Credit Models and the Crisis: A Journey into CDOs, Copulas, Correlations and Dynamic Models (The Wiley Finance Series)

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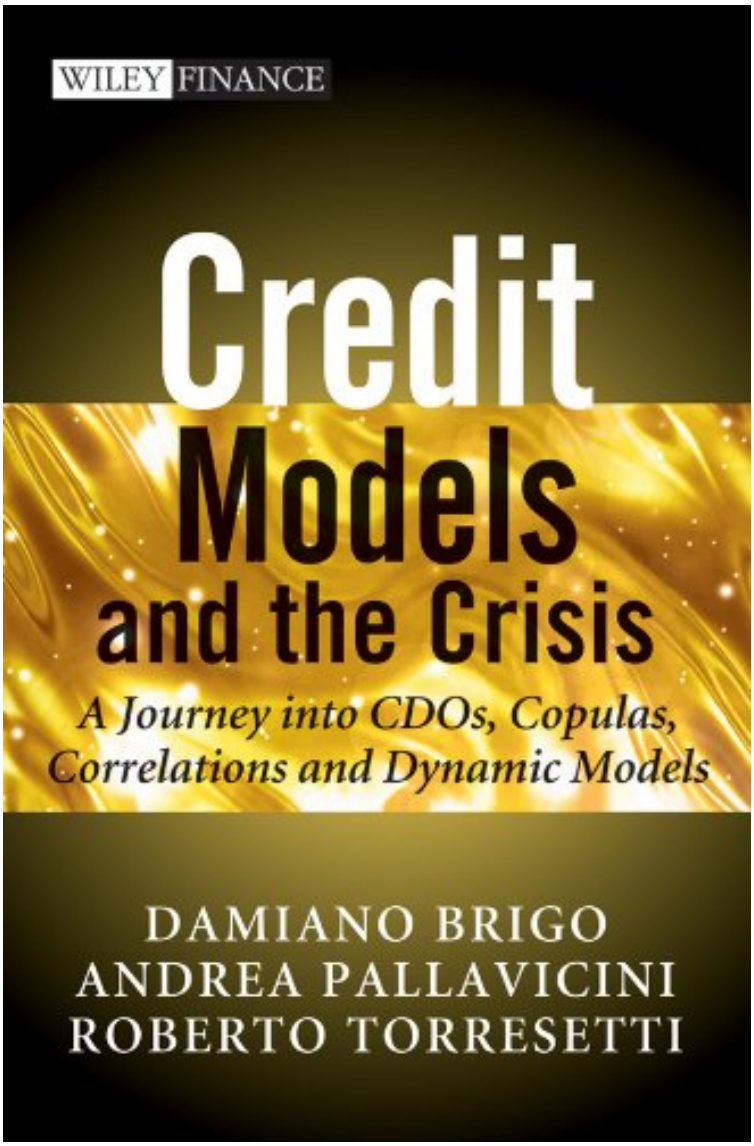

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Damiano Brigo, Andrea Pallavicini, Roberto Torresetti : Credit Models and the Crisis: A Journey into CDOs, Copulas, Correlations and Dynamic Models (The Wiley Finance Series) before purchasing it in order to gage whether or not it would be worth my time, and all praised Credit Models and the Crisis: A Journey into CDOs, Copulas, Correlations and Dynamic Models (The Wiley Finance Series):

