CREDIT RISK: ASSESS PD WITH AN APPLICATION SCORECARD

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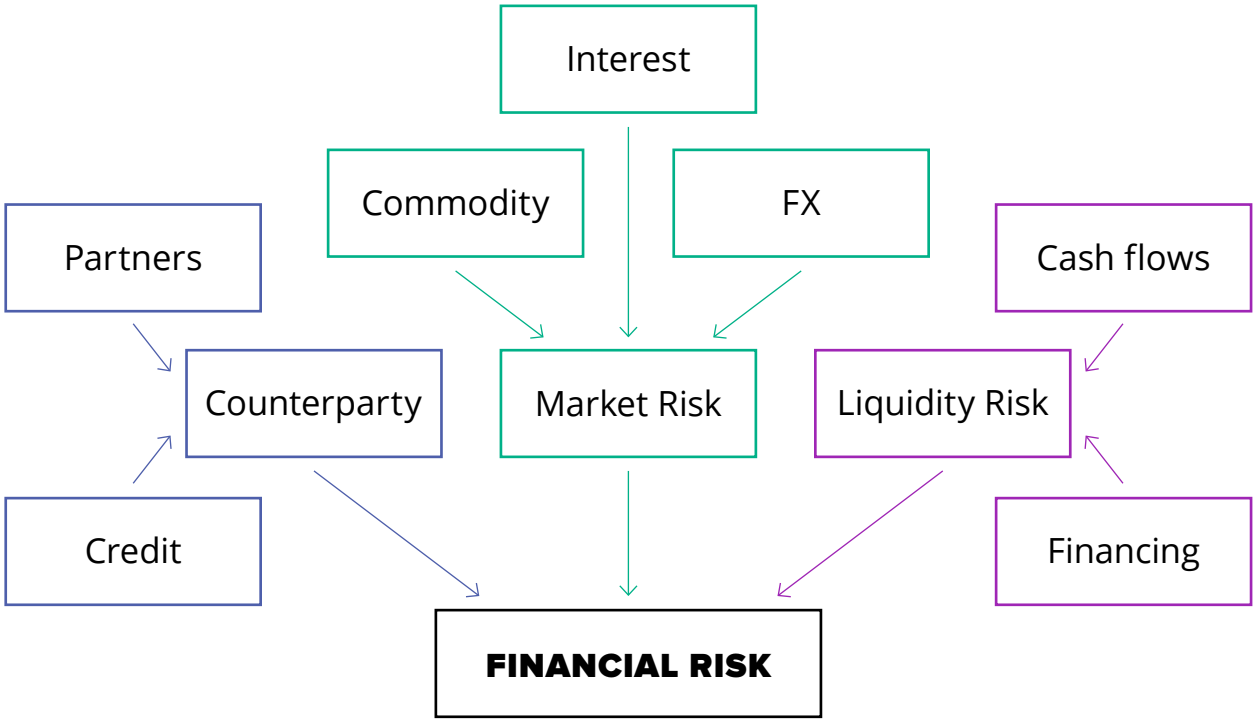
These days, there are a lot of factors that impact risk management: rapidly changing environments, new regulations, and groundbreaking technologies.



Businesses require faster, more robust systems when dealing with a higher volume of calculations. For instance, businesses require daily credit risk frameworks and what-if scenario testing, where traditionally they were only monitored monthly.

So in a fast-paced environment, how do you ensure your business is making the right financial decisions?

Let's consider application scorecards as a typical challenge in credit risk modeling, and the practical steps necessary for success.

