



# GLOBAL STRATEGY & INVESTMENT CONSULTING

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## COLLATERAL DEBT OBLIGATIONS

### A BRIEF OVERVIEW

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## Collateral Debt Obligations

### Introduction

A Collateralized Debt Obligation (CDO) is a credit derivative that creates fixed income securities with widely different risk characteristics from a pool of risky assets. The coupon and principal payments of these securities are linked to the performance of the underlying pool. These fixed income securities are known as tranches and are divided into senior, mezzanine and subordinated/equity tranches. Each of these tranches has a different level of seniority relative to the others in the sense that a senior tranche has coupon and principal payment priority over a mezzanine tranche, while a mezzanine tranche has coupon and principal payment priority over an equity tranche. It is important to note that a CDO only redistributes the total risk associated with the underlying pool of assets to the priority ordered tranches. It neither reduces nor increases the total risk associated with the pool. Credit default swap (CDS) is a bilateral financial contract in which the CDS buyer, alternatively called the protection buyer, pays a periodic fee, also known as premium, which is expressed in basis points per annum on the notional amount and in return for a contingent payment by the CDS seller, alternatively called the protection seller, upon a credit event such as a default or restructuring happening to the reference entity such as a corporate bond.

### Brief Overview of CDO markets

CDOs, which first appeared in the late 1980s, are considered to be the most important innovation in the structured finance market in the past two decades.

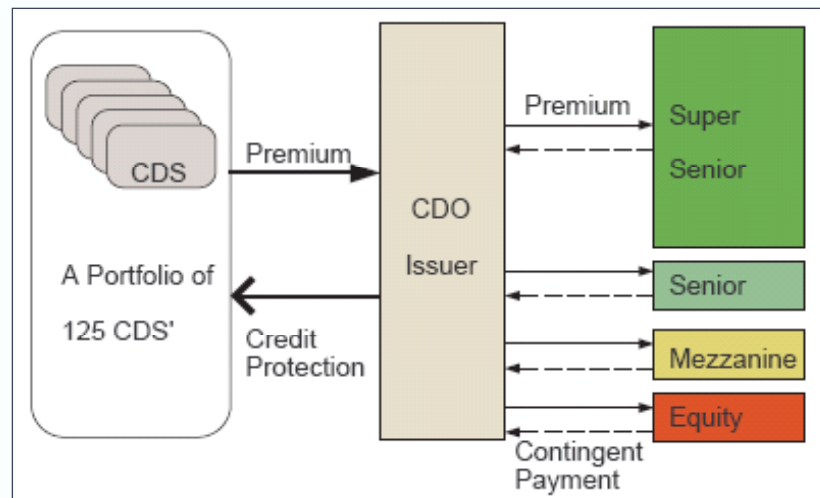
The two main types of CDOs are:

- Collateralized loan obligations (CLOs) -- backed primarily by leveraged bank loans.
  - Structured finance CDOs (SFCDOs) -- backed primarily by asset-backed securities and mortgage-backed securities
- Other types of CDOs include:
- Commercial Real Estate CDOs (CRE CDOs) - backed primarily by REIT assets
  - Collateralized bond obligations (CBOs) - backed primarily by corporate bonds
  - Collateralized Insurance Obligations (CIOs) - backed by insurance or reinsurance contracts
  - CDO-Squared -- CDOs backed primarily by the tranches issued by other CDOs.
  - CDO<sup>n</sup> -- Generic term for CDO<sup>3</sup> (CDO cubed) and higher, where the CDO is backed by other CDOs.

CDOs can also be categorized on the basis of the motivation of the issuer of a CDO. If the motivation of the issuer is to earn the difference between the average yield of the collateral assets and the payments made to the various tranches of the CDO, then the transaction is called an arbitrage CDO. If the motivation of the issuer is to remove debt instruments from its balance sheet, then the transaction is called a balance sheet CDO.

A CDO can be structured as either a cash flow or a synthetic transaction, or a hybrid of both. In a cash flow transaction, the CDO is backed by a pool of cash assets that are truly owned by the CDO sponsor. A synthetic CDO makes use of CDS to transfer the credit risk of a pool of reference entities to tranche investors. The main difference between a cash flow CDO and a synthetic CDO is that no transfer of securities takes place in the latter. Cash flow CDOs dominated the CDO market in the early days, while synthetic CDOs account for a large portion of the overall present CDO market, partially due to the high liquidity of the CDS market and the appearance of the standard credit indexes.

