

THE BOND MARKET ASSOCIATION



# CDO Primer



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### **CDOs Defined**

A CDO, or Collateralized Debt Obligation, is a structured repackaging vehicle that issues multiple classes of liabilities created from a pool of assets (collateral pool). Typically, a bankruptcy remote Special-Purpose Vehicle (SPV) is created to hold the collateral and issue liabilities, which will comprise both debt and equity components (Figure 1). The collateral pool can be static or revolving. A revolving deal often employs an asset manager to reinvest collateral proceeds and to conduct limited trading. Besides the underwriter and the asset manager, other key participants involved in CDOs typically include rating agencies, a trustee and a hedge counterparty.

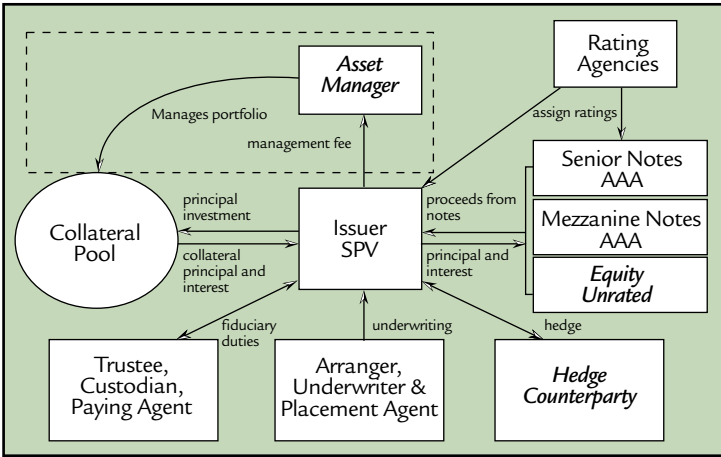
The difference between a CDO and other pooled investments, such as mutual funds, is the partitioning of risk among the investors. Unlike a mutual fund, in which investors have rights and risks in proportion to the size of their investment, some CDO investors have more rights and greater security than other CDO investors of the same transaction based on the priority level of repayment for each tranche of securities, which is based on the risks associated with each of the investments. The specific rights and security of each investor are outlined in the transaction's indenture. Investors with higher risk tolerance may choose to invest in higher yielding and riskier CDO debt or equity, while risk-averse investors will likely choose more senior, but lower yielding, CDO debt. In fact, one benefit of CDO technology is that it allows investors to choose securities suitable to their risk-reward profile.

The relationships among these parties and a general overview of a typical CDO structure are shown in Figure 1.

### **Market Growth and the CDO Family Tree**

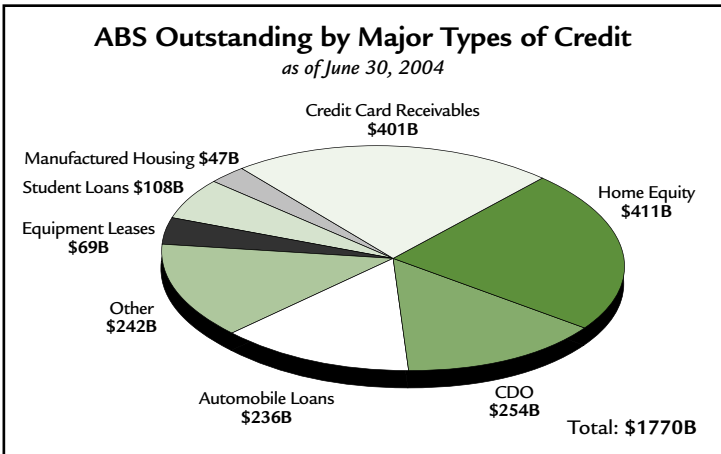
Underpinning the growth of the CDO market is innovation, and CDOs' structural versatility has afforded plenty. The CDO

**Figure 1 Basic CDO Building Blocks**



Source: Credit Suisse First Boston

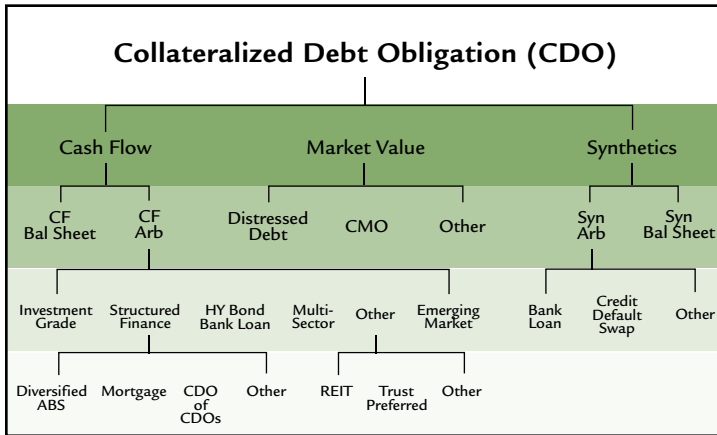
**Figure 2: CDOs Are a Significant Part of the U.S. ABS Market**



Source: The Bond Market Association, as of June 2004

market, which debuted in 1989, now comprises 14.4% of the \$1.8 trillion U.S. ABS market, a significant component of the securitization market (see Figure 2).

**Figure 3: CDO Family Tree**



Source: CSFB

The utility of CDOs as a capital market tool is underscored by their diversity of collateral and range of purposes. CDOs are usually defined by three characteristics: structure, purpose and collateral (see Figure 3). Each of these characteristics is discussed below.

### **Structuring Mechanisms**

CDOs have three broad structural categories – cash flow, market value and synthetic. The performance of **cash flow** deals is mainly tied to the credit performance of the underlying portfolio; market price fluctuations are of secondary importance. The principal risk to collateral cash flows is credit risk, i.e., the possibility that the expected stream of cash flows will not be collected due to collateral default.

In contrast to cash flow CDOs, **market value** CDO structures are rated based on market value over-collateralization, where collateral market price and price fluctuations are key performance drivers.

**Synthetic** CDOs behave like cash flow structures economically, but they typically employ credit derivatives,

such as credit default swaps, and have simple structures with few cash diversion mechanisms.

### ***Purpose***

There are two basic issuance drivers for CDOs: spread arbitrage and balance sheet management. Arbitrage CDOs seek to capture the excess spreads of higher-yielding assets over liabilities. On the other hand, the primary purposes of balance sheet transactions are to reduce regulatory capital requirements, hedge risk, or enhance balance sheet flexibility.