Application Scoring

An application scorecard is a statistic-based analysis of the client's creditworthiness based on applicant and loan information. It belongs to credit risk strategy and modeling (in retail, lending business), and is directly associated with the PD, or probability of default. PD is one of the key parameters in regulatory reporting and measuring capital adequacy for banking institutions according to Basel II and Basel III. Therefore, the higher the score, the lower the PD. The scorecard is presented as a set of characteristics and points corresponding to them:

APPLICATION SCORECARD

Characteristic	*Attribute*	*Score*
Credit history	Good	51
	Bad	0
	N/A	15
Loan amount	100..1500	81
	1500..2300	49
	2300..3500	41
	3500..8000	23
	8000+	0
Number of dependents	0..0	0
	1..2	25
	3+	12
Age	18..24	0
	25..29	22
	30..39	33
	40..55	39
	55+	47
Income (monthly)	0..550	0
	550..1300	10
	1300..2800	22
	2800..4500	48
	4500..8000	67
	8000+	62

To calculate a customer's score, you simply add the characteristic points associated with the customer's application. This makes the scorecard time-consuming to build, but easy to deploy, integrate, and use.

But maybe you're asking yourself: Why do we need to build a scorecard?

Let's examine the benefits.

Motivation

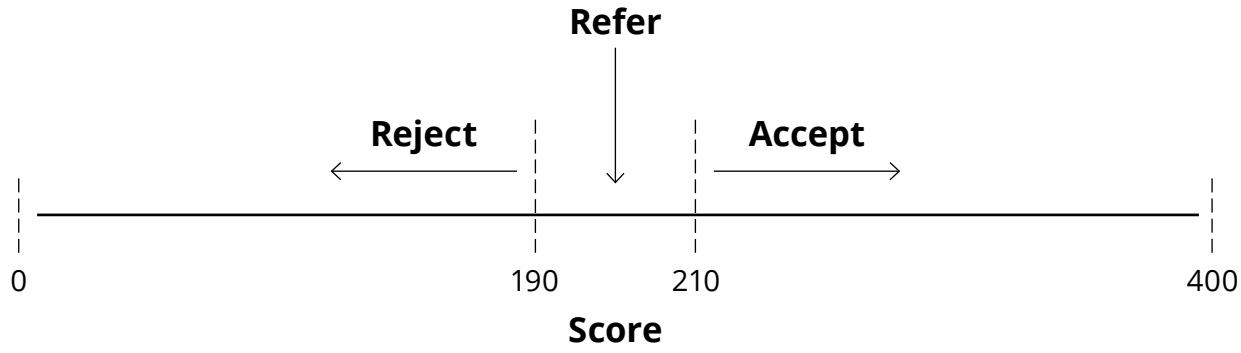
The first benefit of using a scorecard is **reducing the delinquency rate**—a good scorecard helps to distinguish good and bad users efficiently.

The second benefit is **risk assessment**. It enables you to predict your cash flow or P&L (profit and loss), and to reserve a valid amount of funds with respect to the risk associated with the portfolio.

A **significant speed-up of the application process** is another meaningful effect of the scorecard application, giving you results in minutes—not hours or even days.

There's also the possibility of a **risk-based pricing approach** integration, when low-risk customers receive better rates and vice versa.

The requirements satisfaction and **internal fraud monitoring** are among other included benefits, allowing you to get a better read on your customers and to keep an eye on any suspicious activity.



Building the Scorecard

So how do you build it? Let's consider the steps needed to build an application scorecard.

The first step of the approach is to **assume that the customer's behavior will remain consistent with the historical data**, allowing you to predict creditworthiness based on past experience. To extract this "experience" we'll need the historical data from previous loans. Get the data, validate the quality, and make sure you have enough of it (for a stable scorecard, at least 2,000 records are recommended), then prepare and clean it for further analysis. Anomaly detection and missing value treatment are also parts of this pre-processing step. If applicable, credit bureau data should also be gathered; social media data is also a modern source of additional data. Usually, the analysis is done in SAS/R/SPSS/Python, and the data is extracted from the SQL or other database.

The second thing to do is **determine the observation period**: defining "bad"/"default" debt so that the task is transformed into mathematical language: a binary classification problem, to identify whether a new customer will return the loan or not. Typically, payments for 60 to 90 days (conservative approach) past due are treated as defaults.

