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Research Article

Traditional Models Used in Evaluation of Requests for Credit Card and Alternatives (AHP)

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Abstract

Thousands of people are applying for credit cards in the bank now days. Bank department that deals with credit cards is impossible to evaluate all multiple applications. Therefore they used automatic procedures based on computer and statistical models to assess the credit card requirements. The approval rating of applications until recently was based on human judgment that deals with 'is persons evaluating applications. Recently the increasing demand for credit cards brought the necessity of evaluation models. The models used are a synthesis of highly complex mathematical analysis. These models are too difficult to understand as well as their application upon field requires users who have a certain level of education. Deficiencies and difficulties in using of them make the users to look at alternative models which are acceptable and easily accessible. Hierarchical analysis process (AHP) is a model that meets the needs for decision-making but also ease of use from that who owns the model makes it more attractive. Using AHP by banks in their decision-making needs would bring them a low cost and it would be highly efficient.

1. Introduction

By late the decision on lending or not to applicants, in terms of risk that can carry this loan turn back by the consumer, it was based on human judgment (Saaty, 2000). The increase of the demand for loans led to the use of formal methods and objective (generally called as stipple loans) to help credit providers in their decisions against the applicants (Akhavein, 2005).

In fact, these models called credit scoring models separate persons into subgroups (applicants for credit card) according to common characteristics they have (Bugera, 2002). This statistical technique was developed for first time by Fisher, named discriminant analysis this technique would be the pioneer of operational research and statistics developed later (Marquez, 2008). Evidently, the market impact of the financial industry, competition in the growth of the quantity of data available for the applicants and especially developments that have occurred in the world technological occupy a special role in advancing this systems credit scoring level we have now. These systems are nothing but a kind of method to assess the credit risk derived from the analysis of the factors that previously defined as factors that affect the level of risk or cause.

The techniques used for credit scoring meet under two groups.

1. Statistical techniques
2. Operational Techniques

In statistical techniques including linear analysis and logistical discriminant analysis, the operational techniques including decision tree model and artificial neural network model, the latter is one of the models used in combination with software.

1.1 Discriminant Linear Analysis

Discriminant linear analysis was developed by Fisher (1936), which it suggested that the best way to separate the two groups is to find a linear combination of explanatory variables which give the maximum distance between elements of the

two groups (Fisher, 1936). The basic idea lies in the idea that there is a connection between a variable interest "y" and a set of variables "x" that we think that we can carry these ones with variable of interest "y". Discriminant linear analysis aims to classify the sub-elements into a homogenous and heterogeneous group to continue the process of making the decision (Vojtek, 2006). The goal of discriminant analysis, which is a classification technique, is to make possible to maximize the ratio between the variant internal group and the variant between groups. Discriminant function is like this:

$$D = w_i + \sum w_i \cdot x_i$$

D represents the value of discriminant, W_0 fixed value, while W_i (i = 1, 2 ... n) of independent variants, and X_i (i = 1, 2 ... n) indicates the value of the coefficient. Once setting the model discriminant values are accounted for the data set for each group and found an average value. The discriminant value arising from will be compared with the critical value and then it will be decided to which observation group it belongs.

Discriminant linear model analysis is one of the only tools used in econometrics, also is one of the initial analysis tools and remains a lens through which relationships between variables observed (Greene, 2012). Consequently such a tool, although the statistical models can be developed and become more complex with the sole aim to raise as much possibility of prediction, it will still be and will remain one of the essential tools to analyze on possible links between variables.

1.2 Logistic Regression Model

Discriminant linear analysis used successfully on all models where the data are output to consider continuous variable. In fact, in real life there are times that the data output to consider are dichotomous in character or otherwise stated are variable false dichotomies and it is in these cases the model of discriminant linear analysis is not enough to predict the variables that are expected to emerge at a time t + 1. Such analysis that expected output variables that are of a nature or false dichotomies or dichotomous the appropriate model is a logistic regression model.