### ***Collateral Types***

A testament to CDOs' versatility is the breadth of asset types included in their collateral pools. Over time, CDO collateral has expanded beyond the traditional asset types such as high yield (HY) bonds, bank loans and emerging market (EM) debt, to include products such as asset-backed securities (ABS), mortgage-backed securities (MBS), commercial mortgage-backed securities (CMBS), private equity, trust preferred securities, small and medium enterprise (SME) loans, credit default swaps, and hedge fund shares (see Chapter 3 Types of Assets for a detailed description of five of the largest collateral types). Depending on the collateral type, alternative CDO classifications have been used in the marketplace. However, individually and collectively, they all fall under the umbrella of CDO. Identified by collateral, some common categories are listed below.

- Collateralized Bond Obligations (CBOs): mainly invest in corporate bonds or EM debt;
- Collateralized Loan Obligations (CLOs): mainly invest in bank loans;
- Structured Finance CDOs: mainly invest in CMBS, ABS, REIT debt and other CDOs;
- Collateralized Synthetic Obligations: mainly reference credit default swaps;

- Collateralized Fund Obligations: mainly invest in hedge funds; and
- Collateralized Equity Obligations: mainly invest in private equities.

### **CDOs vs. Other Structured Finance Products**

Fundamentally, CDOs apply technologies similar to those used in other structured finance markets. These include priority of payments and credit enhancement triggers to distinguish between senior and junior liabilities. For example, cash flow CDOs use the interest and principal payments from collateral to pay CDO liabilities based on a pre-specified priority of payments

However, there are also some structural aspects that are unique to CDOs. For example:

- CDO collateral is often rated, while the collateral for other structured finance products is usually non-rated.
- With the exceptions of some balance sheet CLOs and SME deals, CDO collateral pools are often lumpy (more akin to aircraft lease ABS and CMBS), while most ABS collateral pools consist of large numbers (i.e., more than 1,000) of loan/receivables and are more homogenous, with similar size and credit quality.
- Currently, CDOs are 144A or private placement transactions, which are not publicly registered.



## The Benefits of Investing in CDOs

CDOs contain a number of unique benefits that make them attractive to investors for a variety of reasons.

### Investment Diversification

CDOs offer investors exposure to a wide array of assets. Because CDO structures strictly limit the collateral concentration within any one issuer, industry or geographic region, investors are able to diversify among a large number of credits via a single investment. In addition to achieving greater diversity within specific asset types through exposure to a pool of perhaps 100 investment-grade credits, CDO investors can also diversify across asset types within the same transaction. For example, a typical multi-sector ABS pool may consist of home equity loans, CMBS and residential mortgage-backed securities (RMBS). Hence, via their collateral pools, CDOs enable traditional fixed-income investors to participate in varied underlying collateral markets while relying on the investment managers' resources and expertise in those respective markets.

### Customized Risk-Reward

CDO structures allow investors to choose securities suitable to their specific risk-reward profile by separating the cash flows of the underlying collateral into tranches of investment-grade and non-investment grade securities. Risk tranching also enables issuers to offer, within a single transaction, CDOs across the entire risk/reward spectrum, ranging from the least risky, AAA rated securities to the high risk, unrated equity investment. A risk-averse investor, for example, can choose to invest in the higher rated senior notes, while investors with higher risk tolerances can select from the subordinated notes and equity asset classes.

## **Attractive Yields**

CDOs often offer higher yields when compared to other ABS sectors and investment-grade corporate bonds. The yield pickup increases as investors move toward the riskier end of the credit spectrum.

## **Leveraged Returns**

As a leveraged investment, cash flow CDO equity represents a unique investment opportunity as part of a diversified portfolio of financial assets without mark-to-market or margin call unwind risk. The financial leverage provided by a CDO could be fixed for as long as 12 years, although the equity owner has the right to exercise an optional redemption and call the deal sooner. The optional redemption feature provides additional flexibility to an equity investor in a CDO, offering potentially greater upside if the collateral performs well and appreciates in price.

## **Transparency**

In contrast to other alternative investments, CDOs offer a high degree of transparency. Monthly trustee reports provide information such as portfolio composition, trading activity and deal performance in the form of a balance sheet of assets and liabilities and an income statement detailing sources and uses of cash. In addition, rating agencies closely monitor the CDO market and publish regular reports containing deal level, asset level and vintage level data.



## CHAPTER 3 | **Types of Assets**

Over time, CDO collateral has greatly expanded the types of assets that can be secured. Beyond the traditional asset types such as high yield bonds (HY), bank loans and EM debt, products such as ABS, MBS, CMBS, private equity, trust preferred securities, small and medium enterprise (SME) loans, credit default swaps, and hedge fund shares are also securitized. Five of the most common asset types are discussed below.

### **Leveraged Loans**

A corporate leveraged loan generally has multiple tranches that include a revolving credit facility (RC) and a Term Loan A (TLA), as well as single or multiple institutional term loans. While any of these subclasses of leveraged loans can be, and have been, securitized, the largest subclass is the institutional term loan tranche.

### **Revolving Credit Facility**

The revolving credit facility is an unfunded or partially funded commitment by lenders that can be drawn and repaid at the issuer's discretion until maturity. The borrower pays a nominal commitment fee on the undrawn amount and a coupon on the drawn amount. Maturities are usually either one year or in the three- to five-year range.

### **Term Loan A**

Term Loan A is a fully funded term loan that usually amortizes throughout the life of the loan. It is unlike the RC facility, in that once the borrowed amount is paid back to the lenders, the borrower cannot re-borrow the money under the TLA facility. In virtually every case, the spread and term of the RC and the TLA are the same.

## **Institutional Term Loan Tranches**

In contrast to payments under the structure of the TLA, amortization payments of institutional term loans are usually more heavily backloaded or come as a bullet payment at final maturity. Institutional tranches are usually named in alphabetical order (Term Loan B, C, D, etc.), depending on the number of tranches. For example, TLA might be five years, TLB might be six years and TLC might be seven years, etc.

Together, the revolving credit facility and the Term Loan A are traditionally referred to as a “pro rata” tranche, because banks that take part in the syndication must commit to an equivalent proportion of both the RC and the TLA. Coupons (shown as LIBOR plus a spread) on pro rata tranches are often lower than comparable coupons on institutional tranches because of higher upfront fees and accelerated payments associated with pro rata tranches.

The leveraged loan, new issue market reached \$139 billion in 2002, with the pro rata and institutional term loan markets accounting for \$81 billion and \$58 billion, respectively.

## **Asset-Backed Securities**

Asset-backed securities (ABS) are bonds or notes backed by financial assets. Typically these assets consist of receivables other than mortgage loans, such as credit card receivables, auto loans, manufactured-housing contracts and home-equity loans. ABS differ from most other kinds of bonds in that their creditworthiness, which is at the AAA level for more than 90% of outstanding issues, derives from sources other than the paying ability of the originator of the underlying assets. This is in much the same way that a CDO’s paying ability does not depend on the collateral manager or the investment bank, but rather on the performance of the collateral.

