# Credit Portfolio Optimization under Condition of Multiple Credit Transition Metrics

Min Han[1]

Copyright 2008 by the Society of Actuaries.
All rights reserved by the Society of Actuaries. Permission is granted to make brief excerpts for a published review. Permission is also granted to make limited numbers of copies of items in this monograph for personal, internal, classroom or other instructional use, on condition that the foregoing copyright notice is used so as to give reasonable notice of the Society's copyright. This consent for free limited copying without prior consent of the Society does not extend to making copies for general distribution, for advertising or promotional purposes, for inclusion in new collective works or for resale.

[1] Master Candidate of School of Management, Fudan University, Shanghai, China. Cell: +86 13816868792; e-mail: muriel.han@gmail.com.

## Abstract

Recent years have seen more and more the importance of the management of credit risk for investors, especially institutional investors with large portfolios of corporate bonds, loans or other credit products. Questions such as how to evaluate the credit value-at-risk given large amounts of information (like different ratings and multiple credit metrics issued by different rating companies) and how to build an efficient credit portfolio (having the highest expected return under a certain level of credit risk) have become increasingly difficult to solve using traditional methods and models. Especially for the second question, the rising dimension of the portfolio under limited computational speed calls for leveraging some more robust algorithms for the large portfolio optimization.

In this paper, we choose JP Morgan's CreditMetrics model to evaluate the portfolio's credit value-at-risk for the elaboration of our thesis and try to solve the problem of how to leverage multiple credit metrics (as a major input for the model) issued by different rating firms to largely reduce the negative impact of variation of different sources, for the slightest difference among the metrics might result in a huge deviation in the evaluation of the credit risk. Last we will introduce and exploit an increasingly popular and robust algorithm in today's Large Scale Linear Planning Problem-Simulated Annealing to optimize our credit portfolio.

Generally, the paper can be viewed as applying existing models with some improving methods to better solve today's problem.

**Key Words:**

C-VaR; Credit transition metrics; credit portfolio optimization; Monte Carlo Simulation; Efficient frontier; Simulated Annealing Algorithm