Global Cash Flow and Synthetic CDO Criteria

Introduction

Since their rebirth in the mid 1990s, collateralized debt obligations (CDOs) have enjoyed remarkable growth on a global level and have truly become a key component of the structured finance market. CDOs are structured, leveraged transactions, which were initially backed by high-yield corporate bonds and loans but now include many different asset types. They offer debt investors that hold rated tranches an opportunity to invest in different levels of risk and return. They also offer the potential of high returns to the equity investors willing to take on the first loss position should some of the assets default.

During the last five years, as the market became more familiar with the CDO structures and risks, the transactions evolved to include different types of collateral including emerging market debt, project finance loans, and investment-grade corporate debt. The transaction structures have expanded from the basic cash flow structures that passed through principal and interest payments generated by the assets, to market value structures that look at the market value of the collateral to payback investors, to the synthetic structures that pass on to investors only the credit risk of the underlying assets.

In 1999 and early 2000, the structures expanded with the emergence of the first structures to repackage CMBS, ABS, and CDOs as assets in new CDOs. Also, the structures evolved to include and repackage assets that do not have set payment terms, such as distressed debt CDOs, CDOs of private equity funds, and CDOs of hedge funds. These structures appeal to different investors, collateral managers, and sponsors for a variety of reasons, including participating in new asset types, capitalizing on market dislocations (arbitrage), or to transfer credit risk.

Standard & Poor's has been rating CDOs since their inception in the late 1980s and has participated in all segments of the CDO market on a global scale. The goal is to provide investors with a clear, transparent, and appropriate methodology for looking at these transactions, and for assessing the risk associated with each instrument. As with all criteria in a rapidly changing market environment, CDO criteria evolved to keep pace with the markets. The global rating methodology and criteria used in rating cash flow and synthetic CDOs are presented in this publication. While the methodology for analyzing different CDO transactions can be presented in fairly detailed terms, Standard & Poor's recognizes that each transaction is different and has individual considerations that must be taken into account. As a result, Standard & Poor's works closely with the sponsor on every transaction and customizes its analyses based on the requirements of each transaction.

Standard & Poor's is constantly reviewing and fine-tuning its criteria in order to best address the embedded risks associated with each transaction structure, legal jurisdiction, and asset type. Standard & Poor's is committed to serving the CDO community globally, and has the appropriate resources to rate CDOs throughout the world. We invite readers, sponsors, and arrangers to review this publication and provide us with any comments, suggestions, or data that might help us improve our analyses and methodology.

The criteria book is divided into a number of chapters as follows:
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The CDO Product

Overview
Collateralized debt obligations, or CDOs, are structured vehicles that are similar to leveraged closed-end funds. As discussed below, the majority are cash flow structures, a fair number are synthetic structures, and some use a market value structure. A majority of all CDOs are actively managed and invested in different asset classes. At the core of the CDO is a bankruptcy-remote, special-purpose entity (SPE) that issues securities to investors in the form of several classes that are tranchied into differently rated and some unrated securities. Each class of securities represents a different level of risk and reward associated with the asset pool. The most senior securities have credit ratings higher than the average ratings of the collateral pool, with lower tranches being rated below the seniors. The first-loss tranche is equity (or preferred shares) that is typically not rated.

The proceeds from the offering are typically used to purchase a portfolio of assets, or may be held in the SPE. Should some of the assets fall into default or trigger some of the transaction covenants, excess spread is first used to cover any losses. However, there might not be sufficient assets to cover these losses, and the lowest-level, or more junior securities may take a loss. Payments to each of the liability classes are dictated by a stipulated priority of payments that reallocates the risk and rewards associated with the assets. This allows the CDO issuer to tailor the liabilities to meet the risk/return profiles of a broad range of investors and to attract additional groups of investors.

Since their creation in the late 1980s, CDOs have evolved into three major classifications: cash flow CDOs; synthetic CDOs; and market value CDOs. Standard & Poor's has rated CDOs from the inception of the asset type and continues to rate all three major classes of CDOs and their subgroups. Below is a brief explanation of the three major classifications.

Cash Flow CDOs
Cash flow CDOs are structured vehicles that issue different tranches of liabilities and use the net proceeds to purchase the pool of assets. The cash flows generated by the assets are then used to pay back investors generally in sequential order from the senior investors that hold the highest-rated (typically “AAA”) securities, to the "equity investors" that bear the first-loss risk and generally hold unrated securities. To compensate for the risk associated with bearing the first-loss position, the equity investors are generally paid most of the residual interest and may achieve a high annual rate of return. The money invested by the noteholders is used by the SPE to purchase the assets and cover the costs associated with executing the transaction. The par value of the securities at maturity is used to pay the notional amounts of the liabilities.

Synthetic CDOs
Synthetic CDOs are structured vehicles that use credit derivatives to achieve the same credit-risk transfer as cash flow CDOs, without physically transferring the assets. The risk is typically transferred to the investors by the entity holding the physical assets. The investors are the sellers of credit protection, since they take the risk of loss should the asset default. The institution holding the assets is the credit-protection buyer, since the risk of the loss was transferred to the investors.

In its simplest structures, the SPE issues notes to the investors and sells credit protection on a reference pool of credits. The money paid by the investors is then held by the SPE to either repay the investors or to pay the buyer of the credit protection should an asset in the reference pool default. The credit-protection buyer pays a periodic premium to the SPE that, together with the interest earned on the money held by the SPE, is used to pay interest to the investors. If and as assets in the reference pool default, the SPE settles with the credit-protection buyer and makes payments. At the end of the transaction, the remaining money held by the SPE is paid back to the investors. Synthetic CDOs can also be used to "bundle" corporate or other credit exposure, not only the risks of traded debt instruments. As will be explained later, synthetic CDOs can be structured differently, may hold a combination of derivative and physical assets, and may be fully funded, partially funded, or unfunded.

Market Value CDOs
Market value CDOs are similar to cash flow CDOs, but the SPE does not issue liabilities based on the par
of the assets. Rather, the SPE issues liabilities based on an advance rate associated with each type of asset purchased. The advance rate is specific to each asset and to each tranche of liability, and is based on historical price or return volatility for each asset type. The collateral pool is then marked to market on a periodic basis, and if the aggregate pool marks breach the pool advance rates, the collateral manager must sell collateral and pay down notes to bring the advance rates back in compliance. Market value transactions can be based on traditional corporate bonds and loans, or on instruments such as private equity or shares of hedge funds.

Cash flow CDOs and synthetic CDOs have more in common with one another than with market value CDOs. This is because the payment of liabilities is strongly dependent on the credit risk of the underlying assets in these two structures, whereas the performance of market value CDOs is based upon the market pricing and returns of assets. Given their similarities, the criteria overlap between cash flow and synthetic CDOs is greater than its overlap with the market value type. This publication covers only Standard & Poor's cash flow and synthetic CDO criteria. The criteria for market value transactions can be found on RatingsDirect, Standard & Poor's Web-based credit analysis system, at www.ratingsdirect.com. It is also available at www.standardandpoors.com.

Cash flow and synthetic CDO issuance is driven either by opportunities in capital market dislocations (arbitrage) or regulatory capital relief motivations. Arbitrage CDOs are designed to capture the positive spread between relatively higher-yielding assets and lower-cost, more highly rated liabilities. The assets in arbitrage deals are typically acquired by the collateral manager in the open market, and traditionally have been high-yield assets with large spreads. The difference between the yield on the assets and the rated liabilities is used to compensate the equity investors that take the first-loss position.

In contrast, balance sheet CDO issuance is motivated by the desire of the sponsoring institution to reduce regulatory capital requirements, increase lending capacity, lower the cost of funding, manage risk, and/or diversify funding sources. This is accomplished either directly through the sale of assets off the institution's balance sheet to the CDO, or by transferring the risk to the CDO through the use of synthetic securities. The sponsoring institution typically has retained all or a portion of the equity interest as a means of increasing return on equity.

The CDO market started in the U.S., but has become a truly global market in terms of both investors and sponsors. The early deals in the U.S. were followed by deals in Asia, but with the Asian economic downturn of the late 1990s the number of such deals dropped drastically. Asia investors, however, continued to invest in non-Asian CDOs throughout this downturn. Asian CDO deals have now started to come back and the market is expected to grow rapidly.

The European CDO deal market began to develop in the late 1990s and has seen tremendous growth over the last few years. As with the other markets, this growth is driven by both a desire to capitalize on spread dislocation and by risk/balance sheet management considerations. The growth in the CDO markets has also been strongly driven by the implications of the Basel accord of 2001 on bank capitalization requirements. As the accord is implemented, financial institutions will no doubt continue to view CDOs as an important tool for meeting the goals of the accord.

Collateral and Deal Types
From the inception of CDO technology through much of the following decade, CDO issuance was based in the majority of cases on portfolios of corporate bonds and leveraged loans. As the investor base expanded, emerging markets CDOs (EMCDOs) also appeared, consisting of sovereign debt and emerging markets corporate debt. The generic term CDO refers to those investment entities that are backed by a portfolio of bonds or loans, or a combination of both. In the infancy of the market, CDOs backed primarily or exclusively by bonds were referred to as collateralized bond obligations (CBOs), while those issuances backed primarily or exclusively by loans were commonly referred to as collateralized loan obligations (CLOs).

By the late 1990s, the market evolved into more diverse product applications including various asset-backed securities and different debt types. In 1999, the CDO market expanded with the inclusion of project finance loans and bonds, forfaiting trade receivables, private placements, and real estate asset-backed securities in CDOs. In 2000, the pace of including new asset classes in CDOs increased, with traditional ABS, CDOs, REITs, and bank tier 1 debt all being included in CDOs as primary assets. At the
end of 2000, the market also saw the resurrection of distressed debt CDOs, where the assets consist of deteriorating bank loans similar to the Grant Street Bank transaction done in the late 1980s. In 2001, the market again saw new innovations, with Standard & Poor's publishing criteria for CDOs of municipal debt obligations (see "Municipal CDOs" in the "Special Topics" section).

The repackaging of ABS and CDO subtranches into new CDOs is now so widespread that CDOs have become major investors in the subtranches of such ABS. The motivations of the different parties to create or invest in the CDO markets are explained later in further detail.

Most, if not all, CDO-type transactions can be executed in synthetic form. The challenge, if executed in synthetic form, is whether the derivative form of risk transfer can be captured properly in existing or modified documentation. The analytic exercise is to work with the documentation and synthetic structure to enable the risk of loss with regard to the synthetic CDO to be rendered comparable to the cash CDO. Synthetic CDOs were first presented primarily for balance sheet CDO transactions, but more recently the major growth has been in the managed arbitrage synthetic CDO and the synthetic CDO of ABS products.

In addition to different types of collateral, the CDO market is segmented between investment-grade and high-yield deals. The investment-grade CDO deals are made up of either investment-grade (e.g., 'BBB' and 'A' rated ABS) corporate securities or ABS collateral repackaged in a CBO. These pools can range from having an average rating of 'BBB' all the way up to 'AAA', depending on where the optimum risk/reward can be achieved and the motivation behind the transaction. While the spread on ABS securities is much less than on high-yield securities, an efficient arbitrage structure may be achieved due to the collateral having a much lower probability of default. Such structures thus have generally less equity and are more leveraged.

As mentioned previously, the majority of CDOs are actively managed. The asset selection and substitution decisions fall under the purview of a collateral manager. This manager is also responsible for the ongoing trading activities during a reinvestment period to realize gains and minimize losses, and maintain the portfolio within the constraints of the transaction structure. As a result of the latitude afforded the collateral manager to actively adjust the composition of the collateral pool to take advantage of market opportunities and to anticipate or respond to credit events, the manager's expertise with the assets and ability to manage within established constraints is paramount to the success of the CDOs. Market consensus is that the manager is the most important factor in a performance of a CDO. The role and importance of the collateral manager are fully explained in the section titled "CDO Manager Review".

The CDO market is not, however, limited to only actively managed transactions. Some transactions, referred to as static pool CDOs, consist of those where the payments cannot be reinvested or securities substituted. Static pool transactions are common in synthetic CDOs where the credit-protection buyer wants to cover its credit exposure to a defined set of exposures for a set period. Between the actively managed and static transaction, there exist some transactions that are actively managed to mitigate defaults. In these transactions the collateral manager monitors the credit risk of the securities and disposes of the securities that are deemed a credit risk. Proceeds from the sale of the securities are either reinvested or used to pay down the liabilities.

**CDO Structures**

**Cash Flow Arbitrage**

Central to all cash flow CDOs is an issuer in the form of a bankruptcy-remote special-purpose vehicle (SPE) whose sole purpose is to hold assets and issue securities using the assets as collateral. The SPE is legally structured to ensure that the entity is unlikely to become insolvent or be subject to the claims of creditors.

A trustee is also hired to protect the investor's security interest in the collateral and perform other fiduciary duties. The collateral is held in segregated accounts under the control of the trustee or administrator, and the trustee buys and sells the securities based on instructions from the collateral manager. The trustee also collects the payments generated by the assets, ensures proper allocation of proceeds to the noteholders and equity investors, and confirms that the covenants of the CDO are maintained.

There is often a mismatch between the interest terms of the assets and those of the liabilities. To mitigate
such interest rate-related risk, the issuer might choose to structure hedge agreements with a counterparty. The section titled "CDO Structural and Collateral Considerations" covers hedge considerations, and the section titled "Hedge Counterparty and Agreement Criteria" covers Standard & Poor's criteria for such agreements.

Some CDOs might involve credit enhancement on the senior tranches in the form of a financial guarantee from a bond insurer. A financial guarantee might be used if the economics of the deal benefit from the use of the insurer, or to attract investors who might not be familiar with the collateral or the collateral manager and would not invest without a guarantee. Typically, an 'AAA' rated monoline insurer will insure (or "wrap") tranches that would be rated at least 'BBB' without the guarantee. In addition, there are 'AA' and 'A' rated financial guarantee companies that are also active in the market.

Charts 1 and 2 show the flow of funds and outline the roles of each of the participants in a typical CBO transaction and CLO transaction, respectively.
The frameworks both CBO and CLO structures share are identical. However, loan assets have some features that can make the analysis more complicated than that of bond assets. Certain credit, legal, and cash flow analyses of CLOs differ from those of CBOs due to the following factors:

- The loan type and loan documentation can affect the degree to which rights and obligations can be transferred from the sponsor to the transferee. For example, a loan may in part be a participation. The lead bank transfers all or part of its interest in a loan (which also may include a pro rata interest in any collateral securing the loan) to one or more participants. Analysis of participations often entails an evaluation of the credit risk of the seller bank, whose insolvency may interrupt payments from the borrower to, ultimately, the issuer, as transferee.
- Loan terms vary widely: there are different amortization schedules, payment dates, rate indices, index reset dates, tenors, and so on, which impact the cash flow analysis.
- The lack of uniformity in the manner in which rights and obligations are transferred also results in a lack of standardized documentation for these transactions. Therefore, loan documents require a more thorough legal review.
- Loan portfolios can be restructured to accommodate the diminished or declining repayment capacity of borrowers.

Markets for bank loans are generally less liquid than bond markets. This may increase the risk of not being able to purchase eligible loans during the ramp-up and revolving periods, as well as limiting the exit strategies should a loan default.

**Cash Flow Master Trust**
The properly implemented master trust structure should allow an issuer to sell multiple series from the
same trust, with each series sharing the credit risk and cash flow from one large pool of assets. This structure is attractive to issuers because it is viewed as being cheaper to issue an additional series out of a master trust than it is to create a new, discrete trust. Depending on the issuer, securities issued out of a master trust may be backed by one large, diverse pool of assets containing a mix of seasoned and newly originated loans. Master trusts may contain other structural features that benefit the structure, such as the sharing of excess principal and excess spread among series.

A typical structure for a master trust transaction is shown in Chart 3. While the structure is attractive and a large number of master trusts have been created, to date only a few of the trusts have issued multiple series. This has to do in part to the complexities related to the allocation of collateral among different series in case of a trust event of default, while allowing each series to meet their respective legal maturity dates. Nevertheless, master trusts are an important structure in CDOs.

**Chart 3**

**Balance Sheet U.S. Master Trust CDO Structure**

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**Synthetic: Simple Credit Default Swap**

The typical synthetic CDO involves one credit derivative contract executed between the trust and the primary beneficiary of the credit derivative protection. The trust funds itself by selling medium-term notes to investors. As defaults in the underlying reference portfolio occur, credit losses are paid by the trust to the swap counterparty. At swap maturity, the remainder of the proceeds of the original sale of notes is then returned to the note investors. This is commonly known as a credit-linked note (CLN) structure and is shown in Chart 4 below. These investors are paid a rate of return on their notes. The source of this interest payment is usually a combination of the sum of swap fixed-rate leg payments received by the trust from the swap counterparty, commonly referred to as premium payments, and interest income generated by the proceeds of the notes themselves. Depositing the proceeds of the notes in a qualified investment contract, guaranteed investment contract (GIC), or eligible investments account typically generates the floating LIBOR or EURIBOR component of the interest income needed for the investors.
Synthetic: Partially Funded

In a partially funded synthetic CDO, the simple default swap structure defined above is modified to only issue and sell notes to investors sufficiently to cover ‘AAA’ risk, but not the entire balance of the reference asset pool. For example, for a $100 pool of assets, the level of credit support needed for an ‘AAA’ rating may be $30. The trust could thus issue only $30 of debt to investors. The difference between the funded or issued notes to investors and the reference asset pool is the super senior piece. This piece can remain outstanding with no investors covering the risks and the primary credit-protection buyer taking on the remote risk that defaults will exceed the ‘AAA’ level. Alternatively, the primary credit-protection buyer can pay a premium to a counterparty or monoline insurance company, typically an ‘AAA’ rated one, to make payments should defaults exceed the sized 'AAA' level.
Mixed Cash Flow and Synthetics
A number of structures combine elements of both cash flow and synthetic transactions. For example, a transaction can be structured where the SPE issues securities and uses part of the proceeds to buy a pool of physical assets (loans, bonds, ABS, etc.) while the remaining portion of the sale proceeds are invested in a GIC and the SPE enters into synthetic contracts with a buyer of credit protection. The cash flows generated by the physical assets, plus the returns on the GIC, plus the premium received from the credit-protection buyers are used to pay interest on the issued securities and to pay down the securities as the physical assets mature. Should defaults occur, proceeds from the GIC can be used to pay the credit protection buyer. An example of such a hybrid structure is presented below.
Structuring such deals poses more issues since the investors should not be subjected to the forced market liquidation of the physical assets or cash bonds, in order to pay back the credit protection buyer.
Market Dynamics

The rapid growth of the CDO market has been driven by a combination of factors and a convergence of players with complementary interests. The first CDO transactions were done in the late 1980s, and Standard & Poor's has been rating CDOs since their creation. After a number of CDOs were issued in the late 1980s, with the occurrence of the U.S. savings and loan banking crises and the recession of the early 1990s, only very limited new deal issuance occurred for some time, and some of the existing deals were liquidated.

The CDO markets slowly came back to life with new deals in 1995 and 1996, and by 1997 it was once again recognized as a growing asset class in structured finance. Beyond the early market participants that were the pioneers in a new asset class, rating agencies played an important role in the development of the market since they were able to develop criteria to size default risk based on ratings of the underlying obligors. The rapid growth that the product has experienced also has been strongly driven by issuers, investors, and collateral managers who saw a number of benefits in participating in such transactions. Key motivational drivers for the participants are as follows:

- **Issuer motivations**—the two basic motivations behind the issuance of CDOs are to capitalize on spread dislocation opportunities and to get regulatory capital relief. Arbitrage CDOs allow the issuer to realize the positive spread between the higher yield-generating assets and the lower all-in funding costs (liabilities). Balance sheet CDOs allow the issuer to transfer assets off their balance sheet, shifting risk to the capital markets. This lowers their capital reserve requirements and frees up capital for additional lending. Furthermore, the issuer is able to tap into lower funding costs and diversify funding sources. By retaining only a small portion of the equity, the issuer is able to increase its return on equity.

- **Collateral manager motivations**—CDOs allow the collateral manager to increase assets under management, leverage its existing asset management capacity, and generate stable management fees in addition to attractive incentive management fees (which may be based on the returns of the equity investors). In addition, by retaining a portion of the equity of the CDO, the manager is able to participate in leveraged upside potential.

- **Investor motivations**—similar to other, more traditional ABS products, CDOs are able to tailor the capital structure to attract investors across a broad range of risk/reward profiles. CDOs, however, have traditionally offered an attractive yield opportunity to investors seeking a yield premium over the more traditional investment alternatives. CDOs also allow investors to participate indirectly in a diversified high-yield or investment-grade portfolio with a collateral manager of their choice. Investment-grade investors are able to participate in the high-yield market through the purchase of a senior note of a high-yield CBO.

- **Motivations for synthetic structures**—the work associated with achieving true sale and cross-border transfers of underlying bond and loan portfolios is challenging and also may be prohibitively costly. In such cases, the credit derivative has become an effective tool for sponsors looking for regulatory capital driven risk transfer.

Other considerations that have fueled the development of synthetic CDOs include:

- Lack of availability of some cash-settled debt instruments,
- Broader benefits by the defining default for the general category "borrowed money" as opposed to referencing a specific loan or reference obligation default, and
- Extending the arbitrage from solely the instruments trading in the cash market to the traded spread product in the derivatives market in the form of a single name versus pooled credit derivative-associated spreads.

Comparison of CDOs With Traditional ABS

Similar to traditional structured ABS products, CDOs contain various mechanisms and covenants that dictate all aspects of the transaction, such as the types of and limits to assets owned by the SPE, responsibilities of each of the participants, priority of payments and allocation of losses to each class of liabilities, overcollateralization and interest coverage requirements, and note redemption mechanisms. There are, however, certain features and characteristics that distinguish CDOs from traditional ABS.
• Most CDOs are managed vehicles. The structure contains a reinvestment period during which the collateral manager can actively trade assets within clearly defined covenants. This trading activity could cause the composition of the asset portfolio to change significantly throughout the duration of the transaction.

• The CDO may include an initial ramp-up period, typically three to six months, during which time the collateral manager acquires additional assets with remaining issuance proceeds. This ramp-up period allows CDO transactions to close without fully acquiring all the collateral in the portfolio, thereby shortening the warehousing period. The additional time available to the manager to source collateral also potentially may result in a greater opportunity to accumulate a more diverse portfolio across industry, credit, and vintage.

• CDO asset pools are not as homogeneous as traditional ABS. In general, arbitrage CDOs have 70-90 obligors with the collateral being quite lumpy. Master trust CDOs have larger pools, typically in the 200-300 obligor range, but are still far short of the highly diversified ABS pools. Some CDOs, however, are even more concentrated, having only 20-30 obligors. Because of this, the traditional actuarial loss methods used in ABS cannot be applied to CDO pools.

• CDO transactions have potentially greater ratings volatility relative to traditional ABS because their performance is susceptible to more variables. CDO performance is affected by factors such as the ratings migration of the underlying collateral, the trading activity of the collateral manager, the timing and magnitude of defaults in the collateral pool, and the recoveries realized on defaulted assets. A CDO transaction may be placed on CreditWatch or downgraded even if it has not suffered any defaults, but purely due to ratings migration of the underlying assets. CDO investors for the most part understand this and adjust their risk/return profile.

• The portfolio collateralizing CDO transactions can include multiple types of assets. Besides corporate bonds and loans across industries and credit ratings, collateral pools for CDO transactions have also included various asset-backed securities, CDOs and synthetic securities. This "mixed" CDO allows greater diversity that potentially results in lower default correlation across asset types. It also allows for CDOs targeted to a particular type of investor. An example of this is a CDO of real estate that contains a mix of CMBS, RMBS, and REIT securities in the portfolio. Such a mix of assets is not possible in the Re-REMIC structure.

• Relative to traditional ABS products, the CDO market is still in its nascent stages; secondary market trading, while becoming more widespread, is still limited. CDO structures across underwriters, collateral managers, and asset types tend to vary, with few deals being identical in terms of structure and collateral.

**Standard & Poor's CDO Rating Process**

**Procedures**
As dynamic, multivariate structures, CDOs demand a flexible yet disciplined approach. This section provides an overview of the process for obtaining a transaction rating and highlights the elements of the rating analyses. For CDOs, a Standard & Poor's rating addresses the likelihood of full payment of interest either on a timely or ultimate basis, and of ultimate payment of principal to noteholders. Specifically, it addresses the likelihood of the first-dollar-of-loss based on the stated interest and maturity terms. In CDOs the goal of the structure is to allow an assignment of a rating higher than those of the sponsor (collateral manager or seller/servicer) and higher than the average rating of the underlying assets. This is not alchemy or turning straw into gold, but rather the implementation of structured finance to create different investment risk profiles, based on the structuring of credit support.

The ratings assigned to each tranche of a transaction reflect the assessment of risk given the transaction's structure, credit enhancement, and legal structure. If each investor in a pool of assets shared losses pro rata with the first dollar of loss shared among all investors, then the risk taken by any one investor would be no better that the weakest credit in the pool. If, however, losses were distributed in a prearranged order with some investors taking losses first, up to a certain dollar amount, before the higher-level investors were hit with losses, then each level of investors would face a different level of risk. The analyses in CDO transactions, as in all structured finance ratings, focus on how much credit enhancement is needed to achieve a given level of risk and the commensurate rating.
The foundation of structured finance ratings first focuses on the legal isolation of the assets from the credit risk of the seller and/or servicer, and from any other outside party. The aim is for the investors to take on only the risk of the underlying asset pool. To the extent such separation is not possible or complete, then the rating of the transition is affected, or limited by the involvement level of such parties. Prior to discussing how ratings are affected by different parameters, it is beneficial to first give an overview of the rating process and highlight the different steps in the process.

The rating process begins with a request for a rating from the sponsor, which can be made on its behalf by its investment banker or legal counsel. The preliminary steps usually followed to facilitate the start of the transaction are as follows:

- A discussion by the sponsor, investment banker, or legal counsel with Standard & Poor's about the proposed transaction and its structural features;
- Submission to Standard & Poor's of a detailed transaction book, and/or presentation at a meeting to elaborate on transaction specifics as well as to address any rating concerns;
- Submission of a detailed term sheet to Standard & Poor's, laying out the anatomy of the transaction (see box, CDO Term Sheet Summary), is critical to launching an efficient and effective rating analysis, particularly in view of the complexity of and variations in CDO structures. The term sheet is especially important for Standard & Poor's to give the issuer feedback on material issues that may require additional analysis or criteria decisions and, at the very minimum, explain the main aspects of a CDO; and
- Execution of an engagement letter to retain Standard & Poor's for the analyses.

Once the above steps have been completed, Standard & Poor's can begin to fully focus on the transaction. A primary analyst is assigned to each transaction, along with a backup analyst.

The specific steps of the CDO transaction rating process leading to the rating of a transaction are as follows:

- Reviewing the structural basics and legal structure,
- Sizing the default frequency of the proposed asset pool,
- Reviewing the collateral manager,
- Sizing the loss severity,
- Reviewing of the transaction's collateral and structural features,
- Establishing the required level of credit support for each rated tranche,
- Convening a ratings committee to assess preliminary ratings,
- Reviewing final documentation and legal opinions, if required, and finally
- Issuing the rating(s) of the transaction.

The above steps are discussed below and details are provided in the subsequent sections of this publication.

**Structural Basics and Legal Structure**

Even though Standard & Poor's has rated hundreds of CDO transactions, each transaction is unique and merits careful consideration in regard to its collateral composition, operational features, and structure. While various types of assets back these transactions, CDOs may be more dynamic than traditional ABS in part due to the active management. Each sponsor/collateral manager has unique objectives and strengths that they wish to take advantage of and implement through the transaction. At the same time, the investors commit to the transaction because it promises to meet their objectives and they believe in the collateral manager's abilities to pick assets and manage credit risk and potentially defaults.

As a result, each transaction is unique in its features, ranging from the portfolio composition, the way it
ramps up, how it reinvests, how it stays in compliance, and how it pays down. While each transaction is different and Standard & Poor's treats it as such, over the years there are some common elements that are present in most transactions. These elements are presented and discussed in the section titled "CDO Transaction Structural Basics".

Beyond what is detailed in that section, one of the first things that Standard & Poor's does in looking at a new proposed transaction is to review the proposed legal structure. This is necessary in order to make sure the transaction is a structured finance transaction and to establish if the transaction will be rated on a stand-alone basis or will be linked to any counterparty.

A discussion of the legal considerations for CDO transactions is presented further on in this publication. This analysis is done at the start of the rating process to evaluate whether the transaction is feasible. Over the years, the legal structure of CDO transactions has become somewhat standardized, but new legal issues arise as new assets, participants, and structures are introduced. Thus it is important to determine if the transaction's legal framework has been employed in the past and is a proven structure or if the structure is new and requires different legal analyses.

**Sizing Default Frequency**

Not surprisingly, the parties to the transaction are most focused on the determination of the credit enhancement levels needed to achieve various ratings. The challenge, however, is that there are many "moving parts" to CDOs, and credit enhancement is sensitive to structure and collateral.

The assessment of proposed credit enhancement levels typically begins with evaluating the default frequency of the proposed asset portfolio. For this, Standard & Poor's has a number of proprietary models that are available free of charge under a licensing agreement to all CDO transaction participants. The principal model used is the CDO Evaluator, which employs a Monte Carlo simulation to establish the default level of the proposed pool at each rating level. A full description of the model is provided in the section "The CDO Evaluator and Portfolio Benchmarks". The model uses default probabilities for each asset in the pool, based on their existing ratings. Thus, for Standard & Poor's the main determinant of defaults for corporate assets is the issuer credit rating of the obligor. For synthetics and structured finance assets, the rating of each instrument is viewed as the predictor of defaults. If the obligor or the assets are not rated, Standard & Poor's has a variety of methodologies to establish ratings for the purposes of including the assets in the collateral pool of a CDO. These methodologies are described in the "Special Topics" section.

Assuming the transaction will not be rated using a weak-link approach or the actuarial method, the portfolio characteristics and rating will drive the default frequency. Through the use of the appropriate model, Standard & Poor's and the sponsor will come up with the default rate expected for the asset pool at each rating level. An example of this is a default rate of 30% at the 'AAA' level, and 18% at the 'BBB' level. This means that to rate the transaction 'AAA', the structure must withstand defaults equal to 30% of the original dollar amount of the asset pool. To rate it 'BBB', the transaction must withstand 18% defaults. The securities offered to investors in a CDO are typically tranched at different rating levels, with the subordinated tranches providing credit support for the most senior tranche, which is typically rated 'AAA'.

The sponsor or collateral manager may choose to use the CDO Monitor or trading model (see "CDO Evaluator and Portfolio Benchmarks" for a complete description) as a surveillance tool in managing the portfolio during the revolving period. Alternatively, the sponsor or manager may choose not to use the model, but to manage the portfolio within "stressed" eligibility criteria. Each of these management choices has important ramifications for the relationship between the portfolio assumptions used in sizing credit enhancement, and the actual portfolio composition as it changes over the life of the transaction (see "Portfolio Composition" in the "CDO Transaction Structural Basics" section).

