

# Risk and Reward Analysis Model

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**Abstract:** This paper presents a comprehensive review of the studies conducted in the application of data mining techniques focus on credit scoring and market segmentation. The studies are categorized and classified into enterprise, individual and small and mid-sized (SME) companies credit scoring. Data mining techniques are also categorized to single classifier, Hybrid methods and Ensembles. Variable selection methods are also investigated separately because there is a major issue in a credit scoring problem. The findings of this literature review reveals that data mining techniques are mostly applied to an individual credit score and there is inadequate research on enterprise and SME credit scoring. Data mining uses sophisticated software to collect, analyze, and report on large accumulations of data in order to extract information that provides insight into business and consumer processes. Customized data mining software is designed to convert raw data into useful information. Among the beneficial strategies for data mining is customer segmentation. Customer segmentation can be defined as the process of dividing a customer base into distinct and internally consistent groups in effort to develop and differentiate marketing strategies according to customer characteristics.

**Keywords:** Liquidity analysis, Profitability analysis,, Trend Analysis, Fund Flow. Cash Flow, Financial Risk, Country Risk, Moratorium Period, Disbursement Period.

## I. INTRODUCTION

Credit scoring consists of the assessment of risk associated with lending to an organization or a consumer (an individual). There are so many papers used intelligent and statistical techniques since the 1930s. In that decade, numerical score cards were first introduced by mail-order companies [1]. It seems that since then, although statistical techniques are used in some papers especially in hybrid techniques which mainly combine different techniques strengths to overcome their weaknesses, the usage of data mining techniques in the area of research has increased and become the dominant area in the field. When assessing the credit, according to the context we can roughly summarize the scoring as [2]:

**Application (credit) scoring:** It refers to the assessment of the credit worthiness for new applicants. It quantifies the default, associated with credit requests, by questions in the application form, e.g., present salary, number of dependents, and time at current address. Usually, a credit score is a number that quantifies the creditworthiness of a person;

Data mining is a type of sorting technique, which is actually used to extract hidden patterns from databases. The major advantages of using data mining are the fast retrieval of data or information, Knowledge Discovery from databases, detection of hidden patterns, and reduction in the level of complexity, time saving etc.

## II. PROBLEM DEFINITION

To design and implement a complete software system that stores all the details of the companies' assets, liabilities, profit, loss, the trend in market in terms of product sales. The system contains the method to approximate the cost of mobile, tablet and accessories as per the cost involved in manufacturing of the same which includes the cost of acquiring of raw materials to making finished good ready to sell in market. It also allows company to take decision to launch which particular mobile in which particular region so that the gross profit increases and the customer

retention is improved. The bank needs loans from bank and while applying for loan banks needs proper projections of how the business will proceed and how well it was managed in past. Depending upon the projection provided to bank the bank will scrutinise the data and generate a credit rating. This credit will determine what amount of loan can be sanctioned to the company at what rate of interest and for what period of time.

## III. LITERATURE SURVEY

### 3.1 Data Mining:

Data mining is the computational process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine learning, statistics, and systems. The overall goal of the data mining process is to extract information from a data set and transform it into an understandable structure for further use. Aside from the raw analysis step, it involves database and data management aspects, data pre-processing, model and inference considerations, interestingness metrics, complexity considerations, post-processing of discovered structures, visualization, and online updating.[4].

