

# Profitability scoring and optimal decisions

## ABSTRACT

Behavioral scoring is commonly used in direct marketing and credit granting situations. Behavioral scoring uses the past purchase or payment behavior of the customers, in addition to the sociodemographic details, to predict the future behavior of the existing customers or to predict the behavior of a new set of customers having similar characteristics.

Although Bayesian decisions theoretic approaches lead to optimal decisions, use of point estimates of parameters is prevalent primarily due to computational simplicity. We show that when using a point estimate, the impact of convex and concave operating regions on different decisions such as profit maximization, market penetration pricing and market skimming pricing is different.

Unobserved customer heterogeneity is often modeled using hierarchical Bayes, random coefficient models. The relative predictive performance of mean regression, quantile regression with  $l_1$  and  $l_2$  penalties and sample selection method is compared in this study.

Receiver operating characteristics (ROC) graphs are often used to visually represent the performance of a classifier and to chose a cutoff for optimal decisions. This study compares the predictive performances of empirical, binormal and fuzzy estimation methods using multiple criteria and shows that fuzzy ROC performs the best under certain profit ranges.

For binary classification of a continuous intermediate variable, the choice between indirect and direct methods is often a matter of convenience. We show that the choice should be based on the optimization target and the method used to estimate the optimal cutoff score.

When the class definition is based on an intermediate variable, the selection of the threshold for defining a class is often done independent of the selection of the classifier and selection of the optimal score cutoff point during prediction. This study shows that the selection of threshold for class definition has an impact on the selection of optimal cutoff of score during prediction and hence the performance of the classifiers.