**Review of the Collateral Manager**

For managed CDO structures, the abilities of the collateral manager play a key role in the success of the transaction and are often the primary reason why investors either invest in a transaction or not. Not only must the collateral manager be able to select the correct collateral, but must also monitor the credits and make decisions about asset purchases and sales, managing credit risk, and managing within the structure. Should defaults occur, the manager must also make decisions as to how to maximize recoveries. For this reason, Standard & Poor's reviews each asset manager for transactions it rates, and also prepares a Manager Focus Report. A detailed description of the importance of the managers, and factors driving
transaction performance are presented in the "CDO Manager Review" section.

**Sizing Loss Severity**
Absent recoveries and excess spread, to achieve the required rating a transaction would require a level of credit enhancement equal to the default rate. However, in most transactions credit is given to recoveries where feasible and to excess spread derived from the assets.

Under Standard & Poor's methodology for corporate obligations, recoveries are driven by the seniority and security of the obligation, not by the issuer credit rating. This is due to the fact that to achieve a recovery, it means that the obligor has defaulted. Thus, it does not matter what the obligor was rated or what the original rating of the security was; once the obligor has defaulted, the rights of the debt holder is driven by how senior and how secured that obligation was. For structured finance and synthetic securities, Standard & Poor's uses the rating and seniority of the security as a proxy for establishing recoveries. Additionally, recoveries vary based on the rating of the liability tranche.

Recoveries are also affected by the legal jurisdiction governing the obligor, the assets, and the rights of the debt holders. Thus Standard & Poor's uses different recoveries in different parts of the world. Furthermore, recoveries can be strongly affected by the manager and structure of the transaction. Standard & Poor's believes that, for corporate credits, superior recoveries can be achieved through an active workout process as opposed to immediate market valuation and liquidation. Thus the experience of the manager to work out the credits and his/her understanding of the bankruptcy process play a major part in the level of recoveries achieved. Because of this Standard & Poor's uses a range of recoveries for each type of corporate obligation and assigns manager-specific recoveries within each range. Recoveries can also be influenced by the structure of the transaction and, for synthetics, the terms in the documents. If the transaction structure requires mandatory sale of the collateral shortly after default, the recoveries will likely be lower.

Standard & Poor's does not require collateral managers to sell defaulted securities within specified time frames, but rather relies on their experience to maximize recoveries. Standard & Poor's also lowers recoveries for synthetics that must be settled shortly after default and those that require cash settlement. This reduction in recoveries is caused by the fact that the collateral manager has no flexibility to work out the security, nor is there time for the market to properly value the collateral. For a complete discussion of recoveries, please see the "CDO Recovery Levels and Timing" section.

**Collateral and Structural Elements**
Beyond the transaction considerations described in the section "CDO Transaction Structural Basics", most transactions have additional features and considerations that must be factored in for the rating. The manner in which the waterfall is structured, the way in which the interest and/or foreign currency hedges work, liquidity considerations and how defaults are defined, all play a significant role in the rating of the transaction. These considerations are discussed in more depth in the "CDO Structural and Collateral Considerations" section.

**Establishing the Required Level of Credit Support**
As previously mentioned, absent recoveries and excess spread, the required level of credit support for a CDO tranche would be the gross default rate expected at that rating level. The majority of transactions, however, rely on recoveries and also on excess spread to cover losses. Thus the level of hard credit support for a tranche is in most cases established by running cash flows to prove that, under the proposed transaction structure, the rated tranche can sustain the commensurate level of defaults and still pay out on its stated terms. A full discussion of the parameters modeled in the cash flows and assumptions used are presented in the "Cash Flow Analytics" section. The cash flow modeling part of the rating process is complex, involving multivariate stress runs. Although the variables to be stressed can be identified (for example, recovery levels, default scenarios, and interest rate stresses), the "dominating" stress runs to test credit enhancement cannot be identified *a priori*, and only become evident once the cash flow modeling results are analyzed.

The transaction's sponsor or banker will generally perform the cash flow modeling and provide Standard & Poor's with the results and the model. The sponsor or the banker doing the cash flow modeling must also provide to Standard & Poor's an independent-accountant verification that the proprietary cash flow model is representative of the transaction structure, and that the dominant cash flow run results are as indicated by
A substantial number of synthetic CDOs do not require cash flow analyses since they do not rely on excess spread. The credit support for each tranche is established by calculating net losses based on the scenario-specific default rate of the portfolio and factoring in expected recoveries.

**The Rating Committee and Final Rating**

After the above steps are performed, a rating committee is assembled. The primary transaction analyst responsible for presenting all pertinent information received is presented to the rating committee. The committee presentation may include information from the collateral manager review, and covers the structural, collateral, and legal aspects, as well as default/cash flow stress and credit enhancement analysis.

The rating committee is typically held before pricing to allow the sponsor or banker to make modifications to the transaction should the transaction not be able to achieve the desired ratings as originally structured. If a transaction is priced prior to the rating committee providing feedback, the sponsor or banker runs the risk of not achieving the desired ratings which were assumed at the time of pricing and of having to make changes after pricing that might affect the circled investors. To avoid any such problems, sponsors/bankers are strongly encouraged to provide all materials required to convene the rating committee prior to pricing. Standard & Poor’s may provide pre-sale reports and answer questions in regard to transaction specifics and rating methodology. Standard & Poor's can only provide these services once the rating committee has reviewed the transaction.

The rating assigned by the committee is based on the representations of the parties and on Standard & Poor's review of the binding legal documents and agreements supporting the transaction. Standard & Poor's reviews the documents and changes made to them through the transaction's closing, to make sure everything is consistent with the ratings requested. The exact documentation reviewed by Standard & Poor's varies from transaction to transaction based on how and where the transaction is structured. Once the rating committee process is complete and the transaction is priced, market convention is that the sponsor/issuer has generally two to three weeks to close the transaction. During this period all open issues must be addressed and all documentation finalized, with the rating letter being delivered by Standard & Poor's on closing date.

The steps described above are fairly generic and apply to all transactions. However, given the variety of assets and structures present in CDOs, there are many nuances and considerations that must be factored into the analyses. Standard & Poor's uses a customized analysis for each different asset type and fine-tunes the criteria as appropriate to address the features present by each transaction type. The methodologies used to analyze some of the different CDOs with specific asset classes are presented in the "Special section.

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**Sample CDO Term Sheet Summary**

A sample term sheet laying out the anatomy of a CDO transaction is as follows:

- Capital structure and requested ratings for each tranche;
- "Waterfall" or priority of payments;
- Proposed credit enhancement levels;
- Eligible asset definition (eligible collateral and investments, including "baskets" such as emerging market debt and other bivariate risk assets);
- Portfolio parameters and collateral quality tests;
- "Surrogate" ratings (e.g., correlated ratings or credit estimates);
- Substitution/asset addition, reinvestment, restructuring/modification and trading criteria (including any proposed use of the CDO Evaluator);
- Ratio tests (coverage tests, maturity tests, triggers);
- Ramp-up and revolving/reinvestment periods;
• Amortization/redemption triggers and periods;
• Interest rate/currency hedging;
• Legal aspects (special-purpose entity bankruptcy remoteness, collateral transfer, etc.); and
• Regulatory issues.

CDO Transactions Structural Basics

CDO structures contain various covenants and mechanisms that dictate the composition of the collateral portfolio, define the trading activities permitted, allocate cash proceeds to the rated notes and equity, and aim to protect noteholders by paying down debt if certain triggers are tripped. This section will focus on the features common to most CDOs, outline considerations and risks associated with each, and highlight Standard & Poor’s criteria developed to address such concerns.

Cash Flow CDOs’ Collateral Debt Securities/Eligibility Criteria

CDO technology allows for the accumulation of collateral across a wide range of assets. For example, the portfolio might include bonds, loans or synthetic securities, corporate securities, structured finance securities, assets denominated in U.S. dollar or other currencies, and investment-grade or noninvestment-grade securities. Absent constraints, investors and rating agencies would have great difficulty identifying the risks in the CDO as each type of assets introduces different cash flow characteristics and risk sensitivity factors.

The trading mechanism included in most transactions further complicates the issue as the risk profile of the portfolio may change during the reinvestment period. Constraints on the types of collateral and concentration limits are established through the definition of collateral debt securities and eligibility criteria to alleviate this concern. Such parameters define the types of assets the manager can purchase and place limits on the concentration of assets across characteristics such as type, issuer, credit rating, and industry to create diversity. These constraints might take the form of “buckets” that set maximum limits, outright exclusion on the purchase of certain assets, or a maximum/minimum range for assets.

The collateral eligibility constraints typically cover the following:

• Types of assets eligible for inclusion in the transaction (e.g. corporate, ABS, synthetics);
• Form of the assets (loans, bonds, derivatives, etc.)
• Payment terms (frequency, interest, currency);
• Credit quality (investment-grade, high-yield, rating concentrations); and
• Aggregate pool characteristics (minimum coupon, recovery rates, concentrations).

For example, typical constraints found in corporate cash flow CDOs include:

• List of permitted asset types;
• List of permitted or excluded corporate industries;
• Range of bonds and loans as a percentage of total par;
• Range of fixed interest rate and floating interest rate assets as a percentage of total par;
• Buckets for assets such as structured finance securities, synthetic securities, and guaranteed securities;
• Buckets for assets that have unstable cash flows such as interest-only securities and assets that have the ability to defer or capitalize interest obligations;
• Limits on assets with bivariate or multivariate risk such as assets issued by foreign obligors, synthetic securities, and loan participations;
• Buckets to control concentration in single issuers or issuances;
• Limits on non-U.S. dollar-denominated assets;
• Prohibition by investors on purchasing credit-risk securities and defaulted securities; and
• Buckets for assets such as convertible bonds or bonds with attached warrants that introduce market value risk into the cash flow structure.

Typically such limitations and constraints are specified by the sponsor, banker, and collateral manager based on their perceptions of what the investor community wants and can be comfortable with. At certain times, investors also may request additional constraints to address specific concerns that they may have.

In its assessment of collateral debt security and eligibility criteria, Standard & Poor's takes into consideration items such as the experience of the collateral manager along asset types and across the credit spectrum, the feasibility of adequately modeling cash flows, and the introduction of atypical risks. When warranted, Standard & Poor's highlights collateral characteristics that increase risks.

A general trend among transaction arrangers is to want to include buckets for all different types of collateral. The belief is that this will give the collateral manager greater flexibility to manage the transaction. While in general this is true, if the collateral manager has no experience with such collateral and does not intend to use it, this flexibility might actually cost the transaction. Why allow a 20% emerging markets bucket in a transaction when the collateral manager has no experience with managing such debt and does not intend to purchase such? Recoveries on emerging markets corporate debt are very low, and by having such a bucket, the weighted average recovery for the transaction will suffer, since Standard & Poor's will assume that the bucket will be used. Sponsors and transaction arrangers are encouraged to consider the consequences of including such buckets if the collateral manager will not use them.

Since, for most transactions credit support is sized through cash flows, the CDOs ability to adequately cover its principal and interest obligations under various stress scenarios is a key component of Standard & Poor's analysis. Assets that introduce variability in cash flows and cannot be effectively modeled therefore require added scrutiny. Payment-in-kind (PIK) assets, which have the ability to defer or capitalize interest as shortfalls arise, are one such example. Modeling the behavior of these assets proves difficult due to the scarcity of empirical data on the likelihood and timing of payment shortfalls. This concern is typically addressed by limits to the inclusion of PIK securities and/or through the use of a liquidity facility to cover shortfalls in the payment of interest on the senior class of liabilities resulting from deferred interest on the PIK assets.

Convertible bonds, exchangeable bonds, and bonds with warrants attached introduce other risks. These instruments are convertible, and are allowed in transactions only if such convertibility is not mandated by the issuer of such debt but rather only by the holder of the debt. Prior to conversion or exchange, convertible and exchangeable bonds that meet collateral eligibility guidelines will be permitted in collateral valuation and coverage tests. After conversion, if the securities are not eligible as transaction assets, these securities are no longer considered eligible collateral debt securities, and should not be included in the coverage tests. Furthermore, the collateral manager must consider the effect that such conversion has on the transaction prior to exercising the conversion option.

For example, since equity is not given credit (either as principal or interest) in these types of transactions, converting eligible debt to equity weakens the transaction. The collateral managers should only exercise this option if they are certain that they can sell the equity and reinvest to maintain or improve the transaction tests. Equity warrants can remain attached to bonds in the collateral pool, but should not themselves be assigned any value in the collateral tests. As a result, bonds with equity warrants are generally constrained. Furthermore, certain debt having equity convertibility features might be considered margin stock, as in the United States, and subject the transaction to specific regulations should certain concentrations of this debt be held by the transaction. Transaction sponsors and organizers are strongly urged to consider all such implications before proposing inclusion of convertible instruments.

Interest-only securities are another example of assets with relatively volatile cash flow streams. These assets may be first loss pieces covered by excess spread from several structured finance products such as CMBS and RMBS. As first loss pieces, their ability to provide cash flow is highly susceptible to voluntary and involuntary prepayments of the underlying collateral. These securities are typically limited to 5% of the collateral pool in conventional corporate CDO transactions, and a "haircut" is applied in the modeling of cash
A growing number of CDO structures are including "baskets" for assets with bivariate credit risk. These baskets can enhance yield, or expand the eligible collateral universe, especially later in the reinvestment period when a collateral manager's asset maturity profile contracts. Bivariate risk arises when the probability of default on an asset is the combination of the probabilities of default of two obligors or counterparties. These "bivariate risk assets" include loan participations, credit-linked notes (CLNs) or credit derivatives, securities loans, and corporate debt from obligors domiciled in countries rated lower than 'AA'. Standard & Poor's does not limit bivariate exposure in transactions because it has the analytical tools to size such risks, typically resulting in a higher level of required credit support. The "basket" limitations are driven by the investors and bankers that want to constrain certain risks.

A payment default may occur on a participation if either the borrower, the lending bank selling the participation, or both default. A credit derivative, such as a CLN, in which a counterparty promises payment based on performance of an underlying reference obligor or security, can default if either or both parties default. Similarly, securities can default if the counterparty (cash borrower and collateral pledgor), the obligor on the underlying collateral securities held by the lender, or both default. Finally, emerging market debt denominated in a foreign currency (for example, U.S. dollar-denominated assets from corporate obligors domiciled outside the U.S.) may default if the corporate obligor defaults, if the sovereign government actions adversely affect the ability of the obligor to make timely payment on its obligations, or both the sovereign and the obligor default.

Not only is the risk of default higher on such assets, but it is also more difficult to assess. In addition, transparent, consistent pricing of such assets and secondary market liquidity are often not available for these assets. As a result, default recovery, and therefore loss levels are more difficult to estimate.

In order to help protect CDO noteholders from this incremental risk, bivariate default risk exposure is either generally limited or sized into the credit support. If total bivariate risk exposure is substantial, then the portfolio will be analyzed using Standard & Poor's multi-jurisdictional default model, which assesses the incremental default risk these assets introduce. This typically results in higher default estimates and credit enhancement levels. (See "Emerging Market CDO Criteria" in the "Special Topics" section for a more detailed explanation of bivariate risk.)

Corporate debt from countries rated as high as the most senior rating in the transaction at closing, or above 'AA', would not be analyzed as bivariate risk (for example, countries with foreign currency ratings of 'BBB' in a 'BBB' rated CDO). However, there should always be disclosure to investors of the presence of multiple jurisdictions and the potential impact of subsequent downgrade of a country.

CDOs continue to expand the collateral universe that is eligible for inclusion in CDO transactions, such as other CDOs or more traditional asset-backed securities (ABS). In traditional corporate CDOs, limited provisions have been permitted for including ABS and other rated CDO tranches. CDOs are increasingly investing in generally the rated tranches of other CDOs and even considering market value CDO debt tranches, as well as equity tranches of other CDOs. Managers have an appetite not only for senior tranches, but also for mezzanine pieces in senior-subordinated transactions, typically rated in the range of 'BBB' to 'BB'. Although these investments give the seller an additional distribution channel, and a liquidity or funding source for its CDO, the CDO transaction investing in other CDOs may face certain additional risks such as industry over concentrations that need to be addressed. Because of this, CDOs that repackage other CDOs or ABS are analyzed differently, from an asset default correlation standpoint, than are CDOs collateralized with corporate credits.

As structured, the credit quality of ABS, in CDO transactions, is generally strong, with a large portion carrying investment-grade ratings. Often, ABS comprises the highest-rated collateral in a portfolio, especially for arbitrage transactions. However, there are other considerations in looking at ABS transactions as assets in CDO transactions. Although highly rated secured financings, the secondary ABS market is not as mature or deep as the unsecured corporate debt market. Default and recovery history is limited for ABS, and investors that invest in traditional corporate CDOs may not be comfortable with investing in CDOs of ABS. As such, basket provisions are appropriate in corporate CDOs. Generally, asset managers should not "cross-invest" in their transactions by purchasing their own CDO tranches in other CDOs under their management. Investors in such CDO-backed CDOs may face the risk of highly correlated defaults if
managers encounter problems.

**Synthetic CDOs' Collateral Debt Securities/Eligibility Criteria**

Since synthetic CDOs take on credit risk through the derivatives market, the same issues that prevail in cash CDOs are applicable, but must be viewed slightly differently. A synthetic CDO is in a sense a CDO with a 100% synthetic bucket. As such, counterparty risk, which has traditionally been referred to as bivariate risk, is a primary focus of concern. Currently, this risk is addressed structurally rather than being explicitly modeled into the synthetic CDO.

A synthetic CDO transaction takes on credit risk by entering into one or more credit derivative contracts with one or more counterparties, as opposed to acquiring the physical assets. The credit derivative swap contract will list the reference asset. Typically however, as opposed to a cash CDO where a portfolio manager will purchase a specific bond, the credit derivative simply lists the name of the company as the reference entity. Typically, the obligation category selected in such transactions is "borrowed money". Thus, default of any bond, loan, deposit obligation or reimbursement obligation by the reference entity constitutes grounds for exercising what amounts to a default option the CDO manager has sold to the counterparty on the reference entity.

When the physical settlement option is selected, upon default the synthetic CDO replicates the cash CDO most closely, but not exactly. As noted above, the cash CDOs have extensive thought given to the nature of the collateral debt securities and the characteristics of the pool. In the synthetic CDO, the sources of credit risk are explicitly not acquired assets but rather sourced as a derivative. Thus, as is commonplace in the credit derivatives market, only the name of the company is of concern, and the eligibility issues in regard to the cash flow characteristics of the assets are not an issue.

The cash flow the synthetic CDO receives is the spread associated with the credit risk of that particular obligor. It is at the time of contract not a specific security that would require eligibility scrutiny. This cash or spread income, if unstructured is subject to two risks, default of the reference entity or default of the counterparty that has entered into the credit derivative contract with the CDO.

**Counterparty Risks**

Standard & Poor's has required that mitigation of the counterparty risk be addressed by eligible counterparty ratings. Thus a highly rated 'A-1+' counterparty is deemed to be of sufficient credit quality to warrant no further adjustment. A counterparty rated 'A-1' may be required to post some amount of the cash flow (the swap premium referred to in the credit derivatives definitions as the fixed-rate payment) in advance. Typically, this is simply one periodic payment that must be made in advance, and thus the net effect is to have the premium payment made at the beginning of the period as opposed to the conventional end-of-period payment. Counterparties rated 'A-2' are deemed insufficient to contract in a 'AAA' rated synthetic CDO transaction without posting the present value of all future periodic payments up-front. This posting requirement mitigates the risk that cash flows, that have been modeled and relied upon as credit support in the transaction are terminated for reasons other than default of the underlying reference entity.

The other risk that the counterparty presents in synthetic CDOs is termination risk. As opposed to a cash CDO, the synthetic CDO faces not only the risk of default of the underlying bond-the reference entity-but also the possibility that a counterparty will cause termination of the credit derivative contract. This opens up the unsized and unanticipated risk of not only loss of the premium, or cash flow, which was previously addressed, but also the reality that swap mechanics demand a mark-to-market (MTM) on the swap contract at the time of termination.

In a scenario where the associated credit spread with the reference entity or entities in the credit derivative have widened in the traded market relative to when the contract was initiated, it is quite likely that the credit derivative protection the CDO sold to the counterparty could be repriced at an MTM that is "out of the money" from the CDO. In other words, the CDO has an unanticipated cash payment due through no fault of its own and only because the counterparty defaulted. This payment could cause default of the CDO on its rated obligations to investors and to other counterparties. Typically, solutions include subordinating the termination in the waterfall to the rated noteholders, or eliminating the responsibility to make such a payment by rendering Section 6(e) of the swap master agreement "Not Applicable" at the outset of the transaction.

Having addressed the counterparty risk and the nature of how the synthetic CDO takes on credit risk, it
becomes clear that in typical synthetic CDOs, as in cash flow CDOs, the primary focus is the credit risk of the reference entity and the premium spreads (cash) being paid to the CDO. The collateral debt security is actually defined by its characteristics in the credit derivative contract. These characteristics help relate the credit derivative contract to the actual collateral debt securities that would be purchased by a typical cash flow CDO. The following are some of the typical characteristics of the International Swap Dealers Association Inc.'s (ISDA) credit derivative contract that Standard & Poor's requires in order to establish the nature of the credit risk.

**Reference Price**
A reference price of 100% of par is selected in the vast majority of transactions. If a reference price lower than 100% is selected, the discount, represented by a cash payment to the CDO, must be retained in the structure. It is common to limit the discount to no more than 2% of the market "price" as represented in the spread.

**Obligation Category**
The broad concept of "borrowed money" is acceptable, but typically the general concept of bonds or loans is referenced. Loan is typically elected in synthetic balance sheet transactions. This election is possible because the bank seeking regulatory relief has a specific loan already on the books and is seeking regulatory capital relief on that specific loan. This is advantageous because, if a workout consistent with Standard & Poor's assumptions is allowed, recovery assumptions may be higher for these "loan"-only reference pools (see Synthetic Recoveries).

**Obligation Characteristics**
For this, "None Specified" is acceptable. "None Specified" means that the standard characteristics found in the ISDA 1999 document are applicable.

**Settlement Terms**
Either cash or physical settlement is acceptable. As noted earlier, recovery assumptions will be lower for cash settlement relative to physical settlement. Similarly, recovery assumptions may be lower for physical settlement than for a traditional cash CDO. This focuses on the relevant eligibility criteria under the settlement terms present in the synthetic. Most often, transactors do not want to pre-define what the settlement obligation will be but rather give a wide range of obligations that are pari passu. This is quite different from a cash flow CDO that has eligibility criteria because of cash flow concerns.

Thus the credit derivative is really a credit default put option that is sold by the investor to a transaction's counterparty to be exercised upon a credit event of the referenced entity. The investors are thus considered sellers of credit protection and the counterparty the buyer. The counterparty has, for a premium, gained the ability, in theory, to deliver an eligible instrument to the CDO upon default of the underlying reference entity. What security will be delivered is generally not known prior to default. A cash CDO knows exactly what security it owns since it has purchased it already. In the synthetic CDO, typically this security is not pre-specified and thus the manager does not know what security will either be delivered or priced depending upon whether physical or cash settlement is elected.

This put option on the asset held by the counterparty is recognized as inferior to the manager's ability to have sourced a specific obligation and manage it through the default process. But such difference can be minimized or mitigated as follows:

- Defining the deliverable obligation or settlement asset by utilizing the eligibility criteria typically found in a cash flow CDO. This makes the credit derivative slightly less desirable to the counterparty since the flexibility to deliver the cheapest possible asset may be compromised. However, it makes the credit derivative more consistent with what cash flow CDOs would have acquired to begin with.
- Eliminating contingent obligations and limiting the newly defined "Not Contingent" deliverable obligations. The "Not Contingent" definition now includes zero-coupon, convertible, and bonds. These exposures would typically be limited in cash flow CDO portfolio eligibility criteria, and lower recoveries are currently assumed by Standard & Poor's for these assets with either out-of-the-money options or options that have questionable value at the point of default of the reference entity.
- In all cases, the option must be held by the holder and not the issuer of the security, and this is standard in the new ISDA 99 definitions.
• Limiting the maximum maturity of the deliverable or settlement obligation to that consistent with maturity of collateral debt securities criteria applicable to a cash flow CDO. This limitation is less relevant given the maturity restriction limitation in the new ISDA 99 definitions.

If the characteristics of the physically delivered settlement obligations are likened to those which a CDO manager would have purchased under typical eligibility criteria described previously, then the recoveries identical to those the managers would qualify for in cash CDO are applicable. In all other cases, lower recoveries will be assumed. The deliverable characteristics and recovery mechanism in the synthetic CDO affect recovery values similar to how these parameters affect recovery values in cash flow CDOs.

In synthetic CDOs that repack ABS or other CDOs, specific reference obligations are mandatory, as there is no applicable concept of default of a reference entity for structured financings that could be equated to a corporate entity. For example, if a subordinate bond of a corporate issuer defaults, it is generally assumed that the modern bond, loan, and reimbursement documentation contains cross-default language such that the entire capital structure will have the ability to declare a default event. Capital structure for the corporate entity is considered to be most important to the recovery assumptions, but not probability of default. This is completely inconsistent with structured finance obligations where the probability of default is totally tied to the place in the capital structure. Thus, specific reference obligations must be referenced in a synthetic CDO that repackages ABS or CDOs.

For inclusion in synthetic CDOs, reference entities are rendered eligible if they have a public, private, or implied issuer credit rating (ICR) by Standard & Poor's. Notional amounts and tenor are characteristics in regards to the specific credit, but are not typically covered eligibility criteria for the transaction, other than to limit obligor and industry concentrations.

Upon an event of default in a synthetic CDO, the settlement obligation characteristics typically have:

• Precluded indirect and direct loan participations,
• Accepted the assignable loan or consent required loan characteristic, typically with language that the ability to assign or transfer the loan has been secured, and
• Specified a currency that is usually the currency of the synthetic CDO issuer.

However, it is possible to not require the specified currency of the CDO issuer, given one of two solutions to the currency risk:

• The cash settlement price is calculated on a percentage basis and then translated into the issuer's currency, thus eliminating additional loss to the investor that could have been reflected in the currency loss; and
• The physical settlement recovery assumption is haircut to reflect the additional loss possible due to currency conversion-rate loss. These currency stress haircut assumptions are derived from Standard & Poor's Foreign Exchange Extreme Value tables.

The contingent ability of a manager to enter into a currency hedge upon physical delivery of a defaulted asset is not generally accepted, as it is hard to determine the cost in advance to reserve in the capital structure to address such cost and at the time of default it is hard to determine precisely what the recovery will be. Thus the CDO will be under- or over-hedged, which introduces new risk to the synthetic CDO investor.

Traditionally, the portfolios of a synthetic CDO has been investment-grade corporate names due to the fact that those are the names that are relatively liquid in the credit derivatives market. The derivative market for high-yield companies and instruments is currently still in the nascent stage, and while such instruments and companies are eligible for inclusions in synthetic CDOs, some further refinements and haircuts in recovery values for cash settlement options are appropriate, given the liquidity of the market.

Standard & Poor's takes into consideration items such as the experience of the collateral manager, financial institution, or calculation agent, along with the asset types and the credit spectrum, when considering recovery assumptions in synthetic CDOs.
**Ramp-Up Period**

A CDO transaction may involve an initial period of time post transaction closing during which the manager acquires the underlying collateral from the proceeds of the rated securities. This is most prevalent in cash flow transactions, since in synthetic CDOs the portfolio is typically fully identified. The period during which the portfolio assets are purchased in the market or are originated is called the "ramp-up" period. Typically, in cash flow arbitrage transactions, 50% to 70% of the assets are accumulated by the closing date, with the balance acquired during the ramp-up period which generally ranges from three to six months.

The ramp-up period gives the manager more flexibility to identify assets that will add diversity and solid credit standing to the portfolio. The manager is able to choose from a larger universe of assets as new issuances are brought to market. This is particularly important during times of market upheaval such as those experienced during the Asian financial crisis and Russia's default in the late 1990s. Absent the ramp-up period, a CDO closing at a time of constricted debt issuance or in a stressed interest rate environment would experience difficulty sourcing acceptable collateral and might be forced into purchasing assets with less desirable credit or payment characteristics.

There are, however, several risks associated with long ramp-up periods. The most prevalent risks during ramp-up, when bulk purchases of collateral are made over uncertain market conditions and time horizons, include the following:

- Negative carry between short-term earnings on undeployed cash proceeds and the already issued note liabilities;
- Liquidity risks due to accrued interest flows and payment date differences;
- "Origination risk" due to unavailability of the bonds and loans the manager intended to buy; adverse credit spread or price movements, which increase the cost of purchased assets;
- Interest rate movements or "spikes," which increase the interest cost on any floating-rate liabilities; and
- Concentration risk in the portfolio prior to full ramp-up.

Concentration risk can arise despite portfolio diversification guidelines because the investment may initially be concentrated in a small number of obligors, few industries, or relatively weaker credits compared with the portfolio's intended composition at the end of the ramp-up period. Though the transaction is under-leveraged during ramp-up based on the "injection" of equity and mezzanine debt proceeds at closing, these risks are present, especially when interest rates, or credit spreads for corporate debt over applicable risk-free rates, become volatile or when corporate debt market liquidity diminishes.

Arbitrage CDOs have designed numerous solutions to mitigate these risks. Many structures have incorporated a "phased" ramp-up, for example, a nine-month ramp-up period divided into three three-month periods, during which notes are redeemed if collateral purchase targets have not been met at the end of each of the three-month periods. Another protective feature is to fix the interest rate on floating-rate note liabilities during the ramp-up period, which usually differs in length from a regular interest accrual period. Standard & Poor's rates the transactions based on the anticipated effective date portfolio, and expects to affirm its rating on the fully ramped-up portfolio on the designated effective date or on the date that marks the end of the ramp-up period.

While the ramp-up risks in the transaction are real, the vast majority of CDOs closed to date have not had a problem with ramp-up. The primary and secondary debt markets have been fairly liquid, and collateral managers have been able to purchase assets that met the overall transaction requirements. In certain cases, collateral managers have turned to synthetic securities to craft certain asset characteristics that were needed for the CDO, but perhaps were not available in the market. Such strategies do work to a certain extent; however, most cash flow CDOs have limitations on how much synthetic collateral may be contained in the asset pool, and such synthetic collateral is typically less liquid.

**Effective Date**

At the end of the ramp-up period most transactions have an effective date. This date occurs after the last day of the ramp-up period, or earlier if the required amount of collateral has been purchased. Typically, for the transaction to become effective the ratings of the transaction must be affirmed. For this to occur,
Standard & Poor's requires the manager to provide information on the composition of the portfolio and to verify that the portfolio default rate is lower than the break-even default rate shown by the cash flow analyses prior to closing. In addition, the portfolio collateral eligibility and coverage test should be met.

If the transaction does not meet all of its tests, Standard & Poor's will generally rerun the cash flow analyses and assess if the ratings can be maintained. In rerunning the cash flows, Standard & Poor's may modify some of the original assumptions used prior to closing to better reflect the actual composition of the collateral. For example, even if the default rate of the ramp-up portfolio is greater than the break-even default rate, the actual collateral pool may have a weighted average coupon or spread significantly above the minimum at which the transaction was initially modeled. Thus the transaction can still perform at the respective rating level.

If the ratings of the transaction are not affirmed, most transactions require a paydown of the rated notes to bring themselves back in compliance.

