

600 Views | 417 CrossRef citations to date | 13 Altmetric

VALUATION

Risk and Valuation of Collateralized Debt Obligations

Darrell Duffie & Nicolae Gârleanu

Pages 41-59 | Published online: 02 Jan 2019

 Cite this article  <https://doi.org/10.2469/faj.v57.n1.2418>

Sample our
Mathematics & Statistics
Journals
>> [Sign in here](#) to start your access
to the latest two volumes for 14 days

 References  Citations  Metrics  Reprints & Permissions

[Read this article](#)

 Share

Abstract

In this discussion of risk analysis and market valuation of collateralized debt obligations, we illustrate the effects of correlation and prioritization on valuation and discuss the “diversity score” (a measure of the risk of the CDO collateral pool that has been used for CDO risk analysis by rating agencies) in a simple jump diffusion setting for correlated default intensities.

A collateralized debt obligation (CDO) is an asset-backed security whose underlying collateral is typically a portfolio of (corporate or sovereign) bonds or bank loans. A CDO cash flow structure allocates interest income and principal repayments from a collateral pool of different debt instruments to prioritized CDO securities (tranches). A standard prioritization scheme is simple subordination: Senior CDO notes are paid before mezzanine and lower subordinated notes are paid, and any residual cash flow is paid to

an equity piece. CDOs form an increasingly large and important class of fixed-income securities. Our analysis may provide useful approaches to valuation and diagnostic measures of risk.

We concentrate on cash flow CDOs—those for which the collateral portfolio is not subjected to active trading by the CDO manager. The implication of this characteristic is that the uncertainty regarding interest and principal payments to the CDO tranches is determined mainly by the number and timing of defaults of the collateral securities. We do not analyze market-value CDOs, those in which the CDO tranches receive payments based essentially on the marked-to-market returns of the collateral pool as determined largely by the trading performance of the CDO manager.

In our analysis of the risk and market valuation of cash flow CDOs, we illustrate the effects of correlation and prioritization for the market valuation, “diversity score” (a measure of the risk of the CDO collateral pool that has been used for CDO risk analysis by rating agencies), and risk of CDOs in a simple jump diffusion setting for correlated default intensities. The main issue is the impact of the joint distribution of default risk of the underlying collateral securities on the risk and valuation of the CDO tranches. We also address the efficacy of alternative computational methods and the role of diversity scores.

We show that default-time correlation has a significant impact on the market values of individual tranches. The priority of the senior tranche, by which it is effectively “short a call option” on the performance of the underlying collateral pool, causes its market value to decrease with the risk-neutral default-time correlation. The value of the equity piece, which resembles a call option, increases with correlation. Optionality has no clear effect on intermediate tranches. With sufficient overcollateralization, the option “written” (to the lower tranches) dominates, but it is the other way around for sufficiently low levels of overcollateralization.

Spreads, at least for mezzanine and senior tranches, are not especially sensitive to the “lumpiness” of the arrival of information about credit quality, in that replacing the contribution of diffusion with jump risks (of various types), while holding constant the degree of mean reversion and the term structure of credit spreads, plays a relatively small role in determining the spreads.

Regarding alternative computational methods, we show that if (risk-neutral) diversity scores can be evaluated accurately, which is computationally simple in the framework

we propose, these scores can be used to obtain good approximate market valuations for reasonably well-collateralized tranches.

This work was supported in part by a grant from the Gifford Fong Associates Fund at the Graduate School of Business, Stanford University. We are grateful for discussions with Ken Singleton of Stanford University, Reza Bahar of Standard and Poor's, and Sergio Kostek of Morgan Stanley Dean Witter. Helpful comments and research assistance were provided by Jun Pan. We are also grateful for several helpful suggestions for improvement by Kazuhisa Uehara of the Fuji Research Institute Corporation.

Related Research Data

[Two Singular Diffusion Problems](#)

Source: *Annals of Mathematics*

[Limited liability and incentive contracting with ex-ante action choices](#)

Source: *Journal of Economic Theory*

[A YIELD-FACTOR MODEL OF INTEREST RATES](#)

Source: *Mathematical Finance*

[A Liquidity-based Model of Security Design](#)

Source: *Econometrica*

[Modeling Term Structures of Defaultable Bonds](#)

Source: *Review of Financial Studies*

[COMBINATORIAL THEORY \(second edition\) \(Wiley-Interscience Series in Discrete Mathematics\)](#)

Source: *Bulletin of the London Mathematical Society*

[Pricing Derivatives on Financial Securities Subject to Credit Risk](#)

Source: Unknown Repository

Related research

People also read

Recommended articles

Cited by
417

[Global Portfolio Optimization >](#)

Fischer Black et al.
Financial Analysts Journal
Published online: 31 Dec 2018

[Credit Swap Valuation >](#)

Darrell Duffie
Financial Analysts Journal
Published online: 2 Jan 2019

Information for

[Authors](#)
[R&D professionals](#)
[Editors](#)
[Librarians](#)
[Societies](#)

Opportunities

[Reprints and e-prints](#)
[Advertising solutions](#)
[Accelerated publication](#)
[Corporate access solutions](#)

Open access

[Overview](#)
[Open journals](#)
[Open Select](#)
[Dove Medical Press](#)
[F1000Research](#)

Help and information

[Help and contact](#)
[Newsroom](#)
[All journals](#)
[Books](#)

Keep up to date

Register to receive personalised research and resources by email

 [Sign me up](#)



Copyright © 2026 Informa UK Limited [Privacy policy](#)

[Cookies](#) [Terms & conditions](#) [Accessibility](#)

 **Taylor & Francis**
by **informa** •••

Registered in England & Wales No. 01072954
5 Howick Place | London | SW1P 1WG