## **Commercial Mortgage-Backed Securities**

Commercial mortgage-backed securities (CMBS) are notes backed by a pool of loans secured with commercial rather

than residential property. Commercial real estate includes multi-family, retail, office properties, etc.

Both ABS and CMBS are characterized by high quality ratings, high liquidity, low ratings volatility and separation from originator/servicer bankruptcy. However, since these securities are not standardized, numerous details associated with their structure, credit enhancement, diversification, etc., must be analyzed when valuing these investments.

At the end of the second quarter of 2004, mortgage-backed securities accounted for a total of \$4.5 trillion and asset-backed securities totaled \$1.8 trillion.

## **Corporate Bonds**

Corporate bonds are debt obligations issued by corporations. The bonds can be characterized as either high-yield (HY) or investment-grade (IG) securities, based on their current ratings. The HY bonds have ratings below BBB (or Baa3); the IG bonds have higher ratings, reflecting their relatively lower credit risk. Bond coupons are usually fixed for the life of the bond. In lieu of cash bonds, synthetic CDOs reference credit default swaps linked to the cash bonds.

Since the majority of CDOs have at least one floating-rate tranche, interest rate hedging is a particular concern with CDOs backed by corporate bonds. Generally, the resulting interest rate mismatch (fixed-coupon collateral vs. floating-rate liabilities) is mitigated through interest rate hedging in the CDO structure.

Corporate bonds are probably the most well-known debt instruments in the CDO market, with extensive historical data readily available for research and due diligence purposes. The U.S. corporate bond market totaled \$4.6 trillion at the end of the second quarter of 2004.

## **Capital Trust Pass-Through Securities**

Capital Trust Pass-Through Securities (TRUPS) are credit-linked notes issued by a bank holding company (BHC)

through a pass-through grantor trust. TRUPS are a low cost, tax-deductible form of Tier 1 regulatory capital for U.S. BHCs. TRUPS are subordinated to all other senior and subordinated debt of the BHC. The notes are de-linked from the common shares of the BHC; therefore the issuance of TRUPS does not increase the number of common shares outstanding. The notes usually have a maturity of 30 years, but are callable at par after five years. Floating rate, fixed rate, and fixed/floating rate variations are available. The BHC must also comply with a number of additional restrictions in order to participate in the TRUPS program.

Since the October 1996 Federal Reserve Board announcement permitting BHCs to include TRUPS in Tier 1 capital, approximately \$107.0 billion of TRUPS-like securities have been issued by BHCs to achieve low-cost core capital. Approximately \$39.0 billion of the securities were issued in the retail market, and \$68.0 billion of the securities were issued in the institutional market.

## **Types of Structures—Cash Flow, Synthetic and Market Value**

### **Basic CDO Structure**

Although no two CDO structures are alike, they do fall neatly into three categories: cash flow, synthetic and market value. We will focus our discussion primarily on the first two, as very few market value structures—used to securitize relatively more volatile, equity-like assets and funds—have been used in the past few years.

What all CDO structures do have in common is the basic asset-liability structure: The assets of the CDO trust are funded by a capital structure consisting of some combination of debt and equity. For purposes of this chapter, our focus is on the right hand side of the CDO balance sheet (e.g., the debt and equity).

In a CDO, a trust issues multiple classes of debt and equity that are tranching with respect to credit losses and timing of cash flows. The equity tranche receives all residual cash flows after payment to the note holders. Therefore, the equity investors absorb any of the first losses and are subordinate to the debt holder claims. The amount of equity required by a deal is primarily a function of the riskiness of the underlying collateral and varies between approximately 3% to 5% for a deal referencing investment grade (IG) assets and 8% to 12% for a high yield (HY) asset portfolio. The debt tranches are structured to balance the constraints of investor requirements with the CDO's objective to minimize funding costs. Subordinated CDO tranches (e.g., B and BB) absorb losses before the mezzanine (e.g., BBB and A) and senior tranches (e.g., AA and AAA) and therefore bear commensurately higher yields.

## **Structural Distinctions**

In distinguishing between cash and synthetic structures, the major difference is the former's strict senior funding reliance on triple-A bond investors and the latter's ability to access the more cheaply priced super senior swap market. The funding advantage for synthetics is so great that over the past six years they have accounted for all of the growth in the global CDO market. However, other than the securitization of IG corporate credits, most assets still require the cash structure, which can be applied to all debt collateral types.

Multi-sector CDOs—where the collateral is primarily structured product, including other CDOs in some cases—have the most overlap of cash and synthetic structures. However, even here, the synthetic structure is usually more beneficial for securitizing senior-rated, low spreading asset pools to access commensurately lower senior financing costs in the swap market.

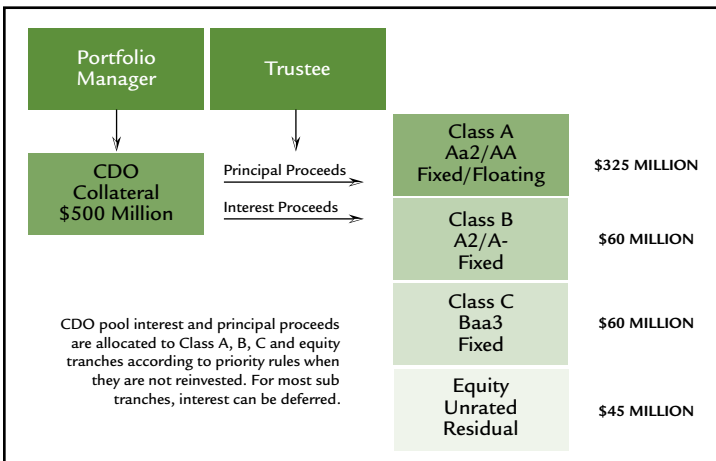
Another important distinction in CDO structure is managed versus static. Managed deals are typically, but not always, cash flow structures and “rule based,” ensuring that the manager balances the interests of both the equity and the debt holders. By contrast, static deals, which increasingly give limited substitution rights to the investor, are typically synthetic structures that either arbitrage the spread between the assets and the trust's funding costs or reference on-balance sheet credits for regulatory and/or economic capital relief.

## **Cash Structure**

The assets of a cash flow CDO are funded by a capital structure consisting of some combination of debt and equity (see Figure 4). As the first loss holder, the equity has the highest expected return and volatility. Similar to a CMO's debt, the debt of the CDO trust consists of tranching notes rated as low as B and as high as AAA. The lower-rated tranches absorb losses prior to higher-rated tranches and enjoy a commensurately higher

coupon in return for this additional risk. Principal cash flows are paid to the tranches sequentially. Hence, the percentage of each note's subordination increases as its principal is amortized later in the CDO's life in accordance with maturing assets. The number of tranches varies greatly from deal to deal, with some CDOs having as few as one tranche and others having more than 10. Furthermore, the expected average life of each tranche varies based on the structure's prioritization of cash flows under a base case assumption for the expected timing and amount of future losses. However, depending on these assumptions, the actual collateral, and the structure, senior tranches typically have average lives of six to eight years, whereas junior tranche average lives typically extend from eight to 11 years.

