Invited Editorial

CDOs cubed: The first-ever triple derivative

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Abstract

This paper examines the newly created 'CDOs Cubed', which are the first-ever triple derivative, that is, a derivative of a derivative of a derivative. Not surprisingly, CDOs Cubed are often called, 'derivatives on steroids'. Unlike traditional derivatives, which are utilised for risk reduction and/or leveraged speculation, this innovation has created thousands of new investment assets, covering the entire spectrum of risk and return. This paper traces the evolution of this innovation, and examines how this triple derivative is created, structured, and priced.
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INTRODUCTION

In 2005, the first-ever triple derivative was issued, that is, a derivative of a derivative of a derivative. 'CDOs Cubed' are Collateralised Debt Obligations which, like a Russian shell doll, contain other CDOs which, in turn, shell still other CDOs which, finally, contain investment assets of all types. Unlike traditional derivatives, which afford risk reduction and/or leveraged speculation, CDOs literally create thousands of new assets covering the entire risk/return spectrum. Not surprisingly, CDOs cubed are frequently referred to as, 'derivatives on steroids'. This paper examines this innovation, and its impact upon contemporary financial markets. The paper is organised as follows.

The next section of this paper traces the evolution of CDOs from their inception in 1985 (as single derivatives) to their highly evolved state of today. The section thereafter describes how CDOs cubed are created, structured, and priced. The final section of this paper discusses the impact which CDOs cubed are having upon world financial markets.

A glossary of CDO terms is also appended to this paper. Some readers may find it helpful to read the glossary before reading the paper itself.

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THE EVOLUTION OF CDOs

CDOs trace their origin to the US S&L financial crisis of the 1980s. A new instrument,

Collateralised Mortgage Obligations (CMOs), was created during this period to remove some of the assets — and their commensurate risk — from the balance sheets of risky S&Ls, and thereafter package these assets as separate investment units (CMOs) which were then sold to individual investors, thus diversifying the balance sheet risk of S&Ls throughout the US financial system. (For readers who are unfamiliar with CMOs, see Davidson.[1]) These investment shells traded so smoothly and efficiently in the US financial markets that it soon became apparent that such shells could easily contain other assets, thus spawning Collateralised Bond Obligations (CBOs) and Collateralised Loan Obligations (CLOs), which still trade today.

In 1995, leading investment banks created investment shells containing all types of rated and unrated securities — bonds, promissory notes, project-finance loans, leases, etc — and these investment shells (which were the first CDOs) eventually became known as 'unit-level CDOs' and, also, as 'plain vanilla' CDOs. (For readers unfamiliar with unit-level CDOs, see 'CDO Guide: Understanding the Product.'[2]) A typical unit-level CDO is a derivative by virtue of obtaining its value from the underlying securities comprising the CDO. A unit-level CDO typically contains approximately 100–1,000 individual securities of all types.

In 1999, investment banks next created 'CDOs squared', which are CDOs containing two or more unit-level CDOs. A CDO squared is a double derivative because its value is derived, first, from its underlying unit-level CDOs whose values are, in turn, derived from its underlying securities. (For readers unfamiliar with CDOs squared, see Batchvarov,[3] Patel,[4] and Watterson.[5])

In 1999, the Bank for International Settlements held the Basel II conference at which it concluded that the risk of the balance sheets of commercial banks in developed countries was dangerously high. Consequently, one of the accords issued by this conference was that central banks should encourage techniques and innovations to remove some of the debt from the balance sheets of their commercial banks and diversify such risk throughout their respective financial systems, analogous to the US S&L financial solution of the 1980s. (For readers unfamiliar with the Base II accords, see Bielski[6] and Rowe.[7])

Following the Basel II accords was a multi-year period of historically low interest rates. In 2004, as a means of using CDOs to create yield pickups during this period, investment banks began issuing CDOs cubed. (*The Economist*,[8] *Business Week*,[9] and *U.S. News & World Report*[10] subsequently reported the introduction of CDOs cubed in 2004 and 2005.) CDOs cubed created hundreds of new risk/return investment combinations, and investors were willing to pay premiums for these new and unique risk/return vehicles that exactly suited the unique needs of their portfolios. (For a discussion of the magnitude of these yield pickups (generally, between 20 and 60 basis points), see Tett.[11])

A CDO cubed is a CDO that contains two or more CDOs squared, or one CDO squared and at least one unit-level CDO. A CDO cubed is a triple derivative because it derives its value from other underlying derivatives (the CDOs squared) that, in turn, derive their values from their respective underlying CDOs (the unit-level CDOs) that, finally, derive their values from the securities comprising the unit-level CDOs. A CDO cubed typically contains several CDOs squared.

CREATING A CDO

In order to create a CDO, a 'CDO dealer' arranges a series of loans, called a 'Special Purchase Vehicle', and uses such financing to buy securities of all types. These securities are then bundled into a unit-level CDO.

