

CDOs in Plain English

A Summer Intern's Letter Home

13 September 2004

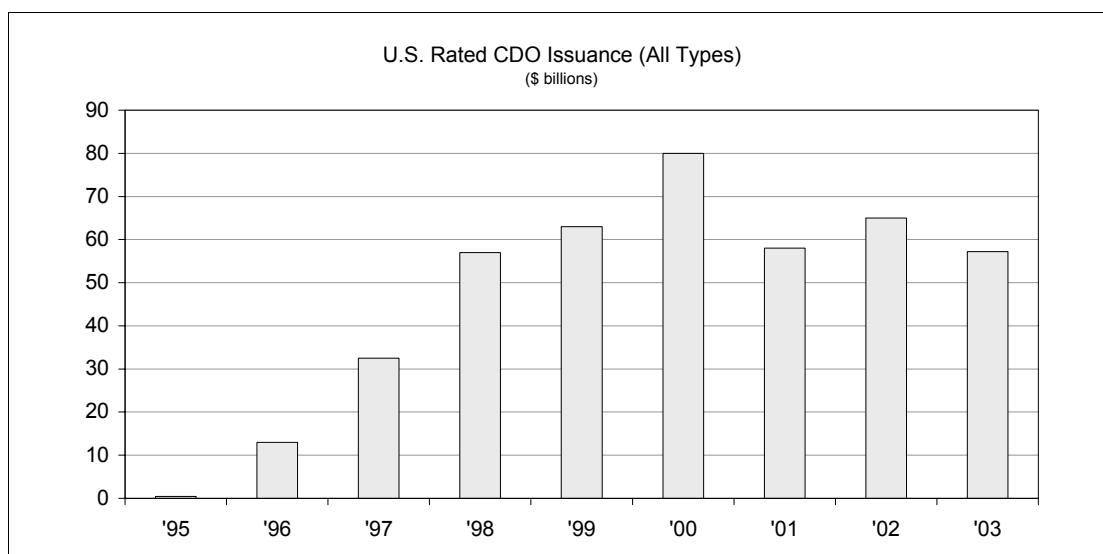
Dear Mom and Dad,

It's now been about a week since I started my summer internship at Nomura Securities. They have me working on products called "CDOs." The initials stand for the words "collateralized debt obligations." I never heard about CDOs in school, but they seem very interesting. Here's some of what I've learned so far...

I. Introduction

A CDO is similar to a regular mutual fund that buys bonds. However, unlike a mutual fund, most of the securities sold from a CDO are themselves bonds, rather than shares. In simplest terms, a CDO is an arrangement that raises money primarily by issuing its own bonds and then invests the proceeds in a portfolio of bonds, loans, or similar assets. Payments on the portfolio are the main source of funds for repaying the CDO's own securities.

CDOs have become a notable feature of the financial landscape. CDO issuance in the U.S. has exceeded \$50 billion per year for each of the past six years:



Source: Moody's

The CDO area hit a rough patch a few years ago but now it seems to be bouncing back. The wave of junk bond defaults in 2001 and 2002 stressed the CDO sector because junk bonds composed the underlying portfolios of many older CDOs. The creators of the older CDOs seem to have over-estimated the diversification in the underlying portfolios. That is, they over-estimated the benefit of having junk bonds from many different companies. Now, however, newer computer models for creating CDOs attempt to reflect diversification more accurately. The jury is still out on whether the newer models actually work better.

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Most CDOs have actively managed portfolios. A typical deal has a manager (*i.e.*, a management company) that collects fees for managing the portfolio – again similar to a mutual fund. However, a small proportion of CDOs has static, unmanaged portfolios. Those deals resemble old-fashioned unit investment trusts.

But, there are lots of details and other features. For example, a standard feature of virtually all CDOs is "credit tranching." Credit tranching refers to creating multiple classes (or "tranches") of securities, each of which has a different seniority relative to the others.¹

For example, a CDO might issue four classes of securities designated as (1) senior debt, (2) mezzanine debt, (3) subordinate debt, and (4) equity. Each class protects the ones senior to it from losses on the underlying portfolio. The sponsor of a CDO usually sets the size of the senior class so that it can attain triple-A ratings. Likewise, the sponsor generally designs the other classes so that they achieve successively lower ratings. In a way, the rating agencies are really the ones who determine the sizes of the classes for a given portfolio.

