

**ESTIMATION OF CREDIT AND INTEREST RATE  
RISKS FOR LOAN PORTFOLIOS**

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## ABSTRACT

Banks need to estimate the risk of their loan portfolios, both for regulatory reasons and for purposes of ensuring the correct capital reserve in case of large losses. The two main risks of a loan portfolio are credit risk and interest rate risk. Most existing risk models compute credit and interest rate risks separately. We propose a model which estimates both credit and interest rate risks simultaneously. The model can also be used to separately estimate the two risks. Combined estimation of credit and interest rate risks is important, because in many real-world scenarios credit and interest rate risks are not independent. Our model calculates the probability distribution function (pdf) of portfolio losses for a given time horizon. Given the pdf of portfolio losses we can easily obtain various risk metrics, such as Value-at-Risk or Expected Shortfall. The model does not have a complete analytical solution for the loss pdf. We give an efficient approximation to the loss pdf based on a fast Monte-Carlo method. The running time of the algorithm is linear with respect to the number of loans. Also, we present a semi-analytical model for combined credit and interest rate risks. The solution for the semi-analytical approach is based on a numerical integration, which is performed efficiently using adaptive quadrature.

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