### 3.2 Association Mining:

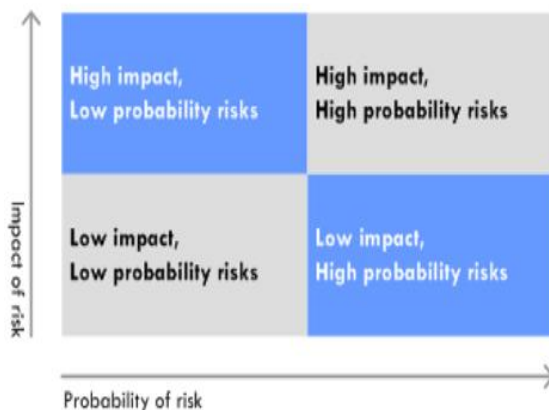
In data mining, association rule learning is a popular and well researched method for discovering interesting relations between variables in large databases. It is intended to identify strong rules discovered in databases using different measures of interestingness. Based on the concept of strong rules, Rakesh Agrawal et al. introduced association rules for discovering regularities between products in large-scale transaction data recorded by point-of-sale (POS) systems in supermarkets. For example, the rule {onions + potatoes} Burger found in the sales data of a supermarket would indicate that if a customer buys onions and potatoes together, he or she is likely to also buy hamburger meat. Such information can be used as the basis for decisions about marketing

activities such as, e.g., promotional pricing or product placements. In addition to the above example from market basket analysis association rules are employed today in many application areas including Web usage mining, intrusion detection, Continuous production, and bioinformatics. As opposed to sequence mining, association rule learning typically does not consider the order of items either within a transaction or across transactions.[2]

### 3.3 Risk Assessment:

Risk assessment is the determination of quantitative or qualitative value of risk related to a concrete situation and a recognized threat (also called hazard). Quantitative risk assessment requires calculations of two components of risk(R): the magnitude of the potential loss (L), and the probability (p) that the loss will occur. Acceptable risk is a risk that is understood and tolerated usually because the cost or difficulty of implementing an effective countermeasure for the associated vulnerability exceeds the expectation of loss.

In all types of engineering of complex systems sophisticated risk assessments are often made within Safety engineering and Reliability engineering when it concerns threats to life, Environment or machine functioning. The nuclear, aerospace, oil, rail and military industries have a long history of dealing with risk assessment. Also, medical, hospital, social service and food industries control risks and perform risk assessments on a continual basis. Methods for assessment of risk may differ between industries and whether it pertains to general financial decisions or environmental, ecological, or public health risk assessment.



### 3.4 Credit Rating:

A credit rating is rating of the debtor's ability to pay back the debt making timely interest payments and the likelihood of default. An agency may rate the creditworthiness of issuers of debt obligations, the debt instruments, and/or in some cases, the servicers of the underlying debt, but not individual consumers [4].

## IV. CLASSIFICATION METHOD AND MARKET SEGMENTATION

In this section, a graphical conceptual framework shown in Figure 2 is used for classifying credit scoring and data mining techniques. The conceptual framework is designed by literature review of current researches and books in

credit scoring area [3]. As shown in Figure 2, the given framework consists of two levels. The first level includes three types of credit scoring problem comprising Enterprise credit score, individual's credit score and small and mid-sized credit score. (i) Individual (consumer) credit score: The individual credit score, scores people credit using variables like applicant age, marital status, income and some other variables and can include credit bureau variables.

(i) Enterprise credit score: using audited financial accounts variables and other internal or external, industrial or credit bureau variables, the enterprise score is extracted. (ii) SME credit score: For SME and especially small companies financial accounts are not reliable and it's up to the owner to withdraw or retain cash, there are also other issues, for example small companies are affected by their partners and their bad/good financial status affects them, so monitoring the SMEs counterparts is another way of scoring them [3]. As a matter of fact, small businesses have a major share of the world economy and their share is growing, so SME scoring is a major issue which is investigated in this paper.

Although some differences can be found for scoring of export guarantees, EXIM banks and other institutions which have not the profit as their main goal, they are excluded because of their low literature [3].

Data mining can contribute to solving business problems in banking and finance by finding patterns, causalities, and correlations in business information and market prices that are not immediately apparent to managers because the volume data is too large or is generated too quickly to screen by experts. The managers of the banks may go a step further to find the sequences, episodes and periodicity of the transaction behaviour of their customers which may help them in actually better segmenting, targeting, acquiring, retaining and maintaining a profitable customer base. Business Intelligence and data mining techniques can also help them in identifying various classes of customers and come up with a class based product and/or pricing approach that may garner better revenue management as well.