II. Capital Structure

A typical CDO might have an underlying portfolio of roughly 100 corporate bonds with an average rating of single-B-plus (Moody's B1, S&P B+). If the total size of the portfolio is \$300 million, the CDO might issue six classes of securities as follows:

Table 1: Example of Basic CDO Capital Structure				
Class	Amount (\$ millions)	Pct. of Deal	Subordination (%)	Ratings (Moody's/S&P)
Class A	243.0	81.0	19.0	Aaa/AAA
Class B	13.5	4.5	14.5	Aa2/AA
Class C	10.5	3.5	11.0	A2/A
Class D	9.0	3.0	8.0	Baa2/BBB
Class E	9.0	3.0	5.0	Ba2/BB
Equity	15.0	5.0	0.0	not rated

In buying and selling assets for the portfolio, the manager would be required to maintain an average portfolio rating of single-B-plus or higher. If the average rating of the portfolio slips lower, the terms of the deal might curtail the manager's discretion in managing the portfolio. In addition, the rating agencies might downgrade the securities.

Naturally, investors demand higher yields on classes exposed to greater credit risk. In the example above, the Class A securities would command the lowest yield because they carry the highest ratings. Conversely, the equity class would command the highest yield because of its station at the bottom of the deal's capital structure.

III. Motivation

Companies have different reasons for creating or sponsoring CDOs. For example, some CDOs are created by investment advisory firms (*i.e.*, money management firms). Such a firm earns fees based on the amount of assets that it manages. By creating a CDO, the firm can increase its income by increasing its assets under management. This kind of CDO is usually called an **arbitrage CDO** because of the (hopefully) positive spread between the yield that the CDO earns on its portfolio and

¹ The word tranche comes from the French word for slice. In CDOs, the terms "tranche" and "class" are synonymous.

the yield that it must pay out on its own debt securities.² In many cases, the profit goes mostly to the holder of the equity class, with some portion going to the manager as a performance-based fee.

Other CDOs are created by banks as a way to remove assets from their balance sheets. A bank can remove assets from its balance sheet by creating a CDO and transferring assets to the CDO's portfolio. Such a CDO is called a **balance sheet CDO**. Removing assets from its balance sheet can be advantageous for a bank when it calculates its regulatory capital requirement.

IV. Diversification³

A CDO sponsor tries to create value by assembling a well-diversified portfolio of assets to back its CDO. In principle, diversification within a CDO's portfolio can make it stronger than merely the sum of its parts.

The idea of diversification is central to estimating the riskiness of a CDO's different classes. Professionals grapple with diversification through the statistical concept of "correlation." They gauge the riskiness of a CDO's different classes by running computer simulations where they make assumptions about correlation. The rating agencies often use the same approach when they analyze CDOs for the purpose of rating them. For example, when a CDO's underlying portfolio consists of corporate bonds, Standard & Poor's assumes a constant correlation of 0.3 for companies within a given industry and zero correlation among companies in different industries. Similarly, when a CDO's underlying portfolio consists of asset-backed securities, S&P assumes constant correlations of 0.3 within an ABS sector and 0.1 between ABS sectors.⁴

Assumptions about correlation have a strong effect on the predicted credit quality of a CDO. A few years ago, many of the outstanding CDOs performed much worse than the rating agencies and other market participants had predicted. Some professionals now feel that wrong assumptions about correlation were the cause of the inaccurate predictions. Following the wave of poor CDO performance, each of the rating agencies modified its CDO rating approach to place greater emphasis on correlation.

Correlation can produce opposite effects on different tranches in a CDO. Senior tranches tend to benefit from low correlation of credit risk among the assets in the underlying portfolio. Conversely, the junior tranches tend to benefit from high correlation. Think of it like this: Strong diversification (*i.e.*, low correlation) dampens the overall performance volatility of a CDO's underlying portfolio. That is, strong diversification makes extreme outcomes less likely. The CDO's senior tranche can suffer only if the extreme outcome of *very high* losses occurs. Conversely, the CDO's equity tranche may survive only if the extreme outcome of *very low* losses occurs. Thus, the senior tranche favors low correlation but the equity tranche favors high correlation.