**Portfolio Composition and Asset Additions**

The sponsor or collateral manager may choose to use the CDO Monitor, also known as the Trading Model (see the "CDO Evaluator & Portfolio Benchmarks" section for a complete description), as a surveillance tool in managing the portfolio during the revolving period. (Note: Any reference in this section to the CDO Monitor can apply to the single-jurisdictional or multi-jurisdictional version.) Alternatively, the sponsor or manager may choose not to use the model, but to manage the portfolio within "stressed" eligibility criteria. Each of these management choices has important ramifications for the relationship between the portfolio assumptions used in sizing credit enhancement and the actual portfolio composition as it changes over the life of the transaction.

Credit enhancement may be analyzed based on a closing portfolio if regular ongoing tests are performed, including running the CDO Monitor upon substitution and reinvestment. Notification to Standard & Poor's should occur when limits are reached, or when the potential default rate exceeds the threshold established at closing. In this application, reliance on the manager may increase, particularly if the manager changes strategy or is replaced. The portfolio may evolve differently from the assumptions in the original rating, and the transaction may be subject to a rating change. Sponsors and investors alike should be aware of the trade-offs between the level of credit support and potential rating volatility of the transaction, and carefully consider them in structuring a transaction and setting up management guidelines.

Credit enhancement also may be analyzed based on a "stressed" eligible portfolio. Based on transaction investment parameters, the assumed portfolio will be constructed by filling the rating, concentration, and maturity buckets with the riskiest assets. In this application, the manager does not regularly run the CDO Monitor during the reinvestment period.

For example, consider portfolio eligibility guidelines that permit up to 10% 'CCC' rated assets, 50% 'B', and 40% 'BB'; 100 obligors with a 1% obligor limit; and a maturity distribution of 20% in 10-year, 20% in seven-year, and 60% in five-year assets. Given these transaction parameters, Standard & Poor's analysts would expect an assumed stressed eligible portfolio, and fill the buckets as follows: The 20% maximum 10-year maturity bucket would comprise the lowest rated 'CCC' assets totaling 10%, with the remaining 10% comprising the next lowest rated 'B' assets. The next longest seven-year maturity bucket would comprise another 20% of 'B' assets. The remaining 20% of 'B' assets would be placed in the five-year maturity bucket, along with the remaining 40% of 'BB' assets. No more than 100 obligors and assets would be assumed, as this would fill the 1% obligor limit.

The highest-risk, lowest-rated assets are distributed in the buckets to maximize credit exposure assuming the manager exercises his full flexibility to the limits of the eligibility criteria. As a result, the credit enhancement level will be higher to cover this "stressed case." Under these assumptions, the manager does not use the CDO Monitor, and can trade to eligibility criteria. The benefit is the simplicity in managing to eligibility guidelines for which initial credit enhancement has been sized. All else equal, a change in manager or strategy may not adversely affect the CDO rating, as long as the manager does not breach eligibility criteria.

While the "stress case" gives the manager more flexibility per se, since he/she can manage to only the eligibility requirements without running the model, in most cases the default numbers are more onerous than
when the transaction is structured using a representative portfolio and the CDO Monitor. As such, the arrangers structure most transactions with the CDO Monitor. Most collateral managers also like the concept that they are not tied to hard bucket limitations or weighted-average rating concepts.

In synthetic CDOs, as with cash flow CDOs, the sponsor or collateral manager may choose to use the CDO Monitor as described above. The synthetic CDO considerations revolve around the structure. In a synthetic CDO with no trading gains or loss but with substitution, the CDO Monitor will simply reflect the changed credit quality of the portfolio based upon the deletion of one reference entity and the associated Standard & Poor's rating compared with the new credit risk associated with the new reference entity's rating. In a synthetic CDO with trading gains and losses, the identical procedure as described in the cash CDO Monitor section is applicable.

**Revolving Credit Facility Risks**

CDOs are increasingly tapping into revolving credit facility assets and offering to investors revolving liabilities. Revolvers introduce payment, liquidity, and portfolio concentration risks in exchange for the flexibility they provide. Revolving credit facilities are more prevalent in bank balance sheet CDOs than in arbitrage CDOs (for a fuller discussion, see the section on "Master Trust CDO Structures"). In arbitrage transactions, revolvers generally comprise a small portion of the portfolio, and their purchase and funding is often done through the SPE. Below is a general discussion of revolving credit facility risks, and key analytical issues, including those germane to funding via the SPE.

The main financial risks that must be covered are:

- The ability of the CDO sponsor SPE as lender to make unfunded commitments, in full and on time, to its borrowers on the asset side of the CDO;
- The ability of the CDO sponsor or SPE as borrower to make payments on its funded commitments, in full and on time, to its lenders on the liability side of the CDO; and
- The sufficiency of credit enhancement to withstand default and interest rate stresses in cash flow tests under various revolver origination and funding scenarios.

On the asset side, revolvers affect the portfolio and the transaction cash flows because they affect the relative balance of the pool. For example, if 50% of revolver assets with higher-rated obligors are not fully funded, the resulting portfolio may be smaller, lower in credit quality, and more highly concentrated per obligor. The weakness, however, is partially offset by the higher spread from the higher margins on the loans of weaker borrowers. In general, these risks should be covered by credit enhancement as demonstrated in the cash flow analysis, by reserves, or by liquidity or support agreements from providers rated as high as the senior tranche.

Revolving credit facilities on the asset side of a CDO transaction impact portfolio composition, based on varying drawn and undrawn amounts from different borrowers of different credit quality. In a difficult economic environment, it will be likely to see lower-credit quality borrowers making more use of the funding sources at their disposal, even with a weakened lending institution. In other situations or for higher credit quality borrowers, however, some assumption of portfolio payment or purchase rates may be warranted. In order to assess the many asset portfolios and cash flow risks that can arise, revolver stress scenarios are analyzed by generally varying the asset portfolio in terms of size, drawn versus undrawn percentages, credit quality, obligor/industry concentrations, and interest rate spread. CDO criteria focus on the impact of revolving credit facility assets and liabilities on the transaction's cash flows, liquidity, and portfolio composition, which are summarized below:

- **Cash flow analysis.** Changes in the amount outstanding under revolving facilities impact transaction liquidity and cash flow. Analysts will request that cash flows be stressed using a default frequency assumption at several drawdown levels on revolving assets and liabilities.
- **Reserves.** If the SPE is obligated to fund revolving assets, it may set up a cash reserve to fund its draws. Credit enhancement must be sufficient to cover the resulting negative carry between the earnings on reserve fund-eligible investments and the transaction's interest cost.
- **Liquidity or support agreements.** If the SPE is obligated to fund revolving assets, it may also fund draws by purchasing liquidity lines or standby commitments from providers rated as high as the senior-most tranche. Eligible providers should be rated as high as the senior-most tranche.
Alternatively, an 'A-1+' rated entity may participate in an 'AAA' CDO with appropriate replacement provisions upon downgrade. To cover negative carry, the commitment fees earned on the unused revolving credit facility assets should be higher than the commitment fees charged on the unused revolving credit facility liability. These liquidity agreements can also be put in place to support revolving rated liabilities issued by the SPE.

Revolving loans also introduce additional legal risks to the transaction. These should be adequately addressed (see "Legal Considerations").

Reinvestment Period

Cash Flow Transaction

Although cash flow and synthetic CDOs do not rely on collateral market value to pay debt service, they can be impacted by changes in market value. The reason is that, although limited, some trading and secondary market sales are allowed. The period during which assets may be traded under specified conditions is called the "revolving" or "reinvestment" period. During this time in cash flow transactions, asset cash flows can be reinvested or used to purchase eligible assets as long as certain tests are met, mainly coverage, collateral quality and portfolio profile tests. After the revolving period, collateral principal proceeds are typically used to pay down senior notes until they are retired, even if the coverage tests are passed. In synthetic CDOs, the collateral manager may also have the option of selling securities and entering into new arrangements.

Issuers prefer the option of trading CDO portfolio assets throughout the term of the transaction. Credit enhancement in CDOs is sized to account for losses on defaulted assets, but not on performing assets. As a result, trading and portfolio turnover is limited, either by reinvestment criteria during the revolving period or by specific trading rules.

Typically the revolving period ranges from two to six years. Reinvestment of collateral cash receipts during this time has several advantages. Reinvestment can be used to maintain collateral quality and portfolio diversification, as rating changes, or as maturities, amortization, prepayments, or defaults reconfigure the pool. In addition, if prepayments during the revolving period are reinvested in eligible collateral, they may preserve yield for investors and excess spread for the transaction. The revolving period also enables a transaction to profit purely from limited trading activities, that is, buying and selling of collateral.

Replacing collateral, however, instead of paying down notes, can add credit and market risk to any transaction. Failure of some or all of the coverage, collateral quality, or portfolio diversification tests may trigger delevering or paydown of the rated notes in order of seniority. These tests, and their remedies upon failure, are very important to the integrity of the structure. That is, maintaining a particular rating level depends directly on meeting, on an ongoing basis, the fundamental requirements of that rating.

The majority of rated CDO transactions provide that the collateral manager may trade assets during the reinvestment period via four collateral sales mechanisms:

- Credit-risk security sales,
- Credit-improved security sales,
- Defaulted asset sales, and
- Discretionary sales.

Assets judged to be credit-risk (or "credit-impaired") securities can be sold to avert default losses, while credit-improved (or "credit-appreciated") securities can be sold to improve collateral quality and boost returns to equity investors. The intention of such trading should be to protect against default by selling credit-risk assets with a deteriorating credit profile. The intention of such trading should not be to exercise greater discretion and flexibility in asset management, particularly to proffer gains for the manager or other equity holders at the expense of rated noteholders.

There are two aspects of constraining the trading of these assets in order to protect the portfolio from high turnover and undue exposure to price erosion: designation, and application of proceeds. The designation or definition of credit-risk and credit-improved securities controls how often the sale occurs, and should be specific. The application of proceeds controls uses of the sales proceeds, reinvestment in new assets, and
payment of all or part of the sales proceeds to investors according to the priority of payments, or "waterfall." These guidelines should protect senior noteholders from the release of cash should the transaction be underperforming.

There are many variations in terms of the definition of credit-risk and credit-improved securities. However, there are at least two elements important to carving out these assets. First, the concept of a significant change in credit standing should be clear. Second, the manager’s responsibility to judge that an asset fits the applicable definition should be clear.

The manager should certify to the trustee in writing his opinion that the asset should be so designated and sold, and that any replacement asset meets applicable reinvestment criteria. Standard & Poor's believes that the manager’s judgment and responsibility are paramount in making these decisions, and therefore does not impose price or other hurdles before the manager may consider something credit-improved or credit-impaired.

The application of sales proceeds is more complicated. General reinvestment criteria should apply, as well as additional guidelines as follows to fulfill the purpose of the trade:

*Credit-risk security*- If the manager deems a security to be a credit-risk security, the manager should be able to take appropriate action to avert a likely default in the future. The problem that arises is that, unless the manager is way ahead of the market sentiment, the sale price of such security is at a considerable discount to par. Requiring the manager to satisfy, or if not currently satisfying the coverage test or CDO Monitor test, to maintain or improve the test, would de facto force the manager to buy another deeply discounted security.

In Standard & Poor's opinion, this would not benefit the transaction. Standard & Poor's thus believes the manager should use all the sale proceeds to buy a new security without the requirement to maintain or improve the par coverage test and the Standard & Poor's CDO Monitor test. This gives the manager the flexibility to buy a good credit and not focus on replacing par with another "credit-risk" security. The interest coverage test and the other quality tests must still be maintained or improved. Also, the manager and the transaction might be better served if the proceeds from the sale of a credit risk security were used to pay-down the notes. Many indentures allow this if the collateral manager cannot find a suitable reinvestment option or deems that pay down is the best course of action.

*Credit-improved security*- If the credit view on the security has improved, it is likely that the market value of the security has improved relative to where it was purchased. After selling a credit-improved security, Standard & Poor's requires that the manager replace the par of the credit-improved security with an asset the par value of which is equal to or greater than the credit-improved security sold. The manager must also satisfy the collateral quality tests and the Standard & Poor's CDO Monitor tests, or if they were not satisfied prior to the sale of the credit-improved security, to maintain or improve the results of the test with the purchase. If the tests are not satisfied prior to the sale of the credit-improved security, Standard & Poor's prefers that capital gains be used to purchase new par value securities and such gains not paid out as interest to junior noteholders or equity holders.

Some transactions track par loss and require all gains to be reinvested until the par loss is made up. A structure that continues to reinvest premiums and capital gains in a par replacement of collateral during the revolving period is stronger from an overcollateralization perspective. For example, if a collateral debt security (CDS) with a par amount of $100 was originally purchased for $80, but sold for $90 (for example, as a credit-improved security), a $10 capital gain is realized upon sale. If the collateral manager reinvests the entire $90 sale proceeds to replace the $100 par amount sold, the new $100 CDS will maintain the overcollateralization test and remain in the transaction for the benefit of the rated noteholders.

However, if the collateral manager "bifurcated" the $90 sales proceeds by releasing the $10 capital gain as excess interest through the interest waterfall, he would be left with $80 to reinvest as principal. Even if the structure had a par replacement provision, the manager is at a disadvantage, having a more limited investment universe since he could not buy anything costing more than $80. To maintain credit quality, it is more likely that the replacement collateral would have a par amount significantly lower than $100. From the point of view of the rated noteholders, the first structure, which reinvests the capital gain, is stronger from an overcollateralization perspective than the second structure, which "flows out" the capital gain to enhance the return of equity holders.
Defaulted security—Defaulted securities may be sold at any time or worked out to recovery. In general, most transactions use such recoveries to pay down the rated notes should the overcollateralization (O/C) or interest coverage (I/C) tests be breached. If the coverage tests are not satisfied, the sale proceeds or "recoveries" from the defaulted security must be held in the collection account and used to pay down the liabilities on the next payment date. Some transactions allow reinvestment of these sales, as long as the coverage tests are maintained or improved. For these transactions, Standard & Poor's models the cash flows assuming that recoveries on defaults are never used to pay down the notes during the reinvestment period, regardless of whether the coverage tests are met or not.

The risk of price depreciation and liquidity diminution in the secondary market, particularly in defaulted asset sales for recovery, is important in cash flow transactions. The loss of expected interest proceeds from defaulted assets stresses the interest coverage ratio and the transaction’s ability to make timely payments on its interest obligations. Defaulted assets are also treated at recovery assumptions that reflect substantial price depreciation in the par coverage ratio. Through sales of defaulted securities, the manager frees up cash to reinvest in performing assets or pay down the senior-most notes. However, there is a trade-off between current market value and ultimate recovery. In a majority of cases defaulted securities trade at much lower prices than the ultimate recovery that they would achieve. Part of this is due to the carrying cost over the recovery period, and part is associated to the uncertainty as to what the ultimate recovery will be. The collateral manager must evaluate this in conjunction with the current status of the transaction and make a decision if it is better to hold or sell such defaulted securities. Defaulted securities can be sold both during and after the reinvestment period.

Discretionary trading—In addition to credit-risk, credit-improved and defaulted asset trades, CDOs often allow discretionary trades during the revolving period, subject to coverage tests and reinvestment criteria. In general, these trades are limited to a small basket (typically 10% to 20%) which caps the principal amount purchased in a calendar year or one-year period to a percent of the pool principal balance. The concerns cited above regarding release of premiums and capital gains to equity holders prior to the repayment of rated notes also apply to discretionary trades. Recent deals seek to alleviate such concerns with the inclusion of provisions that shut off the manager’s access to discretionary trading should the transaction have migrated significantly from its coverage or/and collateral quality tests. Standard & Poor's requires that the manager replace the par of the discretionary security traded with an asset whose par value is equal to or greater than the discretionary security sold. The manager must also satisfy the collateral quality tests and the Standard & Poor's CDO Monitor tests, or if they were not satisfied prior to the sale of the discretionary security, to maintain or improve the results of the test with the purchase.

Equity Securities—Equity securities get no benefit in any test in the indenture. Such equity is either acquired through a debt conversion or as recoveries on defaulted obligations. In general cash flow and synthetic CDOs are not allowed to purchase equities. Equity securities may be sold at any time. If the equities are acquired through a debt conversion, the collateral manager is typically required to maintain or improve all coverage tests after the conversion. If the equity is acquired as recoveries, then any sale proceeds from such equities must also be deemed recoveries and must be applied similar to any other recovery. The collateral manager may also hold onto equity securities obtained as recoveries if he/she believes that such securities will improve in price over time.

To monitor the quality of the portfolio during the reinvestment period for Standard & Poor's, the majority of transactions are structured with the use of Standard & Poor's CDO Monitor (see "CDO Monitor" in the "Sizing Defaults" section for a complete explanation). The Monitor looks at the total dollar amount of losses that the transaction can sustain as established by the initial cash flows for each rating, and compares that with the default potential of the current portfolio plus par loses to date. For other than credit risk sales, the collateral manager runs the Monitor before and after the proposed reinvestment and sees if the results are maintained or improved. Most managers view this as a useful tool in maintaining portfolio quality and stipulate in the transaction documents that they will only reinvest if they can maintain or improve the results. If the transaction fails the Monitor test, the collateral manager must notify Standard & Poor's of such failure in order to reevaluate the transaction.

A certain number of CDOs aim to combine the benefits of arbitrage with those of off-balance sheet treatment. Under FASB 125 in the U.S., the collateral manager must relinquish control over his ability to trade the transferred assets, and trade only credit-risk securities, which are defined based on "objective" criteria. The investor should note that some interpretations of FASB 125 can translate into automatic sale of
broadly defined credit-risk securities. For example, such transactions can have provisions that if the rating of the asset migrates to below 'B' then such asset must be sold out of the collateral pool. In these situations, there could be higher asset turnover because not only defaulted assets would impact the transaction, but also assets with negative credit migration. In such cases Standard & Poor's has to size how many assets would transition from B directly to default and how many would be downgraded to below B and sold. This analysis is more complex but feasible. In addition assets that must be sold increase exposure to market value risk, thereby warranting a more price-based analysis of credit enhancement.

Overall, the trading flexibility discussed above represents an additional level of risk to the investor, who is exposed to the collateral manager's decisions. As a result, there is a greater risk in CDOs (versus more traditional asset-backed paper in which assets tend to be homogeneous) that the rating on a prospective CDO can change over time as the composition of the asset pool deteriorates. These changes can be a result of long revolving periods, credit upgrades or downgrades in the underlying assets, and active management. Transactions permitting portfolio turnover, whether through discretionary trading, or the trading of credit-risk or credit-improved assets, should adequately disclose that the ultimate rating of the respective transaction may be affected by the changing composition of the asset pool and the manager's skill in trading such assets.

**Synthetic Transactions**

In a synthetic CDO, the typical transaction has been a five-year bullet with the potential for up to one year of extension risk to give time for recoveries to be established on defaults that occur in the fifth year. These transactions typically have reinvestment periods that can extend all the way to days prior to the swap contract maturity date. More recently, the investment bankers who are more familiar with cash CDOs have structured synthetic CDOs with five-year reinvestment periods and 12-year legal final maturities. As the credit derivative contract is totally flexible, it renders irrelevant the concern that the collateral manager may not find debt securities with the appropriate maturity. Physical collateral is not being sourced; thus the contract can reference the desired maturity up to transaction maturity date. The one caveat is that the credit derivative market is currently not liquid beyond the five-year point and thus provides a market-driven maturity limit.

In synthetic CDOs, the portfolio is typically modeled to five years, the bullet maturity of the transaction. Weighted average life and actual maturity profiles of a portfolio of underlying credit default swaps may alternatively be considered if these are factored in the notional of the contracts.

In a synthetic CDO, the concept of trading is also slightly different from that in cash CDOs. One way to effect a trade occurs when the manager entices the counterparty to accept unwind of the swap contract. Unfortunately this can be non-economic relative to selling a cash bond because the counterparty must agree to the unwind and thus holds some leverage over the CDO. This leverage can be assumed to cost something, most easily coming from the spread income. To date there has been relatively little trading in the synthetic CDOs that absorb trading gains and losses. Alternatively, a CDO could book an offsetting trade which could be assumed to render the position "flat" from a credit perspective, and thus the gain or loss is the difference between the two spreads, the premium received in connection with a particular reference entity on which the CDO sold protection and the spread payment due out to a counterparty. In fact, this risk may not be flat the credit. The CDO has hedged the credit risk of the reference entity, but has taken on the new risk of the counterparty's ability to perform. One way to think about it is as an insured bond. The underlying may have a natural rating of "BBB", but the "wrapped" rating is "AAA". It is NOT however, risk-free. It is risky to the extent the insurer does not perform. So too is the new, opposite credit derivative trade risky to the extent the counterparty performs. This risk is typically treated at the new assumed risk of "AAA" on the "package" as long as the counterparty is rated A-1+. To count as a totally offsetting trade, the two contracts must have identical counterparties, reference obligations, reference entities and terms. The one caveat is that the credit derivative market is currently not liquid beyond the five-year point and thus provides a market-driven maturity limit.

Furthermore offsetting trades are included in the discretionary trading bucket to prevent large exposures.

As with cash arbitrage CDOs, so too have managers of synthetic CDOs tried to pick up the language of credit-risk security sales, credit-improved security sales, defaulted asset sales and discretionary sales. However, one must think, again, in terms of spread. These credit-risk securities are defined as those for which the mark has widened by 100 basis points. Credit-improved securities are generally assumed to be credits whose mark to market spread has tightened by 20 basis points. Both definitions have included the manager's discretion provisions typical of traditional cash CDOs. Defaulted exposures are either cash settled or physically settled. Managers retain the ability to make discretionary trades with a limit of between 10%-20% established either for the lifetime or per annum. That differentiation is based upon the
strategy and background of the manager.

Reinvestment After the Reinvestment Period

Cash Flow Transactions
Traditionally, the end of reinvestment period in a CDO transaction means principal proceeds, with the exception of principal prepayment, thereafter will be used to pay down liabilities. As such, noteholders can expect winding-down of their investment based on the priority of the notes they hold in the capital structure of the transaction. From a credit point of view, the amortization of the asset pools brings some interesting consideration. All else being equal, the credit protection provided by the equity position in the transaction increases as a percentage of the transaction (the structure is “delevering”). At the same time the maturity of the assets is getting shorter and thus most likely the probability of default is getting smaller. At the same time, adverse ratings migration and greater collateral lumpiness can be increasing the portfolio default rate. The sequential paydown structure, coupled with the shorter maturities, affords the senior tranches sufficient protection while they pay down.

More recently, however, Standard & Poor's has seen a marked increase in structures that permit reinvesting principal proceeds after the reinvestment period. Specifically, some structures permit collateral managers to reinvest sale proceeds from credit-risk, credit-improved, and even discretionary trading after the end of reinvestment period. While this trend reflects issuers’ desire to keep assets under management for as large and as long as possible, Standard & Poor's views this development as presenting additional risk factors. Primary among them are:

Back-Ended Default: Standard & Poor's adjusts its cash-flow stress tests based on the weighted average life of the collateral pool. This limitation stems from the fact that imposing a certain level of defaults based on the original balance of the asset pool cannot be achieved and may be onerous once the pool balance declines past a certain point. If, however, the transaction has the option of maintaining pool balance due to added reinvestment alternatives, Standard & Poor's will likely impose additional stress tests that extend into the reinvestment period to test for the robustness of the structure. If the collateral manager can take a transaction with an eight years average life and turn it into a 12-year bullet pay structure, then that transaction will be analyzed as such.

Credit Quality Monitoring: At present, Standard & Poor's monitors the credit quality of the collateral asset pool via the Standard & Poor's CDO Monitor. The CDO Monitor measures total dollar of loss potential and is most meaningful during the reinvestment period. Added trading flexibility while the asset pool is amortizing requires additional tests and ongoing credit quality monitoring.

Interest Rate Hedges: A transaction typically structures its interest rate hedge to the original balance of the pool. This strategy is probably the most efficient and rational one. However, the structure may face more interest rate risk if the original pool is kept for longer than anticipated beyond the reinvestment period. This problem may be especially acute if the structure allows for a mix of fixed- and floating-paying assets. Additional cash-flow stress tests may be called for to examine the impact of longer asset life on the adequacy of interest rate hedges.

Because of these additional risk factors associated with trading activities after the reinvestment period, Standard & Poor's may require additional cash flow stress tests and collateral tests if the transaction proposes reinvestment during the amortization period, depending on the nature and extent of proposed trading activities.

Reinvestment of principal prepayment only: This provision does not require any additional testing if the documents require that the replacement asset should have an equal or better rating and an equal or shorter maturity than the asset it prepays. Alternatively, indenture can require that Standard & Poor's CDO Evaluator be run, and the scenario default rate has to be maintained or improved, and the collateral manager has to test the hedging structure for adequate coverage. Furthermore, all other reinvestment criteria concerning collateral quality tests and concentration limitation have to be met.

Sale of credit-risk assets: Proceeds must be used to pay down the liabilities or reinvest in the most par possible with equal or shorter maturity; otherwise additional stresses will be tested in the transaction.
Credit-improved and discretionary trade: In the case of sale of credit-improved and discretionary sales, the indenture has to require that sale proceeds be equal to or greater than the principal balance of assets sold. Additional cash-flow stress tests may apply to back-ended default if reinvestment is permitted without the equal or shorter maturity test. The indenture has to require that replacement assets should have an equal or better rating and an equal or shorter maturity than the asset that is traded out. Alternatively, the indenture can require that Standard & Poor's CDO Evaluator be run and the scenario default rate has to be maintained or improved, and the collateral manager test the hedging structure for adequate coverage. Furthermore, all other reinvestment criteria concerning collateral quality tests and concentration limitation have to be met.

Synthetic Transactions
In a synthetic CDO, reinvestment after a reinvestment period is a slightly different concept due to the traditional short bullet structure. If principal returns are contemplated in a five-year structure, consideration must be given to what "de-leveraging" means. In a traditional synthetic CDO, the funded "AAA" noteholders have a synthetic or "super senior" swap counterparty. The presence of this counterparty leaves the open question of what de-leveraging means. It can mean the reduction of the notional exposures the super senior swap counterparty takes on. But it must be remembered that the super senior swap counterparty is a contingent participant. It did not put any cash into the deal. Thus, this counterparty is not due a principal distribution. If actual principal return to the AAA noteholder is contemplated, the super senior swap counterparty traditionally opposes such an action because it reduces the subordination protection it would likely be called upon to provide. Thus, the AAA noteholders, who would typically have a shorter expected life than legal final maturity, do not have such an assumption as appropriate in the synthetic CDO. Some transactions require a pro-rata reduction of the unfunded and funded senior-most risk positions, but that is not a rating requirement of Standard & Poor's.

Interest Rate Hedges: The partially funded synthetic CDO structure typically locks in the floating-rate component of the income due to the noteholders by investing in a GIC or locking in a repo rate of return. The credit derivative spread premium income represents fixed spread income and is used to pay the spread over LIBOR / EURIBOR that is required to service the noteholders. Thus, interest-rate hedges are not typically required. Standard & Poor's cash flow runs that pick up the fixed-floating risk in a typical cash CDO are generally not required in the synthetic CDO.

Sale of credit-risk assets: Proceeds must be used to pay down the liabilities or retained in the structure as credit support against which new credit derivative risk could be written pending the passing of the model run. The CDO Evaluator is typically run for trading eligibility purposes in synthetic CDOs. Certain older structures depend upon limit structures, the bucket approach that seeks to limit risk by limiting the initial portfolio to "ratings" buckets, and substitutions are required to be of the same then-current rating of the exposure being removed or of a higher rating.

Coverage Tests
Cash Flow Transactions
The coverage tests-overcollateralization (O/C) or par coverage ratio, and the interest coverage ratio (I/C)-are the main financial ratios that drive the manager's decision to "reinvest" cash in new collateral or pay down noteholders during the revolving period.

The par coverage ratio is essentially the ratio of CDO asset par to CDO rated tranche par. This test ensures that there are adequate assets to cover the liabilities, as measured on a par basis.

The typical O/C ratio for senior securities is calculated as follows:

- Total dollar par of assets in collateral pool
  + Cash
  + Defaulted securities at lower of market or expected recovery rate

- Divided by
  Total amount of senior securities presently outstanding.

In general most transactions have an O/C test for each class of securities issues. Thus there would be a
class A O/C test, a class B O/C test, a class C O/C test, etc. Each of the tests below the senior-most security test would also include all the senior securities in the denominator. Thus the denominator of the class B O/C test would be made up of the class A securities and class B securities. Since the numerator of the O/C test is the same regardless of the class, the class B and C O/C tests are lower than the class A test.

With the notable exception of defaulted assets and some special securities, which are given credit for the lower of an assumed recovery rate and market value, the par coverage test does not take into consideration the market values of assets. Furthermore, this coverage test typically makes no adjustments based on asset credit ratings. Recently however, some transactions have started to haircut the par value of certain low rated securities to the extent such securities exceed certain limits which are higher than the original composition of the asset portfolio. For example, "CCC" securities that exceed 10% of the total asset pool must be included at 75% of the par value. This is done in order to trip the O/C test faster and start delevering the transaction in order to compensate for the added credit volatility associated with a large concentration of low rated securities.

In addition, certain assets with unique cash flow characteristics are afforded special treatment in the O/C test. For example, zero-coupon bonds are treated at their accreted value, and I/O securities and equity receive no credit. Securities that are deferring interest are also accorded special treatment.

The interest coverage ratio (I/C test) is essentially the ratio of interest collected in a given period net of transaction expenses, divided by the interest payable on a respective tranche of the CDO in that period. If the transaction has multiple tranches there will likely be one I/C test per tranche. The I/C test is a liquidity test that ensures that there is adequate interest generated by the assets to cover the interest payment obligations of the liabilities plus a certain cushion. The I/C test is generally set higher than the minimum needed to pay interest on the tranche. If the I/C test failed, the transaction will trap interest and principal collections and pay down the senior notes. The I/C test is both a cash and an accrued interest test. On any determination date the numerator should be given credit only to interest actually received in that period, while on any measurement date within the period, the numerator includes interest collected and interest expected to be received, in the reasonable judgement of the collateral manager. Thus, any interest payable by defaulted securities should always be excluded.

The typical I/C ratio for a senior security on determination date is calculated as follows:

- Interest received during period
  Expense payable above interest payments
  + or - Net swap payments
- Divided by
  Total amount of interest payable on the senior securities.

At this point the money actually received during the period, net of expenses or hedge income or costs, should cover interest payable on the senior securities more than 100%. In general most transactions have an I/C test for each different class of rated notes. Some transactions, however, combine some of the tranches. For example, the senior test might include the class A and B of the securities.

The investor should be aware of subtleties in the definitions of these ratios that might not properly reflect transaction interest cash flow and can distort or overstate interest coverage. An example of such is how hedge receipts or payments are reflected in either the numerator or the denominator. Such differences in treatment make direct comparison of such ratios across transactions difficult and misleading.

The investor should be aware that there are very important subtleties in how coverage tests are managed. Some structures require that the issuer "maintain compliance at all times" and trigger a special redemption whenever a coverage test is failed and not brought back into compliance with the original minimum ratio. If one or more of the coverage tests is not met, principal proceeds should not be allowed to be reinvested unless the coverage tests are brought in compliance as a result of the reinvestment or trade. This early amortization trigger works to return available cash to rated noteholders sequentially, thereby converting risk into a prepayment.
Other structures have the provision to "maintain compliance or improve" and may permit intra-period noncompliance and collateral substitution. This allows the manager to bring himself closer to compliance after a trade. In such "maintain or improve" structures, there may not be cash available to redeem liabilities sequentially and restore compliance on the next payment date. The investor in a "maintain or improve" structure is buying a CDO that gives the collateral manager more flexibility than a "maintain at all times" structure. One noteworthy "carve-out" in many CDO structures is for credit-risk sales proceeds, which may be reinvested under limited circumstances in order to protect noteholders from credit losses, even if compliance is not immediately restored.

