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Spline Based Survival Model for Credit Risk Modeling *

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Survival modeling has been adapted in retail banking because of its capability to analyze the censored data. It is an important tool for credit risk scoring, stress testing and credit asset evaluation. In this paper, we introduce a regression spline based discrete time survival model. The flexibility of spline function allows us to model the nonlinear and irregular shape of the hazard functions. By incorporating the regression spline into the multinomial logistic regression, this approach complements the existing Cox model. From a practical perspective, the logistic regression is relatively easy to understand and implement, and the simple parametric form is especially advantageous for predictive scoring. Using a credit card dataset, we demonstrate how to build a cubic regression spline based survival model. We also compare the performance of spline based discrete time survival model with the classical Cox model, our results show the spline based survival model can provide similar statistical explanatory and improve the prediction accuracy for attrition model which has low event rate.

Key words: Retail Banking, Credit Risk Scoring, Survival Modeling, Regression Spline

1. Introduction

In the past 50 years, consumer credit has been the driving force of economics in most developed countries. For example, in August 2015, the consumers in USA own $11.85 trillion in debt, of which $8.17 trillion is on mortgages and $2.08 trillion on consumer credit (e.g., credit cards and student loans), see Chen (2015). Similarly, in the UK, the average total debt per household (including mortgages) is £55,384 and the total personal debt reaches £1.463 trillion at the end of November 2014, see Curphey (2015). The rapid growth of consumer credit brings the demand for better credit scoring system to managing credit lending business.

The credit scoring has been successfully applied in credit risk management. However, with the fierce competition, the credit scoring has also been expanded from only controlling the credit default risk to maximizing the profit. In the 1950s, it was first noticed that the statistical classification methods could be applied in discriminating the good and bad loans. The Fair Isaac in San Francisco makes it into a commercial product, and it has been proved to be effective for automatically

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