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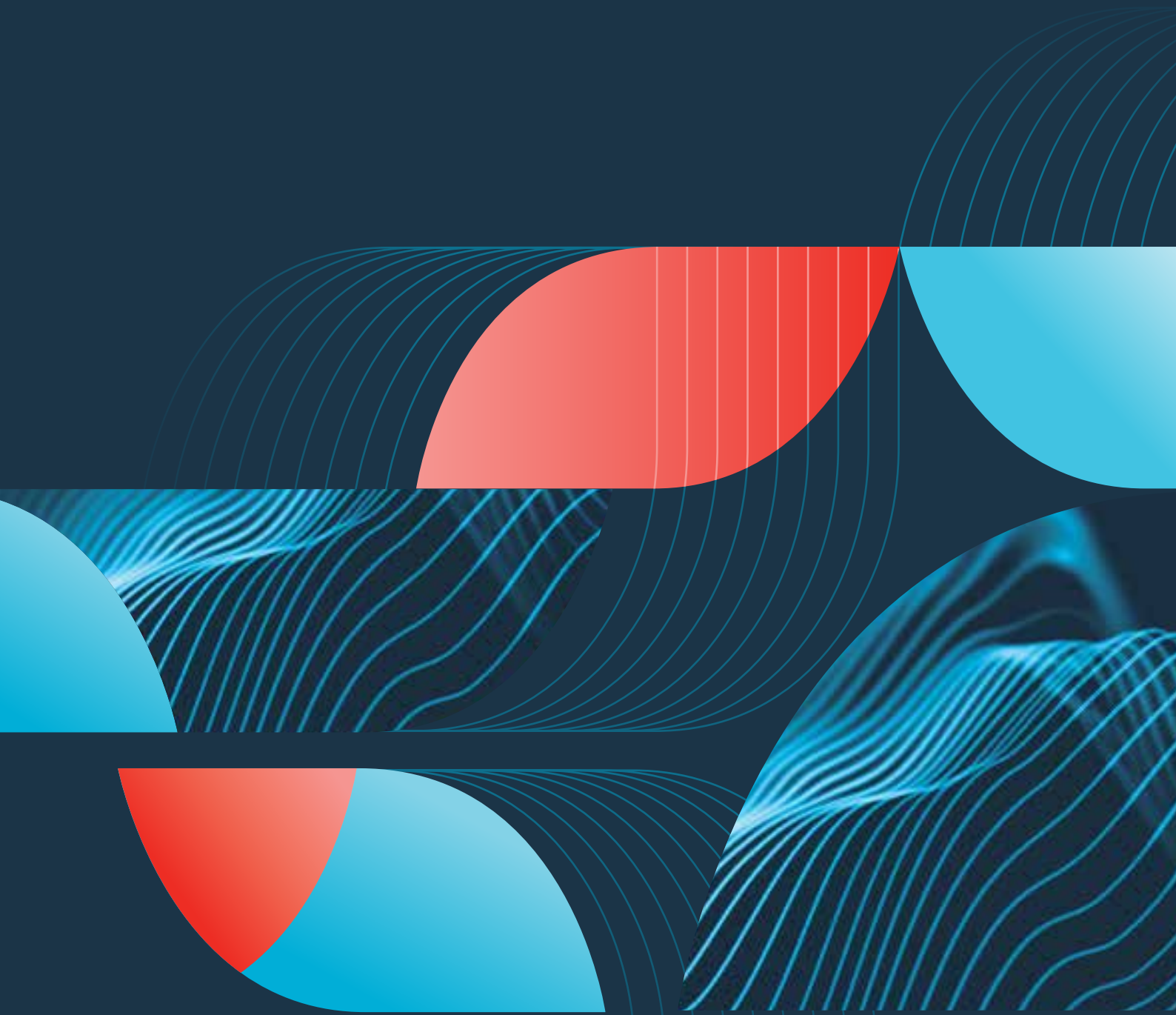
# Credit Scoring Guide



POWERING BUSINESS DECISIONS

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# Overview

Each year, hundreds of millions of business decisions are based on data insight from Creditsafe. Our credit scores and limits are used by companies of all sizes within multiple industries to make fast and informed decisions, automate workflows and guide strategic direction.

We are proud to be the world's most used provider of commercial credit reports and make it our highest priority to deliver accurate data and highly predictive scores to our customers across the globe. As a result, we invest millions of pounds in continually enhancing and monitoring the scorecards across the Creditsafe Group.

We are extremely pleased to share with you the details of our Scorecards which accurately predict risk and business failure across each region.

# What is a Scorecard?

Creditsafe Scorecards are a series of highly predictive algorithms created by our world-leading in-house Analytics Team. A Credit Scorecard in general is a mathematical model that attempts to predict the likelihood that a company will display a specific behavior, considering all relevant and correlating information, over a certain period of time. It can be understood as the refinement of all significant characteristics into one measure of risk.

Using advanced statistical techniques, the team evaluate hundreds of million rows of validated data from over 9'000 trusted sources globally. Each country within our group has its own generic scorecard built to accurately reflect the local characteristics and trends of the region. For each country's scorecard, the team evaluates all active companies within the country on a regular basis. This is done to identify those characteristics in the respective country that either lead to or are indicative of upcoming insolvency within the next 12-month period. Of the hundreds of variables evaluated, only those that statistically indicate default or economic stability are included within the scorecard.