The timing and frequency of test performance is also an important aspect of the effectiveness of reinvestment criteria. In addition to regular monthly and due period measurement dates, any date on which there is a proposed collateral purchase or change in the portfolio (for example, downgrade, default, maturity, or redemption) should trigger recalculation of the coverage tests.

While the coverage tests are designed to buffer rated noteholders from declining portfolio performance through the early paydown of senior notes, such tests are susceptible to collateral manager actions that can delay the paydown at the risk of more severe future losses. Noteholders should scrutinize the manager's reinvestment of sales proceeds to ensure that proceeds are re-deployed in solid credit positions. Take for example a scenario where the par coverage ratio falls below the set threshold between payment dates due to the default of an asset. At this point, the par credit assigned to the defaulted asset is the lower of market value or assumed recovery rate. Let's say it's $40. The collateral manager is able to bring the coverage test back into compliance by selling the defaulted asset for $40 and purchasing a performing asset at par of $100 with the sales proceeds. Let's also assume that the interest rate on this asset is at the current market rate. The credit for the new asset of $100 par brings the test back into compliance. The manager averts early pay down of the senior notes, thus allowing the interest and principal proceeds to flow down the waterfall at the next payment date. Both the noteholders and equity investors receive payments and the manager has built par back into the deal. Unfortunately, the scenario likely doesn't end here. By purchasing the replacement asset at $100 par with $40, the manager acquired the asset at a heavy discount that the market deems highly likely to default. Should this asset subsequently default, the transaction is back to the earlier predicament but some proceeds have already been passed on to the equity investors. In such a situation, the noteholders would have been better served had the manager purchased $40 par of an asset with solid credit fundamentals. The par coverage test failure would trigger early partial redemption of the senior notes, but the portfolio would have a stronger credit base.

It is also possible that the collateral manager arbitrages the test through discretionary sales. Assume that a transaction is failing its coverage tests and a collateral instrument is scheduled to pay down the day before the period end and the determination day. Thus the money would be available to delever the transaction on the payment date. To avoid paying down, the collateral manager could simply sell the security as part of discretionary sales, and then reinvest the proceeds in new collateral that has a maturity date later in the future. For these reasons, Standard & Poor's requires that the transactions be modeled assuming that no scheduled principal is available for paying down on O/C or IC test failures during the reinvestment period. Generally only recoveries on defaulted securities and excess spread are used to pay down during the reinvestment period.

Synthetic Transactions

Synthetic CDOs also have coverage tests as seen in cash flow CDOs, the overcollateralization ratio (O/C), and the interest coverage ratio (I/C). There is much discussion about eliminating the I/C test in a synthetic CDO as the total spread income coming into the portfolio, due to the leverage, usually dwarfs and real risk of having interest coverage shortfalls. But, not surprisingly, Standard & Poor's has seen portfolios where loss of one, two, or three of the highest-spread derivatives exposures could lead to the payment-in-kind (PIK) of the lowest-rated security. As a result, Standard & Poor's does usually require an I/C test. In certain structures, enough comfort can be drawn from a minimum spread test that the I/C test could be eliminated.

Because a large portion of a synthetic CDO is supported by an unfunded liability (typically a "super senior swap") and therefore the leverage afforded off funded notes, these coverage ratios are primarily used to trap cash, not to pay down noteholders but to divert cash into the collateral account to build subordination. But there are exceptions. In "hybrid" transactions where there are characteristics of both cash flow and synthetic CDOs and in some of the more recently structured synthetic CDOs, there are instances where the tripping of O/C and I/C tests leads to amortization from "super senior swap" on down the different classes. Additionally, in synthetic CDOs where all excess spreads are trapped to build subordination, there are obviously no O/C
or I/C tests.

How the O/C is defined in a synthetic structure is driven by whom the O/C is aiming to protect. If the funded noteholders are those that are to be protected, the likely O/C ratio is defined as the ratio of funded note proceeds par to tranche par. Funded note proceeds are typically deposited into a guaranteed investment contract (GIC), a reverse repurchase (repo) agreement using appropriate collateral, or purchase of very high quality corporate paper with market risk removed, for example, through a par put agreement. All of the counterparties involved, whether it is the GIC provider, the reverse repo counterparty or the put provider, are subject to rating downgrade trigger to ensure the availability of resources to pay for credit protection upon credit events. The typical O/C ratio for senior securities is calculated as follows:

- Undrawn amount of funded note proceeds
  + Cash
  + Defaulted securities at lower of market or expected recovery rate

- Divided by
  Total amount of senior securities presently outstanding.

Most transactions have an O/C test collectively for the senior class securities and the junior class securities. For example, there would be a class A, B, and C O/C test. Each of the tests below the senior-most security test would also include all the senior securities in the denominator.

While there are structural provisions to minimize the market risk in funded note proceeds, some of the more recent synthetic CDOs have adopted similar haircut to the par amount of the high-grade collateral, itself a contra-liability, depending on the credit quality of the assets. For example, if the notional amount of credit default swaps written referencing B+ or lower rated obligors exceeds 1% of the portfolio, for the computation of the par amount of the collateral, it is haircut by 20% of this excess. Thus the O/C will trip sooner and cash will be diverted more quickly into the collateral account.

Since trapped cash in synthetic structures is often re-levered through the synthetic CDO writing more credit default swaps, how much credit exposure can be written is ultimately governed by a synthetic exposure to synthetic coverage ratio. This ratio is aimed at protecting the unfunded and funded investors as well as credit default swap counterparties. It is calculated as follows:

- Total amount of credit default swaps written
  - defaulted or credit event credit default swaps
  - hedged credit default swaps

- Divided by
  Undrawn "super senior swap"
  + cash
  + funded note proceeds in the collateral account
  - net undelivered defaulted credit default swaps

The ratio has to be less than or equal to 1, so that synthetic coverage is always enough to cover synthetic exposure.

In structures where the protection of the super senior swap provider takes on priority, we will likely see the super senior swap notional in both the numerator and denominator, so that the senior O/C is now calculated as:

- Undrawn amount of funded note proceeds
  + Cash
  + Defaulted securities at lower of market or expected recovery rate
  + " super senior swap"
• Divided by
  Total amount of senior securities presently outstanding
+ "super senior swap"

The I/C ratio is calculated as follows:

• Premium received from credit default swap written
  + interest income from funded note proceeds in a given period

• Divided by
  Insurance premium payable to an unfunded tranche or tranches
  + interest payable to a funded tranche or tranches of the CDO in that period.

The I/C test is set higher than the minimum needed to pay interest and insurance on the tranches. But again the same distinction from cash flow CDOs holds. If the I/C test fails, cash trapped will only go into the collateral account to build subordination but notes will not be amortized.

Similar to cash flow CDOs, on top of regular monthly and due period measurement dates, any date on which there is a trading, hedging, or changes in the existing portfolio such as downgrade, default or maturity should trigger recalculation of the coverage tests.

**Collateral Quality Tests/ Portfolio Profile Tests**

In addition to coverage tests, collateral quality tests serve as a "blueprint" for eligible collateral and for portfolio parameters during the revolving period. For example, an arbitrage transaction may allow collateral debt securities that are U.S. dollar denominated from U.S. issuers with a minimum issuer credit rating of 'B-', and no more than 8% total principal balance of collateral debt securities may be from the same industry. Such limitations are not imposed by Standard & Poor's, but generally by the investors, since Standard & Poor's uses the CDO Evaluator (see the “Sizing Defaults” section) to size default risk and the Evaluator uses correlation between assets in the same industry and can handle assets with any issuer rating.

Other trading and reinvestment criteria may include par replacement criteria (for example, the principal amount of the purchased collateral debt security at least equals 100% of the principal amount of the sold or paid down collateral debt security). In contrast to coverage tests, many of these reinvestment and trading criteria are qualitative and dependent on availability of desired collateral in the market. Consequently, some structures give the issuer the flexibility to reinvest cash to be closer to compliance if a failure occurs.

Covenants to maintain the portfolio at or above a minimum weighted-average coupon (WAC) for fixed-rate assets and minimum weighted-average spread (WAS) for floating-rate assets are common portfolio profile tests. Such measures are necessary to facilitate the modeling of the cash flows in transactions that have revolving collateral pools. An alternative to these tests is a covenant to replace interest with interest for each trade.

One particular collateral quality test that deserves mention is designed to limit individual asset and/or portfolio maturity. Typically, collateral eligibility definitions include individual or discrete maturity restrictions (for example, all collateral debt securities must mature prior to the stated maturity of the notes). Pool parameters may include a weighted average maturity (WAM) limit on the portfolio.

Any number of portfolios could satisfy these guidelines, including the following three sample portfolios: a portfolio of all short-term securities maturing within one year and then having to be reinvested; a bar-belled portfolio of short- and long-term securities; or a portfolio with equal amounts of principal maturing in every year of the transaction.

As much as it would simplify the analysis and management of collateral, the portfolio with equally sized, evenly distributed maturities is not typical in CDOs given the nature of the corporate debt markets. In fact, a "barbell" distribution with a portfolio concentrated in the short- and long-term ends of the maturity spectrum can occur, given that the cash flow characteristics of the assets differ, and that the portfolio changes over time. Such a skewed portfolio may be permissible under collateral stated maturity limits or a portfolio WAM
requirement. For "barbell" or at least "lumpy" CDO portfolios, investors should be aware that sole reliance on arithmetic weighting, averaging or aggregation of maturities may not effectively measure the risk or effect a prudent reinvestment decision. For this reason, Standard & Poor's used the CDO Evaluator and CDO Monitor to factor in the characteristics of the portfolio into the default estimation.

Analysts review the issuer-provided reinvestment or trading guidelines—the collateral quality and portfolio parameters discussed above—to determine that each new asset meets certain eligibility requirements before it replaces an asset. As mentioned, the manager may choose to run the CDO Monitor, in addition to checking coverage ratios and collateral quality tests, to assess the portfolio and the impact of reinvestment on an ongoing basis. Such regular testing gives the manager access to "updated" portfolio information for his consideration in the decision to reinvest cash.

If the manager chooses to use the CDO Monitor for a replacement test, analysts will request copies of the results. If the default rate of the pool after replacement is less than or equal to the default rate of the pool before replacement, the replacement can occur without causing deterioration in the pool credit quality or significantly increasing expected defaults over time. The manager may run the CDO Monitor to see the default rates on the pool with and without replacement, compare the results with the "break-even" default rate and portfolio assumptions applied in the transaction, and make his decision. A rating action may be taken if, upon replacement, the portfolio quality deteriorates.

Alternatively, if the manager is not using the default model, he need only check that both the "before" and "after" positions are within the collateral eligibility criteria. In this latter case, the original credit enhancement level is based on "stressed" eligible portfolio composition with maximum allowable asset credit risk. Therefore, in general, the original credit support should still cover this risk as long as the portfolio quality remains within these assumed stressed collateral quality parameters, and the manager tests and maintains compliance with coverage tests. Standard & Poor's requests that the issuer provide pool information monthly and immediately notify us of any CDO Monitor failure.

**Priority of Payments**

The principal and interest "waterfalls" drive the transaction's allocation or distribution of cash flow down the capital structure. Even synthetic CDOs have cash waterfalls that dictate how premiums, interest, and cash from the collateral accounts will be distributed. These distributions may occur periodically in cash flow transactions, at the end of the transaction in synthetics, or sooner should a transaction unwind due to a transaction event of default.

As one would expect, in senior/subordinated structures, the most senior, highly rated tranche should have priority in the principal and interest waterfalls. Subordinated tranches are in place to provide credit support, which, for example, may translate into deferring interest receipts while the transaction tries to build back its O/C tests. Junior investors, however, have their own return hurdles. Usually, the investor will invest in a single rated or unrated tranche position in the capital structure. When several tranches are rated, however, the "trade-offs" across classes and waterfall mechanics can become quite complex, as differing interests compete for the same collateral cash flow.

In most transactions, the ongoing hedge payments (if hedges are used in the deal) are senior to the senior-most class. Ongoing is the exchange of periodic interest. Hedge termination payments may or may not be above the senior-most class, but are situated after the capped transaction expenses. Under Standard & Poor's CDO criteria, since future hedge termination payments are very difficult to accurately size, any termination payment due from the SPE to any hedge counterparty must be subordinated to the investment-grade noteholders, if such payment is due because the counterparty defaulted on its obligations. If the payment is due to the SPE defaulting, then it may be senior in the waterfall.

The majority of transactions to date use separate priorities of payment for interest and principal and consequently bifurcate all cash receipt into interest proceeds and principal proceeds. Standard & Poor's looks closely at these two "buckets" to ensure that principal receipts are not inadvertently passed down the interest waterfall to the equity investor. Similarly, the analyst checks that all sources of payment are covered within these definitions. The inclusion of catch-all language in the principal proceeds definition to cover any unanticipated items is preferred.
From the perspective of the investors in the rated notes, stronger deal structures will include trapping trading gains in principal proceeds which allows the manager to increase overcollateralization to support the notes. Conversely, investors should note that some transactions divert a portion of the unused proceeds to the interest waterfall after the end of the ramp-up period. To the extent unused proceeds result from purchases of assets at significant discounts, the manager is potentially exposing the noteholders to additional credit risk while flowing the proceeds to the equity holders. Careful attention to the definitions of principal proceeds and interest proceeds is therefore warranted. As a general rule Standard & Poor's considers all money on defaulted securities, either through sale or work-out, up to the par of the security to be principal proceeds.

The priority of payments will also differ from transaction to transaction. Following the breach of a coverage test, most CDOs use interest proceeds for paydown of senior notes and will utilize principal proceeds only to the extent of a shortfall, but some deals start delevering with principal proceeds. Most cash flow transactions will also delever sequentially beginning with the senior-most outstanding tranche. However, under certain conditions, some waterfalls might pay pro-rata or divert the paydown to a subordinated tranche. In general, the analyst looks closely at what is released through both the principal and interest waterfalls to junior debt holders and equity holders while senior debt is outstanding and will apply additional stresses to the cash flow modeling to ensure adequate subordination protection to the senior tranche.

Some of the additional features the analyst will look at in the priority of payments include the following:

- A cap to the payment of administrative expenses and fees to various participants such as the trustee and paying agent senior in priority to payments on the notes. Otherwise, it is difficult to adequately model the cash flow.
- The senior collateral management fee should be adequate to entice a replacement collateral manager should such substitution become necessary. If the fee is too low, Standard & Poor's will stress cash flows at an appropriate fee.
- Triggers that can switch payments back and forth among different waterfalls. Such triggers are very difficult to model because specific transition paths must be modeled. Because of this difficulty such triggers are not common.
- As mentioned, termination payments to the hedge counterparty triggered by hedge counterparty default or termination event should be subordinated to the payment of rated notes.

Some CDO transactions will combine the payment of both interest and principal into one waterfall. The same concerns cited above apply, and the analyst needs to carefully scrutinize the definition of principal distribution amount to identify any potential leakages to equity.

**Definition of Defaults**

**Cash Flow CDOs**

The two most important factors in Standard & Poor's assessment of required credit enhancement for rated notes are the frequency of defaults and the loss severity stemming from defaults. The events of default for the underlying assets need to be clearly defined and consistent with those applicable to Standard & Poor's default study, which is used as the basis of the CDO Evaluator. Standard & Poor's considers the following to be events of default for an asset:

- Failure to pay interest or principal in whole when due;
- Designation by Standard & Poor's of 'D' or 'SD';
- Initiation of bankruptcy, insolvency, or receivership proceedings.

In addition to these items, the judgment of the collateral manager to deem an asset as defaulted based on reasonable belief of pending default should be included. This allows the collateral manager to protect the noteholders since more defaults will trigger the par coverage test and cause early partial redemption of the senior notes.

Absent properly defined events of default, the intent of the par coverage test to limit credit exposure to the senior notes is weakened. A collateral manager who manages to equity would be able to treat such severely distressed assets at par for purposes to the par coverage test to avoid delevering the deal and pass the
proceeds to the equity investors.

Standard & Poor's allows two carve-outs where obligations of an issuer with an ICR of 'D' or 'SD' are deemed performing. These carve-outs are debtor-in-possession (DIP) facilities and certain current pay instruments. These exceptions are discussed in the "CDO Structural and Collateral Considerations; Defaulted Obligations" section.

**Synthetic CDOs**

The CDO Evaluator measures the probability of default on an underlying instrument. The default matrix used is based on Standard & Poor's Corporate Default history, but altered slightly to account for certain mathematical abnormalities and to yield consistent results. In order to put a credit estimate on a synthetic, the definition of default on the synthetic must be consistent with the definition of default used in the default study. In concept, the acceptable default definitions are as follows:

- Payment default on the reference obligation,
- Bankruptcy of the reference obligor,
- Material cross-default with another debt instrument ('SD'), and
- Downgrade to 'D', or withdrawal, of the Standard & Poor's rating.

Synthetic CDOs typically are transacted under the 1999 ISDA, which was designed explicitly for credit derivatives. The following "Credit Events" with regard to the reference obligation, sometimes referred to as "Big O", are currently accepted by Standard & Poor's in synthetic CDOs. They are broader than what is accepted for small baskets, which are typically weak-linked ratings. This difference is based on how dependant upon timing considerations the CDOs, the credit-linked notes (CLN), or single-name credit derivatives are. An example is to say a company accelerates its debt due to a covenant violation. If obligation acceleration were to be called a credit event in a small basket CLN, the investor would automatically lose money at that moment. The synthetic CDO builds in the luxury of time in which we can wait to see if the acceleration was rescinded, or whether the debt was paid in full. If it was, the synthetic CDO investor suffers no loss. This is a simple but crucial example of why credit events may work for one but not the other structures.

It should not be misunderstood; the simplest and best credit derivative is the one that contains only bankruptcy and failure to pay. Each of the other credit events creates more fuzziness around the definition of default. However, the other credit events are largely captured in Standard & Poor's default study. Some, however, are not as, for example, restructuring with regard to the unrated nonpublic loan market for which banks have not been able to supply Standard & Poor's with default data and restructuring with regard to certain cases in which the restructuring constituted a downgraded but not default rating. Standard & Poor's believes that the modification made to the Restructuring credit event goes a long way to solving some of the problems and thus accepts it as a credit event. Non-modified restructuring requires a probability adjustment to reflect the increased probability of experiencing a defaulted Reference Entity.

For corporate credit exposures, Standard & Poor's allows the following credit event:

- Bankruptcy,
- Failure to pay, with the standard payment thresholds, and
- Obligation acceleration.

Obligation acceleration is accepted using the following logic: A trustee may declare an event of default for myriad reasons, but will initiate acceleration only if it is determined that fiduciary duty mandates action of that severity. Once a declaration of acceleration is made, it only qualifies as a "credit event" under the 1999 ISDA if knowledge of this acceleration is available via "Publicly Available Information" [WSJ, Bloomberg, etc.].

Such knowledge, it is assumed, will lead to massive action by lawyers to protect clients’ interests by initiating acceleration on all liabilities of the obligor in question. Thus, all obligations will immanently either be paid or defaulted upon. If default occurs, it is picked up in the default study. If all obligations are paid, the credit event ostensibly leads to settlement at par as long as you either have physical delivery or cash settlement
outside of the window required for this to play out (45 business days or 60 calendar days has been deemed sufficient).

- Repudiation/moratorium: the sovereign rating captures the likelihood of moratorium. The rating of a corporate obligor is typically constrained by the sovereign's rating.
- Restructuring is accepted with the potential probability adjustment noted above. Alternatively, further modifications to the language may be accepted so as to mitigate the added risk of the restructuring credit event. Restructuring only qualifies as a "credit event" if the publicly available sources requirement is retained in the ISDA.

Standard & Poor's explicitly does not accept "Obligation Default", as this includes all technical defaults such as interest coverage ratio violations, which are decidedly not equal to default as defined by Standard & Poor's in the default study.

For structured finance obligations in synthetic CDOs, Standard & Poor's limits the acceptable definition of default to:

- Bankruptcy of the SPE,
- Failure to pay within the stated payment terms, and
- Downgrade to 'D', or withdrawal, of the Standard & Poor's rating. The other credit events are not consistent with structured finance structures, where the subordinated tranches are there to provide credit protection and may only receive distributions at the legal final maturity of the transaction.

**CDO Evaluator and Portfolio Benchmarks**

**Standard & Poor's CDO Evaluator**

Standard & Poor's new CDO Evaluator refines CDO default analysis. This new model uses Monte Carlo statistical methodology to evaluate the credit quality of a portfolio of CDO assets and to provide scenario-default rates for the portfolio at each rating level.

The CDO Evaluator system is used to determine the credit risk of a portfolio of assets both for cash flow and for synthetic CDOs. The direct result is a probability distribution of potential default rates for the portfolio assets in aggregate. These potential default rates range from 0% (no assets in the portfolio default by maturity) to 100% (all assets in the portfolio default by maturity). The more likely outcome is that some, but not all, assets default. The portfolio default rate is computed as the total dollar amount of assets defaulted by maturity, divided by the total principal amount of the portfolio.

The probability distribution describes the likelihood of the occurrence of any particular default rate of the portfolio. Chart 1 below presents an example histogram of a probability distribution for a highly diverse pool of 50 corporate bonds rated 'BB', each with a 10-year maturity and the same principal balance. It shows that the likelihood that 24% of the assets in the portfolio would default is approximately 7%, which means that the odds that exactly 12 bonds of the 50 bonds default by maturity is seven out of 100. Similarly, it shows that the probability of defaults in the portfolio exceeding 28% is less than 3% (calculated as the sum of the probabilities of default rates greater than 28%, which are represented by the green bars on the chart).
After calculating the probability distribution associated with a given portfolio, we can derive a set of Scenario Default Rates (SDRs). This set of SDRs is used in determining, for each credit rating, the default rate that a CDO tranche with that rating should be able to withstand under the various cash flow scenarios encompassed by Standard & Poor’s rating criteria. The determination of these SDRs is a two-step process. First, for a given tranche credit rating, determine the portfolio default rate such that the probability of defaults in the portfolio exceeding this portfolio default rate is no greater than the probability of default of a corporate bond with that rating. Second, multiply this portfolio default rate by an adjustment factor designed for the specific tranche rating. This adjustment factor, which may be either greater than or less than 1.0, depending upon the specific tranche rating, partly reflects the fact that the assumed probabilities of default for each asset are only estimates of the likelihood of default—not the eventual default experience of that particular asset class prior to the maturity of the portfolio.

For example, based on historical default rates, the probability of default for a 10-year ‘A’ rated corporate bond is estimated to be 3.0%. We therefore want to determine the portfolio default rate for which there is no greater than a 3% chance that it will be exceeded by the observed default rate by maturity. For the highly diverse pool underlying chart 1, this portfolio default rate is 28%. That is to say, the probability of exceeding a 28% default rate is no greater than 3.0%. But, since we are working with estimated probabilities of default for the assets in the portfolio, we multiply the 28% by an adjustment factor, which is 1.02 at the ‘A’ rating category. This yields an ‘A’ SDR of 28.56% for the portfolio. A consequence of this methodology for this rating category is that if a tranche can survive defaults less than or equal to the ‘A’ SDR, then its probability of default would be no greater than 3.0%, as would be appropriate for an ‘A’ rating.

The CDO Evaluator replaces the Risk Tabulator Model and the CDO Structuring Model, respectively, used for CDOs backed by ABS (asset-backed securities) and corporate bonds/loans. Unlike these two models, the CDO Evaluator does not use notching penalties for high industry concentration. Instead, it relies on the effects of correlation upon the SDRs to inhibit industry concentration. In addition, it can work with hybrid portfolios of both ABS and corporates. Moving beyond the traditional task of determining SDRs, the CDO Evaluator computes new CDO benchmarks, which may prove useful in describing the credit quality of a portfolio. These include industry friendly measures of default, variability, and correlation. (These measures are explained in Standard & Poor’s Structured Finance Special Report entitled “New Benchmarks Overcome Shortcomings of Traditional CDO Evaluations”).
Conceptual Framework
Although the CDO Evaluator methodology is the same for all types of collateral, the conceptual framework is best understood in the context of a specific example. For ease of reference we chose an ABS CDO transaction. Chart 2 is a schematic of an ABS CDO supported by a number of ABS securities. The ABS securities are securizations of asset-pools, consisting of credit card receivables, auto loans, mortgages, or other pools of financial instruments. For the purpose of the example, we will assume that an ABS security will default because the underlying pool of assets is experiencing too many defaults. In general, the probability of the ABS security defaulting is assumed to be the one implied by its Standard & Poor’s credit rating. For example, based on historical studies Standard & Poor’s uses a default probability of 8% for a ‘BB’ ABS security (see chart 2, and the section on Asset Default Probabilities below for a more detailed discussion).

![Chart 2 Conceptual Framework for CDO of ABS](image)

Given that ABS securities derive their performance largely from the asset pools that collateralize them, it follows that the default correlation that exists between such securities is primarily a consequence of the performance correlation between the asset pools that support them. In general, asset-pool correlation reflects the increased likelihood that one pool will perform poorly (or well) given that another has performed poorly (or well). This may be based on the impact of general economic conditions, as well as on issuer or industry specific conditions or events. For example, the performance of auto loans and credit card receivables may be adversely affected by higher unemployment. If this is the case, then the auto ABS security and the credit card ABS security collateralized by these kinds of asset pools will tend to default together and thus are also correlated.

The framework described above in the context of ABS securities is equally applicable to corporate securities. In this case, the economic performance of an obligor (typically a corporation) would generally be correlated with that of other obligors belonging to similar industry sectors or to industries that may be affected by general economic events in the same manner.

The CDO Evaluator addresses correlation primarily at the underlying obligor/asset-pool level and assumes that it can be expressed in terms of a pair-wise sector correlation table. The advantage of studying correlation at the obligor/asset-pool level, rather than the portfolio level, is that it allows issuers and investors to focus on the general correlation assumptions governing the performance of industries, broad asset-pool classes and the economy as a whole, rather than on the considerably less transparent relationship between
securities or tranches with different positions within the capital structure of their respective issuing entities.

The emphasis placed on modeling correlation in the CDO Evaluator is due to the profound effect that correlation can have on the level of SDR for various credit ratings. Chart 4 vividly shows the effects of correlation on the entire probability distribution of default rates for an ABS CDO consisting of 50 assets, from five different sectors, assuming all securities are rated 'B'. As can be seen in the chart, the mean remains unchanged, but extreme values become more likely. Most affected are the SDR for the higher credit rating categories. For example, with no correlation the 'AA' SDR is 31%. Assuming our current ABS sector correlations, the 'AA' SDR increases to 49% (see chart 3).

Monte Carlo Simulation
To properly model the effect of correlation on the CDO asset pool, Standard & Poor's has adopted a Monte Carlo approach to estimating the probability distribution of default rates. Within this approach, a number of independent trials are simulated. Each trial generates a vector of random numbers equal in length to the number of assets and having the desired correlation structure. For each trial, each asset represented in this vector is then determined to have either defaulted or not, based on the value of its associated random number, in a manner calibrated to be consistent with the probability of default associated with that particular asset's credit rating. The total principal balance of defaulted assets is then tallied up and expressed as a percentage of the total portfolio principal balance. This result represents the default rate for the trial. Collecting all such observed default rates generates a probability distribution for default rates. (See the appendix for a more detailed description.)

The transparent and proven Monte Carlo methodology is no longer difficult to use, given today's fast PCs with superior computing power. The methodology is robust due to its ability to deal with complex relationships between variables. It can fully handle the effects created by portfolios containing assets that are unequal in principal balance, credit rating, and maturity. The Monte Carlo approach enables one to simulate the behavior of a system as it is modeled and then simply to observe the results, thereby avoiding the need to determine these results analytically. For example, capturing the effect of correlation, which is difficult, if not impossible to do analytically, is relatively easy by using the simulation methodology. The methodology makes it possible to include the effects of other important variables, such as concentration...
effects due to servicers, portfolio managers, year of origination, and shared names. These latter variables are not modeled in the current version of the CDO Evaluator, but may be included in the future, as the methodology is refined.

Counter-intuitively, the Monte Carlo methodology can achieve virtually the same degree of precision as a purely analytical methodology, if one were available. This can be illustrated by the problem of computing the probability of winning by betting on red in roulette. When the wheel has 38 slots of which 18 are red, one can easily determine the probability of winning analytically to be 18/38 or 47.37%. Chart 5 depicts the Monte Carlo estimate after a number of different trials. Initially, there is considerable flux, but by 10,000 trials the estimate has settled down to 47.37%. The theme in this chart is one of short-term fluctuations and long-term certainty (see chart 4).

![Chart 4](image)

**Chart 4**

**Cumulative Percent Win**

Clearly, the key to successfully using Monte Carlo simulation techniques is one of performing enough trials to capture long-term certainty. Today’s PCs are fast enough to perform enough trials in a reasonable period of time. For example, it typically takes 30 seconds for 15,000 trials on a portfolio of 100 assets. It takes 2.5 minutes for 100,000 trials on the same portfolio. We recommend the smaller number of trials for initial structuring and request the larger for the final structuring run.

**Portfolio Inputs**

The CDO Evaluator allows the user to input the wide variety of corporate and ABS assets that are currently used in CDO portfolios. The basic information required of each asset is the issuer ID, the par amount, the maturity date, the industry group, and the Standard & Poor’s corporate issuer rating or ABS tranche rating. Presently, there are 40 industry categories, including CDOs, and approximately 20 ABS categories, with the latter consisting of four different basic ABS types in five different geographic areas.

**System Parameters**

While the portfolio inputs are the only variables directly accessible by the user, there are three other sets of system parameters that affect the results given by the CDO Evaluator. These parameter sets are the sector correlation coefficients (which measure the pairwise correlated performance of obligors and underlying pools of receivables and similar obligations within and between sectors), the table of default probabilities for
assets, and the table of default probabilities for CDO tranches.

**Correlation Coefficients**
The CDO Evaluator uses a correlation coefficient of 0.3 within an ABS sector and 0.1 between ABS sectors. For corporate sectors, it uses 0.3 within a given industry and 0.0 between industry sectors. Table 1 lists the corporate industry and ABS sectors. Standard & Poor's believes that correlation will receive considerable attention from market participants in the coming years. As data becomes available, the correlation coefficients will be modified based on documented studies. It should be noted that the Standard & Poor's methodology of estimating correlation coefficients by sectors, rather than assets, leads to asset default correlations that decrease as the asset credit ratings become stronger. This is consistent with the historically observed correlation behavior of corporate obligors. For example, within an industry sector the default correlation between an 'AA' corporate and a 'BBB' corporate is computed to be 4.45%, while between a 'BB' corporate and a 'B' corporate it is 12.72%.

