is dedicated to each customer requesting loan. While comparing this score with borderline score, customers are divided in two categories: "Risky" and "non-risky". S&P INS believes that credit scoring show the credit of customer (entity or personal) in refunding debts – the money and its interest- on time(1).

Default Definition

According to the importance of the subject, default community defines it as follows: default is regarded to a case that one or some of these conditions happen for a debtor:

- There is a doubt in his ability in refunding facilities include loan and its fee.
- 90 days passed his last credit commitment.
- The debtor became bankrupt.

Risk Component and Basel New Capital Adequacy

Basel new capital adequacy is designed for determining legal capital with considering risk in bank credits. This agreement let the banks calculate their required capital for credit risk in two ways: first, a standard method revised based on capital adequacy (1998). Second, Internal Ratings-Based (IRB) method which let banks use internal scoring and extend it. IRB method uses following key parameters for estimating credit risks:

1. PD , Probability of Default of a debtor in a period of one year.
2. LGD, Loss Given Default (1- return rate), part of capital loss and is equal to one minus percentage of capital return which is in cash via bail. LGD is a percentage of EAD
3. EAD ,Exposure at Default (amount and not percentage)

These parameters are used for estimation of Expected Loss (EL) which define as follows:
EL=PD*LGD*EAD
expected loss (EL) = (Probability of Default)*(Loss Given Default)*(Exposure at Default)
Determination of credit risk
a) Expected Loss (EL) and Unexpected Loss (UL)
Expected Loss, is the average of estimated loss for a specific period of time, i.e. 1 year. Unexpected Loss is defined as : Max of loss- EL with a specific probability(1).

Advantageous and Disadvantageous of Credit Scoring

Potential Advantageous of Credit Scoring

- Costs reduction

Systematic evaluating systems such as credit scoring reduce the role of human mistakes, potentially reduce risk and cost of credit for loans.

- More Precise Estimation

Revise and correction of credit scoring will lead to more effective estimation of loans performances, simultaneously.

- Better Products and Marketing

Shorter process of getting loan and faster procedure, will lead to more customer satisfaction and demand increase in Bank credit facilities.

Disadvantageous of the system

- Less access and attention to some cases of loan giving

Those who demand facilities but have finite credit background with respect to other ones may be omitted from list as lenders pay less attention to such customers(2).

- Privacy of Security Information

Credit Scoring systems with database of related customers; increase the probability of attack to confidential information of them.

- Lack of flexibility

In Credit Scoring systems based on statistical algorithm, there is no enough flexibility due to use of old data and their probability distribution function.
The most important functionality of Credit Scoring is that banks determine the amount of loans with respect to level of customer's risk.

History of Credit Scoring Models

Scoring system was created for the first time in 50s and used 5 following benchmark for evaluation:
Person job position
Balance sheet
The guarantees
Information about loan refunds of other banks

Benchmarks for Credit Scoring

The success of credit decisions are affected by two main factors:
"decision making model" and "quality of information"
The more basic information which are used in various models are follows:

- Person Previous trespasses
- Improper payment behavior
- Level of current debts

- Debt length of time in past
- No of demands for loans
- Debt to other credit institutions, banks and …

5C model uses 5 main factors for evaluating the credit of a customer, as follows:

- Characteristic

This factor shows the level of person commitment.

- Income capability

It consist of profit gaining, income, management capability and trade capacity of the person.

- Capital

By that we mean net worth of each customer (person or entity), which show the ability of person for payment.

- Bail

Bail include all free capitals that can be counted as bail like estates, bank bails and guarantee of parent company or other companies.

- Conditions of External Environments

In fact it is the public conditions of the society.

Introducing Credit scoring models

There are various models. Institutes and banks choose one of them based on their conditions and environment(3).