### A synthetic CDO example



The structure of a typical synthetic CDO can be explained through the following example, which is illustrated in the above diagram. This synthetic CDO is based on a pool of 125 CDS. The notional value of each CDS is US\$8 million. The total notional value of the underlying pool is US\$1 billion.

The CDO has four priority ordered tranches:

- (i) An equity tranche with an initial notional value of US\$30 million and a credit spread of 2000 basis points (bps) per annum
- (ii) A mezzanine tranche with an initial notional value of US\$50 million and a credit spread of 800 bps per annum
- (iii) A senior tranche with an initial notional value of US\$120 million and a credit spread of 100 bps per annum
- (iv) A super senior tranche with an initial notional value of US\$800 million and a credit spread of 20 bps per annum.

The equity tranche is the riskiest one, the mezzanine tranche bears a moderate risk, the senior tranche is less risky and the super senior tranche bears the lowest risk. The maturity of the CDO and thus the maturity of each tranche is five years from now and the premiums paid are quarterly. During the life of the CDO, each tranche may receive quarterly premiums from the CDO issuer. The premium that a tranche investor receives for a specified premium payment period is proportional to the remaining notional value of the specified tranche at the end of the premium payment period.



## How does a CDO work?

A CDO (collateralized debt obligation) is nothing more than a redistribution of credit risk, much in the same way a CMO is a redistribution of prepayment risk.

For illustration purposes, taking real ABS CDO featuring mostly RMBS as the base for the percentages of each tranche and making some simplifications to the structure, we shall use fixed interest rates, but almost all CDOs are floating rate. LIBOR is 5.30% and stays static over time.

We start with a \$100 portfolio of ABS bonds which yields 7%. This is called the collateral portfolio and has an average rating of BBB. In order to fund the purchase of this portfolio, 5 different securities are sold. The amount, credit rating and interest rate of the first four securities are given below and fifth security is the equity.

Quantity	Class	Rating	Yield
75\$	A	AAA	5.51%
10\$	B	AA	5.80%
5\$	C	A	7.20%
5\$	D	BBB	9.00%

These are called the debt tranches. Here tranches are rated differently because interest and principal is paid sequentially, starting with Class A and ending with the equity tranche. Only once Class A has been paid the due amount, does Class B get paid, and so on.

So our portfolio of bonds pays \$7 per year in interest. The CDO then owes interest on the debt it has sold:

Class	Interest
A	4.13\$
B	0.58\$
C	0.36\$
D	0.45\$

That makes a total of \$5.52 with \$1.48 left over. In a deal like this, the manager probably charges around 0.20%, 0.05% for admin fees and therefore the net fees amount to \$1.23 which passes through to the equity. The return on equity is quite an attractive 24.6%.

To understand the mechanism in detail, let's say that 2% of the collateral portfolio defaults and recovery is 50%. Now there is \$99 in the collateral portfolio with a 7% yield. Instead of having \$7 in interest, we only have \$6.93. So far, everything seems fine, because we had \$1.23 which we were paying to the equity but now we only have \$1.16, but that's over 20% IRR for the equity tranche.

Making it slightly more complicated, let's say that the deal suffers defaults of 2% per year for 10-years at the time when principal on the debt tranches becomes due. That's a total of 10% losses (2% x 50% recovery x 10 years). You are able to cover interest costs all along, because even after \$10 in principal losses, you have still earned an interest of \$6.30 versus interest costs of \$5.52 plus \$0.25 in fees. \$0.53 is still in the black.

But what about paying off the principal on the debt tranches? You only have \$90 in principal left in your portfolio to pay off \$95 in debt. If that were the end of the story, Class A would get paid its \$75, then Class B its \$10, then Class C its \$5, and Class D would default, and get no principal at all.



Now one might say that net-of-recovery losses of 1% don't seem too extreme. In that case, how would the Class D tranche get an investment grade rating? There are a couple of things that complicate the math, and make the Class D tranche a little safer. First, there are usually two coverage tests which CDO's calculate: interest coverage (IC) and over collateralization (OC). The IC test has the total interest earned in the numerator, and the total interest cost of a given tranche and all tranches senior as the denominator plus fees. So in our case, the IC on Class B at the onset of the deal would be  $\$7/(\$0.58 + \$4.13 + \$0.25) = 141\%$ . Some trigger is set for how high that number needs to be for each tranche and if the actual number is lower than the trigger, some remedy is required. For example, it might be that money that would have gone to the equity used to pay down some of the debt tranches. Since the size of the collateral portfolio is the same while the size of debt is lower, the IC calculation improves.

