## Credit Derivatives and und Credit Risk

Prof. Dr. Georg Schlüchtermann Ludwig-Maximilians-University Munich (Faculty of Mathematics, Informatics and Statistics) and University of Applied Sciences Munich

(Department of Mechanical Engineering, Automotive, and Aeronautical Engineering)

#### Summary:

First different risky assets with varying characteristics are presented, which include the common credit derivatives. In addition, we decribe the markets for these derivatives. In the next section we give the basics for the pricing of the credit derivatives - a review, including new aspects. Using the Black-Scholes-approach and applying the no-arbitrage arguments we model the failure of credit derivatives. The next section is devoted to the evaluation of portfolios, which also includes the standard ones and describes the interplay of the assets in a particular portfolios. Finally, we use the first three sections to price the presented products and calibrate the approaches and models according to the given market prices.

# Table of Content

- 1 Markets and Products
- 1.1 Basic Concepts
- 1.1.1 Credit Risik and Credit
- 1.1.2 Credibility Valuation
- 1.2 Credit Market
- 1.3 Basic Mathematical Concepts
- 1.3.1 Elementary Products
- 1.3.2 Credit
- 1.3.3 Defaultable Bond
- 1.3.4 Kontrahenten Risk
- 1.4 Credit Derivatives
- 1.4.1 Credit Default Swap
- 1.4.2 Digital Default Swap
- 1.4.3 Asset Swaps
- 1.4.4 Total Return
- 1.4.5 Credit Link Notes
- 1.4.6 Options on Swaps and Credit Spreads
- 1.5 Credit Derivatives on a Portfolio
- 1.5.1 First-to-Default-Basket
- 1.5.2 Collateralized Debt Obligations (CDO)

#### 2 Modelling of Credit Risk

- 2.1 Review of fundamental concepts of Finance Mathematics
- 2.1.1 Black-Scholes-Model
- 2.1.2 Derivative Pricing in the Black-Scholes Model
- 2.2 Credit Risk under Consideration of the Theory of No Arbitrage
- 2.2.1 General Arbitrage Theory and Martingale Measures
- 2.2.2 Pricing of Credit Risk Demands and Credit Risk Coupons
- 2.2.3 Application of the Technic of Numéraire
- 2.3 Model Classes for the Default Event
- 2.3.1 Corporate Models
- 2.3.2 Intensity Rate and Hazard Rate Models

### 3 Portfolio Models

- 3.1 Credit Risk in a Portfolio
- 3.2 Loss Distribution
- 3.2.1 Expected and Unexpected Defaults in the Credit Portfolio
- 3.2.2 Value-at-Risk and Economic Capital
- 3.3 Correlated Defaults
- 3.3.1 Bernoulli Model
- 3.3.2 Poisson Model
- 3.4 Factor Models
- 3.4.1 Modelling according to Merton
- 3.4.2 One Faktor Model according to Vasicek
- 3.4.3 Asymptotics
- 3.5 Copulas
- 3.6 Portfolio Models in Practise
- 3.6.1 Credit Metrics
- 3.6.2 The KMV Model and Credit Risk+
- 3.7 Risk Measure

### 4 Pricing of Credit Derivatives

- 4.1 Pricing of Credit Default Swaps (CDS) with Intensity and Hazard Rate Models
- 4.1.1 Intensity Models for CDS
- 4.1.2 Calibration at Market Prices
- 4.1.3 Recovery Rate
- 4.2 The Meaning of Corporate Models
- 4.2.1 Capital Strukture Arbitrage
- 4.2.2 The Approach of Hull, Nelken and White
- 4.3 Pricing of Basket Default Swaps and CDO
- 4.3.1 The Model of Li with Gaussian Copula
- 4.3.2 Pricing of Basket Default Swaps using Monte-Carlo-Simulation according to Li
- 4.3.3 Pricing of CDO
- 4.4 General Framework for the Representation of Faktor Models
- 4.5 One Factor Model for the Pricing of STCDO-Swaps