**Figure 4: Example of a Cash Flow CDO Structure**



Source: Banc of America Securities LLC

## Coverage Tests

In managed cash flow CDOs, debt holders are protected primarily by asset quality and cash flow coverage tests. The portfolio of a managed, cash flow CDO is restricted by asset

quality tests for the collateral's minimum ratings, industry/obligor limits, minimum coupon or spread and maturity profile. The asset quality tests are particularly relevant over the deal's reinvestment period, which consists of a preset time frame within which the manager may use principal proceeds to purchase additional assets and to effect asset substitutions. Whereas a breach of the asset quality test(s) can result in CDO note downgrade(s), coverage test failures can actually accelerate cash flows to the higher-rated tranches. Specifically, when either principal or interest coverage tests are not met, principal is amortized for the senior-most outstanding tranches until the tests are corrected (mandatory redemption). Finally, an optional redemption—usually exercisable three years after deal issuance—occurs when more than two-thirds of the equity holders vote to liquidate the collateral portfolio.

### **Asset quality tests**

Asset quality tests for cash flow CDOs include a list of criteria that the aggregate portfolio of collateral assets must meet on an ongoing basis. Among the types of asset quality tests is the minimum average rating test, for which the weighted average rating (WAR) of all collateral assets must meet a specific level (for example, B for HY deals or BBB- for IG deals). Industry and obligor limits ensure that the outstanding principal of all collateral assets in the same industry classification or issued by the same obligor does not exceed a maximum percentage of the total outstanding principal. A typical maximum industry concentration is 8%, whereas the obligor concentration limit is generally 2.5%. The minimum weighted average coupon (WAC) test requires that the WAC of all collateral assets must be above a minimum level. Finally, the cumulative maturity distribution test ensures a predictable amortization profile of the rated debt after the end of the reinvestment period.



## Cash Flow Coverage Tests

Coverage tests consist of two types: a par amount over-collateralization (OC) test and an interest coverage (IC) test. The OC test must ensure that a minimum amount of collateral par amount secures the rated debt, and the IC test ensures that cash coupon payments generated from the collateral will be adequate to pay fees and interest due on the rated notes. In most transactions, the OC test would typically fail before the IC test, so the market's focus is placed on the performance of the former test. An OC test is set for each tranche designed to accelerate cash flows to the senior-most note and subsequently to amortize more subordinated notes if the deal continues to perform poorly.

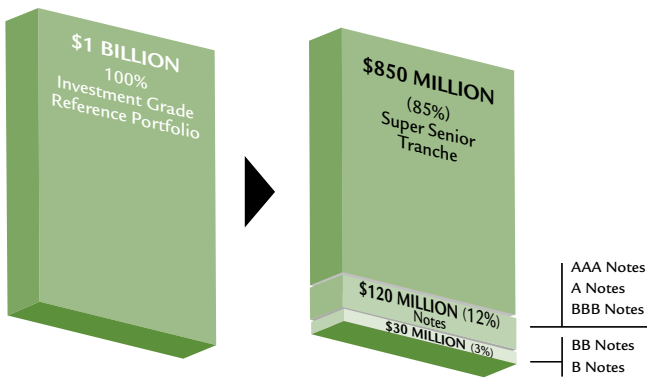
## Synthetic Structure

Synthetic CDOs utilize technology from the credit default swap (CDS) market to synthetically replicate a cash flow CDO. As credit derivatives isolate credit risk from other risks associated with fixed-income instruments, such as interest rate risk, synthetic CDOs represent a pure play on credit for investors and issuers. Synthetic CDO notes are essentially tranching exposures to a portfolio of single-name CDS. In a single-name CDS contract, the “protection seller” receives a periodic premium payment—or a spread roughly comparable to an asset swap spread—for its obligation to compensate the “protection buyer” for credit losses upon the occurrence of a credit event. In a synthetic CDO, a similar contract is simply extended to a portfolio of credits tranching with respect to credit losses. For example, the subordinate-most tranche above equity receives a periodic premium in compensation for its second loss position in the capital structure. The subordinate note holder's coupon would be much greater than that of the mezzanine and senior note holders, who only bear exposure to the subsequent losses, if any.

Whereas cash flow CDO liabilities are always funded notes yielding a spread over a benchmark such as LIBOR or Treasuries,

for synthetic CDOs the liabilities can be either funded, unfunded or both. Similarly, on the asset side of a synthetic CDO, the collateral can be either cash bonds (funded), credit default swaps (unfunded), or both. The synthetic CDO trust issues credit linked notes (funded) and/or swaps (unfunded) with various degrees of exposure to losses incurred by credit events in the portfolio. The remaining super-senior risk is typically swapped out in an unfunded format to investors (see Figure 5). Single tranche CDOs (STCDOs) represent the newest evolution of synthetic CDOs and forego the requirement that the CDO trust to place the entire capital structure. Instead, STCDOs allow for investment in part of the capital structure of an underlying reference portfolio. The STCDO investor determines this reference portfolio, and is then given flexibility to choose the desired level of subordination and the tranche size of the investment.

**Figure 5: Example of Synthetic CDO Structure**



Source: Banc of America Securities LLC

## Synthetics Versus Cash

It is possible to obtain structured exposure to a portfolio of credits in a number of ways. The major distinction arises between the cash and synthetic structures. In the cash

structure, the collateral is usually actively managed and the liabilities are fully funded without using derivatives. In the various synthetic structures, the collateral is typically static—although progressively managed—and the liabilities are normally only partially funded, with the senior risk swapped out to a counterparty or retained by the sponsor. The major characteristics of synthetics and how they differ from cash flow CDOs are as follows:

### **Investor Perspective**

- **Isolated credit risk.** Synthetics typically isolate credit risk from other risks, such as interest rate, prepayment and currency risk, assumed by cash CDO noteholders. Therefore, investors in synthetic structures can focus on selecting the optimal asset classes, desired leverage, investment criteria and style of portfolio management.
- **Short maturity.** Corporate-backed synthetics typically have an average life of six years (vs. eight to 12 years for cash CDOs), yet they offer comparable or better spreads.
- **Low funding cost.** First, super-senior funding in the default swap market—which constitutes 75% to 90% of total funding—is much cheaper than the relatively higher spreads demanded by AAA cash investors. Second, synthetic CDOs usually require lower equity deposits due to enhanced structural flexibility. For both of these reasons, synthetic CDOs typically require lower collateral spreads. However, lower equity deposits translate into less subordination protection for note holders.
- **Low sourcing risk.** There is generally little sourcing risk in synthetic CDOs for three main

reasons. First, CDS can be created to reference almost any corporate credit and can be sourced within a matter of days, compared with months for cash CDOs. Second, synthetic CDOs do not require the physical transfer of assets into a trust. Therefore, a wider universe of assets can be referenced in the synthetic structure (e.g., syndicated loans with restrictions on selling without the borrowers' consent). Third, the lower funding gap required due to the cheaper senior funding expands the universe of investable assets to relatively higher-rated collateral, which is easier to source.