The OC test is similar, except that the numerator is the principal value of the portfolio and the denominator is the outstanding amount of a given tranche and all bonds senior. So for Class B at the outset, the OC test would be  $\$100/(\$75 + \$10) = 118\%$ . Here again, some trigger level is established when the deal is sold, and if the OC falls below that trigger, some remedy is required.

The triggers are usually higher for more senior tranches. So the top tranches aren't just protected by the extra cash flow of the deal, but also by the fact that if anything starts to go wrong, cash flow will be diverted from other tranches. The trigger levels also tend to be higher in deals with riskier collateral.

Now you can see how complicated the cash flow can get. It becomes extremely hard to determine what default level would sink a given tranche. For example, a tranche may be able to survive 5% annual defaults for all 10-years, but might not be able to survive 10% defaults in year 2. A relatively high level of defaults spread out over time is more easily cured through the excess interest the deal collects. But a spike in defaults would usually result in more senior tranches being paid down, and there might not be enough left over to pay the principal on more junior classes.

Another complication is the recovery rate. It is often true that the weaker credits in the deal also recover at a lower rate. For example, you might have a deal that is 50% prime RMBS and 50% B/C Home Equity. That might have an average recovery rate of 50%, because the prime RMBS recovers at 75% and the B/C Home Equity recovers at 25%. But since the B/C stuff is more likely to default, "average" recovery is of less importance? The only thing that matters is the recovery on the bonds that actually default.

The interest spread is probably uneven as well. For example, if the whole deal yields 7%, it might be that the 50% prime RMBS is at 6.5% and the B/C is at 7.5%. So if a B/C piece defaults, there is a larger decline in overall interest earned than what the straight average yield would imply.

Thus, CDOs can get pretty complicated, and it's impossible to say just how many defaults it will take to sink a given tranche. The concern should be with buyers of BBB and A-rated tranches of sub-prime residential deals. If there is a large default spike and recovery rates come in much lower than expected, these tranches will most likely perform poorly.



## CDO – Curing the Sub-prime...

Sub-prime loans or mortgages are those which are given to borrowers with poor credit records and who are often unable to obtain more conventional loans.

There has been an explosion of sub-prime mortgages in the United States in recent years. While initially this was seen as a good thing, allowing more people to buy their own homes, it has now exploded into a crisis as more and more borrowers default. Homes are being repossessed and banks now have to write off the sub-prime debt. The effect has spread far beyond the US as banks throughout the world have bought these sub-prime loans, often packaged up in pools of debt called collateralized debt obligations. After a mortgage is sold, it's usually packaged up with other home loans into a mortgage-backed security, or MBS.

But the question was who buys the riskier parts of these derivatives -- the bits backed by subprime mortgages offered to poorer borrowers with lower credit scores? The answer was collateralized debt obligations, or CDOs. These complex structures, which are similar to a mutual fund that buys bonds, helped fuel the U.S. mortgage boom in recent years by purchasing some of the riskier parts of MBS that other investors didn't want. CDOs have become an important part of the mortgage market because they buy the riskier parts of MBS that others don't want. Infact investments in the riskiest portions of these MBSs were done by the CDO sector.

### ...but for how long?

By exiting in search of more attractive assets, CDOs could limit the supply of money to the mortgage market, making home loans more expensive and reducing the availability of subprime loans. Stagnant home prices and rising delinquencies on subprime mortgages have sparked concern that some riskier MBS tranches could suffer losses. That, in turn, could hit CDOs. Even investment grade rated CDOs will experience significant losses if home prices depreciate. If CDOs take some of the hit, they could exit the residential mortgage market.

Something similar happened several years ago. During the late 1990s, CDOs invested a lot in asset-backed securities backed by manufactured housing loans and aircraft leases. After suffering losses, CDOs got out of those sectors.

The implications of CDOs withdrawing from the residential MBS market could be far-reaching. If they lose their appetite that would mean lower tranches of residential MBS can't be placed and upper tranches won't be sold either.

Mortgage lenders may then find it harder to sell on the loans they originated. That, in turn, could lift interest rates, even for home buyers with good credit scores, and cut the availability of home loans for subprime borrowers.



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