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The Theory behind Logistic Regression

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Abstract : The logistic regression has developed into a standard approach for estimating conditional probabilities in a wide range of applications including credit risk prediction. The article at hand contributes to the current literature on logistic regression fourfold: First, it is demonstrated that the binary logistic regression automatically meets its model assumptions under very general conditions. This result explains, at least in part, the logistic regression's popularity. Second, the requirement of homoscedasticity in the context of binary logistic regression is theoretically substantiated. The variances among the groups of defaulted and non-defaulted obligors have to be the same across the level of the aggregated default indicators in order to achieve linear logits. Third, this article sheds some light on the question why nonlinear logits might be superior to linear logits in case of a small amount of data. Fourth, an innovative methodology for estimating correlations between obligor-specific log-odds is proposed. In order to crystallize the key ideas, this paper focuses on the example of credit risk prediction. However, the results presented in this paper can easily be transferred to any other field of application.

Keywords : correlation, credit risk estimation, default correlation, homoscedasticity, logistic regression, nonlinear logistic regression
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