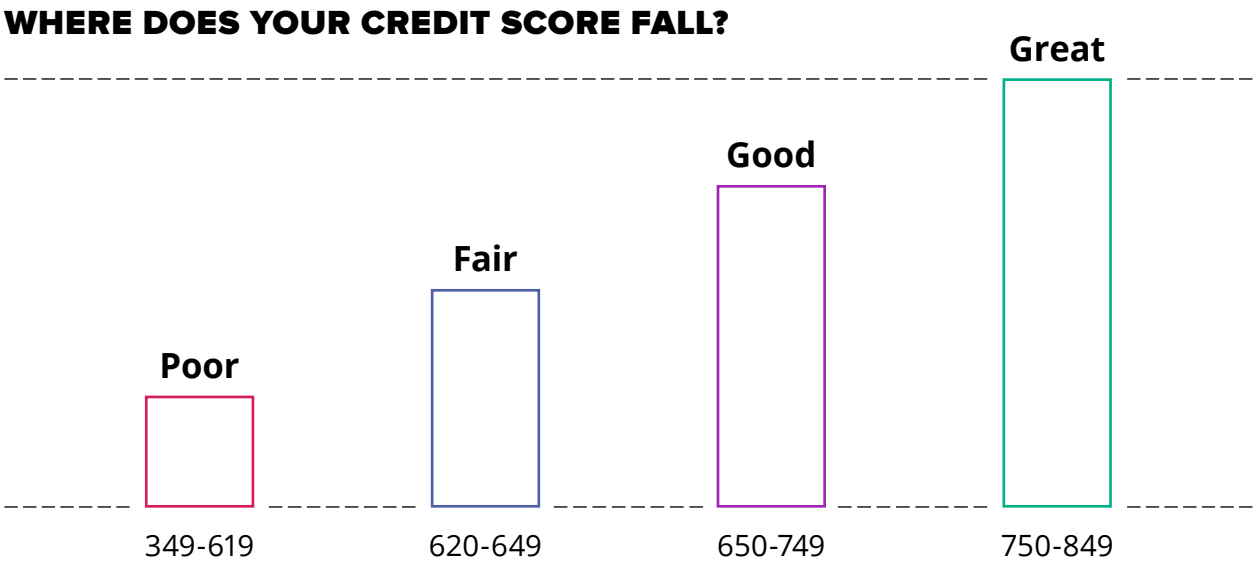
Thirdly, you must **perform data analysis**—categorizing continuous variables, their correlations and filtrations, segmentation, and then separating the dataset into training, validation, and test subsets. This is a significant part of the scorecard development process. The same toolset is used—SAS/R/SPSS/Python or, more unusually, custom software.

Next, you start **modeling**. Usually, logistic regression is under the hood, sometimes decision trees, rarely Artificial Neural Networks (because this algorithm is a "black-box" in terms of interpretation). Modeling is followed by a model assessment, which includes multiple steps and visualizations (e.g. Gini coefficient and ROC-curve, confusion matrices to assess both precision and stability), choosing, and boosting.

After completing the above and, typically, some expert adjustment, you're able to make a PD prediction. Everything you need to **generate a scorecard** from the model—simply select a scale and perform a PD-to-score transformation. Risk buckets and cut-off selection are done at this stage as well, including the optional formation of high-level recommendations for a risk-based credit policy according to the business goals.

Finalization

We've covered the definition of the application scorecard, motivation—why we need it, and the major steps of the scorecard development process. Let's explore where it fits in your overall strategy.



A good scorecard is used as a part or module of the overall credit strategy and process, not as a standalone product. Moreover, to ensure the effectiveness of the scorecard over time, the corresponding monitoring framework and alerts system must be built.

Additionally, regular performance checks should be conducted at least once in a quarter to verify if any adjustments or even a model rebuild are needed.

Conclusion

In this paper, we've outlined the process of building an application scorecard as a typical task of credit risk management as well as the main steps of this process in detail, from getting historical data to modeling to monitoring. Assessing PD helps you run your business more efficiently, monitor the portfolio and profitability, and to make wise choices when it comes to your bottom line.

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