Logistic regression model is a more developed variant of discriminant linear analysis. Discriminant linear analysis cannot be done if an assessment has not normalized data. These data can be analyzed by improving discriminant linear analysis (using logistic regression model). Logistic regression model is written as follows:

$$\log\left(\frac{p}{1-p}\right) = w_0 + \sum w_i \cdot \log(x_i)$$

Unlike discriminant analysis logistic regression model has no need for guesswork. However logistic regression model is easier to interpret as it gives a probability value. Once established model for each applicant viewed variability, assessed the probability and becomes a classification if the condition is greater or less than 0.5.

In the analysis made against applicants for credit card taken into consideration all the variables that represent the type, a living income, in some way the way of life of the applicant. All these data are analyzed in order to conclude that the applicant shall pay or will not pay the debt created by the use of credit card. Completion is expected in this case the analysis is dichotomous or binomial, then with two possible conclusions (will pay the debt created or will not pay the debt created) that makes use of more suitable site logistic regression in this case. Precisely as a result of the expected dichotomous came out this logistic regression model is more analytical used in the evaluation of applications for credit cards.

1.3 Decision trees

The decision trees method which was developed by Bierman, Friedman, Olshen and Stone after decomposition process it came to an assessment under observation rates found inside the group (Vojtek, 2006). The answer of the person who is applying decision tree is intended to be divided into two groups. Then will divide the answer to the question in two groups and after to fix a separate response will respond to maximize the risks between the two groups. So graphically decision trees depict decision to be taken, events that may occur and results associated with the combination of decisions and events.

In this context, decision making trees consist of nodes and branches. In the decision making trees we have three types of nodes and two types of branches. So we make decisions that are node points where to make a choice and we diagrams marked with a square. Branches arising from a decision-making are branches decisional nodes, where each branch represents one of the possible alternatives or potential acts directions at that point. Then come nodes of events, where the uncertainty is resolved node (a node learns where decision makers on the development of the event), these nodes are marked with circle in the diagram, often called and junction possibilities. After the events nodes or spread out

the branches of events which represent a potential event that could happen. We finally have terminal nodes which represent final result of the combination of decisions and events. Terminal nodes are endpoints of Decision trees and marked with a triangle in the diagram.

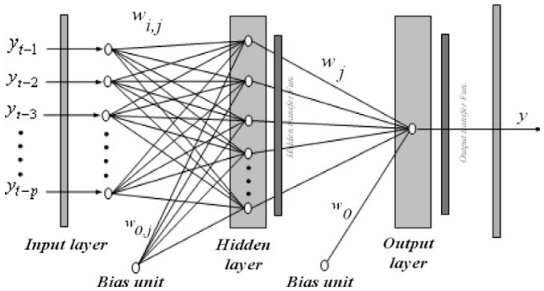
To find the best division performed this procedure for each question. This procedure will continue until the answer is found in a logical statistical difference, if no statistical difference this procedure logical prohibited.

1.4 Artificial Neural Networks

Neural networks are an evaluation method that mimics the logic of functioning of the human brain in terms of decision-making solutions. This method has its origins by 1943 when Waren Mc CULLOCH and Walter Pitts published their paper that showed how the brain can produce models with high complexity using multiple elementary cells connected to each other. These basic brain cells called neurons are a simplified model which where gave to Waren Mc CULLOCH and Walter Pitts paper. According to this artificial neural network model consisting of calculative basic units and recognized processing elements (W. McCulloch, 1943). Waren, Mc CULLOCH and Walter Pitts simplified model gave a great impetus to the development of models of artificial neural networks subsequent supplements.

Another very important direction that brought models of decision making networks neural artificial was the study of Frank Rosenblatt in 1985, where he added model simplified by Waren Mc CULLOCH and Walter Pitts and several features that made the model to gain the property of the learning itself.

Structure: Neural networks structure



Source: Expert System with Applications, (Khashei, 2009).

Artificial neural network model consists of three layers ideally as it is shown in the figure above. Incoming data layer (input layer), hidden layer and layer end (output layer). The input data layer consists of incoming node of data for representing system variables, hidden layer consists of nodes that simplify the flow of information from the input layer of the termination layer. The flow is controlled by the weight factors associated with each connector. Ending layer (output layer) consists of nodes for representing classification system decisions. The final node values are compared with limits set to define and classify each case concluded.