V. CDO Lifecycle and Performance Tests

It is useful to view a CDO as having a lifecycle that consists of several phases. The first phase is the ramp-up phase, when the manager uses the proceeds from issuing the CDO to purchase the initial portfolio. The CDO's governing documents generally specify parameters for the initial portfolio but

² Arbitrage – in the strict sense of the word – has nothing to do with arbitrage CDOs. Arbitrage refers to making an immediate, riskless profit. In a typical arbitrage CDO, the profit is neither immediate nor riskless. The amount of profit depends on the manager's ongoing ability to manage the portfolio in order to produce higher returns than must be paid out on the CDO's own debt securities.

³ See, Whetten, M., and Adelson, M., *Correlation Primer*, Nomura Fixed Income Research (6 Aug 2004); Adelson, M., *What a Coincidence? One Reason Why CDOs and ABS Backed by Aircraft, Franchise Loans, and 12b-1 Fees Performed Poorly in 2002*, Nomura Fixed Income Research (19 May 2003).

⁴ *Global Cash Flow and Synthetic CDO Criteria*, Standard & Poor's, p. 44 (21 Mar 2002).

not the exact composition. For example, the terms of the CDO might require that the initial portfolio have a minimum average rating, a minimum average yield, a maximum average maturity, and a minimum degree of diversification. During the ramp-up phase, the manager must select assets so that the portfolio satisfies all the parameters.⁵

The second phase is the revolving period, during which the manager actively manages the portfolio and reinvests cash flow from the portfolio. The reinvestment phase allows a CDO to remain outstanding – without amortization of the CDO's own bonds – even though the assets in the underlying portfolio reach their maturity dates.

The third period is the amortization phase. During the amortization phase, the manager stops reinvesting cash flow from the portfolio. Instead, the manager must apply the cash flow toward repaying the CDO's debt securities.

A manager generally is required to follow certain rules in managing the portfolio. The rules protect investors by somewhat limiting the manager's discretion. For example, one rule might require the manager to maintain the average yield or spread on the managed assets above a certain level. Another rule might require the manager to maintain the average maturity of the assets within a certain range.

Many CDO's include performance tests that can trigger the early start of the amortization phase if the deal performs poorly. For example, many deals include an "overcollateralization" test based on the ratio of the portfolio balance to the balance of the CDO's debt securities. Likewise, many CDOs also include an interest coverage test, based on the ratio of interest cash flow on the portfolio to the interest that the CDO must pay on its own securities. If either ratio falls below a specified threshold, the deal would enter early amortization. The tests are designed to protect investors by triggering amortization if a deal's performance deteriorates. However, a CDO manager sometimes can manipulate the tests to avoid early amortization. In those cases, rating agencies are likely to downgrade the CDO's securities.

VI. More Types of CDOs

A CDO that has an underlying portfolio composed of bonds is called a **CBO**, which stands for **collateralized bond obligation**. Likewise, a CDO that has an underlying portfolio composed of loans is called a **CLO**, which stands for **collateralized loan obligation**. Some CDOs are backed by asset-backed securities (ABS) or mortgage-backed securities (MBS). Those CDOs are called structured finance CDOs or **SF CDOs**. When a CDO is backed by a combination of corporate bonds, loans, ABS, or MBS, it is called a **multisector CDO**.⁶

Some CDOs are backed by classes of securities from other CDOs. Such a deal is often called a **CDO squared**. In written materials, the term is represented with math-style notation as CDO² or CDO^{^2}. As noted above, mathematical or computer models are essential tools for analyzing regular CDOs and part of the risk in a regular CDO relates to the assumptions embedded in the models. Some CDO professionals believe that model-related risks are amplified in CDO^{^2} deals because analyzing such deals requires two layers of assumptions.

In most CDOs, the source of funds for repaying the CDO's securities is scheduled payments from the assets that compose the underlying portfolio. Such a CDO is called a **cash flow CDO**. Other CDOs

⁵ Some CDOs have been designed so that they ramp-up immediately. In fact, one of the early Japanese CDOs that Nomura structured had an underlying portfolio of corporate bonds that were issued simultaneously with the issuance of the CDO itself.