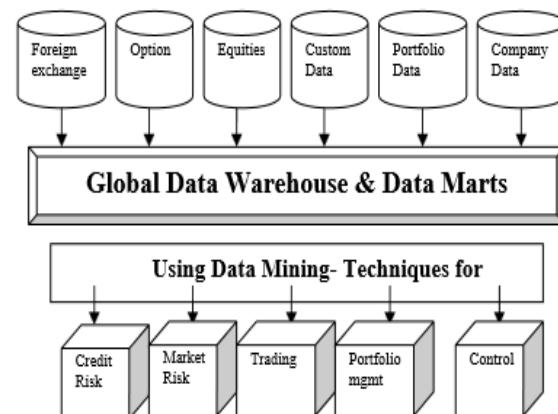


Figure 1. The use of Data Mining Technique is a Global and Firm wide challenge for financial business. Firm-wide data source can be used through data mining for different business areas.

#### 4.1. Business segmentation

There are integral differences between consumer segmentation categories and business segmentation categories. Some of these differences include the larger transactions with longer selling practices that characterize business segmentation. Extensive consultation occurs with representatives as opposed to end-users, making the segmentation process much different than that of consumer segmentation.

Customization is the norm in business markets; whether it is the product, price, or quantity that is customized. Thus it is recommended that each customer be considered its own segment. Due to these unique characteristics, business segmentation is based on the following:

- (i) Value: revenue or profit
- (ii) Size: number of employees, number of subscriptions/subscribed employees
- (iii) Industry type: Government, education, telecommunications, financial, etc.
- (iv) Business life-stage: new business, mature business, etc.

As with consumer segmentation, data mining software must be customized to meet the needs produced by the unique processes that occur during business segmentation.[6]

### V. RISK MANAGEMENT

Managing and measurement of risk is at the core of every financial institution. Today's major challenge in the banking and insurance world is therefore the implementation of risk management systems in order to identify, measure, and control business exposure. Here credit and market risk present the central challenge, one can observe a major change in the area of how to measure and deal with them, based on the advent of advanced database and data mining technology. ( Other types of risk is also available in the banking and finance i.e., liquidity risk, operational risk, or concentration risk. )

Today, integrated measurement of different kinds of risk (i.e., market and credit risk) is moving into focus. These all are based on models representing single financial instruments or risk factors, their behaviour, and their interaction with overall market, making this field highly important topic of research.

#### 5.1 Financial Market Risk

For single financial instruments, that is, stock indices, interest rates, or currencies, market risk measurement is based on models depending on a set of underlying risk factor, such as interest rates, stock indices, or economic development. One is interested in a functional form between instrument price or risk and underlying risk factors as well as in functional dependency of the risk factors itself.

Today different market risk measurement approaches exist. All of them rely on models representing single instrument, their behaviour and interaction with overall market. Many of this can only be built by using various data mining techniques on the proprietary portfolio data,

since data is not publicly available and needs consistent supervision.

#### 5.2 Credit Risk

Credit risk assessment is key component in the process of commercial lending. Without it the lender would be unable to make an objective judgement of weather to lend to the prospective borrower, or if how much charge for the loan. Credit risk management can be classified into two basic groups:

- a) Credit scoring/credit rating. Assignment of a customer or a product to risk level.(i.e., credit approval)
- b) Behaviour scoring/credit rating migration analysis. Valuation of a customer's or product's probability of a change in risk level within a given time.(i.e., default rate volatility)

In commercial lending, risk assessment is usually an attempt to quantify the risk of loss to the lender when making a particular lending decision. Here credit risk can quantify by the changes of value of a credit product or of a whole credit customer portfolio, which is based on change in the instrument's rating, the default probability, and recovery rate of the instrument in case of default. Further diversification effects influence the result on a portfolio level. Thus a major part of implementation and care of credit risk management system will be a typical data mining problem: the modelling of the credit instrument's value through the default probabilities, rating migrations, and recovery rates. Three major approaches exist to model credit risk on the transaction level: accounting analytic approaches, statistical prediction and option theoretic approaches. Since large amount of information about client exist in financial business, an adequate way to build such models is to use their own database and data mining techniques, fitting models to the business needs and the business current credit portfolio.

