

STATISTICS COLLOQUIUM

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“Three Essays on Credit Risk Models and their Bayesian Estimation”

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ABSTRACT

This dissertation consists of three essays on credit risk models and their Bayesian estimation. In each essay, defaults or default correlation models are built under one of two main streams in credit risk model study: the structural and the intensity models. The first essay studies the usefulness and methods to combine multiple securities information in a single firm asset process and to estimate its parameters under the structural model. The second essay investigates multi-firm correlated defaults, with special focus on industry-specific correlation under the intensity model. The third essay studies the use of multiple securities information to estimate the multi-firm correlated defaults model under both structural and intensity models.

In this talk, I will mostly focus on the third essay which combines and extends works of the first two essays by proposing a common model frame for both structural and intensity credit risk models. The common model frame combines the merits of several default correlation studies which are independently developed under each model setting. Following the work of Duffie, Eckner, Horel, and Saita (2009), we apply not only observed common factors, but also unobserved hidden factor to explain the correlated defaults. Bayesian techniques are used for estimation and generalized Gibbs sampling and Metropolis-Hasting (MH) algorithms are developed. More than a simple combination of two model approaches (structural and intensity models), we relax the assumptions of equal factor effect across entire firms in previous studies, instead adopting a random coefficients model. Also, a novelty of the approach lies in the fact that CDS and equity prices are used together for estimation. A simulation study shows that the posterior convergence is improved by adding CDS prices in estimation. Empirical results based on daily data of 125 companies comprising CDS.NA.IG13 in 2009 supports the necessity of such relaxations of assumption in previous studies. In order to demonstrate potential practical applications of the proposed framework, we derive the posterior distribution of CDX tranche prices. Our correlated structural model is successfully able to predict all the CDX tranche prices, but our correlated intensity model results suggest the need for further modification of the model.