- **Hybrid note/equity tranching.** In synthetic CDOs, the lower-rated notes and equity certificates are often a hybrid of debt and equity, a rarity in cash CDOs. For example, the BBBs may have a stated coupon, plus participation in the residual returns. Similarly, the equity certificates of synthetic CDOs may have a stated coupon close to that of a BB cash CDO tranche, plus residual cash flows.
- **Simplicity of waterfall rules.** Cash CDOs can be difficult to analyze, in part due to their intricate waterfall rules, which divert principal payments to higher-rated tranches when collateral tests are tripped. These rules also vary from deal to deal. By contrast, such waterfall or priority of payment rules are either nonexistent or negligible in most synthetic CDOs, because senior risk is often swapped out to a counterparty or retained by the manager or dealer. In synthetics, waterfall rules are usually designed to protect the mezzanine investors, who only get second priority in cash deals after

the AAA and AA senior investors. Another difference is that in synthetics, cash flow coverage tests, when tripped, usually divert excess spread into a cash reserve account or restrict the manager's trading, thereby stopping leakage of cash to the equity and/or subordinate note holders.

- **Single tranche technology.** Whereas cash CDOs require issuance of an entire capital structure, synthetic CDOs referencing liquid CDS names may sell only a portion of the capital structure thanks to delta-hedging technology—analogueous to that used to manage residual interest rate risk in a swap book.

### Issuer Perspective

- **Ease of execution.** As fewer rated notes need to be placed (most of the funding is often a super-senior swap) and lower equity deposits are required, the synthetic CDO marketing process can be more efficient than that for cash CDOs; thus there is a higher probability of the deal closing. Furthermore, the documentation process for synthetics is more streamlined as compared to cash CDOs.
- **Ability to securitize non-transferable assets.** Balance sheet CLOs—the first synthetic subsector—came into being in 1997, because credit derivatives allow financial institutions to achieve capital relief for loans they either want or need to leave on their balance sheet.
- **Lower funding cost.** Since synthetics typically have lower funding costs than cash deals, the manager is able to concentrate investments in higher-quality collateral, and thus faces less

sourcing risk. Particularly in balance sheet deals where the issuer is a highly rated bank, the CDO's funding cost may exceed that of the sponsor. Therefore, the lower funding costs of the synthetic structure are often a necessity in order to achieve the requisite economics in a balance sheet deal.

Since most synthetics in the market are passively managed, much of the issuer's decision as to whether to select the cash or synthetic structure hinges on passive versus active management. The passive structure has enjoyed tremendous growth due to the proliferation of credit savvy investors preferring to do their own analysis on a known static portfolio of IG corporate credits. Furthermore, there is a cost associated with independent management that needs to be taken into account. Many "static" synthetics actually allow limited substitution rights subject to a trading account and/or WAR test, industry limits and other tests.

## **Market Value Structure**

Similar to hedge funds, the market value CDO manager purchases a financed pool of assets that carries, in the manager's estimation, a high total return probability with relatively low risk. That said, market value CDO assets are much more volatile than cash flow or synthetic CDO assets. Therefore, market value CDO equity deposits range from 18% to 22% for HY deals and 28% to 33% for hedge fund deals. High yield market value CDOs include a variety of assets across the risk/return spectrum including cash, Treasuries, commercial paper, bonds, loans, mezzanine debt, distressed debt, equity and emerging market debt. The market value structure has more recently been applied to hedge funds and private equity

funds. Features that characterize market value CDOs include a structure in which collateral assets are marketable, cash-paying instruments for which the price volatility rather than cash flow is assumed to be predictable. Marking-to-market is usually performed daily for market value CDOs. Trading flexibility within this structure allows portfolio managers to periodically adjust the collateral pool based on shifting the market value weight of each asset type that makes up the pool. Trading restrictions are nonexistent as long as asset test requirements are met. The mandatory liquidation of bonds is activated when the minimum net worth and/or market value over-collateralization tests are not met and have not been remedied within a cure period.





## Principal Risks and Analysis of CDOs

### CDO Risks

Proper evaluation of a CDO requires a thorough identification and evaluation of the risks that investors are being compensated for. The primary risks that investors must analyze include the following:

#### ***Systemic or Modeling Risk***

This is the potential rating agency modeling risk assumed by investors, and it stems from: (1) the appropriateness of the statistical methods employed by the agencies when assigning ratings and (2) the accuracy and predictive power of the proprietary default and recovery data used in the models. The rating agency algorithms determine the level of credit enhancement for a given tranche's risk level (i.e. rating). These methods drive about 80% to 90% of CDO deal structures.

#### ***Collateral Credit Risk***

This is the credit risk of the collateral at the portfolio level (diversification requirements within the structure limit bond specific risk). This risk is a function of the performance of each underlying collateral sector as affected by the domestic/global credit cycle or secular events such as high yield market performance, the impact of 9/11 on aircraft leases, etc. Senior CDO investors are insulated against collateral credit risk due to the significant amount of credit enhancement that exists at the top of the CDO capital structure. However, subordinated and equity investors are not. Rather, their investment is a leveraged view on the collateral performance and they are compensated for their higher exposure to collateral credit risk.

## ***Structural Risk***

Structural risk relates to the adequacy of the structural tests to: (1) preserve collateral quality and (2) redirect excess spread and interest cash flows of subordinate investors to pay down senior note holders if the collateral performs worse than expected. The stringency of the tests determines the timing and amount of cash flows to be diverted away from junior notes.

## ***Servicer/Manager Risk***

This risk is a function of the adequacy of the asset manager's infrastructure, credit and portfolio management skills. The asset manager makes asset allocation decisions and selects the underlying bonds within a sector that will comprise the collateral pool. To the extent that the ABS CDO collateral manager has strong credit resources and a solid infrastructure, he or she can buffer investors from collateral risk through better buy/sell decisions at the asset allocation and bond level, both initially and during the reinvestment period. However, CDOs do have built-in criteria to keep wayward managers in check. Such portfolio quality covenants include:

- Limits on the amount of CCC investments
- Restrictions which prohibit the collateral manager from excessive trading
- Limits on collateral concentration
- Revocation of trading privileges if the initial risk profile of the collateral pool is not maintained

## ***Call Risk***

In most transactions, CDO debt investors are exposed to call risk. Generally, CDO deals are callable, in their entirety, after three years. Fixed rate tranches are callable at make-whole prices, while floating rate tranches are callable at par. Deals will be called if there is significant appreciation in the

collateral or, more typically, once the reinvestment period ends and the transactions begin to de-lever.