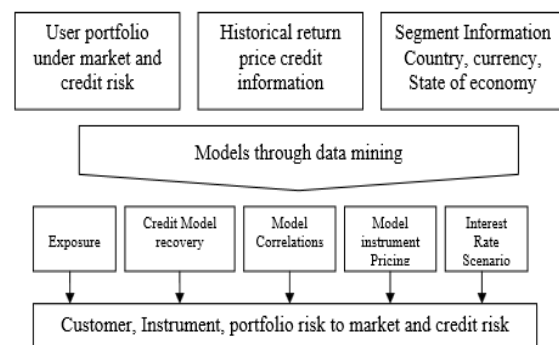


Fig. 2: Using Data Mining technique for customer, financial instrument, portfolio risk to market and credit risk measurement.

### VI. PROPOSED WORK

Our project "Credit & Business Risk and Reward analysis Mode" will help the business organizations in the following ways:

- (i) The project being developed will save a minimum of 5 days per disbursement which would ultimately save both time and money for the company.
- (ii) It will also help the company to choose a product mix that would give maximum return give the limited resources available with the company.

- (iii) It will help in standardization and better decision making for the company
- (iv) It will also be used in risk analysis & management for forecasting, customer retention, credit scoring.
- (v) Till date the company was providing bank, the figures which were not in standard format and hence each time before disbursement we had too many manual calculations. Many a times the calculations like financial risk, county risk cash flow, sensitivity analysis were not as per bank's prescribed norms and hence there was a lot of rework. This will be very much simplified by the project being developed.

#### 6.2 Analysis

*Business Segment wise profitability analysis:* The Company has business spread across many segments and this model will help them to identify the top performers and worst performers helping effective product mix.

*Liquidity analysis:* The model will help to analysis the liquidity position thus forewarning the company for any excess liquidity for lack of liquidity.

*Profitability analysis:* This model will help to predict the overall expected profitability

*Asset and liability analysis:* The assets and liabilities of business can be adjudged based upon the predictions made in the model

*Trend Analysis:* This model will help in analyzing the trend ahead

*Fund Flow:* This model will help to predict the fund inflow and outflow thus aiding cash management.

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*Sensitivity Analysis:* Sensitivity helps to analysis that for a given change in variable what will be the change in final product. This analysis helps to identify the key area which needs to be closely monitored.

*Financial Risk:* This model will help in prediction of the finance risk involved in a given business thus facilitating decision making as to such risk is actually to be taken and if yes the reward that will arise from the same.

## VII. CONCLUSION

“Credit & Business Risk and Reward Analysis Model” will help the company to improve its credit worthiness by concentrating and working on its weak sectors thus allowing the organization to get higher loan. This project will also help in market segmentation allowing company to launch newer model aiming at targeted audience.

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## REFERENCES

- [1] Edelman, D.B. and J.N. Crook. (2002). Credit scoring and its applications. Society for Industrial Mathematics.
- [2] Van Gestel, T. and B. Baesens. Credit Risk Management: Oxford University Press.
- [3] Edelman, D.B. and J.N. Crook. (2002). Credit scoring and its applications. Society for Industrial Mathematics.
- [4] The Risk in Credit Ratings by Markus Krebsz, Scottish Financial Risk Academy.
- [5] M.S. Chen, J. Han, P.S. Yu (1996) “Data mining: an overview from a database perspective”. Knowledge and data Engineering, IEEE Transactions on 8 (6), 866-883.
- [6] Tsipsis, K., Chorionopoulos, A. (2009). Data mining techniques in CRM: Inside customer segmentation. John Wiley & Sons, LTD: United Kingdom