The next step in the CDO creation process is to rank-order all the securities, from the securities having the least risk of default to the securities having the greatest risk. The securities having the least risk comprise the senior 'tranche' of the CDO. ('Tranche' is the French word for 'slice'.) The securities in the senior tranche are normally all rated by one or more of the 'Big Three' rating agencies (Moody's, Standard & Poor's, and Fitch).

Equities comprise the CDO tranche with the greatest risk and, appropriately, are referred to as the 'equity tranche' of the CDO. Being equities, none of these securities are rated by the Big Three. The CDO dealer (or his assistant, the 'collateral manager') will utilise standard measures of the risk/return trade-off (the Sharpe Performance Ratio, the Treynor Index, etc) in order to prioritise these equities with respect to risk.

The middle tranche of a CDO is referred to as the 'mezzanine tranche' — or, more commonly, as simply 'the mezzanine'. This tranche consists of a potpourri of lower-quality debt securities, some of which are rated (such as project loans) by the Big Three, and some of which are not (such as leases). For unrated securities in the mezzanine, the CDO dealer will again utilise standard risk/return trade-off measures to assign a degree of risk to such securities.

CDO dealers will also occasionally include credit default swaps in a CDO, in lieu of outright buying the securities from a commercial bank. (For readers unfamiliar with credit default swaps, see Benkert[12] and Meng and Gwylim.[13]) Also, CDO dealers will occasionally include equity default swaps in their CDOs, in lieu of outright buying the equities. (For readers unfamiliar with equity default swaps, see Cluleyis.[14]) In both cases, the CDO dealer will price the swaps using their *notional* values, thus adding some leverage to the CDO.

Each of these three major tranches is then sliced further into subtranches, each of which is then prioritised again with respect to risk, so that a CDO is always prioritised from the least risky subtranche to the most risky. Each subtranche is subordinate to the subtranche above it, meaning that the subtranche with the greatest risk is the first to absorb any CDO losses; then, the subtranche with the second greatest risk is the second to absorb CDO losses; and so on.

Finally, almost all CDOs are 'PFICs' — Passive Foreign Investment Companies. PFICs are almost always headquartered outside of the country where the CDOs trade, usually in the Caribbean, in order to avoid security regulations and, also, to minimise taxes.

ASSIGNING LOSSES

Before a subtranche is sold to an investor, the CDO dealer must assign 'points' to it. Specifically, the 'attachment point' is the point in the subtranche at which it begins to absorb a CDO loss, and the 'detachment point' is the point at which the subtranche ceases to absorb the CDO loss.

A CDO dealer will set the attachment and detachment points widely apart for the riskiest subtraches, and progressively narrower for the least risky tranches. In this manner, a CDO's losses are distributed across the entire CDO, with the riskiest subtranches absorbing the

greatest losses, and the least risky tranches absorbing the smallest losses (if any). Setting these points is a combination of art and science, so that the price of a subtranche appropriately reflects its risk/return trade-off.

PRICING TRANCHES

A subtranche's price is essentially a function of four variables: (1) the market value of its securities; (2) the default rates of these securities; (3) the default-rate correlations between and among the CDO's securities; and (4) the recovery rates of the CDO's securities subject to default. (See *Credit Magazine*.[15])

In general, the lower the default rate of a subtranche's securities, the higher will be its price, and vice versa. (Table 1 shows typical default rates for rated securities.) Conversely, the higher the default-rate correlations between and among a CDO's securities, the less will be the value of the tranche. And, finally, the higher the recovery rate of defaulted securities, the higher the value of the subtranche. (Table 2 shows typical recovery rates for defaulted securities.)

In rating subtranches, Moody's *assumes* an intra-industry default correlation of 0.25, and an inter-industry default correlation of zero. S&P *assumes* an intra-industry default correlation of 0.3, and an inter-industry default correlation of 0.1. Only Fitch actually calculates intra- and inter-industry correlations in setting their ratings. Although Moody's does not calculate actual correlations, it does issue a 'diversity score' which it issues in conjunction with its CDO ratings.

CDO subtranches are market priced. In theory, the price is the discounted cash flow of its projected cash flow streams, discounted at the required rate of return of the buyer of the subtranche.

Table 1: Recent default probabilities for rated securities

Obligor rating	*Five-year-default probability (%)*	*Ten-year default probability (%)*
AAA	0.38	1.29
AA (high)	0.44	1.55
AA	0.55	1.89
AA (low)	0.69	2.40
A (high)	1.06	3.39
A	1.26	4.04
A (low)	1.48	4.87
BBB (high)	2.06	6.48
BBB	2.77	8.51
BBB (low)	4.15	12.00
BB (high)	6.98	18.18
BB	11.09	26.10
BB (low)	15.55	34.19
B (high)	20.21	42.34
B	31.14	54.96
B (low)	52.28	70.92

Source: Dominion Bank Bond Rating Service, Ltd. (Adams *et al.*[16]).