Setting and adjusting the weights in each other binder is a very important moment. Adjusting the weights in each connector is called differently and calibration process. The process calibration values lies in the entrance test in the final node networks with default. This process continues until the values of weights reduced to a function error. Examples testing predetermined output value used to verify network performance calibrated.

2. Inadequacy of Traditional Models

To determine whether the applicant for the credit card will pay or not debit that will have on the credit card is been used many methods and models. Most traditional models based on statistical and operational techniques. To operate these models the applicant must have "data mine". That is for each credit card applicants need to have data on their economic behavior minimally for a year.

Finding this type of information it is difficult for a bank, since the number of specialists who will process the information in these models is in inverse proportion with credit card applicant. Therefore, delays or granting of credit cards without analysis is a shown phenomenon. Because of the difficulty of understanding the performance of models,

evaluation of credit card applicants is made only by specialists.

Linear regression method is one of the first models that are available for use and can only be used by specialists with a certain level of education. Because of the difficulty of using and when there are many variable linear method conclusions reached are not healthy. Under the assumption of linear regression method, variables should be normally distributed. This assumption suggests that the use of linear regression method serious deficiencies exist (Greene, 1992).

Lack of a normal distribution of the variables that will be evaluated by linear regression method causes loss of credibility as a model. The problem of unwanted solution gives a logistic regression methods. Although logistic regression method provides a solution for cases where there have normal distribution of variables it carries deficiency itself as born of linear regression model. Logistic regression method is equally difficult to use as a linear regression model and requires people with a certain level of education to use. Exclusion of the system variable or variable introduction of the new method does not develop the method, but causes the creation of a new method of assessment. Another shortcoming is the lack of evaluation variable possibility of quantitative and qualitative methods and linear logistic regression, thus discriminant analysis based on a strict statistical assumption rarely makes the conclusions to be satisfactory in real life (Koh, 2006).

The method of decision tree based on a manner of classification and degradation. Decision tree method is simple to understand and interpret, the formation of this method is free and this is another reason why it finds a wide use. One of the biggest shortcomings of the decision tree method is not providing a termination digit. The method of decision tree classification after the procedure and degradation reaches a positive or negative conclusion. Given that conclusion can be accepted or not accepted on the basis of a criterion related to variables that have to do with the search for them it is insufficient compared with other variables. Decision tree method must be used under the companionship of other valuation methods. It is insufficient when used alone in the evaluation process.

The method of artificial neural networks is a mathematical presentation inspired by the nerves and cells of the human brain and the communication between them. This analysis is similar to discriminant nonlinear analysis and is based on the assumption that the variables that participate in are linearly independent analysis. These models examine connections (correlations) between variables potentially hidden predictive models which are included in additional explanatory variables as predictor's nonlinear function of the purpose for which the analysis is performed. Their deficiency rests in the way identify hidden links between explanatory variables. This model shows poor performance when there attribute irrelevant or a set of data is small, it should be mentioned here handicap limit in terms of the long period it takes to calibrate the model in order to find neural networks artificial optimal for the purpose of which analysis is being done (H. M, 1999).

In this context, we can say that the evaluation of applications for credit cards due to not using quantitative and qualitative variables in the analysis together are inadequate, difficult to understand, high cost, therefore we can say that assessments applications for credit cards through traditional methods are inadequate. Instead of using traditional methods that are to blame for inadequate assessments and difficult to use methods can be used for many decision criteria that allow more efficient assessments and are easier to use. One way that enables the analysis of qualitative and quantitative elements used in the evaluation of credit card applications that were insufficient in older models is the method of Analytical Hierarchy Process. This method, which will be examined in more detail is consistently one of the methods of the decision by many criteria.

3. The Problem of Decision and Analytic Hierarchy Process

Human intelligence during the decision-making process to a problem makes the decision making a hierarchical analysis by dividing the problem into smaller parts (most important to least important). At the foundation of analytic hierarchy process (AHP) techniques is the way that is used to solve the problem by human intelligence. People sometimes have difficulty facing complex problems in decision-making and to make decisions consciously use two ways. The first is inductive logic that is systematic and the other is practical logic deduction.

Generally, when people are ready to make a decision using the deduction method. For example, they can take a very quick decision about the problem if you have to go by bus or by taxi to a place. The reason is that the elements that are part of the event and are in interaction are as little as to give the opportunity to analyze easily by the the human brain.

