

Credit Risk Management Using ScoreCards

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Reference Book

- **Credit Risk Scorecards: Developing and Implementing Intelligent Credit Scoring** by Naeem Siddiqi (Author)

Introduction to Credit Scores

Credit scores are important when you want to borrow money. Think of your credit score like a report card for your money habits. It shows how trustworthy you are with money. Your score is a number that tells lenders how likely you are to pay back what you borrow. The score is calculated based on various factors such as loan payment history, length of credit history, individual financial status, industry-specific factors, and other times external data such as social behavior data.

Factors prompting the utilization of scorecards

- ✓ Increased regulation mandating robust risk assessment and credit evaluation processes.
- ✓ Need for standardization and consistency in credit assessment across organizations.
- ✓ Desire to improve efficiency and streamline lending processes.
- ✓ Growing complexity and volume of data necessitate efficient tools for analysis.
- ✓ Need to create value while ensuring profitability for lending products.

Characteristic	Bin	Score
Income	Up to 10k	5
	11k to 30k	15
	41k to 70k	25
	71K and up	32
Age	Upto to 24	5
	25 to 30	17
	31 to 40	25
	40 and up	30
Home Ownership	Rental	15
	Mortgage	23
	Owner	30
Total Score		Score Sum

Score Card Example

Key Considerations

People and Process

Scorecard development should not be a “black box” process. Building scorecards with transparency is crucial to ensure fairness, accountability, and compliance with regulations, as opaque models can lead to bias, and difficulties in validation, hindering both organizational and regulatory confidence.

Data Scientists/Analysts



- Collecting, cleaning, and analysing the data used to develop the scorecard.
- Score card development.

Credit Risk Mgt Team



- Subject matter experts in defining risk criteria & thresholds used in the scorecard, ensuring that it aligns with the organization's risk appetite & Regulatory constraints.

IT & Software Dvpt Team



- Integrate the scorecard into the organization's infrastructure, ensuring functionality.

Product Managers/Owners | Project Management | Compliance & Legal Team | Business Stakeholders

Data Gathering & Preparation

Data gathering and preparation are crucial steps in credit scoring that directly impact the accuracy, fairness, regulatory compliance, and performance of credit scoring models. It could be arguably the most time and labor-intensive process in scorecard development. Adequate time should be put into this process with maximum attention.

Main Steps:



Let's analyze the above 3 main steps in data gathering and preparation

1. Data Availability & Quality Review

- **Quantity of Data** — There is no upper limit to the amount of data that can be used. However, a minimum amount of data is needed to have a reasonable number of bins per feature. Where there isn't enough data, quality data could come in to compensate for the amount of data.
- **Exclusions** — The development sample for credit scorecards should exclude accounts and applications that do not represent the intended customer base or would not be scored in day-to-day credit operations. E.g anyone who would not be considered a 'normal' customer e.g VIPs, Fraud customers, etc. In addition, data that will not be part of the application process in the future should be excluded. E.g If a bank plans to expand into other geographical areas, historical data specific to the bank's current market should be excluded from the development sample for future credit scoring models.

2. Business Rules

- **Sample Window** — The purpose of the sample window is to capture a representative sample of data(sample size) to use in development. This sample window should have a reasonable minimum number of good and bad loans. The sample period should not be too old or too recent. A sample window for instance can be determined from the period in which the bad rate is deemed to be stable.

- **Bad Loans-** The appropriate definition of bad depends on various factors. This includes project objectives, the product or purpose for which the scorecard is being built, differentiation requirements, interpretability, and tracking feasibility.
- **Good Loans-** Good Loans exhibit characteristics such as never being delinquent, having no history of claims or bankruptcy, and being profitable.
- **Indeterminate** — Indeterminate accounts fall between these categories, often due to insufficient performance history or mild delinquency. They can include inactive accounts, voluntarily closed accounts, or applications that were approved but not utilized.

3. Data Cleaning

Effective data cleaning necessitates a comprehensive understanding of both business objectives and the data itself. This iterative procedure is aimed at identifying and addressing irregularities by removing, replacing, modifying, and rectifying data inconsistencies.

- Statistical methods such as distributions of values , mean/median, proportion missing, and range of values for each characteristic can offer great insight into the business, and reviewing them is recommended.
- When utilizing samples, it's essential to compare the distributions of sample data with those of the overall portfolio to ensure the sample accurately represents the entire portfolio.
- Data should also be checked for interpretation (e.g., to ensure that "0" represents zero and not missing values)

Two major issues with unclean data are missing values and outliers.

Handling of Missing Values

- **Imputation** -Utilize statistical techniques or model-based imputation to fill in missing values.
- **Exclusion** — Prioritize excluding characteristics or records with a significant proportion of missing values, especially if this trend is expected to persist.
- **Attribute Treatment** — Incorporate characteristics with missing values into the scorecard development by treating them as a separate attribute. Group and utilize them in regression analysis, allowing the scorecard to assign weights accordingly. This approach provides insights into the nature of missing values.

Outliers

Outliers pose challenges in credit scoring by distorting data distributions, leading to inaccurate risk assessments and potentially biased lending decisions. Their presence increases model risk and can compromise regulatory compliance, as they may not accurately represent the majority of customers or result in fair treatment. Proper handling of outliers is crucial to ensure the reliability and fairness of credit scoring models.

Handling Outliers

- **Data exclusion:** In extreme cases, exclude outliers from the dataset if they are deemed to be erroneous or irrelevant to the analysis. E.g someone's age being 300 years or imputing them if the proportion is not big.
- **Binning:** In constructing grouped attribute scorecards, outliers are binned with the nearest group which neutralizes their effect.