⁶ Rating agency practices in analyzing SF CDOs and multisector CDOs precipitated a heated controversy over a practice called "notching." See Adelson, M., *NERA Study of Structured Finance Ratings – Market Implications*, Nomura Fixed Income Research (6 Nov 2003).

are structured so that sales of assets from the portfolio can supply a source of funds to repay the CDO's securities. Because repayment depends on the market value of the assets in the portfolio, those deals are called **market value CDOs**. In addition to the performance tests mentioned above, a typical market value CDO includes performance tests based on the market values of its underlying assets.

VII. Synthetic CDOs

In some CDOs the underlying portfolio is composed of **credit default swaps**⁷ (CDS) rather than bonds or loans. Because CDS permit "synthetic" exposure to credit risk, a CDO backed by CDS is called a **synthetic CDO**. By contrast, a CDO backed by ordinary bonds or loans is called a **cash CDO**. Synthetic CDOs recently have become very popular, especially in Europe.

Some synthetic CDOs issue regular classes of bonds just like cash CDOs. When they do so, they invest the proceeds of the issuance in low-risk securities. The main risk that the CDO takes is through its portfolio of CDS. Thus, the CDO receives periodic fees as a protection seller. The periodic fees, together with the interest on the low risk securities, provide the source of funds for the CDO to pay interest on its own securities. If a credit event occurs under any CDS in the underlying portfolio, the CDO would be required to pay the protection buyer under the CDS. The CDO would use some of the money invested in the low-risk securities to make the payment. Thus, the CDO's assets would decline and it might not be able to fully repay its outstanding securities. For investors in the synthetic CDO, the

CDS — Credit Default Swaps⁷

A CDS is a contract between two parties in which one buys credit protection from the other. In some respects, a CDS is similar to an insurance policy that covers credit risk. For example, party X might purchase protection from party Y covering the credit risk of Acme Corporation. X is the **protection buyer** and Y is the **protection seller**. Acme is the **reference entity** under the contract. X agrees to pay Y a periodic fee during the term of the contract unless and until a **credit event** occurs. A credit event could be Acme's bankruptcy or a default on its financial obligations. Some CDS also include "debt restructurings" as credit events, but that feature introduces complications and opportunities for disputes. If a credit event occurs, Y has to pay X the amount specified in the contract. In some contracts, the amount that Y must pay is determined by the decline in the price of Acme's debt securities following the credit event. Such an arrangement is called **cash settlement** of the contract. In other cases, X delivers an eligible Acme bond to Y, for which Y must pay par. That kind of settlement arrangement is called **physical settlement**.

A CDS has a "notional amount," which defines the maximum dollar level of exposure under the contract. A CDS also has a specified term, which defines the time limit of exposure. So, X and Y might enter into a 5-year, \$10 million CDS that references Acme. The notional amount is \$10 million and the term is five years. If a credit event occurs during the 5-year term, Y would have to pay X. In a cash settlement scenario, the payment amount would be \$10 million times the percentage decline in the price of specified Acme bonds. In a physical settlement scenario, X would purchase Acme bonds in the open market (probably at low prices reflecting the company's distressed condition) and deliver them to Y, who would have to pay \$10 million for them.

Unless Y (the protection seller) has a very high credit rating, X (the protection buyer) generally will require Y to post collateral as security for its obligation to pay if a credit event occurs. However, the amount of collateral that Y would have to provide would be substantially less than the full notional amount of the CDS.

Selling protection through a CDS involves taking risk that is similar to owning a regular bond of the reference entity. However, selling protection does not require an initial principal investment (and collateral requirements are not as large as the principal investment would be). Thus, CDS provide a way for a company to amplify its exposure to credit risk for a given level of capital commitment. Accordingly, CDS are sometimes described as facilitating leveraged credit exposure.

Buying protection through a CDS is like a short position in the reference entity's bonds. However, actually taking a short position in a corporate bond is often impractical. CDS allow market participants to express a negative outlook on a reference entity.

Corporations and sovereign governments are the most common reference entities for CDS. However, CDS can be constructed with ABS or MBS as the "reference obligations." In fact, it is even possible to make a CDS where the reference obligation is a tranche of a CDO.

Although CDS appear somewhat similar to insurance policies, they are not regulated as insurance policies. A protection buyer is not required to have any economic stake in a reference entity in order to purchase protection. Indeed, both a protection buyer and a protection seller may enter into a CDS for purely speculative reasons. Even so, because a CDS is a kind of derivative, it is not considered to be gambling and is not covered by State gaming laws.