<table>
<thead>
<tr>
<th>Corporate Industry Sectors</th>
<th>ABS Sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace and defense</td>
<td>CDO</td>
</tr>
<tr>
<td>Air transport</td>
<td>ABS consumer</td>
</tr>
<tr>
<td>Automotive</td>
<td>ABS commercial</td>
</tr>
<tr>
<td>Beverage and tobacco</td>
<td>CMBS Diversified (conduit and CTL)</td>
</tr>
<tr>
<td>Radio and television</td>
<td>CMBS (large loan, single borrower, and single property)</td>
</tr>
<tr>
<td>Brokers, dealers, and investment houses</td>
<td>REITs and REOCs</td>
</tr>
<tr>
<td>Building and development</td>
<td>RMBS A</td>
</tr>
<tr>
<td>Business equipment and services</td>
<td>RMBS BandC, HELs, HELOCs, and tax lien</td>
</tr>
<tr>
<td>Cable and satellite television</td>
<td>Manufactured housing</td>
</tr>
<tr>
<td>Chemicals and plastics</td>
<td>U.S. agency (explicitly guaranteed)</td>
</tr>
<tr>
<td>Clothing/textiles</td>
<td>Monoline/FER guaranteed</td>
</tr>
<tr>
<td>Conglomerates</td>
<td>Non-FER Company Guaranteed</td>
</tr>
<tr>
<td>Containers and glass products</td>
<td>FFELP student loans (Over 70% FFELP)</td>
</tr>
<tr>
<td>Cosmetics/toiletries</td>
<td>Project finance</td>
</tr>
<tr>
<td>Drugs</td>
<td></td>
</tr>
<tr>
<td>Ecological services and equipment</td>
<td></td>
</tr>
<tr>
<td>Electronics/electrical</td>
<td></td>
</tr>
<tr>
<td>Equipment leasing</td>
<td></td>
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<tr>
<td>Farming/agriculture</td>
<td></td>
</tr>
<tr>
<td>Financial intermediaries</td>
<td></td>
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<tr>
<td>Food/drug retailers</td>
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<tr>
<td>Food products</td>
<td></td>
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<tr>
<td>Food service</td>
<td></td>
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<tr>
<td>Forest products</td>
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<tr>
<td>Health care</td>
<td></td>
</tr>
<tr>
<td>Home furnishings</td>
<td></td>
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<tr>
<td>Lodging and casinos</td>
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<tr>
<td>Industrial equipment</td>
<td></td>
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<tr>
<td>Insurance</td>
<td></td>
</tr>
<tr>
<td>Leisure goods/activities/movies</td>
<td></td>
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<tr>
<td>Nonferrous metals/minerals</td>
<td></td>
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<tr>
<td>Oil and gas</td>
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<tr>
<td>Publishing</td>
<td></td>
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<tr>
<td>Rail industries</td>
<td></td>
</tr>
</tbody>
</table>
Asset Default Probabilities

Default probabilities for individual assets are assumed to be implied by that particular asset's type (corporate obligor, ABS, municipal security), credit rating and maturity. For example, historical ABS defaults rates are lower than corporate rates and are not as sensitive to final maturity. This may be due to the fact that many ABS securities experience a seasoning effect, as is the case with residential mortgages. All ABS securities are assumed to have a seven-year weighted-average life, with default rates that reflect the results of our ABS default studies. The default rates for corporate assets continue to be differentiated by rating and maturity as used in the previous Standard & Poor's CDO models. They reflect the results of the Standard & Poor's default study of corporate obligors. A portion of the asset default table is displayed in table 2.

<table>
<thead>
<tr>
<th>Security</th>
<th>Maturity</th>
<th>AAA</th>
<th>AA</th>
<th>A</th>
<th>BBB</th>
<th>BB</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS</td>
<td>All</td>
<td>0.25</td>
<td>0.50</td>
<td>1.00</td>
<td>2.00</td>
<td>8.00</td>
<td>16.00</td>
</tr>
<tr>
<td>Corporate</td>
<td>Year 4</td>
<td>0.19</td>
<td>0.57</td>
<td>0.81</td>
<td>1.81</td>
<td>9.48</td>
<td>21.45</td>
</tr>
<tr>
<td>Corporate</td>
<td>Year 7</td>
<td>0.52</td>
<td>1.20</td>
<td>1.81</td>
<td>3.94</td>
<td>14.20</td>
<td>26.15</td>
</tr>
<tr>
<td>Corporate</td>
<td>Year 10</td>
<td>0.99</td>
<td>1.99</td>
<td>3.04</td>
<td>6.08</td>
<td>17.47</td>
<td>28.45</td>
</tr>
</tbody>
</table>

All default probabilities used for sizing of the CDO tranches to be issued by a transaction are designed to be consistent with corporate default probabilities, as given in table 1. CDOs are more like finance companies than asset pools and have the inherent risks of highly levered, actively managed products. The fact that the CDO may only manage ABS assets, in and of itself does not liken these vehicles to a structured ABS portfolio.

For a given tranche rating, one should use the corporate portion of table 1, selecting the probability of default assigned to the corporate bond with the desired rating and with a maturity equal to the weighted average portfolio maturity. If the weighted average portfolio maturity is not a whole number, then interpolation is used. The subsequent steps of determining the appropriate SDR for the tranche are discussed in some detail in the previous section entitled "CDO Evaluator."

Comparison of Results

Because the CDO Evaluator uses specific ABS default rates for ABS portfolio assets, but continues to size tranches based on corporate default rates, the SDRs produced by the CDO Evaluator for ABS portfolios may be significantly lower than those obtained under the Risk Tabulator model. The difference is most pronounced for lower-rated tranches. However, exceptions may occur for portfolios that have heavy concentrations in a few sectors. A comparison of the SDRs generated by the CDO Evaluator and the Risk Tabulator for one typical ABS transaction is given in chart 5.
SDRs for corporate assets are comparable to those obtained under the previous CDO Structuring Model. Because the effects of correlation are more pronounced for higher-rated tranches, these tranches will often have SDRs that may be slightly greater than before. In contrast, lower-rated tranches often have lower SDRs. A comparison for one typical transaction is given in chart 6.
Cash Flow Verification
As seen in the foregoing discussion, the CDO Evaluator creates for each portfolio a probability distribution of defaults and a set of SDRs. A different step in the rating process for cash flow CDOs is the cash flow analysis. The purpose of this step, which is not part of the CDO Evaluator, is to verify that each CDO tranche can continue to pay principal and interest in accordance with its terms notwithstanding defaults up to the SDR on the underlying portfolio. This is accomplished through the detailed modeling of the proposed transaction's cash flow (the waterfall), taking into consideration all structural elements of the transaction. These structural elements may include any reserve accounts, various accelerated amortization triggers, as well as overcollateralization and interest-coverage tests. The cash-flow analysis also incorporates the effect of various hedging instruments and contracts, such as interest rate swaps and caps.

An important element of the cash flow analysis is the appropriate treatment of any recoveries on the defaulted portfolio. This means modeling both the timing of recoveries and the recovery rates. It is beyond the scope of this article to discuss cash flow modeling, other than to mention that the SDR associated with the particular rating for a given CDO tranche is an element of the cash flow analysis. Defaults on the assets, together with recoveries on such defaults, affect the cash-flow available to pay off the CDO tranches.

Modeling Correlation
The following discussion gives a more detailed mathematical exposition of how correlation is modeled and how the Monte Carlo simulation is performed. Each asset is assumed to reflect the performance of either an underlying pool of collateral (e.g. auto loans) or the obligor. Assume that there are N assets and let X(i) denote the performance the pool/obligor supporting the i-th asset, with poor performance corresponding to large values of X(i). Hence, the event that the i-th asset defaults is equivalent to the event that X(i) exceeds some quantity z(i). The quantity z(i) is chosen so that the probability of X(i) exceeding z(i) is equal to the default probability determined for the asset, given its rating and tenor, from the asset default table (see table 2 and chart 7).

It is convenient to assume that the probability distribution of X(i) is the normal distribution. Without loss of generality, it may be assumed that the mean is 0 and the standard deviation is 1. Otherwise, the variable X(i) may be transformed to have such a mean and variance, and the same transformation may be applied to z(i), which leaves the probability of the transformed random variable exceeding the transformed z(i) unchanged.

The above assumption implies that the joint distribution for the random vector X = X(1),X(2), ... , X(N), which is the collective performance of the pools/obligors, is multivariate normal with a mean vector of 0's and a covariance matrix equal to its correlation matrix. The correlation matrix may be chosen to reflect the correlation structure that is assumed to exist among the industry and ABS sectors. That is to say, a value of 0.3 is chosen for the matrix if two pools or obligors come from the same sector, a value of 0.1 for two ABS sectors.
pools not from the same sector, and 0.0 for all other off-diagonal cells. Chart 8 illustrates the joint bivariate distribution of two underlying asset pools, together with their marginal distributions. Also marked are the regions of the bivariate distribution where either or both of the two securities collateralized by their respective pools will default (see chart 8).
Monte Carlo Simulation
The simulation process requires that a large number \( T \) of trials be drawn. Each such trial \( t \) is an independent realization of the random vector \( X \). For that realization, each component \( X(i) \) of \( X \) is compared to \( z(i) \) and if it is greater, then asset \( i \) is deemed to have defaulted. The principal balances of all defaulted assets are added together and the resulting sum, dividing by the total initial portfolio balance, is the observed default rate for that trial. All trials are tabulated and used to create an estimated probability density function for default rates.

The process of generating random drawings from a multivariate normal distribution with a known correlation matrix is relatively easy.

For example, one may begin by generating a sequence of \( N \) independent random variables drawn from a uniform distribution. Then one may convert these into a sequence of independent random variables drawn from a normal distribution with mean 0 and variance 1 by applying the inverse normal function. These \( N \) variables may then be transformed into a multivariate normal distribution by pre-multiplying by an \( N \) by \( N \) matrix \( M \). To obtain the desired correlation structure, the matrix \( M \) is chosen to be the Cholesky decomposition of the targeted correlation matrix.

CDO Monitor
Standard and Poor's CDO Monitor is a software program designed to monitor the total dollar loss that the CDO transaction has already or may incur in the future, relative to the maximum amount of losses the transaction can support at each original rating level. The program is based on the CDO Evaluator, but goes further and is specific to each deal and each rated tranche. Once the transaction has become effective and the effective portfolio is verified to make sure that it meets the modeled parameters done prior to closing, Standard & Poor's will provide each transaction structured with its own customized CDO Monitor. Hard coded in this program is the size of the asset pool and the original default rate that each tranche can sustain without violating its assigned rating. Going forward in the transaction, each time the program is run, the program looks at the current portfolio balance and the current portfolio default rate at each rating level. If the current potential default amount on the current portfolio exceed the total dollar amount of losses calculated through cash flows at closing for that particular rating, minus the losses incurred to date on the portfolio, then the program indicates a failure of the test. For example, if the cash flows at closing showed that for that rating level the transaction could sustain up to \( X \) amount of dollar losses, the Monitor looks at the current portfolio default rated times the current portfolio balance and compares this with \( X \) minus adjusted par losses incurred to date. If the potential losses on the current portfolio were greater than \( X \) minus par adjusted par losses to date, then the Monitor would indicate a failure. Obviously, if there were gains in portfolio par since closing, the potential loss on the current portfolio could increase without failing the test.

This comparison is known as the CDO Monitor Test for each rated tranche. If the manager chooses to use this test in the transaction, the test is required to be run on every measurement and determination date. Furthermore, the collateral manager for sensitivity analysis may use the Monitor on a more frequent basis.

The primary input for the CDO Monitor is the current collateral pool of the particular transaction. The Input page is identical to that of the CDO Evaluator. For a description of each required field, please refer to the CDO Evaluator section.

The CDO Monitor also requires an "As of Date," from which the tenor of the Assets is computed. The "As of Date" will be the determination or measurement date for all indenture required CDO Monitor Tests and any specified date for a collateral manager running hypothetical portfolios. The "As of Date" allows the program to calculate the maturity exposure period for each assets based on the asset's specific maturity date. Thus the portfolio manager can run different future dates and see what will happen with the Monitor Test until the end of the reinvestment period, assuming no further changes in par due to gains or losses.

The output of the CDO Monitor Test consists of three components for each tranche: the Break-Even Default Rate, the Scenario Default Rate (SDR), and whether the test is a pass or a fail.

The break-even default rate is the maximum percentage of defaults a collateral pool can sustain and still pay ultimate principal and all due interest (timely or capitalized) to the tranche. Each tranche will have a
different break-even default rate. This rate is initially set during the rating process by Standard & Poor's, based on the variety of cash flow runs performed.

Each time the CDO Monitor test is performed the break-even default rate is adjusted to reflect any par gains or losses in order to reflect that there are sufficient funds to meet timely or capitalized payment of principal or interest. Thus, as losses occur the break-even default rate for that rating changes.

The scenario default rate is the level of defaults the collateral pool is expected to experience during a given period of economic stress. For example, in an 'AAA' scenario, this collateral pool is expected to have X% default. This X% is known as the 'AAA' SDR.

The CDO Monitor Test Result for a particular tranche is a pass if the break-even default rate is higher than the SDR, otherwise, the test is a fail. Using the CDO monitor allows the collateral manager a great deal of flexibility in selecting securities because the test always factors in the underlying default characteristics and lumpiness of the assets. For example, a large number of CDOs have a 5% 'CCC' collateral bucket limit, which is not imposed by Standard & Poor's. If the manager exceeds this, they may be required to take certain actions. But this limitation does not factor in the maturity and the associated risk for such collateral.

A 5% 'CCC' concentration with assets maturing one year from now will likely add less default risk to the transaction than a 4% 'CCC' concentration maturing 10 years from now. The CDO evaluator captures and reflects such risks. By using the CDO monitor, the collateral manager can fine-tune the portfolio. If he has gone long on 'CCC' exposure, then he will need to improve the ratings or shorten the exposure on other assets to maintain the same default probability. For these reasons, most collateral managers find the CDO monitor to be an effective and flexible tool for monitoring portfolio risk and doing what-if reinvestment analyses.
Portfolio Benchmarks

Introduction
To assist issuers, managers, and investors in evaluating CDOs, Standard & Poor's introduced a set of new CDO benchmarks. Among these are statistics that describe three key portfolio characteristics: the Expected Portfolio Default Rate (EPDR), the Standard Deviation of the Portfolio Default Rate (SD), and the Weighted Average Correlation (WACorr) of the assets in the Portfolio. For the purpose of assessing the credit quality of a tranche issued by a CDO, Standard & Poor's has developed a new type of statistic called the Rated OC, or ROC. It calculates the effective overcollateralization of a tranche, given its credit rating. It overcomes many of the shortcomings of the traditional OC method of measuring overcollateralization. Going forward, Standard & Poor's will seek to make available these benchmarks upon pricing and monthly thereafter on all CDO transactions rated by Standard & Poor's.

Expected Portfolio Default Rate
The statistic Expected Portfolio Default Rate, or EPDR, is the weighted average portfolio default rate. As such, it has a clear, easily understood meaning: it is the expected default rate of the portfolio, based on the asset default rates specified in the Standard & Poor's CDO Default table, which in turn is based on historical default rates as compiled by Standard & Poor's. Unlike other measures of average default currently in use, it encompasses all assets in the portfolio, including defaulted securities and cash. Moreover, it reflects the actual remaining life of the assets, rather than some fixed hypothetical remaining life. The use of the latter would increasingly distort the default probabilities of the portfolio as the actual average remaining life shortens over time. In introducing the EPDR, Standard & Poor's has sought to provide the investment community with a simple, intuitive, and unbiased estimation of portfolio credit quality.

Standard & Poor's will also provide an annualized version of EPDR that will measure the expected annual default rate. Since the expected annual default rate is a parameter frequently used in projecting the performance of a CDO, we believe that it will be constructive for the CDO markets to have an independent, Standard & Poor's derived estimate of this parameter for each CDO.

The EPDR may formally be translated back to give a Weighted-Average Rating (WAR) for the portfolio. To do this, it is necessary to compute the Weighted-Average Maturity (WAM) of the portfolio, weighting by par amounts, and to compute for that maturity the interpolated default probabilities for each rating category. The portfolio WAR is then defined to be the rating that has the least probability of default that is equal to or greater than the EPDR.

It is important to note that a WAR for a CDO portfolio is significantly different from the rating of a corporate bond. While both may have the same EPDR, their respective risk profiles are apt to be substantially different. Similarly, two portfolios with the same EPDR and therefore WAR may also be quite different. Standard & Poor's quantifies these differences thorough the statistic discussed next.

Standard Deviation of Portfolio Default Rate
The statistic Standard Deviation of Portfolio Default Rate, or SD, measures the variability of the default rate about its expected value. Many professionals in finance are familiar with standard deviation and its use in measuring the likelihood of various default rates. It is also a key input parameter in value at risk systems. As applied by Standard & Poor's, this statistic captures the effects created by asset variability in size, credit rating, and maturity. Moreover, it explicitly takes into account the correlation between assets in the portfolio. In doing so, it reflects the effective diversity of the portfolio, but does so in a manner that creates a clear direct connection between the value of this statistic and the degree of variability in the portfolio's default rate.

The formula utilized by Standard & Poor's is a general statistical formula that is independent of any distributional assumptions. As seen in the "Mathematical Descriptions"section following, SD is a function of each asset's size, probability of default, and pair-wise correlation. The probability of default is a function of rating and maturity.

The estimation of the pair-wise correlation coefficients requires some care, as they depend not only upon the asset types, but also upon the ratings of the instruments. Assuming that macro economic activity may
be modeled as a multivariate normal process. Standard & Poor's has derived analytical formulas that permit the correlation between two securities to be derived from their respective credit ratings and an estimate of the correlation of the economic activity of their respective industry sectors. This methodology allows the user to focus on the general correlation assumptions governing industries and the economy as a whole, rather than on the considerably less transparent relationship between securities or tranches with different positions within the capital structure of their respective issuing entities.

Standard & Poor's is conducting research on historical correlation rates within and between industry and ABS sectors. Based on preliminary results, Standard & Poor's is using a correlation coefficient of 0.3 within both the ABS and corporate sectors, 0.1 between ABS sectors, and 0.0 otherwise. The 0.3 within coefficient has been incorporated into models used by some major investors in these sectors. The 0.3 corporate coefficient is also consistent with the implicit correlation produced by the notching methodology of the previously used CDO Default Model.

It should be noted that the Standard & Poor's methodology for estimating correlation coefficients leads to default correlation coefficients that decrease as the probability of defaults decreases. This is consistent with the historically observed correlation behavior of corporate bonds. For example, within an industry sector the default correlation between an 'AA' corporate and a 'BBB' corporate is computed to be 0.0445, while between a 'BB' corporate and a 'B' corporate it is 0.1272. This is in marked contrast to some other diversity measures for corporates that implicitly hardwire correlation to be the same across all credit ratings.

**Weighted Average Correlation**

As expected, correlation has a substantial effect upon the Standard Deviation of Portfolio Default Rates and places limits on the ability of the portfolio manager to diversify away variability in the default rates. Consequently, Standard & Poor's has developed a statistic to quantify the amount of correlation in a portfolio. It is defined as the one correlation coefficient applied to all pairs of assets that gives the same value for the standard deviation as obtained when using the actual correlation coefficients between assets. For a typical high-yield CDO, this Weighted-Average Correlation may be in the range of 0.007. To measure the impact of correlation upon the standard deviation, Standard & Poor's utilizes the ratio of the standard deviation (computed with correlation) to the standard deviation computed without correlation. For a typical high-yield CDO it may be in the range of 1.3. That is to say, the standard deviation is 30% larger due to correlation. For a highly rated CDO tranche, the required Stressed Default Rate that a tranche must be able to sustain without defaulting is often several standard deviations greater than the EPDR. Hence, a 30% larger standard deviation may increase the Stressed Default Rate by a multiple of this increase.

**Rated OC or ROC**

While monitoring portfolio statistics gives direct insight into the initial or current credit risk profile of a portfolio and how it has changed over time, it does not provide direct insight into the level of support that a tranche truly enjoys. For example, a tranche with an EPDR of 10% and a SD of 5% may or may not be better collateralized than a tranche with an EPDR of 20% and an SD of 8%.

To address this issue Standard & Poor's developed the Rated OC or ROC statistic, which estimates the effective over-collateralization of a tranche. Unlike the traditional OC, the Rated OC explicitly takes into consideration three of the most important components of support for a tranche: the credit quality of the portfolio, the recovery rate, and the excess coupon available to support additional principal. A value equal to 1.0 or greater is an indication that there is sufficient support in the CDO to maintain the tranche's rating.

The Rated OC or ROC for a tranche is determined by dividing the amount of tranche debt that can be supported by the collateral at the tranche credit rating by the actual amount of debt that must be supported to avoid a default for the tranche. The result may be interpreted in several different ways. For example, an 'AA' Rated OC may be viewed as the ratio of the 'AA' equivalent par value of the portfolio to the principal amount of the tranches that are rated 'AA' or better. It may also be interpreted as specifying the proportion of the portfolio that may be discarded without affecting the 'AA' rating of the tranche. This proportion, called the Excess Percentage, is approximately the amount that the statistic exceeds 1.0. More details on the computation can be found in the section "Mathematical Descriptions".

The Rated OC effectively addresses many of the shortcomings of using a portfolio's principal balance as a measure to assess the degree of overcollateralization of a tranche. It is much less vulnerable to several
portfolio management strategies that game the OC: selling strong credits and purchasing weaker credits at a discount to improve OC, selling down in coupon to improve OC, and trading into assets with lower recoveries to improve OC. It is less vulnerable because it explicitly takes into account credit quality, excess interest coupon, and recoveries. Consequently, the Rated OC contributes to solving the problem of how to capture the true overcollateralization of a tranche without making a cash flow CDO into a market value CDO.

While the Rated OC has significant strength and is conceptually simple, it is not intended to be a substitute for the more in-depth rating process required when rating or surveilling bonds. Such activities must explicitly consider the cash flow waterfall and the many different scenarios that affect the ability of the collateral to support a tranche, including various default timing patterns and interest rate paths. Consequently, a Rated OC of a value greater than 1 is no guarantee that the tranche will not be downgraded. Nevertheless, this statistic provides valuable insight into the effective degree of support enjoyed by a tranche.

**Mathematical Descriptions**

The previous discussion can be given greater clarity by using mathematical notation. For computing the Expected Portfolio Default Rate, let \( P(i) \) be Standard & Poor’s default rate for the \( i \)-th asset, let \( B(i) \) be the principal balance of the \( i \)-th asset, let \( N \) be the total number of assets, and let \( TB \) be the total principal balance of the portfolio. Then

\[
EPDR = \frac{P(1)B(1) + P(2)B(2) + \ldots + P(N)B(N)}{TB}
\]

For determining the Standard Deviation of the Portfolio Default Rate, also let \( R(i) \) be the ratio of the principal balance of asset \( i \) to the total portfolio principal \( TB \), let \( C(i,j) \) be Standard & Poor’s correlation coefficient between the \( i \)-th and \( j \)-th assets, and let \( S(i) = \sqrt{P(i)(1-P(i))} \). Then the standard deviation \( SD \) for the portfolio default rate is

\[
SD = \left( \sum_{i=1}^{N} \sum_{j=1}^{N} R(i) \times R(j) \times S(i) \times S(j) \times C(i,j) \right)^{1/2}
\]

The portfolio’s Weighted Average Correlation, \( WACorr \), may be obtained by the formula

\[
WACorr = \left( \frac{\sum_{i=1}^{N} \sum_{j=1}^{N} R(i) \times R(j) \times S(i) \times S(j) \times C(i,j)}{\sum_{i=1}^{N} \sum_{j=1}^{N} R(i) \times R(j) \times S(i) \times S(j)} \right)
\]

The effect of correlation upon the portfolio standard deviation, \( SD \), may be measured by the Correlation Ratio, \( CR \), which gives the proportional increase in standard deviation due to correlation. It may be computed by the formula

\[
CR = SD / \left( \sum_{i=1}^{N} R(i)^2 \times S(i)^2 \right)^{1/2}
\]

The Rated OC or ROC for a tranche is determined by dividing the principal amount of debt that can be supported by the collateral at the tranche rating to the actual amount of debt that must be supported to avoid a default for the tranche. The amount that can be supported is estimated as the sum of the amount of collateral that will not default at the rating, the amount of principal recovered after default, and the additional principal that can be supported by the available excess coupon interest. Each component involves its own calculation. The amount not defaulted is the principal amount remaining after subjecting the collateral to the Stressed Default Rate (SDR) for the tranche rating, as computed by Standard & Poor’s CDO Evaluator. The
SDR represents the maximum default rate that the tranche must be able to sustain without defaulting, given its rating and the credit quality of the portfolio. The amount recovered is the present value at default (or at the As-of-Date, if already defaulted) of future recoveries at the applicable Standard & Poor's recovery rates. The value of the excess coupon spread depends upon the coupons of the tranche and all senior and pari passu tranches, and how quickly the Stressed Default Rate is realized for the portfolio. For simplicity, it is assumed that the SDR level of defaults will be realized at a constant rate over the first five years of the remaining maturity of the collateral.

The proportion of the collateral that may be discarded without adversely affecting the rating is estimated to be \((1 - (1/ROC))\). For example, a ROC of 1.05 suggests that 4.8% of the portfolio is not needed for the rating.

**CDO Manager Quality: A Critical Consideration**

CDOs have become a mature investment vehicle and an important liquidity source for the high-yield and leveraged-loan markets. As non-investment-grade markets experience turbulence and many of the early CDO deals season, differentiating between CDOs is becoming more and more important.

CDO investors face many considerations when picking an appropriate transaction for purchase. CDO structure, projected economic assumptions, and manager quality are the most important drivers for success, regardless of where in the capital structure the investment is taking place.

Of the three factors influencing CDO performance, manager quality is probably the most important and difficult to predict. As evidenced by the table below, manager performance within an asset class/vintage can vary dramatically. This variance can be seen when deals of similar asset class/vintage are compared on several dimensions.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Top 10</th>
<th>Bottom 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defaulted Securities Held (%) of collateral</td>
<td>0.10%</td>
<td>13.91%</td>
</tr>
<tr>
<td>Total Sales Net Losses (%) of collateral</td>
<td>0.02%</td>
<td>1.29%</td>
</tr>
<tr>
<td>Recoveries (% of par, for deals with recoveries)</td>
<td>49.49%</td>
<td>2.55%</td>
</tr>
</tbody>
</table>


Managers face many challenges in running CDOs, which make them more difficult to address than a typical total-return strategy. In turn, this makes anticipating their performance difficult.

The conflicting interests of the investors present one challenge in running CDOs. CDO investors are typically composed of senior noteholders, mezzanine noteholders, and equity holders (investors absorbing first loss). These investors have different interests regarding portfolio contents. Senior noteholders typically desire more highly rated assets in the portfolio, while equity holders favor assets that produce higher yield. The mezzanine noteholders want to balance the portfolio's risk and yield to insure their continuing interest payments and the eventual return of their principal. Every investment and divestment decision confronts the manager with this dilemma. These decisions become more difficult when the investors' original expectations (with reference to interest payments, principal return, and expected equity returns) are in jeopardy.

The restrictions and requirements of CDO structures are also complicating factors. For example, cash flow CDOs measure performance by comparing the par amount of the assets to the outstanding liability amount. A manager may choose to keep these ratios above their thresholds by purchasing discounted or lower rated securities, which improves the total par value of the portfolio while potentially sacrificing overall credit quality. Portfolio studies have shown that as these credits season, their default rates do increase, causing additional collateralization test issues, which in turn may lead to more speculative purchasing. These sorts of issues do not present themselves in a typical total-return strategy.
Standard & Poor's will address the issues of CDO structure and economic assumptions separately. To this extent, this article will discuss the various factors that investors should take into account when assessing a CDO manager.

Comprehensive CDO Manager Analysis
The goal of any CDO manager analysis is to attempt to anticipate, as well as possible, how well equipped the CDO team is to meet the diverse needs of a variety of constituents. Given the complexity of the analysis and the poor availability of data, it is necessary to take a multifaceted approach. The three major elements that must be assessed are: the team and the organization, the performance of the existing deals, and the operational, systems, and compliance infrastructure. To aid in this assessment, Standard & Poor's is introducing CDO Manager Focus, a new approach for analyzing CDO managers.

CDO Team Focus
Examining the team, its organizational support, depth, stability, and investment process is a critical component of evaluating a CDO manager. This analysis should be revisited annually, with major personnel/organizational changes, or new deals prompting reexamination.

Organizational Resources
In order for a CDO team to be successful, it is vital that the sponsoring entity has the wherewithal and resources to support the manager. This includes having the ability to properly resource the team with personnel, technology, and appropriate capital. It is also helpful if a firm has the ability to help the team in other areas whenever possible. For instance, if a company has a significant convertible bond operation, it may be able to lend additional ideas, support, and redundancy to the convertible bond specialist dedicated to the CDO group.

In addition, corporate motives must be examined. The CDO business is complex and should only be entered by companies that understand the scope of the commitment needed. It is important that the sponsoring organization recognizes its strategic importance and differentiates it from the total return strategies of its other assets under management.

Manager and Team Asset Expertise
The first step is ascertaining the asset classification in which the manager is specializing. A typical CDO will have restrictions on the asset types that a collateral manager may purchase. For example, a high-yield CDO may limit all investments to only high-yield bonds. Other CDOs may allow the inclusion of several different asset types, such as bonds, loans, and asset-backed or emerging-market securities. A CDO manager and the supporting team must have an in-depth understanding of the eligible assets to be purchased by the CDO. Thus, it is important that the asset class categorization is accurate and does not attempt to overstate the experience of the management team by assuming, for instance, that competence in high-yield corporate debt qualifies the team to competently manage an emerging-market or structured finance portfolio. Once the categorization is established, Standard & Poor's seeks to ascertain whether a manager and supporting team have sufficient experience with the relevant asset types.

A manager should have a several-year track record with the specific asset types that will be included in the CDO. Recommended seasoning varies by asset class and by market cycles experienced. It is generally a risky proposition if the manager is taking opportunistic positions in securities that are not in his/her (or the firm's) core competency.

In addition to the "core asset classes" for a given strategy, it is also important that a team have expertise in some other disciplines, such as hedging (for currency and interest rate hedging), workouts (particularly if the firm's strategy is to allow troubled issues to default and subsequently try to work them out), trading, and CDO structural compliance.

Besides the breadth of portfolio manager experience, it is also vital to examine the credit analytic team. Four important criteria include coverage levels, asset class, sector specialization, and team experience. If a team of three analysts is expected to cover 100 volatile, emerging market debt issues, it is unlikely that each member will offer sufficient analytical oversight, regardless of their individual level of expertise. These guidelines can vary from asset class to asset class. For example, small-cap leveraged loans may require more time to review (and are consequently more labor-intensive) than some other asset classes. Aside from asset class coverage, sector coverage can also be a mitigating factor to support requirements. For example, if a firm opts for a smaller number of sectors per analyst, it may be able to support more issues per analyst,
as the analysts will be able to focus on developments in the industry in question. It is also important that the proper personnel with relevant experience cover the industries they specialize in. Some CDOs have industry diversification requirements—broad company expertise is necessary in these situations. The experience level of the credit analyst is another important consideration. The more experienced an analyst is in a given area, the higher the number of credits he/she can cover. It is also possible that other areas of the asset management organization, such as the equity team, can augment staff efficiency by providing credit-relevant background information on the company and industry.

Manager and Team Structural Expertise
Managers should know the indenture intimately and shouldn't rely on external parties for compliance. To evaluate a manager without CDO expertise, Standard & Poor's will look to his/her prior track record in related asset classes, requiring longer tenure and underweighting this expertise relative to that of a seasoned manager. In situations where a manager lacks specific CDO experience, the organization must compensate by having a compliance officer knowledgeable in CDO structures. This will allow the manager the flexibility to dedicate his/her time to managing credit within the CDO in a downturn. Given this asset class' unique nature, it is desirable to have the portfolio managers run CDOs exclusively, especially those with the same structure.