### ***Credit Analysis and Management of the Major Investment Risks***

Credit analysis of CDOs is intended to address the previously identified risks as described below.

#### ***Systemic or Modeling Risk***

Investors should complete a thorough review of each rating agency modeling algorithm, particularly with respect to the main drivers of deal cash flows: default and recovery rates. The primary factor determining tranche performance is the adequacy of the expected loss assumptions for the collateral pools. The end point of an investor's analysis of the rating agency algorithm should:

1. Provide a conclusion with respect to the reasonableness and "predictive" power of the default and recovery rates used in the model for the collateral pool. Although an analysis of historical default and recovery rates, particularly during a downturn for the sector, is a good starting point, past performance may not always be the best predictor of future performance if sector or collateral dynamics have changed.
2. Determine if the "cushion" around the average or break-even level is reasonable for the ratings level.

Investors can get information and an orientation to rating agency modeling approaches through:

- Data published by rating agencies
- Discussions with specific rating agency analysts
- Research published by underwriters of CDO deals
- Investment bankers who structure CDO deals. Bankers can provide information concerning the modeling

framework used by a particular agency, as well as specific deal information, i.e., expected default and recovery rates for a given portfolio or collateral pool.

- Use of market tools such as Intex (a vendor of CDO analytical software, which can be used, among other things, to run breakevens)

To the extent the investor concludes that the modeling assumptions are conservative, it may want to consider going down in structure, purchasing the deal's lower rated securities, in order to benefit from the "overenhancement." Conversely, to the extent that an investor has concerns about the adequacy of the model assumptions, an investor can move up in structure in order to gain more protection against this risk. As with collateral risk, the more senior the tranche, the more insulated an investor is from the modeling risk.

### ***Collateral Credit Risk***

Investors should assess the collateral risk of the pool at the asset allocation level. For example, investors should look at the following with respect to the sectors of the portfolio:

- Current spreads for the sector (at the relevant ratings level)
- Current default data and downgrade/upgrade/watchlist activity for the sector as published by the rating agencies
- CDO portfolio spread and dollar price

The goal of this analysis is to obtain a sense of how investment sectors included in the portfolio are performing. Sector risk cannot be diversified away; however, an asset manager can diversify against individual bond risk, potentially enhancing deal performance through individual bond selection.

## ***Structural Risk***

Investors should perform breakeven analysis to determine the amount of collateral net losses that can occur before a tranche becomes cash flow impaired. Generally, bankers can provide investors with custom scenarios containing specific default and recovery assumptions. Investors should derive a scenario that is conservative, i.e., worst case, and then determine how the tranche performs. This would be the “money good” scenario. Also, investors should assess how many times their tranche is covered versus historic losses; this is the “relative value” assessment.

In addition to looking at what the structure can absorb in terms of breakeven and average loss coverage multiples, investors also should evaluate the following:

1. Level of amortization triggers and trade off between credit enhancement from excess spread versus subordination
2. Portfolio constraints and their effectiveness in protecting the investors during the reinvestment period

## ***Asset Manager***

As mentioned above, the asset manager makes the asset allocation decision and picks the underlying bonds within a sector. To the extent the CDO portfolio manager has strong credit resources, he can buffer all investors from collateral risk. Also, the asset manager must monitor the portfolio, and is expected to serve as a loss mitigator by exiting positions where the potential for cash flow impairment has increased or is likely to in the future.

Due diligence on the asset manager should include a review of the following:

1. Number of analysts per name and years of average experience

2. Total Rate of Return (TROR) track record in asset class or CDO management history
3. When a TROR record is lacking or not relevant, due to the absence of a market benchmark for comparative purposes, investors can review the manager's record with respect to: (a) number of defaults and distressed sales made within a sector, dollar price of sales, ultimate recovery value on assets and (b) manager's ratio of upgrades to downgrades
4. Review of manager's rationale behind the asset allocation decision
5. Manager's credit approval process for bond selection
6. Approach to monitoring the portfolio and genesis of sells decisions

### ***Call Risk***

Call risk is generally mitigated for fixed-income investors through a make-whole provision. Also, deals are generally non-callable for at least three years.

As detailed above, a comprehensive analysis will include an examination of the parties involved in the transaction as well as any factors that may impact cash flows to investors. Collateral quality, structure, credit enhancement, and management expertise should provide investors with a sufficient foundation to allow for attractive investment returns.

## A Survey of CDO Valuation Methodologies

CDOs are complex structures backed by diverse pools of collateral; because they are complex there is no standard method of valuation for CDOs.

This chapter summarizes the most common valuation techniques with the intention of providing market participants with better tools for approaching and understanding the valuation of CDO securities

### CDO Valuation

Cash flow CDOs rely primarily on the cash flows generated by the underlying portfolio to repay debt and provide returns to equity holders. Like other, more traditional securitization transactions, cash flow CDOs rely on the cash flow from a pool of financial assets to service debt. A common approach to the valuation of asset-backed securities may be applied to CDOs, based on the present value of projected cash flows. This is commonly referred to as the discounted cash flow (DCF) valuation technique, and it attempts to simulate the future payment characteristics of the security. Other approaches may also be applied to CDO valuation. In situations where liquidation is a possibility—where an optional call is expected or the collateral may be liquidated due to a triggering event set out in the indentures—the net asset value, or NAV, approach may be more appropriate. In these cases the current net liquidation value of the assets will determine investor proceeds. In still other situations, investors may want to separate the principal and interest components of a CDO security and value them on an interest-only (IO) and principal-only (PO) basis. Market participants will often use more than one approach to make sure that their assessment of value stands up to different ways of analyzing a CDO security.

The basic analysis of a cash flow CDO structure involves the evaluation of a particular asset portfolio and related reinvestment as well as the specific transaction structure. Maintenance tests and assumptions as to future expected default and realized loss rates must also be considered. The level of expected losses will vary depending on a number of factors, such as the types of assets in the portfolio and the credit quality and diversity of the assets.

## **Methodologies**

### ***Discounted Cash Flow Analysis***

A commonly used technique to value CDO securities is the discounted cash flow (DCF) method. As with any traditional DCF analysis, a stream of cash flows is projected and then discounted at an appropriate discount rate to arrive at a value for the cash flow stream. With respect to cash flow CDOs, the primary variable in any projection is the future performance of the asset portfolio. Since many CDOs are actively managed, the actions taken by the collateral manager in trading the portfolio in the future will also be an important consideration.