Table 2: Recent recovery rates for defaulted debt

	Recovery rates	
	Minimum (%)	*Maximum (%)*
Senior secured bank loans	50	70
Senior unsecured banks loan	40	60
Senior secured public debt	40	55
Senior unsecured public debt	30	50
Subordinated public debt	20	30
Other	0	10

Source: Dominion Bank Bond Rating Service, Ltd. (Adams *et al.*[16]).

INVESTORS IN TRANCHES

Typically, investors with fiduciary responsibilities (pension funds, etc) buy subtranches from the senior tranche of a CDO, while hedge funds and other risk seekers buy from the equity tranche. Buyers from the mezzanine constitute a varied clientele.

FINANCIAL MARKET EFFECTS

The creation and selling of CDOs cubed effectively transfers a huge amount of risk from the balance sheets of commercial banks, and thereafter diversifies this risk throughout the financial system. In the process of doing so, it also creates thousands of new financial assets for the investment community.

SUMMARY AND CONCLUSION

CDOs cubed are the latest hierarchy of investment shells that literally create thousands of new investment assets, covering the entire risk/return spectrum, while simultaneously diversifying risk throughout the financial community. Conceivably, 'CDOs quadrupled' could evolve in the next decade or so. Meanwhile, this innovation continues to grow and evolve as it facilitates and increases the efficiency of financial markets worldwide.

GLOSSARY of CDO TERMS

CDO	Collateralised Debt Obligation, a package of securities which are subdivided into smaller packages and then sold to individual investors.
Unit-level CDO	Also known as a 'plain vanilla' CDO, a CDO whose underlying assets contain only securities, that is, no other CDOs.
CDO-squared	A CDO whose underlying assets contain one or more unit-level CDOs.
CDO cubed	A CDO whose underlying assets contain at least two CDOs squared; or, one CDO squared and at least one unit-level CDO.
Mother CDO	A CDO which has at least one other CDO as one of its underlying assets.
Baby CDO	A CDO which is one of the assets held by a mother CDO.
Cash CDO	A CDO which does not contain swap derivatives.
Synthetic CDO	A CDO which contains one or more swap derivatives.
Static CDO	A CDO whose underlying portfolio of assets does not change during the CDO's life.
Managed CDO	A CDO whose underlying assets are occasionally changed.
CDO dealer	A dealer (normally associated with an investment bank) who raises money to buy securities and then packages them into a CDO.

SPV	Special Purchase Vehicle, the loans which a CDO dealer arranges in order to buy the securities for a CDO.
CDO manager	Also known as the 'collateral manager,' the person who manages the day-to-day operations of the CDO; this person may or may not be the CDO dealer.
Tranche	The portion of a CDO which is sold to an individual investor; 'tranche' is the French word for 'slice.'
Senior tranche	The portion of a CDO which is rated investment grade (AAA, AA, A, BBB).
Equity tranche	The portion of a CDO which is comprised of equities.
Mezzanine tranche	The portion of a CDO between the senior tranche and the equity tranche, composed of various types of debt; this tranche is commonly called 'the mezzanine.'
Subtranche	A 'slice' of securities within one of the three major tranches (senior, mezzanine, and equity); for example, the senior tranche may be composed of four sub-tranches (AAA, AA, A, BBB).
PFIC	Passive Foreign Investment Company, an investment company which is purposely headquartered offshore (such as in the Cayman Islands) in order to avoid security regulations and minimise taxes; CDOs are almost always PFICs
Obligor	The issuer of a given security in a CDO.
Trustee	The 'watch dog' of a CDO who issues monthly reports to the investors in a CDO regarding the status of their particular CDO.
Risk prioritisation	The process of rank ordering all of the securities in a CDO from least risk to greatest risk.
Loss subordination	Refers to the manner in which losses are assigned to a CDO; losses are first absorbed by the riskiest tranche, then by the second riskiest tranche, and so on.
Attachment point	The point in a sub-tranche at which losses begin to occur.
Detachment point	The point in a sub-tran che at which losses stop.
Thickness	Refers to the monetary size of a particular tranche, typically expressed as the

	percentage it constitutes of the CDO's total monetary value.
Default curve	The probability distribution of default for a given security in a CDO over a given period of time.
Recovery rate	The percentage of the lost value of a defaulted security which is recovered via collateralisation.
Credit migration	The real or possible change in the credit rating of a security while it's being held in a CDO.
Overlap	The placing of the same security in more than one CDO; for example, a CDO squared may have the same security in each of its unit-level CDOs.
CMO	Collateralised Mortgage Obligations; essentially, a CDO consisting entirely of mortgages.
Credit default swap	Essentially a put option on one or more of the securities held in the mezzanine tranche.
Equity default swap	Essentially a put option on one or more of the equity securities held in the equity tranche.

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