19 of 21 people found the following review helpful. Interesting and informativeBy Dr. Lee D. CarlsonInterestingly, the blame game for the current "financial crisis" has focused on the financial modeling community, with several books and articles being published that essentially lays the responsibility for market instabilities and the resulting massive unemployment on the laps of analysts and applied mathematicians. Many of these books do not give the details of the mathematics behind the models, and so do not give a quantitative justification for their claims that modeling played a dominant role in the "crisis."This book could be considered to be a counter to some of these claims, but it does so without resorting to overblown rhetoric. Instead, it goes into some of the mathematical details behind the use of what are called `copulas' and how they were (and are) used to price collateralized debt obligations (CDO's). The latter financial instruments have been heavily criticized by both politicians and lay people, but these individuals frequently do not have an in-depth understanding of the relevant mathematics used to price these instruments.Readers of this book are expected to have a strong background in probability theory and quantitative finance, and even though it could be read without some knowledge of what CDO's are all about, the book would perhaps be better appreciated with such knowledge. Even readers with strong mathematical preparation may have not used copula functions explicitly in their work or research, but the authors give enough details so as to make them more understandable. The authors are careful to point out that the use of copulas to price CDO's has its pitfalls, but these were recognized before the "crisis" occurred. They give quantitative evidence for some of the weaknesses in the use of copulas in financial modeling.Of particular interest in the book are the notions of "compound" and "base" correlation in the study of the dependences (or "correlations") among the assets in the underlying reference portfolio. An understanding of the differences between them is crucial to following the authors' narrative since the price of a CDO tranche is a function of the default correlation between the assets in the reference portfolio. The tranches themselves reflect the "long" and "short" positions taken by investors. An investor in the equity tranche for example is going "long" on default correlation and will gain value as the default correlation increases. The converse holds for the senior tranche investor.Loosely speaking, the main idea behind compound correlation is to calculate the "flat" correlation that re-prices each tranche to fit market prices, i.e. obtain the credit default dependence from liquid market data. One would expect that such a calculation could be very complicated if the underlying assets were all different, and so the homogeneity of the reference portfolio is assumed in the first crack at the problem. This means that all assets share the same pair-wise correlation, default probability, and recovery rate. The present value of the tranche can then be written in terms of the upfront payment for the tranche, the tranche contractual spread at issuance, and the survival probability. The latter is a measure of the expected percentage of the notional of the tranche that remains after some time, and it can be written in terms of a (Gaussian) copula, the average pair-wise asset correlation of the issuers in the reference portfolio, and the average recovery rate of the reference portfolio. The expression for the present value of the tranche is then set equal to zero to solve for the (compound) correlation. One might expect multiple roots reflecting different risk profiles (and a resulting non-monotonicity of the correlation curve), and this is borne out by experience, particularly in the mezzanine tranches.In all of these studies, as in most of mathematical finance, there is a no-arbitrage side constraint, which in the case here is reflected in the requirement that the sum of the protection legs of the tranches must equal the sum of the protection legs of the underlying CDS portfolio. In the case of compound correlation there is also the "invertibility" issue that the authors discuss in this book, and which they illustrate graphically. Even though in compound correlation one obtains a unique correlation associated with each tranche, there is no guarantee that such a correlation value can be obtained for every tranche. Non-invertibility of the compound correlation arises in situations where the compound correlation for a tranche cannot be determined by the market spread.The base correlation on the other hand is obtained by assuming that each tranche is effectively a combination of the equity (or "base") tranche. The value of each tranche is then calculated as the difference between two base tranches. The authors show how to obtain the base correlation by bootstrapping through each tranche, beginning with the equity tranche, and how to calibrate the expected tranche loss to DJ-iTraxx tranche spreads. They also discuss in fair detail some of the problems that arise from using the base correlation, such as violations of the arbitrage condition (the expected tranche loss becomes negative). As the graphics illustrate, the "correlation skew" is readily apparent in base correlation, which is to be contrasted with the "smile" that one finds in compound correlation.Reminiscent of hidden Markov and latency factor models and the main focus of the book is of course the implied copula approach. The authors spend an entire chapter on this topic with the key idea being the use of a "systemic factor" over which the default probabilities are calculated. The copula manifests itself in these conditional probabilities instead of being modeled explicitly. This chapter is the most technical, mostly because of issues dealing with the "regularization" of the implied copula. Discussions of the calibration to market data naturally follow, and the authors discuss the weaknesses of this approach, the primary one being that the default dependence is assumed to be static. This limitation is lifted in the authors' discussion of dynamic models, in particular a model where the loss dynamics is governed by independent Poisson processes.The authors address to what degree the constructions they outline throughout the chapters are effective "in-crisis". For compound correlation still exhibits non-invertibility and the multiple solutions for mezzanine tranches again appears. The base correlation, which "out-performed" compound correlation in "pre-crisis", has many problems in-crisis such as the failure of the Gaussian copula to calibrate to 2008 market data. For the implied copula, they show data illustrating how the implied

distribution is calibrated with the (regularized) implied copula. They also show graphically that the probability of default for an entire pool of credit derivatives (what they call an "Armageddon" event) has "increased dramatically". The authors include some very interesting graphs showing how a mode of about twenty names is actually stable throughout the last five years. Along these same lines, the dynamical Poisson loss model is also tested "in-crisis", after first explaining a modified version of it and then a toy model example of this version. All of these discussions are interesting, and serve well to shed light on the role of modeling, especially the use of copulas, had in the events in the financial markets in the last four years. Further study is both needed and justified.

The recent financial crisis has highlighted the need for better valuation models and risk management procedures, better understanding of structured products, and has called into question the actions of many financial institutions. It has become commonplace to blame the inadequacy of credit risk models, claiming that the crisis was due to sophisticated and obscure products being traded, but practitioners have for a long time been aware of the dangers and limitations of credit models. It would seem that a lack of understanding of these models is the root cause of their failures but until now little analysis had been published on the subject and, when published, it had gained very limited attention. Credit Models and the Crisis is a succinct but technical analysis of the key aspects of the credit derivatives modeling problems, tracing the development (and flaws) of new quantitative methods for credit derivatives and CDOs up to and through the credit crisis. Responding to the immediate need for clarity in the market and academic research environments, this book follows the development of credit derivatives and CDOs at a technical level, analyzing the impact, strengths and weaknesses of methods ranging from the introduction of the Gaussian Copula model and the related implied correlations to the introduction of arbitrage-free dynamic loss models capable of calibrating all the tranches for all the maturities at the same time. It also illustrates the implied copula, a method that can consistently account for CDOs with different attachment and detachment points but not for different maturities, and explains why the Gaussian Copula model is still used in its base correlation formulation. The book reports both alarming pre-crisis research and market examples, as well as commentary through history, using data up to the end of 2009, making it an important addition to modern derivatives literature. With banks and regulators struggling to fully analyze at a technical level, many of the flaws in modern financial models, it will be indispensable for quantitative practitioners and academics who want to develop stable and functional models in the future.