In order to perform a DCF analysis, the transaction must be accurately modeled. Then a series of inputs and assumptions must be applied to the model. See “Assumptions Used in Valuation Analysis” below for a list of the assumptions typically utilized in performing DCF analysis. The cash flows are then discounted at an appropriate rate to arrive at a valuation. The discount rate is generally based on the then current market rate for a similar security.

The discount rate used depends on a number of factors. These include the performance of the transaction to date, the credit quality and other characteristics of the portfolio, the track record and expertise of the collateral manager, how the security is projected to perform under different scenarios, and other factors. A higher discount



rate may be appropriate if the transaction is perceived to have more risk than a newly issued CDO due to poor asset performance, a higher concentration of lower quality credits or a less experienced asset manager.

Valuations are usually created for a range of assumptions regarding portfolio performance—such as different default and recovery scenarios—and market discount rates. These scenarios may also be stressed to determine the sensitivity of the valuation to changes in assumptions. An implied valuation can then be determined considering all the relevant factors and the evaluator’s views on the fairness of the assumptions.

### **Interest-Only (IO) and Principal-Only Valuation (PO)**

CDOs can also be decomposed into separate interest- and principal-only components. Thinking of the IO and PO parts as separate securities can make CDO pricing a more accurate assessment of the value of the security. The IO and PO components are treated as having two distinct credit ratings based on their payment priority in the waterfall. Certain bonds may continue to receive interest payments, though principal repayment is less likely. Typically, this will occur with back-pay senior notes or mezzanine bonds.

As is the case with all CDO securities, IO investors need to analyze the priority of payment and the language defining the “events of default” in a transaction. They must also determine whether the IO is categorized as “current pay” or payable-in-kind (PIK), or PIKable. In current-pay tranches in some structures, the coupon payment is senior to the principal payments in all other classes. For PIKable tranches, the coupon may be subordinate to principal on senior classes.

## **IO Valuation**

Because the cash flows of a current-pay IO are relatively secure, this portion of the bond can be priced at a tighter spread than the bond's rating implies. Pricing PIKable IOs is more complex. Generally, they are either performing or distressed. The IO on a distressed bond is deeply discounted, as the coupon is paid only after the coverage tests are satisfied, and a bond backed by distressed collateral may be failing or close to failing those tests.

PIKable IOs backed by performing collateral require further analysis. Investors need to quantify the loss rate the deal can experience before fully diverting all excess cash from the IO. They must also assess the IO's long-term credit risk by looking at where deferred interest is repaid in the capital structure. Once this is known, investors must assume a level of expected loss from the underlying collateral. A price is derived by comparing the cumulative expected loss rate with the total credit enhancement available to make the coupon payments. Armed with this information, investors can judge whether the expected return is fairly priced in relation to the level of credit risk in the IO.

CDOs have not yet been stripped into separate IO and PO securities. Therefore, an IO investor does not face any real threat from amortization risk, which would truncate interest payments earlier than expected. While amortization could curtail interest payments, it would also increase the value of the PO. The PO then, is a natural hedge to the IO.

## **PO Valuation**

When valuing POs, it is useful to divide them into three distinct groups: those with little or no likelihood of receiving principal payments; POs with little to no credit enhancement; and those with a significant level of credit enhancement.

POs with no principal value can be thought of as out-of-the-money options. Depending on the volatility of projected default rates, however, the PO may have some value.

For POs with little to no credit enhancement, investors should, again, look to assign different probabilities to potential loss rates. Using this, they can calculate a probability-weighted return of principal to the PO. The value can be thought of as the premium on an option. POs with limited credit enhancement are typically a relatively small portion of the CDO's capital, a ratio that affects their volatility. Smaller classes are the most volatile, as they are the most frequently in or out of the money.

A PO with significant credit enhancement can be valued much in the same way a PIKable IO is viewed. The precise level of credit enhancement—which typically takes the form of excess spread and the bond's subordination level—should be determined. Investors should then focus on the expected loss from the portfolio's underlying collateral.

### **Assumptions Used in Valuation Analysis**

The value of the DCF analysis as a tool to arrive at appropriate valuations is the fact that the DCF analysis attempts to model the actual expected payment pattern of the CDO security. If the assumptions employed are reasonable based on available information and market conditions, the DCF analysis can provide a realistic expectation of actual performance and fair value.

DCF pricing models must take a range of factors into consideration. These include, among others detailed below, anticipated collateral default rates, recoveries on defaulted assets, the interest rate environment and collateral prepayment rates. While the model itself renders an objective analysis, the factors influencing the results require investors to make several assumptions.

## **Key Assumptions for Cash Flow Projections**

- 1) Current capitalization of the CDO issuer**
- 2) Priority of payments (allocations of cash received)**
  - Allocation of principal proceeds and interest proceeds
  - Allocation of trading gains, premiums
  - Operation of collateral coverage tests
- 3) Assumed level of interest rates (e.g., LIBOR) to the extent the assets and/or liabilities are floating rate.**
  - Use of forward LIBOR curve or other rate scenarios
  - Evaluation of interest rate risk in the structure
- 4) Structure of any interest rate hedge agreements**
- 5) Current portfolio characteristics**
  - Use of actual collateral portfolio vs. “weighted average” collateral metrics
  - Evaluation of distressed assets
- 6) Future characteristics of the portfolio based on reinvestment**
  - Reinvestment assumptions
  - Change of average spread or coupon
  - Assumptions as to future asset prices
- 7) Average cash balance expected**
  - Portion of the asset portfolio—on average—that may be uninvested
- 8) Ongoing administration fees and expenses**
- 9) Structure of fees to the collateral manager, including any incentive or performance based fees**
- 10) Default and loss rates**
  - Level and frequency of defaults
  - Realized trading losses and distressed sales

- Recovery levels and timing of proceeds received on defaulted/distressed assets

**11) Prepayment rates**

- Prepayment characteristics and expectations of the underlying assets

**12) Call options**

- Likelihood of optional call by equity holder

**13) Other Items**

- Bond insurance fees
- Contingent interest or step-up coupon tranches in capital structure
- Reserve funds
- Other cash diversion tests in addition to standard coverage tests
- Other collateral valuation requirements (e.g., “CCC” haircut tests)

## **Net Asset Value**

The NAV technique approaches the valuation of CDOs by estimating the value that could be distributed to note holders and equity holders in a termination scenario. It assumes the asset portfolio is liquidated at current market value and the resulting proceeds are distributed to note holders and equity holders in accordance with the priority of payments. As such, the NAV valuation is complementary to the discounted cash flow valuation, which assumes that the deal remains outstanding to final maturity, and that the collateral continues to generate cash flows that are distributed to note holders and equity holders according to the priority of payments.