Team Stability
Another vital area to evaluate is the depth of the team. It is critical that key skill sets in the major asset classes and major disciplines (such as workouts, trading, etc.) have sufficient levels of redundancy. Given the fluid nature of this market, portfolio manager and analyst turnover is quite high. It is therefore important that the process ultimately be replicable should key talent leave the organization.

Financial incentives can go a long way toward improving team stability and aligning its goals with those of the investors. In some cases, organizations or individual managers take stakes in the lower tranches of a deal, which can prove useful in this regard. Typically, equity ownership can align a manager's interest toward the equity tranche, but is typically regarded as a positive because the manager is receiving a direct incentive to maximize returns. The most important incentive, however, is that the manager must try to balance the interests of all the investors in order to launch additional transactions.

Investment Process
The investment process is integral to evaluating a CDO manager. This process can be broken down into several components: credit evaluation, buy/sell discipline, and checks and balances.

The primary component of a CDO investment process is its credit evaluation practices. This ultimately underpins most actions related to the portfolio. The credit evaluation process will vary dramatically from manager to manager. As stated before, some managers will organize by sector, while others will organize by asset class (for example, separate high-yield and investment-grade teams). Some managers rely on equity departments and public information, while others rely on company visits, internally generated cash flow, and residual value calculations.

While the organization of this function and its components are myriad, several practices are considered desirable. Besides having sufficient support and expertise, it is necessary to have periodic reviews, even if no news has emerged about the credit. Company visits or management meetings have varying degrees of usefulness—they are certainly more vital for companies that are smaller or more poorly monitored. Independence is another important element, particularly if the parent company has investment banking or syndication relationships with some of the portfolio obligors. One warning sign of this is a high concentration of assets from a single CDO underwriter. In this case, it is especially vital for the credit team to feel comfortable with each asset on its own merits.

A well thought out, risk-based sell discipline is vital in preserving ongoing interest payments to the investors and helping mitigate defaults. It is important that the stated strategy marketed to the debt and equity investors be consistent with the philosophy of the firm and its strengths. For instance, a firm with a strong workout group may feel that deteriorated assets should be held, possibly even through default, because the recovery terms may be advantageous. An additional benefit of this strategy is that not all deteriorated assets default, which means the CDO will get the advantage of additional interest payments and no par loss, which could result from selling the asset. The exact opposite approach, a high-turnover strategy (if the manager sells before serious credit problems occur), may also be appropriate in that the par erosion of selling these
assets will be mitigated and defaults lessened. Whatever a manager's style, this process needs to be evaluated for consistency, results, and conformity with the firm's strengths.

Checks and balances are a critical component to ensure process integrity. They can be designed in a variety of ways, but the essential characteristics stipulate that the appropriate senior managers and specialists view and approve the actions of the portfolio managers and credit analysts so the full expertise of the firm is utilized. This helps mitigate over-reliance on key personnel, discourages unauthorized trading, and leverages the strengths of the group's most seasoned resources. The establishment of committees to evaluate credit, make purchase decisions, and formulate asset allocation and other policies is also looked upon favorably.

**CDO Performance Focus**

In addition to examining the quality of the team and its practices, the analysis of a CDO manager's quality via performance is critical in determining how a manager is implementing investment policies and assessing their effectiveness. This analysis has two components: the first is examining how a manager actually has performed in the past; and the second is the positioning of the current portfolio. These elements need to be examined from an absolute (how close has the manager come to not meeting his obligations) and a relative (positioning relative to peers) perspective. This analysis will be revisited annually, with downgrades, defaults, or new deals prompting a reexamination.

Typically, direct examination of specific CDOs is crucial because, if a comparison is made to a manager's previous or existing performance in a total-return fund, such a comparison could be misleading for the following reasons:

- Simply measuring the bond returns may be more reflective of how floating-rate securities have performed as opposed to the competence of the manager.
- Equity performance is a helpful tool, but does not take into account the degree of risk taken to achieve that performance, and equity pricing information (to compute the returns) is generally not available.
- CDOs are more restrictive than total-return vehicles, and have reinvestment restrictions and performance triggers that most total return funds do not have.
- To a great extent, cash flow CDOs measure performance by using the par amount of the assets, while total-return funds measure performance by using market value.
- CDOs have different constituents—senior debt holders, mezzanine holders, and equity holders—whose interests are not always aligned.

This is particularly true when the underlying portfolio of a CDO is performing poorly. Experience has shown that, under difficult circumstances, such as in a high-default environment, even the most disciplined manager will usually behave differently while managing a CDO than when managing a total-return fund. For example, a CDO manager may be tempted to sell credit-deteriorated assets and purchase additional deeply discounted ones in order to maintain portfolio par and avoid triggering the various collateralization tests. Thus, it is important to focus on the performance of past CDOs.

However, if a manager has no CDO track record, or has managed only CDOs that are relatively new, it is important to consider the following:

- Long-term team experience with the asset type that will be purchased by the CDO, including various phases of the economic cycle.
- Performance over this period in the relevant asset class is competitive with appropriate indices.
- Consistent investment philosophy has been demonstrated.

Because asset management tends to involve a team (including one or more managers and analysts), and because of the mobility within the market, it is important to ascertain who was really responsible for historical performance. The Standard & Poor's manager evaluation will focus on people as managers, rather than just the institutions.
Historical Performance Attribution

One critical goal in evaluating current deals is to see the relative efficacy of the management team's policies with respect to its peers and certain absolute standards. A critical component of this analysis is the Standard & Poor's CDO Index. This series of composites, which are asset-class and launch-year specific, is designed to give peer comparisons across a number of vital attributes that reflect the performance of the CDO portfolio, and is used actively in CDO Manager Focus to establish relative performance.

The most important measure of performance in a cash flow CDO is the default behavior of the portfolio. Ultimately, default behavior is the most accurate predictor of par loss, which can lead to the violation of covenants, de-levering, and other events that can undermine payments to the various constituents. The amount of defaulted securities in the portfolio is examined over a period of time. These statistics are compared to the underlying Standard & Poor's CDO Index in order to determine default behavior in context. Given the seasoning effects and differing behaviors among asset classes, it is not an "apples-to-apples" comparison to simply take a composite of CDOs without taking into account vintage and asset class.

Another important area is covenant violation. Two types of covenants are examined for historical performance purposes: the Overcollateralization Test and the Interest Coverage Test.

Generally, violation of the Overcollateralization Test (portfolio par/face value of a given tranche compared to a threshold ratio) is a result of a higher amount of defaults than were originally assumed by the underwriter. While this indicates significant problems, certain managers may allow a deal to de-lever (by violating the Overcollateralization Test) rather than compromise credit quality by purchasing deeply discounted assets (which would cure the violation, but create a riskier portfolio going forward). Additionally, a manager may feel that he/she has an effective workout group and would prefer to allow the securities to default and achieve favorable recovery rates rather than trade out of the securities at a distressed, pre-default price. The Overcollateralization Test spreads, relative to threshold for the senior and junior-most tranches, are reviewed to see how close the deal is to triggering these tests as well as compared to peers through the Standard & Poor's CDO Index.

The Interest Coverage Test is also crucial, as it examines a portfolio's ability to pay each tranche (interest income from portfolio/interest payments to a given tranche). If the Interest Coverage Test is violated, it is very serious, as the debt can no longer be serviced until the situation is rectified. Violations will typically involve de-levering, paying in kind (issuing debt to cover the defaulted interest payments), or deferring interest. These actions have the most directly negative impact on performance because they directly delay or default specific cash flows.

Weighted average spread and weighted average coupon, while not necessarily covenants, are monitored closely as well. If these measures begin to decrease significantly, it usually signals credit deterioration, because a manager will often trade excess spread to rebuild par.

Another area to examine is par erosion. It is important to examine par erosion across the whole portfolio to see whether the default activity has had a significant, long-term effect on the portfolio, or whether, due to astute trading and workout activity, the par characteristics have been maintained without significantly greater credit risk. In addition, cash holdings are reviewed to ensure that cash is being properly deployed. Standard & Poor's views the breakdown of par erosion in conjunction with portfolio credit quality to ensure that par is not rebuilt at the cost of a riskier, more credit-vulnerable portfolio.

Another area that warrants historical examination is the upgrade/downgrade ratio. This ratio measures the credit trends in the portfolio by comparing the par value of the upgrades to the par value of the downgrades. While many CDOs experience a decline in credit quality, the rate of this decline relative to the trends in the market place is an important indicator of past performance and is a helpful indicator to estimate future default behavior.

Trading and Recovery Activities

Trading activity is an invaluable tool for evaluating manager intent, practices, and current positioning of the portfolio. Three primary measures are important in assessing this behavior. The first is selling activity. It is crucial to examine sales prices for all trade types: credit-risk (trades made when credit quality is eroding), credit-improved (trades made to profit from strengthening credit), and discretionary (trades for repositioning or opportunistic reasons). Additionally, recovery rates and purchasing behavior are important measures.
Examining sales prices will help determine whether the manager is making distressed sales (which means in turn that his default rate could be relatively lower) or whether he is pursuing a more aggressive selling policy by selling the securities before significant price erosion. If selling activity occurs at low prices and an accompanying high default rate and poor recovery rate are experienced, it is likely a sign of an unsuccessful strategy. High recovery rates are always viewed positively, but weaker recovery rates are most important if a manager relies on workouts and doesn't sell credit-impaired securities aggressively. Standard & Poor's examines sales prices, recovery, and default rates relative to manager style and its peers via the Standard & Poor's CDO Index. The par loss/gain as a result of the transactions is directly related to sales prices. This is a direct indicator of how successful the trading and workout strategies have been, and is examined relative to peers as well.

Purchase price is also an important indicator of strategy and positioning. High and low purchase prices are not negative or positive per se, but may indicate various practices that Standard & Poor's will examine. High purchase prices typically indicate purchases on the higher end of the credit spectrum. This is generally a positive sign for portfolio default rates, as long as an examination of the Interest Coverage Test reveals that payments will not be diminished enough to cause cash flow problems. On the other hand, a lower relative purchase price could indicate that a manager is trying to rebuild par after a series of defaults or Overcollateralization Test failures. Additionally, a low purchase price at deal ramp-up could indicate a practice that is generally disadvantageous to all but the equity holders. In the ramp-up period, certain managers may purchase securities at steep discounts. Then, once the par amount is within the specifications, they pass out the remaining proceeds to the equity holders. This practice not only leaves the portfolio in a credit-weakened state, but it could also decrease the overcollateralization amount that may be necessary to absorb future losses due to credit risk sales and defaults. In these situations, portfolio credit quality would be examined for significant declines.

Another possibility is that the portfolio manager is purchasing securities that he expects are undervalued. In this situation, the subsequent performance of the securities should be examined to determine if the manager is an effective active trader.

**Current Positioning**
Merely examining what has happened historically in a CDO is tantamount to not examining risk in evaluating return in the total-return space. It is important to examine current portfolio positioning in order to create a balanced evaluation of not only how well the manager has done to date, but how well the portfolio is positioned going forward.

Diversification and ratings breakdown are two important elements in evaluating the contents of a cash flow CDO portfolio.

Diversification has many components, many of which are important to examining CDO portfolios. They include instrument diversification (types of bonds, loans, etc.), geographic diversification (especially important for emerging-market CDOs), sectoral diversification (across industries), and obligor diversification. The degree of diversification in the portfolios is important to understand so that managerial style, risk tolerance, and required support levels can be properly evaluated. Standard & Poor's feels it is important for the investor to understand the various risks implied by various concentrations.

Ratings breakdown is a very important predictor of future portfolio behavior. A large concentration of 'CCC' credits (the cumulative par of all non-defaulted assets below a 'B-' rating) is a definite warning sign that a manager's portfolio credit is eroding rapidly, or that she is aggressively purchasing weaker credits to rebuild the various par measures. In either case, this is a definite negative. Examining rating breakdowns by industry and instrument type can reveal where a manager is taking risks and where a portfolio's vulnerabilities lie. For instance, Standard & Poor's would have a negative view of a manager who had a large 'B' exposure in steel, but did not have any experienced steel analysts. Standard & Poor's would view this negatively because this implies that the manager's practices are oriented toward satisfying some artificial indenture test rather than investing in the manager's area of expertise. This nuance may not have c

**Systems and Operations Evaluation**
It is also necessary to examine the systems and operations area. Given the structural complexity of CDOs, it is important that CDO managers have a current perspective on a portfolio's contents and the associated
implications for the various covenants and structural issues. Reliance on the trustee for these types of
information is not optimal and can lead to operational problems and managerial mistakes. In addition, it is
critical that the appropriate controls and documentation be present so that a manager's firm is protected
from unauthorized trading, poorly researched credits, and procedural violations. While having adequate
operational structure does not guarantee strong CDO management, it is a prerequisite for having an
effective organization in this area.

Why Standard & Poor's CDO Manager Focus?
CDO manager evaluation is a complex, multifaceted process. Standard & Poor's believes that three major
elements are needed for a balanced and robust evaluation of the manager—all of which are related. The
first component is the team and the organization. Portfolio manager skill is quite important in this product,
due to its complexity and the volatility of many of the underlying investments. Portfolio management teams
can be evaluated by their experience, depth, organization, and investment process. The second component
is assessing the performance of the existing deals. This is also a multifaceted process, involving examining
default and return behavior, as well as trading practices and portfolio positioning. Over time, equity return
results will be incorporated into the analysis as well. Finally, it is important that an appropriate operational,
systems, and compliance infrastructure exist to allow the management team to achieve its objectives.

Standard & Poor's maintains a neutral opinion in terms of evaluating manager style. Looking at past CDO
performance tells Standard & Poor's that many different approaches can work, as long as they are properly
supported and consistently applied. For instance, some managers are more aggressive traders, selling
securities when they become distressed. Others are experts at workouts and allow securities to default to
optimize terms upon recovery. Some managers maximally diversify their portfolios, while others focus on a
few sectors that are their core areas of expertise. Standard & Poor's main focus in these evaluations is to be
able to ensure that the managers are sufficiently resourced to accomplish their goals, that their results
compare favorably with those of their peers, and that they conform to their own processes and indenture
guideline in a relatively consistent manner.

Ideally, all investors should go through a similar line of inquiry when investing in a CDO deal. Alternatively, in
building on the large volume of transactions analyzed and access to large amounts of data by Standard &
Poor's, CDO Manager Focus can assist investors in effectively evaluating collateral managers.

CDO Recovery Levels and Timing

Corporate Assets in Cash Flow CDOs
Recovery timing and loss severity assumptions are an intrinsic part of CDO transaction analyses. They aim to
predict the loss severity or expected loss on an asset upon default by the obligor, and when this is realized,
thus the credit enhancement needed to cover such defaults. In Standard & Poor's view recovery rates
depend on three main factors:

• Seniority of the obligation;
• Timing allowed to achieve the recovery; and
• Post-default management though the recovery process.

The recovery rates applied in one jurisdiction for assets governed by that jurisdiction—corporate bonds or
loan agreements that are governed by same jurisdiction—are not necessarily appropriate for other
jurisdictions. A number of important factors, including specific insolvency provisions of a given jurisdiction and
historic experience may warrant very different treatment. The recovery assumptions explained in this section
can serve as a general benchmark for assets originated in the specified jurisdictions. The actual numbers
applied will be determined based on a thorough review of the relevant system and infrastructure, transaction
details and experience of the collateral manager.

Benchmark recovery assumptions were developed first in the U.S. asset markets based on two factors:

• Empirical recovery data on defaulted bond and loan recoveries; and
• Differences in transaction structures, including post-default liquidation timing and management constraints.

The U.S. recovery rate assumptions are shown in table 1 and are expressed as a percentage of principal amounts of defaulted assets. A range applies to each bond or loan class by seniority or position in the capital structure, as opposed to a uniformly applied discrete value for each bond or loan class. All else being equal, post-default recoveries increase with seniority in the capital structure. Timing of disposition is also important. If an indenture specifies that a defaulted asset be sold within a certain time frame, the recovery rate may have to be discounted to reflect an accelerated sale scenario. For example, recovery rates for senior unsecured loans may range from 25% for CDOs with "forced sale" time frames, such as 30 days, to 50% for CDOs with a disciplined three-year workout or a rated-sponsor repurchase or redemption feature. Effective post-default management of the recovery process helps establish recovery "credit" in the upper end of the range.

<table>
<thead>
<tr>
<th>Recovery Range Assumptions As A Percent Of Default Amount*</th>
<th>Recovery range assumptions</th>
<th>Recovery Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans</td>
<td>Recovery range assumptions (%)</td>
<td>Recovery Timing</td>
</tr>
<tr>
<td>Senior secured bank loans</td>
<td>50 to 60</td>
<td>2-3 years after default</td>
</tr>
<tr>
<td>Senior unsecured bank loans</td>
<td>25 to 50</td>
<td>2-3 years after default</td>
</tr>
<tr>
<td>Subordinated loans</td>
<td>15 to 28</td>
<td>2-3 years after default</td>
</tr>
<tr>
<td>Bonds</td>
<td>Recovery range assumptions (%)</td>
<td>Recovery Timing</td>
</tr>
<tr>
<td>Senior secured bonds</td>
<td>40 to 55</td>
<td>1 year after default</td>
</tr>
<tr>
<td>Senior unsecured bonds</td>
<td>25 to 44</td>
<td>1 year after default</td>
</tr>
<tr>
<td>Subordinated bonds</td>
<td>15 to 28</td>
<td>1 year after default</td>
</tr>
</tbody>
</table>

*In this table, the default amount is assumed to equal $100 million in collateral. If all collateral consisted of senior secured bonds, then the assumed total recovery amount could range from $40 million to $55 million, depending on the recovery time period and sponsor workout history.

Standard & Poor's generally assumes that the upper recovery rate on defaulted senior loans will be higher than the recovery rate on senior bonds. This is because bank loans generally are subject to workouts between the lender and its obligors. Bank loans also benefit from tighter covenant restrictions and closer scrutiny by the lenders, such as reviews of quarterly covenant compliance statements, and collateral reports, which provide a good picture of a borrower's ability to meet its financial obligations. Bank loans also benefit from flexible restructuring, presumably because of the ongoing dialogue between the lenders and the borrowers, and other favorable aspects of the lender-borrower relationship.

Lack of historical recovery data has made it difficult to precisely quantify recovery values. However, it is possible to assume higher recovery rates within the range in well-developed markets, if warranted by the lending institution's or asset manager's historical recovery experience, and/or the asset characteristics and performance. In such cases, the role of the originator/servicer or asset manager becomes even more important to the transaction.

The recovery assumptions for transactions with non-U.S. assets will depend on the jurisdiction under which the recovery will take place. Given the lack of sufficient quality and quantity of historical data in many jurisdictions, Standard & Poor’s has had to make a number of general assumptions that serve as starting point for analyses of recoveries outside of the U.S. For European assets, Standard & Poor’s uses the recovery rates shown in table 2 as starting-point assumptions. The legal framework and right of the debt holder should a company default largely drives the distinction in the range of recoveries. For example, senior secured loan recoveries in the U.K. are generally higher, since under the U.K. legal systems only the senior noteholders get a voice in the proceeding. Thus, subordinate noteholders generally get very little recoveries.
Recoveries outside the US also require a more detailed instrument analyses since loan and bond offerings are not as standardized, with terms and conditions varying greatly. This is especially true in certain cases, such as specialized instruments such as private placements or pools very concentrated in an industry or region. Standard & Poor's will work with each sponsor and banker to carefully analyze each asset pool and provide more transaction specific recoveries, where warranted.

<table>
<thead>
<tr>
<th>Table 2: Summary of European CDO Recovery Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash Flow Recovery Rates</td>
</tr>
<tr>
<td>Loans</td>
</tr>
<tr>
<td>Senior Secured</td>
</tr>
<tr>
<td>55-65%</td>
</tr>
<tr>
<td>Senior Unsecured</td>
</tr>
<tr>
<td>25-50%</td>
</tr>
<tr>
<td>Subordinated</td>
</tr>
<tr>
<td>10-15%</td>
</tr>
<tr>
<td>Bonds</td>
</tr>
<tr>
<td>Senior Secured</td>
</tr>
<tr>
<td>45-60%</td>
</tr>
<tr>
<td>Senior Unsecured</td>
</tr>
<tr>
<td>25-41%</td>
</tr>
<tr>
<td>Subordinated</td>
</tr>
<tr>
<td>10-15%</td>
</tr>
</tbody>
</table>

For defaulted emerging market assets, recovery assumptions are 25% for sovereign debt and 15% for senior unsecured corporate debt. These more conservative recovery levels are based on lower recovery realizations and lower liquidity in secondary markets for emerging market obligations.

Within a particular jurisdiction and market system, recoveries are dependent upon the actions of a particular collateral manager or financial institution. When there is evidence of strong historical underwriting and effective market or workout remedies, Standard & Poor's will give credit to higher recovery levels. Conversely, if the collateral manager or financial institution's default and recovery experience is below that set forth above, conservative (lower) recovery levels will be applied. A certain amount of management flexibility is a strength, especially with respect to loan assets, where maximizing recovery may be more dependent on a gradual workout process. Forced loan sales within a constrained time horizon could result in lower realized recoveries. There is a trade-off between recovery level and timing. If the manager requests the flexibility to accelerate recoveries, rapid recoveries at a discounted level will be assumed. The reason for the assumed lower recovery levels is that most historical data from which the recovery ranges are derived are based on workout scenarios, and not "fire sale" value.

Timing of Recoveries
In most cases, two general assumptions are made for the timing of recoveries on defaulted assets:

- Recoveries on defaulted sovereign and corporate bonds are assumed to occur one year after default through secondary market liquidation.
- Recoveries on defaulted loans are assumed to occur over a three-year workout period, with half of the recovery received at the end of the second year and the remaining half at the end of the third year.

The above assumptions are fairly consistent across a large number of jurisdictions. A longer recovery horizon is assumed on defaulted loans, because the loan markets are not generally as liquid as bond markets. Therefore, generally it is easier to sell a defaulted bond than it is to sell a defaulted loan. Although liquidity in the secondary loan market has increased, "vulture" and distressed debt funds mainly supported this liquidity in the early 1990s. Only time will tell if the secondary loan market will remain liquid. Until then, it will generally be assumed that the recovery on a defaulted loan will be extended over a longer period because of the workout process.

Standard & Poor's is actively monitoring recoveries globally with the help of its subsidiary Portfolio Management Data (PMD) In addition to obtaining recovery data from publicly available data, PMD is working with a large number of private parties in gathering and analyzing the level of recoveries achieved and what drives recoveries. Standard & Poor's will continue to refine the recovery assumptions used in CDO transactions based on input from these studies, and from market participants.
Recoveries in Synthetic CDOs
The starting point for recoveries in synthetic CDOs are the cash flow transaction recovery tables shown above. These tables assume that recoveries will be achieved through a workout and the collateral manager has the flexibility to decide if they should sell the obligation prior to resolution of the default, or hold on to it for ultimate recoveries. If the synthetic CDOs were structured with the collateral manager having the option of getting physical delivery of the defaulted obligations to then work them out, then the recoveries in such transaction would be similar to the recoveries presented in the above tables, since the collateral manager would be controlling the recovery process. In many synthetic CDO transactions however, there is no collateral manager and since the assets may not be available on the market for physical delivery or the counterparties do not want this obligation, the option of having physical delivery is often not included in the transaction.

Cash Settlement of Synthetics
In establishing the expected recoveries that would be realized in a transaction that employs a cash settlement methodology, Standard & Poor's considers the following parameters:

- Time,
- Law,
- Geography,
- Class, and
- Settlement mechanism.

To illustrate how the above parameters drive recoveries in synthetic CDOs using cash settlement, shown below is an example of how recoveries for a U.S. senior unsecured security would be established:

- CDO Cash Criteria establishes the recovery range as 25 - 50% for loans and 25 - 44% for bonds. Cash settled synthetic CDO transactions can point to either a bond or loan for valuation. Thus, we use the bond range as it may indeed be the valuation obligation for each credit event.
- Having established 44% as the maximum recovery, we move to the next threshold: cash recoveries. The average recovery assumed for "true sale" (or "cash") CDO transactions is 37%. Cash settled transactions with market polling most likely do not exceed the results of an average cash CDO portfolio manager. Thus, the mid range ceiling of 37% is appropriate.
- The ceiling of 37% is achieved only where market bidding calculation methodology is "highest", is only for U.S., U.K., or Canadian exposures, and is only when the polling period equals or exceeds one year and when the deliverable obligations characteristics have been modified to reflect typical cash CDO eligibility criteria. We mirror the cash CDO assumptions of one-year recovery. Valuation periods of less than one year generally require a haircut of recoveries. Thus, 37% is the highest recovery one could receive for general cash settled synthetic CDO transactions. This applies to both static and actively managed pools. As indicated previously, loan portfolios for balance sheet transactions could qualify for a higher recovery rate assumption.

The parameters affecting cash settlement are further discussed below.

Time
To avoid a 50% haircut on the assumed recovery rate, the valuation date may be set no sooner than 45 business days (or 60 calendar days) from the calculation agent's declaration of a credit event. Standard & Poor's view after consulting market participants is while certainly with exception, the further out from the event the valuation date is—in this case the credit event—the better the recovery prospects. As the time from the destabilization of price caused by the credit event declaration the better in all likelihood will be the recovery. A longer time period gives more time to market digestion of financial condition of the company reviewed as part of the bidding evaluation process. Finally, it potentially gives time for accelerations to result in an actual default upon acceleration, or for the acceleration to be rescinded.
The above graph represents the likely price behavior post credit event, based upon information gathered from market participants in the credit derivative dealer community. The assumed recovery of 37% after one year is based on the law of large numbers as observed in Standard & Poor's analysis.

The recovery rates assigned to the transaction is generally driven by the valuation timeframes and mechanism used. Standard & Poor's works with each sponsor and banker to fine-tune the methodology used in the transactions. Standard & Poor's has an ongoing project that can help refine recoveries as a function of time based on market pooling. Nevertheless, Standard & Poor's looks for longest possible valuation time period. Dealers on the other hand typically argue for shorter time periods because they must carry the basis risk for this time period. Standard & Poor's may however accept fewer than 45 business days without implementing the 50% haircut in specific cases. This would require a successful bid being defined as having a price floor of no lower than the recovery assumption being made for the transaction when the bidding starts prior to the 45th business day.

Law
Standard & Poor's explicitly haircuts recoveries for obligors domiciled in jurisdictions that benefit from bankruptcy laws protective of defaulting obligors. The two concerns are secrecy provisions and stays. Secrecy provisions preclude information to be disseminated with regard to defaulting obligors without explicit consent of the obligors in some cases, or not at all in others. Certain countries are more likely than others to have such provisions.

Standard & Poor's depends on the opinion received and its interpretation of the applicable law to determine in which countries such laws are governing. In certain jurisdictions, a defaulting obligor would lose the benefits of secrecy that the law provided to the obligor prior to default. Standard & Poor's assumes that lack of access to information lowers the bids in the market below the lower boundaries in physical settlement. These countries typically received recovery rates of below 20%. Obligation in certain countries also received a similar haircut if the country has a stay provision in its bankruptcy laws.

Secured obligations countries where market workout and sales are limited, have generally received recovery of 10% due both to the unclear nature of what a market pooling would look like and due to data reviewed by Standard & Poor's which shows that Distressed debt market activity and workout practices are not widespread.
Geography
In addition to timing and legal jurisdiction, the domicile of the obligors may affect recoveries based on the level of liquidity in local market. Certain secondary and distressed markets have not yet fully matured, and pricing obligations through such markets yields additional inefficiencies. At certain times, the structured finance analyst will call upon the experience of the corporate analysts for company specific recovery analysis in a given legal and geographic environment. This team approach fosters a better understanding of the relevant issues and specific recoveries.

The exact level of recovery expected in each country is subject to the exact market bid mechanism. Information received shows that recoveries in a country can vary widely and are thus hard to classify.

Class
The recoveries classifications described above apply to senior secured securities prevalent in most synthetic transactions. Senior unsecured obligations or references have traditionally not been included in synthetic transaction other then for in a very few transactions. When senior secured debts are present, Standard & Poor's generally assigns recovery of 45% higher than the recovery expected on senior unsecured obligation under the same settlement process. For subordinated obligations, Standard & Poor's generally assigns 7%-15% recoveries to reflect the lack of liquidity in the credit derivative market for high-yield credit exposures.

Mechanism
All the above discussion contemplates cash settlement where "Highest" or "Average Highest" is the only acceptable calculation methods without further haircutting. For physical delivery synthetic transactions without partial cash settlement (Section 9.4 of ISDA 1999) can receive the same recovery assumptions as a cash flow CDOs. For this to be achieved, Standard & Poor's must review and evaluate the collateral manager or trading desk that will dispose of the physical asset in order to determine distressed and defaulted exposure history and expertise, as indicated previously for cash flow transactions. A distressed debt group and workout group generally are plusses in that evaluation. Underwriting procedures are often reviewed in conjunction with Standard & Poor's financial institutions group.

A synthetic CDO having a physically settled option has been deemed to place the transaction in the same exact position as the portfolio manager who purchased a bond or loan. This is true but with one important qualification: Credit derivative contracts are settled with the cheapest to deliver. A portfolio manage may have purchased a 10-year coupon bearing bond if given the selection ability, but may receive from the derivative counterparty a convertible bond. Since general consensus indicated lower recoveries for convertibles, such delivery options must be accented for in the structure. Standard & Poor's is currently studying these issues and will update its criteria as appropriate to incorporate the conclusions drawn from the findings. Sponsors are invited to discuss this with Standard & Poor's as early as possible in the transaction and to provide appropriate date that would support their position.

ABS Recoveries in CDOs
Standard & Poor's assigns post-default recovery rates to structured finance assets in CDOs by first considering the rating of the asset and whether or not it is the senior-most tranche of its issuance. Then recoveries are tiered based on the rating of the CDO liability tranche. This approach to recoveries takes into account the fact that the source of cash flows is for structured finance products, limited to a set portfolio of assets and hedging instruments, and the fact that each class of notes are paid in a defined sequence.

In the sequential pay and subordination credit support structures typical in a large portion of structured finance products, losses stemming from the deterioration of the collateral pool impact liabilities sequentially from the unrated notes, to the lowest-rated notes, and ultimately up to the highest-rated notes. Given any cumulative level of collateral pool deterioration, losses would have a more pronounced impact on the notes lower down the priority of payments. Using the rating of an asset as the proxy for its position along the capital structure, higher rated assets are therefore assigned higher recovery rates. The same is true in pro rata payment structured finance transactions where losses are allocated from the bottom-up with the senior tranche receiving a larger percentage of the distribution and the subordinated classes are written-down.

Another characteristic typical to most structured finance products is that the senior-most class of notes is the largest tranche as measured by par amount. For each incremental deterioration in the collateral pool, the impact of the loss measured as a percentage of the overall size of the tranche is less for large tranches than it is for smaller tranches.
It then stands to reason that an asset that is the senior-most tranche in its issuance should generally realize higher recoveries than assets that are junior tranches. This is strengthened by the fact that under Standard & Poor's methodology of rating to the first dollar of loss of interest or principal, an event of default would occur if the senior most tranche would not be paid interest. This in general triggers the transaction and allows the senior noteholders to get control and be paid out first.