The scorecard is then applied to the current population of companies in the country concerned. A Probability of Default (PD) for each business is determined by the scorecard which, in turn, assigns the corresponding score between 1 and 100, or A-D for its international score. We continually assess the performance of the scorecard to ensure it remains highly accurate in calculating the likelihood of business default.

# Scorecard development process

The essential concept behind Creditsafe's scoring models is the accurate and robust prediction of insolvency occurrence within the next 12 months, using a set of characteristics that clearly identify why a business is at high or low risk.

Businesses come in many different shapes and sizes, from your local independent café around the corner to the industry leader. The resulting different dependencies and complexities are in turn reflected in various causalities, or set of characteristics, which can lead to insolvency.

To increase the discriminatory power of the scorecard, meaning the ability to distinguish between "good & bad", segmentation is conducted. The aim of the segmentation is to define a set of sub-populations in such a way that, when modelled individually and combined, rank risk more effectively than a single model on the overall population.

The main characteristic used for segmentation has been the size of the company, reflected by financial statements and respective national legislation, whereby companies without timely financial statements as well as start-ups are reflected in separate models depending on their legal form, company age and a set of over criteria.

## i. Population design

As the foundation for a successful model development, three critical areas need to be identified and clearly defined. These three areas are:

- Development sample: When building a scorecard, a sample of data containing companies corresponding to the companies to be scored later in production need to be identified. From the total universe of companies in the database, some companies will be excluded from the development sample without impacting the scorecard quality. In addition, identifying all available data at a certain time, called observation point and period, is crucial. This sample will then be divided into the different segments as mentioned above.
- Bad definition: The bad definition is the behaviour a scorecard will predict. The definition of a bad (an insolvent or bankrupt) company is determined by the country-specific legal definition and terminology of the bankruptcy processes. For this reason, the definition of insolvency may vary slightly among countries.
- Outcome period: This means the time it will take until a company will turn bad. Normal and standard for these kinds of models is a 12 month outcome period.

## ii. Characteristic analysis

All available company data variables, called characteristics, have been considered for modelling and tested univariately.

Subsequently, coarse classification in intervals is performed by stepwise combining those ranges. This ensures a statistically robust number of observations in every interval, smooths out erroneous characteristics in the risk profile and eliminates outliers.

The characteristics are then prioritised according to their information value and those with too little content as well as those without economically comprehensible logic are rejected.

## iii. Modelling methodology

Stepwise logistic regression (SLR) is used to develop the scorecard. This is Creditsafe's preferred method and frequently used in scorecard development. SLR has its benefit of generating accurate and robust predictions for a binary outcome, such as will a company become insolvent within the next 12 months.

Starting with the characteristic with the highest statistical significance, all other significant characteristics are then gradually (step by step) added to the models until there is no more improvement in the existing model.

## iv. Characteristic selection

p-Value > Chi-Square:
This measures the likelihood whether the respective parameter estimate (the statistical statement of a characteristic) is based on chance and thus does not add any value to the model. The higher the p-value, the lower the significance of the parameter estimate in a prediction model.

Significance Level α (p-Value < α):
The significance level reflects the defined threshold where a characteristic is considered significant and informative enough to be included in the model. It is directly related to the p-value > chi-square, whereby a parameter estimate is only considered statistically significant if its p-value is less than the significance level.

## v. Checking business logic

As explained in step "ii. Characteristic Analysis", statistical significance alone is not sufficient to enter the model. Each characteristic must be in addition adequately checked for its business logic.
The first test is therefore already carried out during the univariate analysis, the significance analysis, in which each characteristic is individually tested for its significance.

Unsuitable characteristics are also discarded despite statistical significance. Afterwards, all characteristics are also combined and checked for their relationship to each. This is to avoid any mutual correlations or results that are illogical from an economic point of view.

If the analysis is carried out correctly, the model should be predictive and mathematically correct.
Another essential test procedure deals with the consistency of the beta coefficients or regression parameters respective weights. This examines whether the beta values assigned to the characteristic values (their weighting) are consistent with the respective default level, with particular attention to the sign of a beta coefficient.

# Probability of Default

The probability of default (PD) provides information on how stable a company is, or more importantly how high the risk is of doing business with this company.

In fact, it can be understood as the refinement of all significant company characteristics into one measure of risk, i.e. the percentage probability that a company will become insolvent within the next 12 months.

In order to meet the needs and application areas of our clients, the PD is additionally converted into different units of measurement - score (1-100), risk class (A-E) or traffic light scale.

With the introduction of the new scorecards, the Creditsafe score is additionally provided with the calculated PD.

# Final Scorecards

Creditsafe's scorecards map the default risk on an easy-to-use and representative scale from 1 to 100 for clients, from very high to very low risk, based on the respective underlying PD.

It is important to note that the score itself is not a percentile score (percentile rank) where the population is forced into a certain position to achieve a desired distribution.

Creditsafe applies different statistical methods for the scaling ("good/bad odds principles"), whereby the respective score ranges decrease with decreasing risk in order to represent the overall risk in a differentiated manner.

Each score value therefore represents a certain range of default probabilities.

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