The calculation is straightforward, and looks at all sources of value in the asset portfolio, including:

- current market value of collateral debt securities, including accrued interest

- hedge agreements (swaps, caps, floors, etc.) at current market value or breakage cost (e.g., swap market values may be positive or negative to the CDO)
- current cash balances of principal and interest collections

Once the realizable value of the asset portfolio is determined, this value is compared to all outstanding classes of liabilities and equity (including accrued interest). The NAV of each class is computed by determining how much of the asset value can be distributed to such class, in accordance with the priority of payments as specified in the indenture. Generally this means that any realized value from the asset portfolio is first distributed to the senior notes, then the remaining proceeds are distributed to the mezzanine notes and, finally, any residual proceeds are distributed to the equity classes. The NAV (in percentage terms) is equal to the ratio of the distribution proceeds received to the par amount outstanding of the class being evaluated.

The NAV is a useful valuation indicative that is often used in conjunction with the discounted cash flow valuation, particularly in the following instances:

- Valuation of market value deals (which may be difficult, if not impossible, to analyze in a discounted cash flow framework that requires estimating future cash flows and trading gains)
- Deals in which an optional call scenario should be assessed as part of the valuation (here, any applicable call premiums for the liabilities should be included in the calculation)
- Distressed deals in which an event of default/liquidation scenario should be assessed as part of the valuation

- Relative value of a deal versus comparable deals or versus “re-creation value”: NAV can be a useful measure of the relative quality and extent of collateralization for a CDO security, particularly in the context of relative value between secondary offerings and new issues

While a widely used and informative valuation indicative, the NAV approach has certain limitations, including the following:

- Because it assumes an immediate liquidation of the collateral pool, the NAV ignores the considerable excess spread (the difference between asset yields and funding spreads) that is generated over time, in a cash flow CDO, which is the primary economic basis for investors to invest in a cash flow CDO
- The NAV does not equate to the economic value that an investor may realize over time: cash flow CDOs typically have limited trading flexibilities (e.g., annual turnover on the order of 20%), and are generally never required to liquidate (except in extreme event of default scenarios). As a result, the NAV does not necessarily equal the distributions that are likely to be paid to an investor over time.

The NAV is subject to mark-to-market volatility of the underlying assets, which may not be reflective of the intrinsic value of the CDO security (since CDOs are generally not required to liquidate positions). In other words, non-credit-related price volatility on the underlying portfolio may have a significant impact on the CDO NAV.





## **Parties to the CDO Transaction**

### **Collateral Manager**

Sometimes referred to as the portfolio or asset manager, the collateral manager's primary function is to sell investments in the collateral pool that may lose value, default or become impaired, and to purchase investments with attractive yields and a favorable investment outlook. Therefore, the manager must possess a fundamental knowledge of the collateral as well as broad market trading abilities. Collateral managers are not given free reign to invest in any security, however; they are subject to certain rating agency and investment criteria as set forth in the deal's indenture. Of course, this responsibility only applies to actively managed transactions and is not relevant to CDOs with unmanaged or static portfolios, where trading in the underlying assets is prohibited.

### **Investment Bank (Arranger, Underwriter and Placement Agent)**

The role of an investment bank is multidimensional and crucial to the creation, but not the ongoing operation, of a CDO. Often, the same bank will serve as deal arranger, underwriter and placement agent. Although these roles are related, each could be, but rarely is, performed by a separate firm. As the arranger, the investment bank facilitates conversations between parties interested in a CDO transaction. For example, the arranger will organize meetings between investors and a collateral manager in order to discuss a potential transaction, or the investment bank may advise the collateral manager concerning rating agency requirements or apprise them of the specific nuances of certain investors. As underwriter and placement agent, the investment bank is responsible for

the orderly execution and delivery of the promised bonds. Usually the bank underwrites CDOs on a best efforts basis.

### **Trustee (Trustee, Custodian, Paying Agent)**

Similar to the trustee of other securitized products, the trustee for a CDO transaction is custodian of the collateral and protects investors' security interests by ensuring that transaction covenants are honored. These responsibilities include an evaluation of the trade recommendations of the collateral manager in order to ensure compliance with deal covenants, the release or receipt of cash or securities (from trading activities, for example), the distribution of cash to investors, and the creation and distribution of deal surveillance reports, as well as other general administrative duties for the trust.

### **Rating Agencies**

Moody's Investors Service, Standard & Poor's and Fitch Ratings Ltd. assign credit ratings to different parts of the CDO capital structure based on their perceived levels of risk. Factors considered include the riskiness of the underlying collateral, collateral manager trading restrictions, structural features governing the allocation of cash to investors, and credit enhancements such as those provided by monoline insurers. Qualitative aspects of the CDO transaction, such as the experience of the collateral manager and their trading record, also influence rating assignments.

### **Investors**

CDO investors are typically sophisticated institutional investors, such as insurance companies, money managers, banks, pension funds, hedge funds, and asset-backed commercial paper conduits. These investors are attracted to the diverse collateral pool supporting CDO transactions, as well as the relatively high yields and wider spreads versus comparably rated corporate or ABS paper. Thus, these investors are generally already familiar with asset-backed and investment grade corporate securities, yet desire exposure

to these assets in a leveraged format. Some investors prefer CDOs managed by a collateral manager with specific product expertise, while others prefer a static but diverse ABS or corporate debt pool. CDO equity investors, who buy the most subordinate part of the CDO transaction, are typically seeking high yields and are comfortable with the risk profile associated with a highly levered investment. These investors tend to be insurance companies, high net-worth individuals and hedge funds.

### **Hedge Counterparty**

The hedge counterparty is generally a highly rated investment or commercial bank that enters into an interest rate swap, currency swap, liquidity swap or another type of basis swap for the purpose of removing non-credit-related risk from the CDO transaction.

### **Credit Enhancer**

The credit enhancer is generally a monoline bond insurer that is paid an upfront and/or ongoing fee to insure a class of CDO securities against losses. Typically, any senior class debt which ends up with credit enhancement would have an underlying rating of AAA, AA or A; the credit enhancement wrap ensures a AAA rating on the security.

### **Special Purpose Vehicle (Issuer)**

The issuer of CDO transactions is a bankruptcy-remote special-purpose vehicle (SPV) located in a tax-friendly jurisdiction. The SPV purchases securities which will comprise the collateral pool and issues CDO securities. Because the operation of the SPV is precisely defined in the indenture, there is no need for employees and therefore it has none. Its function—to simply facilitate the transfer of cash from the assets to the investors—is purely mechanical.



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