Parametric Credit scoring models

- Linea probability model
- Logit – Probit Models
- Based on discriminate- analysis
- Neural network

Nonparametric Credit Scoring models

- Mathematic programming
- Tree classification (recursive segmentation algorithm)
- Most similar models
- Analytic hierarchy process (AHP)
- Expert systems

Linear Probability Model

It is a king of regression model that independent variables take quantitative amounts and dependent ones take 0 and 1. When dependent variable (Y_i)=0 then resumed event has not happened yet, and while it is equal 1, the event is has happened definitely.

$$\hat{Y} = E(Y_i \mid X_i) = \beta_0 + \sum_{i=1}^{n} \beta_i X_i = P_i$$

Conditional Mathematic hope of Y_i by X_i can be defined as conditional probability of the occurrence of resumed event with specific X_i .

In other word, conditional probability of the occurrence of resumed event (not refund) must be necessary between 0 and 1. As the probability of an event will never be bigger than 1 or smaller than 0, so if it equals 0 then the event definitely will not happen and when it equals 1 then the case is reverse(4).

Although this is theoretically correct but there is no guarantee to get a number between 0 and 1.

Logit - Probit Model

This model estimated with maximum likelihood. Unlike the Least Square Estimation Model which explanatory variables in duplicate hypothetical tests were supposed to be constants,

here there is no such presumption. Here we suppose that variables of the data society are varying.

Thus maximum likelihood estimation is theoretically stronger than Least Square Estimation. This implies that various statistical results several samples. The aim of this method is to answer this question that a resumed specific sample with maximum probability belongs to which population?

Probit and Logit are non-linear and their estimations are based on maximum likelihood. Thus we do not deal with classic standard assumptions and their opposite.

Neural Networks

Artificial neural networks are systems based on artificial intelligence which tries to simulate human function in decision making process brain as a network of connected neurons. Neurons are smallest units of calculation and decision making in neural networks. A converting equation is defined in each neuron. This equation can be a econometric model or any mathematic one like sigmoid functions. In each neuron, it is tried to determine the weight of each variable via defined equation so find a meaningful relationship between data and result vectors(5).

Analytic hierarchy process (AHP)

This method is important for some of its aspects:

1. There is o need to allocate weights to criterions.
2. Unlike parametric methods there is no need to average for comparing units to find the best performance among all units, but Data Envelopment Analysis (DEA) optimizes any of the observations with the efficient frontier and uses all gathered observations for measuring efficiency.
3. DEA is a simple method and due to its specific abilities , can lead to proper and trusted credit decision making and satisfy the customers.
4. The last benefit of this method is using occurred and practical information. Unlike famous methods such as Multiple Audits Analysis, Logistic Regression Analysis and neural networks which are used for estimation of predicted needs, Data Envelopment Analysis uses real and practical set of information related to customers for calculating their credit scores.

Expert Systems

Expert system, unlike information systems that work with data, focuses on knowledge. Also in a decision making process, it can use various types of data such as numeral, symbolic and comparative. Decision making in expert system is based on inductive and comparative methods. According to the abilities of these systems, in case of lack of complete information or various level of assurance in answers of asked questions, expert systems are good samples for working in uncertainties or multi aspects environments. Knowing what expert systems do is useful for determining their capacity and for doing financial tasks. expresses the general tasks as follows: changing, detection, monitoring estimation, planning and designing(6).

By this method, credited customers are distinguished from non-credited ones and bank resource flows toward those who deserve more for getting facilities. Also necessary bail and guarantees are determined according to their credit scores and prevented unnecessary severities.

Conclusion and Suggestions

Risk and accepting of that is the base of business in each job. The dream of more benefits and market development via increase in customers' number and variety in products and services is impossible without acceptance of risk. As we know, risk is a chance and not a threat for a company, thus risk culture in managers with respect to its management can provide benefits for each organization. Managers of credit part can reduce their uncertainty and risk by planning and using mathematical and qualitative analysis(7).

Thus by benchmarking operations of insurance companies in covering their risks, we can manage resources and usages in banks, i.e. by evaluating customer and its credit, interest rate is defined individually so customer has to the risk coverage cost based on his/her documents and capitals. If a scoring systems exists, after gathering information of each customer and using them in system, score, ranking and risk level (Default Probability) of customer calculated and is used in decision making about facilities, determining interest rate and reducing effective credit risk.

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