Recoveries assigned to assets are also tiered based on the rating of the liability because Standard & Poor's believes that the performance of the underlying collateral pool deteriorates as the general economic environment is exposed to more stressful conditions. The ratings assigned to the liabilities reflect their ability to withstand increasingly stressful economic conditions. A 'BB' rated tranche is much more likely to recover less in an 'AAA' environment, then in a 'BBB' stress environment. For this reason, an asset is afforded lower recovery rate assumptions at the higher rated liabilities than at the lower rated liabilities.

Within this framework, Standard & Poor's assigns recovery rates for most of the structured finance products purchased into CDO collateral portfolios. The recovery rate matrix is provided in table 3 below.

<table>
<thead>
<tr>
<th>Asset class</th>
<th>Liability rating =&gt; (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior</td>
<td></td>
</tr>
<tr>
<td>AAA</td>
<td>80.00</td>
</tr>
<tr>
<td>AA</td>
<td>70.00</td>
</tr>
<tr>
<td>A</td>
<td>60.00</td>
</tr>
<tr>
<td>BBB</td>
<td>50.00</td>
</tr>
<tr>
<td>Junior</td>
<td></td>
</tr>
<tr>
<td>AAA</td>
<td>n/a</td>
</tr>
<tr>
<td>AA</td>
<td>55.00</td>
</tr>
<tr>
<td>A</td>
<td>40.00</td>
</tr>
<tr>
<td>BBB</td>
<td>30.00</td>
</tr>
<tr>
<td>BB</td>
<td>10.00</td>
</tr>
<tr>
<td>B</td>
<td>2.50</td>
</tr>
<tr>
<td>CCC</td>
<td>0.00</td>
</tr>
</tbody>
</table>

This is not to be used for ABS assets in conventional CBOs

The investor should be aware that these recovery rate assumptions are based on Standard & Poor's analysis of existing ABS recovery empirical data that is both limited and narrow in scope. The ABS market has only existed for about 20 years, with most innovations occurring over the last 10. During this span there have not been many defaults in ABS securities and such defaults have been concentrated mostly in the RMBS product. Given this dearth of data, these recovery rates are assumptions based on reasonable judgment supported by limited data. These assumptions are also applied across a broad spectrum of ABS products. Over time, as additional default and recovery data are collected, Standard & Poor's will re-assess these assumptions and adjust the matrix as warranted.

Recoveries in synthetic CDOs of ABS are haircut in structures where cash settlement is elected. The haircut is driven by the fact that ABS markets for distressed/defaulted ABS securities is not as broad as the market for distressed/defaulted corporate securities. In addition haircuts are applied if not enough time is built into the settlement bidding beyond the timeframes mentioned for corporate securities. Most distressed ABS buyers require updated trustee information on the transaction and cash flow modeling to properly value a defaulted ABS security.
Structural and Collateral Considerations

Credit Support and Payment Structures
This section highlights the credit support and payment features of CDOs, and their effect on the CDO transactions.

Subordination
One of the most common forms of credit enhancement in CDOs is subordination of junior tranches. In the multi-tranche or senior/subordinated CDO the subordinated or junior tranches support the senior tranches. The issuance proceeds from debt and equity are used to purchase collateral (assets) generally with a principal balance equal to the rated debt amounts (liabilities) plus the equity share. Since the equity is not typically rated, the asset pool supporting the rated liabilities is greater than the rated liability amounts. Thus, there is a loss amount that the assets can sustain without immediately affecting any of the rated liabilities.

The payment priority waterfall in the transaction prioritizes the payments to each class of debt holders. In CDO payments are typically paid sequentially for the senior to the more subordinated tranches. Thus, holders of the senior debt tranche have priority of payment over the holders of any junior debt tranche. As a result of their subordinated status, the junior debt tranches generally are rated lower than the senior debt. However, the junior debt holders are compensated for the additional risk by being paid a higher interest rate.

Overcollaterization
Instead of using subordination, the senior liability class in the structure can also be supported by overcollaterization. In this structure, the rated class is supported by an excess of assets. The overcollateralization amount covers the estimated level of credit losses that the structure is expected to withstand without causing a loss to the holders of the rated senior tranche, in accordance with the risk expectations of the senior tranche rating.

Consider, for example, a cash flow transaction involving the issuance of $80 million of rated senior debt supported by a collateral pool with a total par value of $100 million. This "80/20" liability structure consists of 80% rated senior debt, and 20% unrated supporting debt or equity. The senior overcollateralization ratio (O/C ratio) equals 125% (100/80), which is defined as the ratio of assets over rated liabilities. The funds used for the purchase of surplus assets ($20 million in this example) are typically raised by the issuance of unrated equity.

The same level of credit protection for the senior class could have been provided through subordination by issuing $80 million of senior notes, $10 million of class B subordinated notes, $5 million of class C subordinated notes, and $5 million of unrated equity. If the transaction allocated losses from the equity tranche up, in all likelihood the class B and class C notes could have been given some rating lower than the rating of the senior class. This would likely lower the interest rate needed for payment on these tranches to less than if they were all part of the $20 million unrated equity. The rate would be lower because the class B is protected from losses by class C, and class C is protected from losses by the equity. If they were all part of the $20 million unrated equity, all investors would have faced a loss after the first default. Hence, creating different tranches in a structure with different payment priorities allows the issuer to create different risk/reward profiles. This is the concept behind CDOs, where the lowest class in the structure takes the first loss. By segregating the risk/reward profile of the portfolio, the senior tranches of the CDO can be rated higher than the average rating of the pool. However, because the equity investors take on the first loss risk, they demand high rates of return.

Payment Allocations
The manner in which collateral principal payments and losses are allocated among classes has a large impact on the level of credit support each tranche has over time. All payment structures represent different trade-offs between paydown and support of the senior class, versus return of cash to the junior debt and equity holders. There are several types of payment structures, of which the most commonly used are sequential pay, pro rata, and fast pay/slow pay. It is worth noting that though this discussion mentions three different payment structures, the sequential payment structure with fast pay features is by far the most common structure used in CDOs.
Sequential Pay
These structures require payment of senior debt in full before the payment of junior debt. In the 80/20 example discussed earlier, the $20 million subordinated class would remain outstanding until the entire $80 million senior class was retired. Clearly, as the $80 million senior notes pay down, the effective senior O/C ratio builds to well above 125%. In such structures that pay senior debt first, senior debt holders benefit from an increase in credit enhancement as the portion of subordinated debt grows in relation to total debt.

Pro Rata Paydown
In this structure, available funds are allocated to pay down principal on the rated debt in proportion to the size of each tranche. Thus, the degree of overcollateralization is maintained at the same percentage, until retirement of the senior class. In the example above, the overcollateralization would be maintained at the 80%/20% level, assuming no losses occur. Subordinated investors will be paid out at the same time as the senior investors assuming no losses occur and there are no credit support floors in the deal. Thus the hard dollar amount of credit support to senior noteholders decreases as time goes on. If losses are incurred, the loss amount is allocated to the lowest tranche first. Thus in the example, the lowest tranche would receive less than 20% of the principal collections.

Given that collateral pools are lumpy and defaults can occur at any time, the pro rata paydown does not protect senior noteholders as well as sequential paydown. Assume in the previous example that there were only $20 million in assets outstanding with no defaults having occur. At that point, 80% of the debt would be senior ($16M), and 20% would be subordinated ($4M), the same proportions as at the start of the transaction. If at that point the transaction would incur a $5 million dollar loss, only $4 million would be allocated to the subordinated tranche, and the senior tranche would lose $1 million. If the transaction had paid down sequentially, however, the senior class would have been retired once only $20 million of assets were outstanding, and would have not suffered any loss. For this reason, pro rata structures are not optimal for CDOs and typically must have hard dollar floors of credit support.

Fast Pay/Slow Pay Structures
This structure pays down both classes, but pays down senior debt faster than the junior debt and at a higher rate than pro rata. Like sequential pay structures, these structures typically require a "minimum par value overcollateralization ratio," in which the ratio of assets over liabilities must be maintained at a minimum level, for example, of at least 125%. If this test is breached due to defaults or trading losses, a higher percentage or all of the collateral cash flow will be used to pay senior debt until compliance is restored. If excess funds are available after meeting senior and junior debt service and coverage requirements, they may be used to pay down junior debt, even before senior debt maturity.

A variation on the fast pay structure is a turbo paydown of junior notes with excess interest proceeds when the coverage tests for the senior notes are satisfied and the coverage tests for the junior notes are not satisfied. In this structure, excess interest is used to pay down the most costly debt, and in effect substitutes overcollateralization for subordination, since the par amount of assets does not decrease as the subordinate class is paid down. While these structures do provide some benefits, in general they may be harder to model since transition between triggers is difficult to accurately predict.

Other Credit Support

Cash Collateral or Reserve Accounts
Cash collateral or reserve accounts are another form of credit enhancement. Excess cash is held in highly rated and liquid investments that provide security to the debt holders, generally in an account under the control of a trustee or custodian. Cash reserves are often used in the ramp-up phase of a cash flow transaction. During this phase, cash proceeds from the sale of CDO securities can be used to purchase the underlying collateral and to fund reserve accounts.

Cash reserves may not be the most efficient form of credit support because of the relatively low assumed interest rate earned on the eligible investments held in the reserve account. As interest owed on the CDO securities is typically higher than the interest earned on these reserves, allocation of cash to reserve accounts can result in "negative carry". The benefits of accumulating cash balances in the structure somewhat offset the lower interest earnings.
Excess Spread or Interest
When the all-in interest rate earned on the assets is higher than the all-in interest and fees paid on the rated CDO securities, excess spread or interest is generated. The difference, commonly seen in arbitrage structures, occurs because the bond and loan assets are rated lower, on average, than the rated debt, and thus earns higher coupon or spread. Under normal circumstances when credit loss is low, the excess interest is typically distributed to equity holders and is not needed to support debt holders. When credit loss exceeds a certain predetermined level, excess interest can be redirected to either sequentially pay down notes or be used to purchase additional assets. Either way, overcollateralization increases credit support to noteholders.

Defaulted Obligations
Unless the transaction is a Distressed CDO (see the "Distressed Debt CDOs" section in "Special Topics") collateral generally should not, on inclusion in the portfolio, be a defaulted obligation. This requirement is very analogous to the now ubiquitous asset eligibility parameter specifying that an asset, upon inclusion in the portfolio, not be a credit risk obligation, or an asset which, after the date of purchase, has a significant risk of declining in credit quality and, in the subjective judgment of the collateral manager, has a significant risk of becoming a defaulted obligation with a lapse of time.

A defaulted obligation is defined solely from the perspective of the CDO transaction as specified under the definition of defaulted obligation. The collateral asset in question may not actually be in default under the terms of the underlying instrument. Nonetheless, the asset is highly unlikely to provide the ongoing interest and/or principal payments necessary to fund the CDO's liabilities.

Defaulted obligations are fundamentally securities for which there has been a failure in the payment of principal and/or interest that has occurred, and is continuing, with respect to that debt obligation (i.e., a default). Such failures are without regard to any credit-related grace period or waivers permitted under the terms of the security.

In connection with this CDO-focused definition of default, it is important to highlight that for corporate/sovereign obligations, in the majority of circumstances Standard & Poor's requires the use of the issuer credit ratings (ICR) in lieu of asset's individual rating to assess the credit worthiness and default probabilities of the collateral pool. Accordingly, even where the securities are current on their payment, a defaulted obligation is generally defined broadly so as to include those assets for which:

- A default in the payment of principal and/or interest has occurred and is continuing on another debt obligation of the same issuer which is senior or pari passu in right of payment to that debt obligation (the relevance is obvious where both debt obligations are full recourse obligations);
- The issuer or others have instituted proceedings to have the issuer adjudicated as bankrupt or insolvent or placed into receivership and such proceedings have not been stayed or dismissed or such issuer has filed for bankruptcy protection; or
- Standard & Poor's has assigned an issuer credit rating of "D" or "SD" to the issuer. The collateral manager is also afforded the flexibility to deem any security a defaulted obligation for reasons other than those specified.

Application of defaults to synthetic securities in CDOs is the same as for synthetic CDO structure and includes publicly documented rescheduling. A synthetic security is deemed a defaulted obligation where either the counterparty of the synthetic security is in default under the terms of the security, or the reference obligation of the synthetic security would be a deemed a defaulted security. If the counterparty defaults in synthetic CDOs, this most likely is deemed a transaction event of default and not an event of default for the reference obligation.

Standard & Poor's allows two "carve outs" for performing securities while the issuer carries an ICR of 'D' or 'SD'. One such carve out is debtor-in Possessing (DIP) financing. These facilities are set up after the obligor has filed for bankruptcy and are senior to the other obligations. DIP financing allows companies to operate during bankruptcies and is approved by the bankruptcy court. As such, DIP securities are not defaulted obligations even if the issuer had an ICR of 'D' or 'SD'. To the extent that DIP financings are included in collateral pools, they are included in limited concentrations, are carried at par value, and must have a Standard & Poor's rating which typically is higher than D.
The other carve out is where collateral assets are technically defaulted obligations but currently paying interest and principal nonetheless. Limited (5% or less) “current pay” buckets may be used in transactions if such buckets include the following defaulted obligations:

- Obligations that have paid in cash the most recent interest payment and principal payment due;
- The collateral manager subjectively expects that the next interest and/or principal payment due will be paid in cash;
- The obligations have a market value greater than a threshold amount (e.g., 80% of par); and
- If the issuer of such a security is subject to a bankruptcy proceeding, a bankruptcy court has authorized the payment of interest due and payable on the collateral obligation.

Obligations that display these characteristics are not very common. For the purposes of the CDO Evaluator, such obligations are deemed to be ‘CCC-’ unless a different instrument rating is assigned by Standard & Poor's.

The primary impact of deeming assets as non-current pay defaulted obligations is to the overcollateralization tests of the transaction. Defaulted obligations are afforded more onerous treatment since they are carried at the lesser of the Standard & Poor's-assigned recovery rate and fair market value in lieu of par. Current pay bucketed securities are generally treated at the lesser of fair market value and the par amount or some haircut of par, for so long as they continue to satisfy the definitional requirements of such buckets.

Although not generally defined as defaulted obligations, collateral obligations which by the terms of the underlying instruments permit the deferral of payment of accrued, unpaid interest (often referred to as PIK assets) are often grouped together with defaulted obligations by market participants. The association is attributed to the similarity in treatment.

PIK assets for which interest has been deferred and capitalized for each consecutive payment date occurring over a period of 12 months are afforded the same onerous treatment in overcollateralization tests as defaulted obligations. Until such time as payment of interest is resumed and all capitalized and deferred interest is paid in cash in accordance with the terms of the underlying instruments, deferring PIK assets are carried at the lesser of fair market value and the assigned recovery rate. While PIK assets are treated as defaulted for the purposes of the O/C and I/C tests, Standard & Poor's puts no requirement that the collateral manager follow the recovery process as for defaulted securities, unless the manager deems them defaulted.

The market value treatment of defaulted obligations and deferring PIK assets is of significant focus in a down credit cycle. Negative ratings migration and credit deterioration manifest into the greater potential failure of overcollateralization test triggers. De-levering of liabilities may occur with increased frequency and severity. It is important to note however that there is no requirement by Standard & Poor's to sell defaulted obligations and/or deferring PIK assets. Such a forced liquidation of collateral exposes transactions to the obvious risks associated with fire sales, thus Standard & Poor's would rather have the collateral manager use best judgment in such cases.

**Liquidity Considerations in CDOs**

CDO rating analysis addresses credit and liquidity considerations to determine whether asset cash flows will assure timely payment of interest of the rated liabilities. Liquidity is a paramount concern in cash flow CDOs because the timely payment of a CDO’s liabilities depends on the timely payment of the underlying assets. Assets which do not pay timely interest in cash may lead to a shortfall of cash within a particular due period and create a liquidity problem for the rated liabilities. In general, Standard & Poor's encourages each CDO transaction to include an aggregate percentage limitation on the type of assets that do not pay timely interest in cash. However, once the aggregate percentage limitation is specified within a specific CDO transaction, Standard & Poor's goal is to evaluate and analyze the impact of these types of assets on the rated liabilities.

There are several types of assets, which appear in cash-flow CDO transactions, that do not pay timely interest in cash: zero-coupon securities, securities with a mismatch in payment frequency in comparison to the rated liabilities (i.e. a semi-annual paying asset in a quarterly-paying liabilities CDO transaction), and PIK securities. Each of these assets is treated generally in the following sections.
Zero-Coupon Securities
A zero-coupon security is a security that makes no scheduled interest payment but instead is sold at a discount from its par value. A CDO transaction that purchases a zero-coupon security cannot rely on a periodic stream of interest payments in cash from this type of security. As a result, zero-coupon securities must be treated for the purpose of the interest coverage tests and the par value tests, as follows:

- For the purpose of the interest coverage test, zero-coupon securities are excluded from the calculation of interest coverage because the security is not generating a predictable stream of interest in cash.
- For the purpose of the par value test, zero-coupon securities are included at their accreted value instead of par value to capture the discounted value of a security that does not make periodic interest payments.
- For the purpose of eligibility criteria and the inclusion of zero-coupon securities in a CDO transaction, Standard & Poor's has traditionally accepted a 5% limitation on such inclusion without imposing special modeling requirements, provided that a specific CDO transaction can demonstrate that it can make timely interest payments on the rated liabilities with a 5% allocation to zero-coupon securities.

Mismatch in Payment Frequencies

Differences in Periodicity
This risk arises when the frequency with which payment is received on assets differs from the frequency with which payments must be made on the rated securities. The risk is compounded when payments on different assets are received with different frequencies. For example, some of the assets may pay interest quarterly, while others may pay semiannually. If the assets pay interest more frequently than the liabilities, then the transaction is subject to negative carry. If the assets pay interest less frequently than the liabilities, then the transaction is subject to liquidity risk. These mismatch risks can be addressed in various ways. One example is a hedge agreement, such as a total return swap, with an 'AAA' rated counterparty that will pay the interest deficiency. Another example is a set of collateral and portfolio guidelines designed to limit the risks, such as a maximum limit on assets paying interest less frequently than liabilities (as well as coverage calculations to properly track this). In addition, a reserve can be funded for differences between the interest coverage ratio for different due periods.

Differences in Payment Dates
This risk arises when the dates on which payments are received on assets are different from the dates on which payments must be made on the rated securities. This risk may partly be a result of differences in periodicity, or simply a result of differences in payment dates without any differences in periodicity. For example, in a transaction in which all the assets pay quarterly interest, some assets may pay in January, April, July, and October, while other assets may pay in February, May, August, and November.

Payment-in-Kind
Payment-in-kind (PIK) securities are those securities that have the ability to defer and capitalize current interest without triggering an event of default under their terms of issuance. PIK securities pose an interesting concern for a CDO transaction because there is no guarantee that these assets will resume current interest payments in cash or will repay the interest that has been deferred and capitalized and the interest due on such deferred interest. As such, PIK securities must be treated in a special manner as discussed below, for the purpose of the interest coverage tests and the par value tests.

For the purpose of the interest coverage test, the interest due on PIK securities is excluded from the interest coverage test once a payment of interest has been deferred. Once the PIK security resumes paying current interest in cash, the cash flow is once again included in the interest coverage test.

For the purpose of the par value test, the PIK securities are treated in a special manner. If a PIK security is current on its interest, and if it is not included at a lesser value for some other unrelated reason, it is included in the par value test at its par value. However, if a PIK security misses current payment of interest for a year, such PIK security is treated in a manner similar to a defaulted security and is included in the par value test at the recovery value assigned to this type of security. In order for a PIK security to be included at its par value in the par value test once again, it would have to resume its current payment of interest in cash and repay...
the interest that has been previously deferred and capitalized.

In addition, if the percentage of PIK securities within a CDO transaction exceeds 5%, it is likely that Standard & Poor's will request that the excess of the 5% of these securities be subjected to additional liquidity stresses to demonstrate the transaction's ability to pay timely interest on the rated liabilities.

A special consideration is given to PIK securities within a CDO of CDOs transaction, where a great percentage (up to 100%) of the underlying assets may pay in kind. PIK securities may pay in kind indefinitely without triggering an event of default until maturity, in accordance with their terms of issuance. As a result, liquidity within a CDO transaction with underlying CDO assets may be severely compromised by a large number of noncurrent-pay assets. The special treatment accorded to these assets for the purpose of the interest coverage tests and the par value tests becomes especially important to monitor the potential liquidity risk to the rated liabilities.

In addition, third-party liquidity providers are often engaged to provide payments of timely interest on the rated liabilities. The third-party liquidity providers covenant will pay the interest shortfall due on the rated liabilities that are caused by underlying assets that go into payment-in-kind mode. Third-party liquidity providers should stop advancing monies when the PIK securities are deemed defaulted for the purposes of the par value test in order to avoid becoming de facto credit support and financing underlying assets that may not come back into compliance.

**Interest Rate Hedging**

As previously mentioned, most cash flow CDO transactions have interest-rate hedges to mitigate the risks between fixed-rate assets and generally floating-rate liabilities. Synthetic CDOs also use interest-rate hedges in a variety of ways to insure sufficient interest will be available to pay investors and mitigate interest rate movement risks. Such hedges are generally structured under ISDA documentation following Standard & Poor's criteria presented in the "Hedging Considerations" section.

In cash-flow transactions, a variety of swaps and caps are typically employed. When testing cash flows, Standard & Poor's uses different interest paths to test the sensitivity of the transaction to movement in interest rates. Since each transaction is different, there is no ideal hedging structure and Standard & Poor's does not require any particular hedging strategy. All Standard & Poor's requires is that the transaction is hedged to pass Standard & Poor's interest-rate stresses and that hedge termination payments due to any counterparty in cases where assets default or the counterparty defaults, do not jeopardize payments to noteholders.

The majority of arbitrage cash-flow transactions use a combination of swaps and caps to achieve this goal. Typically the transaction has one general swap at a set notional amount covering the entire reinvestment period. Then the notional of the swap is reduced based on the anticipated maturity profile of the assets. Typically in the amortization period, the swap notional amortizes rapidly, and additional caps are used to mitigate the risk of a high interest-rate environment. The caps also typically have an amortizing notional.

The amount of swap/cap required is a function of the fixed and floating percentages in the asset pool and the fixed to floating amounts of rated liabilities. Since in most transactions, the percent of fixed and floating assets may vary over time, Standard & Poor's stresses cash flows assuming the minimum and maximum amount of fixed and floating assets. In certain cases Standard & Poor's also biases the defaults between fixed and floating assets to see if the transaction is sufficiently robust.

The hedges are generally independent of the asset's defaults, and do not change notional amounts based on the levels of defaults occurring. The notional amounts may however be changed during the life of the transaction if the collateral manager wishes to do so, and with rating agency affirmation. Since the cash flows are modeled with the asset pool balance decreasing due to defaults, while the swap notional stays as contracted, there must be sufficient liquidity in the deal to allow ongoing hedge payments to the counterparty under even the most stressful rating scenarios. There must also be sufficient liquidity in the deal to pay senior interest on all non-PIK tranches.

The strategy of using a number of hedges to cover the entire asset pool is employed in most arbitrage transactions. In certain cases, however, the sponsor proposes to use asset-specific swaps to cover interest-
rate risks. If properly structured, such swaps may be used, as long as the default of the asset does not trigger a termination payment payable to the swap counterparty high in the waterfall. The risk is that if an asset with an asset-specific swap defaults while the SPE is out of the money, the SPE might not have sufficient money to pay the termination payment while meeting the timely payment of interest requirements. Standard & Poor's rating methodology can establish the level of default expected in the asset pool at different rating levels, but it is difficult to identify which particular assets will default, and when. Thus if an asset has an asset specific swap that must be terminated with any payment due, it is extremely difficult to predict what the termination payment will be and when. This makes cash-flow modeling almost impossible.

For these reasons, Standard & Poor's allows asset-specific swaps in transactions only if they are structured with no termination costs due from the SPE to the counterparty, or if such termination payments are subordinated below the rated noteholders.

Asset-specific swaps in CDOs also make trading and reinvestment more difficult. The collateral manager must either sell the swap with the asset, or find an asset that matches the payment characteristics of the old asset under the swap. Even if they succeed in selling the asset and the swap, then they either have to buy an asset that does not need a swap or find an asset and a corresponding swap. Because of all these considerations, asset-specific swaps are not widely used in hedging interest rate risks in CDOs. Nevertheless, they may be employed for assets that have unique payment characteristics and requirements.

**Foreign-Exchange Hedging**

As CDO transactions are increasingly becoming global products, naturally the need to incorporate foreign-currency hedges has also grown. This is driven both by the desire to broaden the asset pool as well as the need to broaden the number of investors. For example, European euro-denominated transactions may want to diversify the asset pool by including some U.S. dollar-denominated assets. At the same time, an Asian bank that has noneuro loans may want to increase the investor universe for its CDOs by offering euro-denominated notes.

Ideally, the FX swap would take currency as received on the asset and would convert it at the set rate. This swap would be outstanding for the life of the asset or until a recovery is achieved on a defaulted asset. The swap would then terminate with no termination payments. Unfortunately, such swaps rarely exist and are expensive since the swap counterparties must balance their positions through other swaps.

To achieve effective foreign-currency hedging, a number of different strategies, as outlined below, have been employed. There is not a single best strategy that can be used, but rather the most appropriate strategy depends on the specific of the transaction and the level of foreign currency mismatch between the assets and liabilities. Standard & Poor's does not recommend any one particular strategy over the other, but rather will analyze each deal on its merits and work with the sponsor in evaluating different solutions. Some of the possible strategies to mitigate FX risk are described below.

**Model the Risk**

Standard & Poor's has developed a foreign-exchange model that uses the extreme value theorem to generate foreign-exchange appreciation and depreciation curves between any number of major currencies, under different rating scenarios. Using these curves, it is possible to model the results of a transaction that uses no foreign-currency hedges. While this is possible, it has not proven practical on a large scale since the depreciation risks are somewhat large and render the transaction uneconomical. For example, in a 'AAA' rating scenario, the American dollar-British pound depreciation exceeds 40% over 12 years. Thus the transactions must have large amounts of overcollateralization to support such foreign-exchange movements. Nevertheless, such curves are very useful to model transactions that have some levels of foreign-exchange hedges but are not perfectly hedged.

**Asset-Specific Swaps**

A number of transactions have incorporated asset-specific swaps to broaden the asset universe for the collateral manager. These are most commonly seen in European transactions denominated in euros that purchase a number of U.S. dollar assets to diversify the asset pool. Such swaps typically have no termination payments due should the asset default. The same asset specific hedge considerations as outlined in the Interest rate hedge section above apply to these swaps.
**Single FX Swap for the Entire Pool of Assets**
As in the case of interest rate swaps, it is possible to use a single swap to cover a pool of assets that pay in a different currency. The swap would have a set notional schedule and pay the corresponding amount in the other currency based on the set exchange rate. Such swaps work best if all the asset pool is in one currency and the rated liabilities in another. For such swaps, the cash flow modeling stresses would principally focus on making sure that sufficient currency is generated by the assets while defaulting and recovering to make sure the SPE can meet the payment due under the swap.

**Single FX Swap for Part of the Asset Pool**
In this case only some of the assets are in a different currency (say, 30% of the pool) and the rest are in the same currency as the liabilities. In such a case, it is possible to get one swap that would cover the entire FX exposure as outlined in the paragraph above, but the analyses becomes more complicated.

The complication arises for the fact that if defaults were sized based on the entire pool, it is very difficult to predict how much of the defaults would occur in each currency. It is possible to bias default in one currency or the other and model accordingly, but often this produces inefficient transactions.

To get around these problems, it is possible to model the transaction as consisting of two different asset pools, with one pool being in a different currency and having a FX swap. The default rate on each pool would be set separately by running each individual pool through the CDO Evaluator. Then separate cash flow runs would be run under the usual stresses on each pool, and the payments would be combined to pay the note holders. Because the pools are independent, the cash flows must also stress the entire possible combinations of default timings and patterns that may occur between the two pools.

This type of analysis is more stressful, because in general the asset pools are smaller, hence there is less diversification and the default rates are generally higher. In addition, tighter eligibility and reinvestment criteria may be imposed on each pool to keep it within the needed parameters. Thus there is a higher risk that the collateral manager may not be able to find the right investments. Because of the constraints, this structure may be best suited for static pools, but nevertheless, a number of both static pool and revolving transactions have been done this way.

**Options on Hedge Notional**
One other strategy to deal with the FX risk is to hedge the FX pool of assets; the purchase a number of options to reduce the notional amount of the hedges should assets defaults. Such options should be purchased upfront and be available to be exercised without the SPE incurring additional termination costs. If a FX asset defaults, then the collateral manager can exercise part of the options to reduced the hedge in line with the estimated loss and still have sufficient hedges to also cover expected recoveries.

Standard & Poor’s would analyze the respective asset pools and establish default and recovery parameters, then see if the proposed level of options is sufficient. The cash flow would then be modeled assuming such options are exercised as needed. Obviously this places additional requirements on the collateral managers since they must be able to demonstrate that they have the ability to manage and properly exercise the swap reduction strategy. While options are generally expensive, a good number of transactions have successfully closed using this strategy.

**Combination of Strategies**
A handful of deals have been done employing a combination of all of the above FX risk management strategies. Such deals generally have employed a combination of asset specific and pool asset swaps. Then they also purchased a number of different options to adjusting the notional of the swaps, but they left a small part of the structure unhedged. Needless to say, such deals are much more difficult to model, and the collateral manager must demonstrate that they have knowledge of hedging.

**Synthetic Securities in Cash Flow CDOs**
Many traditional cash flow CDO structures allow for the purchase of synthetic securities as eligible collateral. Typically, the amount of collateral that may be purchased in synthetic form is approximately 20% of the total portfolio, based on investor requirements. Synthetic securities are commonly defined as derivative structures that expose the holder of such securities to the credit risk of two or more entities. As a result, these securities are classified as bivariate or multivariate risk instruments that contain risks that are not fully
measured by the single jurisdiction CDO Evaluator model. Consequently, these instruments require additional review to measure the ultimate default probability of the instruments as well as any expected recovery value. Examples of synthetics include credit-linked notes and credit default swaps. Most CDO structures will require rating confirmation prior to the purchase of such instruments.

Standard & Poor's rating confirmation will be contingent upon review of all documentation related to the structure of the synthetic instrument, including any SPE documents, trust agreements, and hedges. Furthermore, all relevant ISDA documentation including schedules and confirmations will be reviewed. Once the confirmation process is completed, Standard & Poor's will assign a default probability to the instrument as well as an estimated recovery value for Standard & Poor's modeling purposes.

The default probability assigned will reflect a number of factors including the issuer credit rating of a reference entity, the risk which is being transferred by the counterparties, as well as any counterparty's rating to the extent that the CDO is relying on payments (i.e. premiums) to be received from such counterparty on an ongoing basis. Recovery assumptions will reflect the CDO manager's expertise, the level of security supporting the reference obligation as well as the settlement provisions provided for in the derivative contract. To the extent that the derivative provides for physical settlement of the contract upon a credit event, recovery levels should approximate the assumptions normally afforded to the respective reference obligation.

However, if the derivative contract requires cash settlement, recovery assumptions will be significantly lower since the CDO may be exposed to a depressed price on the reference obligation since most market price calculations would occur relatively shortly after the credit event occurred with respect to the reference obligor.