However, for some decisions, must be taken into account all the elements that lead to the problem and structure (framework) that is formed by the interaction of these elements. This approach is called the method of induction.

During the process of making a decision to understand the complexity of current system also use both inductive and deductive methods. The system facility which allows to merge these two approaches in an integrated and logical is

Analytic Hierarchy Process (AHP-Analytical Hierarchy Process) (Saaty, 2000). In order to make a decision analytical hierarchy process is not only used by ordinary people but also from people who are competent leaders in the fields of economy and politics. According to sociologists mechanisms used to make decisions is divided into two types:

1- Use of logic and experience
2- Use of instincts

In everyday decision making mechanism is used more logic and experience. As the decision as an individual in deciding as a group of speakers experience and support of his speech in logic, can be influential in a decision that will take the group members. Completion of such a mechanism in making a decision, since it is not based on a concrete work may vary depending on the skills compelling speakers in the group.

While in some decisions problems, instinct appears in the foreground as a guide. According to sociologists, rational thinking or decision making process is just a thin overlay on instinctive behavior (Saaty, 2000). According to studies, one when playing chess can analyze concurrently till seven possible move (plus, minus two) (Miller, 1956). When analyzing the elements that should have been more, people move in a confuse order and decide without being too safe. Most cases in the decisions people are directed by their simple instincts. Even when logic and/or calculations show the contrary, they choose to follow the path that tells instinct for making the decision. Instincts born of faith and the idea of thinking that can predict the future. Therefore decisions based on instincts can sometimes be more absurd.

Given the words of Charles de Gaulle "only by decisions people can become great" men as they are forced to take simple decisions in everyday life, they can be forced to make decisions for complex and difficult problems (Çoroğlu, 2003). Ways used for everyday decisions rarely used when making decisions about important projects or who are turning points in people's lives. In these cases we can see that the more commonly used mathematical techniques known.

Deduction and other methods that include due-end relationships, can bring solutions in the decision-making process for simple problems. While terms of the most complex problems (consisting of qualitative and quantitative elements) remains insufficient. In case of problems formed by quantitative and qualitative elements we can use AHP as an effective technique to make decisions. AHP can help the receiver of the decision, having carefully mutual interaction and simultaneous many elements that are not part of the same structure and complex (framework) (Saaty, 2000).

AHP helps the decision of the people who will decide for the problem by taking a hierarchical structure evaluation, opinions, experiences and all information about this problem. This flexible structure enables analytical feelings and instincts to organize and align with a shape that resembles human logic. Thus this analytical flexible structure, allowing to adjust upon the paper instead of the mind, gives people the opportunity to intervene in the most difficult problems and complex.

When trying to solve the problems using AHP, we face three phases:

1- Presentation of complex mechanism of decision by a hierarchical structure,
2- Determination of priorities
3- Calculation and evaluation of results (Partovi, 1994).

In the first phase, it is easier to make a decision when placed in a hierarchical structure of all the elements that are part of any problem for who should be decided. Forming an analytical hierarchical structure can be assessed all the elements that are part of the problem and double comparisons can be made. The use of AHP method, the analytical evaluation of the problems encountered is necessary because the human mind can only carry twain comparisons (Saaty, 1996). The human mind can gets faster decisions based on twain comparisons and sometimes compare the elements regarded as unrivaled. For example, when you ask a hungry man "between apple and pear which would you choose?" He will make a choice as to make a comparison. That is, one can make comparisons for all facilities that serve the same purpose. It is this kind of intelligence used by the human brain to make this comparison, used by AHP method.

4. Conclusions

Problems of decision making are more pronounced today. The banking system is one of the sectors that need accurate models of decision making. Nowadays there are many models to approach reality but have a host of mathematical manipulation that makes more difficult to use and too expensive to buy. Such models not only cost more but also have high operating costs, as staff who will use must have a certain level of education or a certain training level. Introduction of simpler models in use is an advantage to the banking system. Just like this hierarchical analysis process (AHP) is low-cost, simple and efficient model. Using this model with low-cost and simpler free upgrade will be an advantage for all banks that will use it.

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