Introduction of Scoring and its Realization

by Means of Discriminant Analysis and Neural Networks

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Abstract

The paper used methods for time series forecasting and risk analysis of the quality of the consumer loan portfolio and compare their quality, used technique of scoring and its implementation through the use of discriminant analysis and neural networks to predict the likelihood of timely repayment of the loan borrower. Forecasting is done in software product «Statistica». In this paper we implemented ARIMA model, seasonal decomposition, exponential smoothing, discriminant analysis and neural network techniques.

Keywords: Building prediction, statistical methods, credit
1 Introduction

In a market economy, consumer lending takes on particular importance and is one of the main and most profitable activities of modern commercial banks. However, this type of lending is also the most risky. The subject of study is the trend of consumer credit and the quality of the consumer loan portfolio of JSC «Avtogradbank». In this analysis of the quality of the loan portfolio by using prediction residuals share of overdue debt in the total outstanding loan consumer debt, and decrease the riskiness of loans by applying the technique of scoring.

2 Introduction of scoring and its realization by statistical methods

For the analysis of consumer credit in JSC «Avtogradbank» for the period from 2009 to 2013 is considered the total loan portfolio and found that consumer loans there are a considerable share: in 2009 it amounted to 17%, by the beginning of 2014, in During steady growth, was already 26%. Such weighty share of loans for consumer needs and their tendency to constant growth allow us to judge the importance of this type of lending for the bank. A smaller proportion of consumer credit take car loans, followed by loans for the purchase of property, and have the highest proportion of "other" loans (loans without purpose loans, student loans, rest, treatment, etc.).

Dynamics of balances of loans for consumer loans during the period from January 2009 to February 2014 analyzed in order to evaluate the activity of the bank’s activities in the consumer lending. In addition, from this value depends on interest income received from consumer lending. In general, during the period under review, the remnants of loans grew in February 2014 amounted to 1848804 thousand rubles. Of forecasts constructed using ARIMA - models and seasonal decomposition method, it was found that the trend of growth of loans to continue, which means that the bank will continue to develop and expand its activities in the field of consumer credit.

Visualizeforecast - Figure 1.

Figure 1: The schedule of the forecast
Thus, in accordance with the constructed model, we can say that the remnants of consumer debt continued to grow, and in February 2014 will be approximately 2075476000 rubles. The peak is projected to have on December 2014. In this month the debt of approximately 2638851 thousand rubles.

In this case, the use of ARIMA models showed that the remains of consumer debt to February 2015 was approximately 2075476 thousand rubles. The peak is projected to have on December 2014. In this month the debt of approximately 263885 thousand rubles.

Forecast error for cross-checking when using this method is 5.2%.

For clarity, we consider and assess the quality of the forecast as a graph - see Figure 2.

![Graph of original series prediction]

**Figure 2:** Schedule prediction of the original series

In accordance with the prediction obtained in the next 12 months, the remains of loans for consumer loans will continue to be an upward trend. In February 2015, the debt will be equal to approximately 2482274 thousand rubles. And in December 2014 it will reach its maximum and is equal to approximately 2777059 thousand rubles. In January and February 2015, according to the forecast there will be a slight decline.

Seasonal decomposition method gave better quality forecast - an error in this case is 3.2%. According to the forecast obtained by this method, to February 2015, the outstanding balance will be equal to approximately 2482274 thousand rubles. And in December 2014 it will reach its maximum and is equal to approximately 2777059 thousand rubles. Application of the seasonal decomposition showed a higher quality prognosis than building ARIMA - models, though, in general, both methods gave quite similar predictions: the general trend of growth and maximum peak in December.

Both methods showed that the upward trend in the debt continues, and this is a positive sign. However, as consumer credit is one of the most risky types of lending, it is important to bear in mind that the remains of loans included balances of overdue loans. In this connection was examined and predict the dynamics of overdue loans.
According to the forecast obtained by exponential smoothing, the remains of arrears continue to grow, and by February 2015 was approximately 48716,2 thousand rubles, with a peak in January 2015 – 50053,25 thousand rubles. The average absolute error in this case was 6.9%. Application of neural networks also confirmed the continuing trend of growth and showed that the overdue loans by February 2015 will be equal to 50890,86 thousand rubles, The highest peak of the same will be made in January 2015, when arrears of approximately 53700 thousand rubles.

Forecast error using neural networks is equal to 4.6% .This method gave a higher quality prognosis than exponential smoothing.

The resulting predictions were used to calculate the predicted values of the share of overdue loans in total consumer debt. The forecast shows that the share of overdue debt from March 2014 to February 2015 will fluctuate at about 2%, which is indicative of a positive characterizing consumer portfolio.

However, despite such a small percentage of the share of non-performing loans, it can be seen that since 2012 it has a tendency to grow and for 2 years increased by almost 1%, which is quite fast paced growth. In this regard, in order to reduce the share of non-performing loans is proposed to use the methodology of scoring that classifies borrowers to "reliable" and "not reliable" and thus makes it possible to predict whether a potential borrower to repay the loan on time. The paper presents the implementation of scoring approach using the method of discriminant analysis and neural networks (in the package Statistica). Based on the data of 70 borrowers of the bank carried out the classification of 5 new borrowers.

Both methods are classified new borrowers is identical, but the application of neural networks gave a qualitative forecast (allowed one mistake classification), whereas the use of discriminant analysis allowed 2 errors.

Results of the analysis showed that consumer credit is one of the priorities of JSC «Avtogradbank». It is developing dynamically. The quality of the loan portfolio is maintained at a high level, but increasing the riskiness of loans granted is the need to take additional measures to reduce it. As such measures proposed implementation methodology scoring by statistical methods.

References


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