Abstract

This thesis consists of four papers on dynamic dependence modelling in portfolio credit risk. The emphasis is on valuation of portfolio credit derivatives. The underlying model in all papers is the same, but is split in two different sub-models, one for inhomogeneous portfolios, and one for homogeneous ones. The latter framework allows us to work with much bigger portfolios than the former. In both models the default dependence is introduced by letting individual default intensities jump when other defaults occur, but be constant between defaults. The models are translated into Markov jump processes which represent the default status in the credit portfolio. This makes it possible to use matrix-analytic methods to find convenient closed-form expressions for many quantities needed in dynamic credit portfolio management and valuation of portfolio credit derivatives.

Paper one presents formulas for single-name credit default swap spreads and k-th-to-default swap spreads in an inhomogeneous model. In a numerical study based on a synthetic portfolio of 15 telecom bonds we study, e.g., how k-th-to-default swap spreads depend on the amount of default interaction and on other factors.

Paper two derives computational tractable formulas for synthetic CDO tranche spreads and index CDS spreads. Special attention is given to homogenous portfolios. Such portfolios are calibrated against market spreads for CDO tranches, index CDS-s, the average CDS and FtD baskets, all taken from the iTraxx Europe series. After the calibration, which leads to perfect fits, we compute spreads for tranchelets and k-th-to-default swap spreads for different subportfolios of the main portfolio. We also investigate implied tranche-losses and the implied loss distribution in the calibrated portfolios.

Paper three is devoted to derive and study, in an inhomogeneous model, convenient formulas for multivariate default and survival distributions, conditional multivariate distributions, marginal default distributions, multivariate default densities, default correlations, and expected default times. We calibrate the model for two different portfolios (with 10 obligors), one in the European auto sector, the other in the European financial sector, against their market CDS spreads and the corresponding CDS-correlations.

Paper four performs the same type of studies as in Paper 3, but for a large homogenous portfolio. We use the same market data as in Paper 2. Many of the results differ substantially from the corresponding ones in the inhomogeneous portfolio in Paper 3. Furthermore, these numerical studies indicate that the market CDO tranche spreads implies extreme default clustering in upper tranches.

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JEL classification: G33; G13; C02; C63; G32

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