⁷ See Whetten, M. et al., *Credit Default Swap (CDS) Primer*, Nomura Fixed Income Research (12 May 2004).

occurrence of a credit event under any CDS in the underlying portfolio has essentially the same effect as if the CDO had purchased a bond that subsequently defaulted.

Other synthetic CDOs issue unfunded classes as well as regular classes. An unfunded class is like a CDS that references the whole underlying portfolio of the synthetic CDO (which itself consists of CDS). An investor that "purchases" an unfunded class does not pay a purchase price. Rather, the investor receives payments as a protection seller and must pay the CDO issuer (as the protection buyer) if the underlying portfolio suffers losses above a specified level. For example, a hypothetical partially unfunded synthetic CDO might have the following capital structure:

Table 2: Example of Synthetic Partially-Funded CDO Capital Structure					
(\$150 million funded, \$850 million unfunded)					
Class	Amount (\$ millions)	Pct. of Deal	Subordination (%)	Ratings (Moody's/S&P)	Attachment & Detachment Levels
Super Senior (unfunded)	850	85.0	15.0	not rated	15%-100%
Class A	50	5.0	10.0	Aaa/AAA	10%-15%
Class B	30	3.0	7.0	Aa2/AA	7%-10%
Class C	30	3.0	4.0	Baa2/BBB	4%-7%
Equity	40	4.0	0.0	not rated	0%-4%
Total	1,000	100.0			

Assumes the underlying portfolio consists of CDS on 100 reference entities having an average rating of roughly BBB and that all underlying exposures are investment grade. The \$150 million proceeds from issuing funded tranches is invested in low-risk (i.e., highly rated) securities.

The "super senior" tranche in the example above is unfunded. The holder of that tranche makes no principal investment but receives payments for assuming the risk that losses on the underlying portfolio exceed 15% (\$150 million). If they do, the holder of the super senior tranche would be required to pay the CDO issuer the amount of losses above that level. The holder of the super senior tranche is in a position similar to an insurance company that writes an \$850 million insurance policy with a \$150 million deductible. The holder of the super senior tranche should feel pretty safe because the likelihood that losses will exceed \$150 million is quite small. This is evident from the triple-A ratings on the Class A tranche, which is *subordinate* to the super senior tranche.

Apart from the super senior tranche, the other tranches of the synthetic CDO are funded. That is, the holders of those tranches invest the principal amount of their tranches. They receive interest payments to compensate them both for the risk that they take and for the time value of their invested principal.

VIII. Single-Tranche CDOs

Beyond synthetic CDOs, there are "single-tranche CDOs." A single-tranche CDO is one where the sponsor sells only one tranche from the capital structure of a synthetic CDO. For example, using the capital structure shown in Table 2, the sponsor might sell only the Class C tranche. The investor would bear the risk that losses on the underlying portfolio exceed 4% (\$40 million). If losses reach 7%, the tranche would be wiped out. Between 4% and 7%, each dollar of losses on the underlying portfolio translates into a dollar of losses for the holder of the Class C tranche.

From the sponsor's perspective, selling the Class C tranche amounts to buying 3% of protection on the whole underlying portfolio, subject to 4% deductible (in insurance terms). In CDO jargon, the Class C tranche has an "attachment point" at 4% and a "detachment point" at 7%. The sponsor tries to earn a profit by re-selling protection on each of the individual reference entities included in the underlying portfolio. Naturally, the sponsor needs to have an elaborate computer model to determine

the right amount of protection to sell on each one. In effect, the sponsor buys protection in bulk form and sells it in smaller, individual pieces.

IX. Conclusion

There is so much to say about CDOs that I cannot possibly fit it all into a quick letter home. As you can see, the details of the product seem somewhat complicated. However, the special jargon for the product makes things seem much more complicated than they really are. In truth, nothing I've learned yet about CDOs seems nearly as complicated helping Uncle Hank last summer to fix the automatic transmission in his old Buick – that was really hard. Anyway, I'll tell you the rest of what I've learned about CDOs when I come home to visit later in the summer. Please give Buffy and Jody a hug from me.

Love,

Pat

X. Further Readings on CDOs

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