As an alternative to obtaining rating confirmation prior to the purchase of each synthetic instrument, CDO managers may obtain approval for a template for future synthetic transactions, also known as a "form-approved synthetic." The "form-approved synthetic" will be a defined term in the CDO indenture and will reference a specific derivative template that will be an appendix to the CDO indenture. The template will be reviewed by Standard & Poor's prior to execution and may serve as a basis for future trades that conform in all material respects to the approved template, alleviating the need for rating confirmation prior to each individual trade. Although rating confirmation will not be required prior to the execution of individual trades, Standard & Poor's will still require, on a post-closing basis, notification of the trade as well as receipt of all relevant documentation in order to assign the appropriate default probabilities and recovery assumptions related to each derivative contract.

**Cash Flow Analytics**

The exact capital structure for cash flow CDO transaction, or for synthetic CDO transaction with cash flow components, is determined by modeling cash flow simulations under different assumptions. The aim of this analysis is to show that each tranche can withstand the stresses commensurate with the desired rating. Relevant parameters incorporated in the cash flow analysis include:

- Transaction payment priority and triggers;
- Intrinsic cashflow characteristics of the assets;
- Default rate—the expected level of gross defaults;
- Default timing—when defaults will occur;
- Default patterns—pattern of defaults that will occur once defaults start;
- Recovery timing—when recoveries will be achieved after a default occurs;
- Recovery levels—amount of the recoveries achieved;
- Interest rate curves—different interest rate paths; and
- Hedge structures.

Each of these above parameters is fully discussed further in this section.
Cash flow analysis is aimed at evaluating the availability of funds for full payment of interest and principal in accordance with the terms of the rated securities. If a transaction has multiple tranches, cash flows will be run for each tranche to assess whether the level of credit support provided is consistent with the rating sought on each tranche. Cash flow analysis also is used for sizing liquidity and other reserves. The analysis takes into account the structural elements of a transaction, including the principal and interest payment allocations; early amortization, "fast pay", or redemption events; excess spread accumulation; and reserve levels.

CDO cash flow analysis takes into account application of available cash flow to pay down notes based on a transaction’s priority of payments. Most arbitrage cash flow CDO transactions are structured with a five-year reinvestment period and a seven-year amortization period. Synthetic cash flow transactions may also have reinvestment periods and amortization periods, but their length may vary. Mostly outside of the US a good number of transactions are also structured as amortizing static pools that just pay down.

Cash flow transactions typically have coverage tests which function as early or rapid amortization triggers. Coverage tests in arbitrage deals are the “O/C” or par value ratio (for example, collateral principal and cash balances divided by the rated note principal balance must equal at least 115%), and the interest coverage or "I/C" ratio (for example, collateral interest receipts divided by the rated note interest payable and senior expenses must equal at least 150%). When these O/C and I/C ratios are breached, the structure should trigger and the cash flow model should reflect the way in which the transaction is structured.

Principal payments during the amortization period may either pay down the liabilities if the triggers are breached, or may be reinvested if they maintain or improve the triggers. A structure that does not shut down reinvestment to pay down notes to maintain the trigger O/C and I/C ratios, but rather permits temporary noncompliance and subsequent improvement, may increase risk over time. The reason for this is that each subsequent reinvestment may lead to additional defaults rather than paying down the rated liabilities. If a structure permits reinvestment of these proceeds in order to come closer to compliance for an O/C or I/C test violation, then the cash flow model must reflect the way in which the transaction is structured.

CDO cash flow analysis normally does not take into account collateral prepayments, either from optional redemption of bonds or from unscheduled amortization of loans. Such prepayment analysis would require a complex model that both generated interest rate term structures and forecast corporate bond and loan prepayment rates across yield curve evolutions. In addition, interest rate models are unreliable over more than very short horizons. This, coupled with a portfolio’s own deviation from aggregate behaviors, would tend to make this type of modeling exercise less than productive for analytical purposes. Given the uncertainty associated with interest rate modeling, cash flow models also cannot currently account for price depreciation risk on performing assets traded out of the portfolio. Erosion of par through trading is captured in the transaction by the O/C trigger, but cannot be effectively modeled to capture par erosion above where the O/C trigger is set.

Because cash flow transaction structures vary, a standard cash flow model is not used for all deals. Instead, analysts rely on the transaction-specific proprietary cash flow model prepared by the sponsor or its advisor. Each cash flow model is evaluated to assess whether it accurately reflects the transaction structure, and can measure a variety of risk factors for collateral assets, and debt or equity liabilities.

Examples of such risk factors include payment terms of the collateral versus debt; interest rate mismatch (for example, fixed-rate collateral versus floating-rate debt); interest rate risks arising from multiple loan indices, payment frequencies, and different amortizing schedules of each asset; and a variety of delinquency, default, and recovery risk scenarios. A qualified, independent accounting firm should review the cash flow model results, and ideally "tie-in and tie-out" the model, in order to verify in writing that the model properly reflects and analyzes the transaction structure and relevant risks. This verification should be performed in accordance with an agreed upon procedures letter. Table 1 illustrates a typical set of assumptions for a CBO/CLO cash flow model.
Table 1: Example Of Typical CBO/CLO Cash Flow Model Assumptions

<table>
<thead>
<tr>
<th>Liabilities</th>
<th>Par amount (Mil. $)</th>
<th>Coupon/spread (%)</th>
<th>Price (%)*</th>
<th>Maturity (yrs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior notes (AA)</td>
<td>1,000.0</td>
<td>LIBOR + 0.40</td>
<td>99.9</td>
<td>12</td>
</tr>
<tr>
<td>Mez. notes (BBB)</td>
<td>75.5</td>
<td>9.0</td>
<td>100.0</td>
<td>12</td>
</tr>
<tr>
<td>Equity</td>
<td>125.5</td>
<td>-</td>
<td>100.0</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>1,201.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assets</th>
<th>Par amount (Mil. $)</th>
<th>Yield (%)</th>
<th>Avg. life (yrs.)</th>
<th>Price (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonds</td>
<td>1,088.0</td>
<td>9.00</td>
<td>8.50</td>
<td>99.50</td>
</tr>
<tr>
<td>Loans</td>
<td>100.0</td>
<td>9.26</td>
<td>5.20</td>
<td>101.00</td>
</tr>
<tr>
<td>Asset total/W.A.</td>
<td>1,188.0</td>
<td>9.02</td>
<td>8.22</td>
<td>99.63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Asset defaults (%)</th>
<th>Default timing</th>
<th>Recovery (%)</th>
<th>Recovery delay (yrs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.5</td>
<td>Series 1</td>
<td>33</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overcollateralization</th>
<th>Result</th>
<th>Interest coverage</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger: 115%</td>
<td>Pass</td>
<td>Trigger: 125%</td>
<td>Pass</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fees</th>
<th>Amount (%)</th>
<th>Reinvestments and reserve (%)</th>
<th>LIBOR information (%)</th>
<th>S&amp;P up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trustee</td>
<td>0.05</td>
<td>Yield</td>
<td>9.00</td>
<td>LIBOR series</td>
</tr>
<tr>
<td>Other</td>
<td>0.02</td>
<td>Spread</td>
<td>0.00</td>
<td>Min. LIBOR 2.0</td>
</tr>
<tr>
<td>Mgmt.</td>
<td>0.55</td>
<td>Int. res.</td>
<td>0.50</td>
<td>Max. LIBOR 22.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Res. yield</td>
<td>5.00</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percent of par. W.A.-Weighted average.</th>
</tr>
</thead>
</table>

In general, the cash flow analysis is based on collateral pool parameters specified by the transaction documents. At closing, the transaction may not have purchased all the collateral that is required. Typically, at closing, the majority of the portfolio has been purchased with remaining balances to be purchased after closing during the ramp-up period. These periods are typically three months, but in certain deals they extended as far as one to two years.

Cash flow models cannot capture the degree of risk associated with not being able to fully ramp-up. While failures to ramp-up to the required collateral balance or collateral pool characteristics have not happened very frequently in the past, a ramp-up period nevertheless does pose an additional element of risk to investors. If the transaction is a static pool, then all the asset characteristics and actual payment terms may be incorporated in the cash flow models. For deals that are not fully-ramped-up at closing, the transaction is modeled incorporating conservative assumptions that the collateral pool is at the minimum weighted averages allowed by the transaction documents, instead of the typically higher rate available in the market.

For the most part, CDO transactions are modeled based on the aggregate characteristics of the asset pools, and not using asset specific models. Thus, defaults are taken pro-rata across the asset pools and payments are reduced uniformly as defaults occur. Nevertheless, there are transactions that utilize asset specific cash flow models and have sufficient specificity to permit biasing of default across specific assets. Asset-specific cash flow models are preferred for asset pools where the assets have unique payments characteristics that are not fairly represented by average pool characteristics.
In modeling the cash flows, the sponsors or their bankers typically perform the modeling. The results of the cash flows typically are the maximum "Break-even Default Rate" (BDR) that the transaction can withstand at each set of input parameters. If the BDR is greater than the Scenario Default rate calculated by the CDO Evaluator (see "CDO Evaluator and Portfolio Benchmarks" section), then that tranche can achieve that rating.

For example, if the 'AAA' scenario default rate is 30% and the cash flows for that tranche show that the transaction can sustain a BDR of 33% to 39%, then that tranche can be rated 'AAA'. This means that the transaction is sufficiently robust to sustain up to 33% defaults over its life. Since 33% defaults are greater that the 30% expected default rate under the ‘AAA’ stress, that tranche then can achieve that rating. In general, each tranche has a range of BDR, since multiple cash flow runs are modeled for each tranche. As explained below, each cash flow run takes into account different parameters such as pattern of default, timing of defaults, interest rates, etc. The parameters incorporated into the cash flow analyses are described below.

Characteristics of the Asset Pool
The cash flow model must reflect the characteristics of the asset pool in all material aspects. If the composition of the collateral pool is known, then it is not a problem to come up with payment frequencies amortization schedules, coupon, spread, and the other provisions that affect cash flows. If the portfolio is only partially known, then the cash flows must be conservatively modeled using the pool eligibility and reinvestment criteria. If the asset pool parameters allow minimum and maximum fluctuations, then the cash flows must be modeled taking into account both extremes. Some specific examples of this are provided elsewhere in this article.

Transaction Structure
First and foremost, the cash flow model must accurately incorporate the transaction structure and provisions. It must model the payment waterfall as detailed in the documents, must incorporate the triggers provided in the transactions and requisite tests. Triggers and payment amounts must be calculated as per the definition in the indenture, and the calculation of interest and principal proceeds must also mirror the indenture. If the indenture caps certain fees and has cash diversion tests, these must also be factored in the cash flow models.

Default Rates
This is the specific level of defaults anticipated for a given pool of assets. Default rate is rating scenario specific and is expressed as a percentage of the original asset pool balance. The asset pool balance multiplied by the scenario default rate equals the total dollar amount of gross defaults that the transaction must be able to withstand at the given rating. The higher the rating is for a tranche, the higher the expected level of defaults will be for any given asset pool. For example, a given pool may have a 40% default rate under the 'AAA' scenario, while the same pool may have only a 25% default rate under the 'BBB' scenario. In the above example, to rate the transaction tranche 'AAA', the cash flows must show that if 40% of asset pools defaults, then the 'AAA' tranche would still receive timely payment of interest and ultimate payment of principal. In the above example, if the asset pool is $300 million, then the transaction must be able to withstand $120 million ($300 million x 40%) of defaults.

The transaction default rate is established by running the asset pool through the appropriate Standard & Poor's model, depending on the level of bivariate risk in the pool. Under Standard & Poor's methodology, bivariate risk refers to the credit risk of default being driven by more than one counterparty (e.g., a default-swap synthetic security, where both the reference obligation and/or the swap counterparty may default). Under bivariate risk, the transaction is exposed to the credit events caused by the obligor, the second party, or both. For a more detailed explanation of bivariate risk, please see the "Emerging Markets/Multi-jurisdiction CDOs" in the "Special Topics" section.

Currently, the following two models are currently in use:

- The CDO Evaluator—for use with corporate and ABS pools having no more than 20% bivariate risk; and
- the multi-jurisdictional model—for use with pools having more than 20% bivariate risk.
For the purposes of running cash flows, it is important to keep in mind the following things regarding the default rate:

- First and foremost, the default rate is specific to the pool of collateral in each transaction. It is driven by the individual ratings, maturity of assets, and by the concentration of assets across industries and obligors.
- Secondly, the default rate is specific for each rating level. Default rates for ‘AAA’ rated liabilities are higher than for lower-rated liabilities backed by the same asset pool.
- Thirdly, the default rate projects gross default rates over the life of the asset pool. It is expressed as a percentage of the original pool balance. This is the fixed dollar amount that must be defaulted in the cash flow analyses.
- Lastly, the default rate provides no indication of how and when defaults will occur, when recoveries will be achieved and what the level of recoveries will be if any. All of these parameters must also be modeled in the cash flows and are discussed below.

**Default Patterns**

Given the nonhomogeneous nature of the collateral pools backing CDO transactions, it is also very difficult to estimate how much of the collateral will default in any one period. The default rate of the pool defines the expected level of defaults over the life of the pool; however, it provides no indication when defaults will occur. The most drastic assumption is to assume that all defaults occur at once. This, however, is highly improbable because it assumes that all credits will transition from their current credit ratings to 'D' at the same time. Even if a large portion of the credits in the pool were rated ‘CCC-’ or ‘CC’, it is unlikely that they would all default at the same time. In reality, most asset pools have a range of credit ratings and the ratings transition before the defaults occur. Because of this it is necessary to test CDO’s cash flows using different default patterns.

Default pattern assumptions reflect the belief that credit enhancement should be sufficient to absorb losses and pay the rated liabilities under appropriate stress scenarios. The timing of defaults in the cash flow model may be tailored to the payment allocations within a transaction and to the characteristics of the asset pool. In general, if there is a substantial change in the credit support level during the life of a transaction, then stress should be applied at several intervals to test the ability to pay the rated liabilities according to their terms. Front-loaded default patterns tend to stress the transaction's dependence on excess spread, while the even defaults pattern stresses more the back end of transaction. These default patterns specify what percent of the total default rate will occur in each year, once defaults start.

For most arbitrage transactions, Standard & Poor's first uses a set of standard default patterns to test the transaction. The patterns are as follows:

- 15/30/30/15/10
- 40/20/20/10/10
- 20/20/20/20
- 25/25/25/25

The above numbers indicate the percentage of the default rate occurring every year once defaults start. For example, if a transaction has a ‘AAA’ scenario default rated of 30%, under default pattern curve two above, one would expect that 12% of the total pool would default in year 1 (30% pool rate X 40% year 1 default %), 6% of the total pool in year 2 (30% pool rate X 20% year 2 default %), and 6% in year 3, 3% in year 4 and 3% in year 5. Obviously, the total dollar default over the five years must add up to 30% indicated by the default rate. Under default patterns 1 through 3 above, defaults are spread over five years, while pattern number 4 spreads default uniformly over four years.

Since defaults do not occur in set patterns, the aim of the cash flow analysis is to run different patterns to test the sensitivity of the transaction. In addition to the pattern listed above, Standard & Poor's subjects most transaction to saw-tooth defaults patterns that assume defaults occur every other year or every third year until year nine or 10 in the life of the transaction. These patterns are especially appropriate for transactions that use principal proceeds to pay deferred interest.
While a high level of defaults in the early part of the deal is stressful, to a certain extent they are also helpful because they trip the transaction’s O/C and or I/C triggers, forcing all cash to be trapped and used to pay down the existing debt. If defaults do not occur year after year, and occur in a more on/off fashion, it may be possible for the transaction to trigger, get back in compliance and release money, then trigger again. The saw-tooth default patterns test the sensitivity of the transaction should such default patterns occur.

It is also possible that because of the management style of the collateral manager, the transaction may not experience any default, or it may suffer losses but in equal increments every year. Obviously the transactions must also survive these stresses. For these reasons, Standard & Poor's subjects all transactions to a no-default run as well as to a set of runs where the default rate is spread out evenly over six to 10 years.

Given that each transaction is unique, Standard & Poor's may modify the above mentioned default patterns and may add other default patterns to test the strength of the transaction based on its proposed feature. The goal is to make sure that the transaction is sufficiently robust.

**Default Timing**

Default timings refer to when defaults will start in the life of the transaction. Since CDO transactions are backed by nonhomogeneous pools of assets and by different asset types within the same pools, there is no accurate way to predict when obligors will default. As a result, in modeling cash flows, different timings of defaults must be assumed. Defaults may start soon after the deal closes, or may occur after the transaction has been outstanding for a number of years. This is not only driven by the underlying obligors, but also by the ability of the collateral manager to select and monitor credits.

Second, since a fixed dollar amount of assets are being defaulted, the amortization schedule of the asset pool limits how far back defaults can be pushed. There comes a point in the life of the transaction that, if defaults start after a certain time, there is no way to default the total fixed dollar amount predicted by the default rate, short of taking large lumps of defaults. This is caused by the fact that nondefaulting assets are paying off as time goes on. Thus the weighted average dollar maturity of the portfolio must be factored into the analyses. Obviously, if the collateral pool is all bullet maturity, defaults can be pushed further back than if the pool is amortizing. For each transaction, Standard & Poor's looks at the weighted average maturity of the collateral pool to decide how far back it will push the starting of default.

Third, the timing of defaults is driven by the rating definition associated with the rating assigned to each class. 'AAA' rated securities must be able to withstand more severe stresses over longer periods of time, while a 'B' rating is more susceptible to change over time. Thus Standard & Poor's pushes back 'AAA' default starting times further in the life of the deal than for 'B' default starting times.

As previously mentioned, every transaction is unique and is reviewed based on its assets and structural features to determine the appropriate cash flow stresses that will be employed. Nevertheless, Standard & Poor's has developed standard methods for reviewing similar transactions, and subjects all similar transactions to similar stresses. The aim is to create a level playing field for the bankers wanting to do such transactions and to permit investors to analyze the deals in a similar matter. The general default timings used for the typical sequential pay transaction consisting of a five-year reinvestment period with a seven-year amortization period are as follows:

- For deals with weighted dollar average life of 7.5 to 9 years, start the specific default patterns in year 1, and repeat the patterns starting in every year thereafter, up to and including the last year of the reinvestment period.
- For deals with weighted dollar average life of greater than nine years, continue with default starting in first year of amortization period, and push back as far as possible while still defaulting the entire original dollar amount.
- For deals with weighted dollar average life of less than 7.5 years, push back the start of defaults as far as possible during the reinvestment period, while still defaulting the entire original dollar amount.

Based on the above methodology, a transaction with a five-year reinvestment period could start experiencing default at the end of the reinvestment period and perhaps later if there is sufficient collateral to default. Under the above methodology, and given that some default patterns are spread over five years, a
A typical 'AAA' tranche supported by an eight-year weighted dollar average collateral pool will be analyzed for defaults occurring at different levels over a 10-year period. This is done by running all standard default patterns starting in year 1, then in year 2, then in year 3, etc. up to the last year of the reinvestment period. Starting times for defaults are generally scaled back one year per rating category starting with 'A' range ratings. This is consistent with the rating definitions highlighting the fact that lower ratings face greater uncertainty in the long run. For static pools, default patterns are scaled back based on the weighted dollar average collateral maturity.

Each of the default patterns mentioned before is run starting at the different starting points in the life of the transaction. Thus if we are using seven default patterns with five starting years, 35 different cash flows will be modeled. The aim is to show that the transaction is sufficiently robust to survive the different stresses. Given the multivariate nature of CDO analysis, transaction complexity, and the nuances of each cash flow model, it is difficult to predict in advance what cash flow runs will prove more stressful to the transaction.

**Modeling Defaults**

The way in which defaults are modeled can also impact the results of the cash flows. To start defaults in year 1, the entire year 1 default amount should occur in one lump on the last day of the last period of year 1 of the transaction. This is more likely to occur than defaults being evenly spread out over the first year of the deal life, given that the collateral manager has just closed the transaction and has diligently reviewed all credits going into the deal. Since most deals prohibit the purchase of credit risk assets, most transactions should perform without defaults for some period of time. Thus spreading default over the first year starting in month one is not realistic. After the first year in which defaults occur, defaults should be modeled as occurring semiannually on the last day of the period. If preferred, defaults after first occurrence may be modeled all in one lump sum at the end of each subsequent year.

If defaults occur in a given period, they should be assumed to occur at the end of the period, with no interest being earned on the defaulted amounts in the period that they default or thereafter. It is not reasonable to say that the obligation first pays interest then defaults in the same period. Defaults are typically defined as failure to pay, and there are very few instances where defaulted obligations stay current on interest while defaulting on principal. Thus, no interest is paid or earned on the defaulted amount for and in the period that it defaults. Interest is earned only on the performing pool balance.

Money collected during a payment period is invested in eligible investments earning interest at the applicable reinvestment rate. Given that asset specific payment dates are generally not modeled in such analyses, it is appropriate to assume that interest on eligible investments is earned only for half of the period.

**Recovery Rate**

Recovery rates specify the amount of money received on a defaulted obligation after it has defaulted. Recoveries on corporate obligations rates are not dependent on the rating of the obligor or of the transaction. They are solely dependent on the type, seniority, and security of the obligation and, for synthetics, the settlement mechanism. For ABS collateral, the rating of the security, its position in the capital structure, and the rating scenario drive recoveries.

Recovery rates are also heavily influenced by the actions of the collateral manager and the requirements of the transaction to dispose of defaulted assets within a specified timeframe. Standard & Poor's view is that superior recovery rates can be achieved through active workout with no forced sale. Standard & Poor's will assign transaction-specific recovery rates based on a review of the collateral manager and of the transaction requirements. If the transaction specifics require a forced sale or a forced cash settlement in a short period of time, Standard & Poor's will generally reduce recovery in such deals.

Recovery rates for different types of assets and different regions are detailed in the "CDO Recovery Levels" section. Once specific recoveries are assigned to each class of assets eligible for inclusion in the transaction's asset pool, the cash flows for the transactions are modeled at the minimum Weighted-Average Recovery rate. The minimum Weighted-Average Recovery rate is calculated based on asset eligibility parameter on the transaction, assuming that the collateral manager will have the highest concentration of low recovery assets permitted by the transactions. Some transactions do not have asset limitations but simply require the manager to maintain a given minimum Weighted-Average Recovery.
Recovery Timing
Recovery timing specifies the time it will take to achieve recoveries once an obligation defaults. As discussed in the CDO Recoveries section, time to recovery is influenced by the type of asset (corporate versus ABS), the form of the obligation (loan, bond, or synthetic), the actions of the manager (sell versus workout), the liquidity of the market coupled with the legal jurisdiction governing, and the requirements of the transaction in regards to forced sale or settlement.

The cash flow models should lag recoveries as driven by Standard & Poor's criteria and the requirements of the transaction. Once something defaults, it stays defaulted without generating any income for the required period of time, then the recovery is assumed. In general Standard & Poor's models recoveries as occurring in one to three years after default. Once recoveries are achieved, they are available to either pay down the rated notes or to be reinvested. The use of recoveries is driven by the transaction specifics, and the modeling should reflect that.

Recognizing recoveries after a shorter period of time than assumed by Standard & Poor's is allowed only if the transaction documents require a sale of defaulted obligations at a specified time after default. In such cases the recovery rates are reduced to reflect anticipated lower recoveries. In general Standard & Poor's does not allow modeling of instantaneous recoveries.

Interest Rate Stresses
CDO transactions often have a fixed- to floating-interest rate mismatch between the assets and liabilities. To mitigate this risk, transactions are often structured with interest rate hedges. These hedges must meet Standard & Poor's swap criteria as outlined in the "Hedging Considerations" section. The transactions are, however, not perfectly hedged, so it is necessary to test the transaction under different interest rate paths to make sure the hedge structure is commensurate with the desired ratings. These interest paths are based on the historical movement in interest rates in which the assets and liabilities reset. In general, transactions are stressed under the following index scenario:

- Index Up
- Index Down
- Index Down/UP
- Forward curve
- At Swap
- At Cap

The interest curves are adjusted to match the length of the transaction and may vary by rating level (see appendix E) The "At Cap" and "At Swap" rates are typically run to give an indication if the hedges are providing credit support for the transaction.

In addition to running interest rate sensitivities to test fixed-rate to floating-rate mismatch, if the transaction warrants it, Standard & Poor's will test basis risk if assets and liabilities price off of different interest rate indexes. Also, some transactions have foreign currency risk that requires modeling of different currency curves and different interest rate indices. These features are also modeled into the cash flow to test the sensitivity of the transactions to FX movement and different interest indices. If the FX risk is not totally hedged, Standard & Poor's has cross-currencies appreciation and deprecation curves that can also be modeled into the transaction.

Fixed-/Floating-Rate Asset Mix
In general, most transactions allow the manager a certain degree of flexibility in shifting collateral between fixed- and floating-rate assets. For example, the deal may allow the manager to have anywhere from 50% to 80% floating-rate assets and the remaining fixed-rate assets. Transactions generally have a minimum spread test and a minimum weighted-average interest test. The floating instruments must pay at the minimum index plus X, while the fixed instruments must have a weighted-average rate of Y. As the assets in the pool shift between fixed and floating, the excess spread in the deal will be affected, especially if the transaction has swaps.

To test such stresses, Standard & Poor's requires that the transaction be modeled at both portfolio extremes, assuming the minimum and the maximum of the fixed-rate assets. The transaction runs must be
sufficiently robust to pass these stresses coupled with the different default patterns and timings and interest rate paths.

**Biased Asset Default**

As previously mentioned, most CDO transitions are modeled based on the general pool characteristics and on a pro rata default across all asset assets. This is a fairly good modeling technique in most circumstances. If, however, the asset pool composition can shift substantially over time, it might be appropriate to test certain biases in default. For example, in a high interest rate environment, obligors that are paying a floating rate might be under more pressure to meet their obligations due to the rising rates. In such scenarios, a larger percentage of the floating rate obligors might default. While in a low interest rate environment, obligors that are paying high fixed interest rates might be more likely to default. Since most transactions are hedged, in the low interest rate environments, the transaction will likely be out of the money in the swap, making substantial payments to the swap counterparty. If at this time the high fixed-rate obligors are defaulting, there might not be sufficient liquidity in the deal to pay the swap counterparty and the rated liabilities.

To test for such interactions, Standard & Poor's will request certain cash flow runs where defaults are biased towards the fixed-rate assets during low interest rate environment and towards the floating assets in the high interest rate environments. The goal of this analysis is to see that the rated tranches can still pay out even if defaults shift within the collateral pool.

There are many factors that affect borrower default characteristics beyond whether one is paying fixed or floating rates in different interest rate environments, but such factors may be extremely complex to model. If feasible, however, such default bias factors should be modeled and stressed through the cash flow analyses. Standard & Poor's reviews the characteristics of each asset pool and requests biased default runs where necessary. Another example of when biased defaults runs are requested is where the collateral is heavily bar-belled across the coupon it pays, with a large percentage of the pool paying very high rates and the remaining portion paying low rates. In such cases the pool weighted-average correlation (WAC) may not be meaningful.

**Asset Payment Characteristics and Payment in Kind (PIK)**

The cash flow models must accurately reflect the payment characteristics of the asset pools. Asset eligibility criteria generally defines the required payment frequency of the assets and sets up limits as to how much of the asset pool may pay less frequently than the rated liabilities. For example in a semiannual pay transaction, only 10% of the asset pool may pay less frequently than semiannually, but not less frequently than annually. In addition to such limitations, the eligibility criteria may also allow zeros, which pay no interest but accrete to a stated par amount. Such asset eligibility criteria must be factored into the cash flow analyses and modeled correctly, assuming that all such assets are the maximum allowed concentrations in the pool.

In addition to different payment frequency features, certain collateral types have options of payment in kind (PIK) or payment deferral features. Such obligations are not required to make a periodic payment if funds are not available, but can defer payments and pay back at a later date with interest on the interest. If the obligation is structured with such a payment feature, then failure to pay in not considered an automatic default. This feature is common in certain types of corporate obligations and in lower-rated tranches of CDOs, ABS, and synthetics.

Cash flow analyses for transactions containing these assets must take into account such features and must model PIKing for a certain period of time. Standard & Poor's assumes different PIKing intervals depending on the asset type and requested rating on the transactions. The issue of PIKing is more severe in CDOs of ABS and CDOs of CDOs, where the assets are subordinate tranches of the structured deals that can PIK endlessly until the legal final maturity of the deal or until the deal hits an event of default and is forced to liquidate. For such transactions, Standard & Poor's typically request runs where the assets PIK for the life of the deal. These runs are designed to size the liquidity needed in the deal in order to pay required timely interest on the rated senior liabilities.

The matter in which the PIK featured is modeled in the cash flows may be somewhat different than the treatment of the assets in the transaction documents. In general transaction documents, deem PIK assets as defaulted for the purposes of the O/C test if the asset has PIKed for more than one year. If this happens,
the collateral manager may or may not be under any requirement to sell the asset. If such O/C treatment exists, the cash flow model should factor it into the O/C test. If the assets must be sold if deemed defaulted, then a low recovery should be assumed into the cash flow model to account for the fact that the manager may be required to sell during difficult market conditions. Forced sales may increase losses since a PIK asset may not necessarily have defaulted. Thus, on top of the expected defaults, the transaction will incur losses from PIK assets. If the manager has the option of not selling a PIK asset, then the cash flows may be modeled reflecting that the assets pays back after a period of time.

Interest on Assets
Standard & Poor's criteria include modeling CDO cash flows that assume the minimum weighted average coupon and the minimum spread for the asset pool allowed by the transaction documents. This is a conservative assumption, but given that excess spread plays a major part in the credit support of the deal, using conservative assumptions is warranted. Furthermore, in most transactions the collateral manager has the ability to engage in discretionary trading (usually 20% per annum) that includes credit-improved and credit-impaired sales. This allows the portfolio quality to migrate over time, and creates uncertainties as to how coupon or spread will be affected. Also, at pricing, most transactions are based on hypothetical portfolios that are only partially ramped up. The exact composition of the portfolio is not known until the ramp-up period is completed.

Exceptions to this assumption may be made in a number of cases. The first is for static portfolios that have already been acquired at closing and cannot be substituted. The second is in cases where the collateral pool is very close to being fully ramped-up at closing and the transaction has a "replace interest with interest" provision in the reinvestment criteria. This provision requires the manager to reinvest in securities that generate the same interest cash flow as the traded security. Barring default and credit-risk sales, this provision maintains the effective coupon. Lastly, for deals that are very close to ramp-up and the actual portfolio has a weighted-average coupon or spread substantially over the minimums, Standard & Poor's may give credit to this for a period of time, depending on the reinvestment and discretionary provisions of the transaction.

In general, Standard & Poor's does not allow modeling of the asset pool at the yield rate, since yield is a return concept, not a cash flow concept. In CDOs, full credit for the collateral par is given in the O/C tests, regardless of whether purchased at a premium or discount. Also, the I/C test and cash flows must reflect actual interest dollar amount, not a hypothetical yield.

What Sponsors Must Provide
To become comfortable with the cash flow results associated with any given transaction, each transaction sponsor must provide Standard & Poor's with the following:

- The collateral input File for the CDO Evaluator;
- The results of the CDO Evaluator for the input file;
- A summary of all assumptions used in the cash flows;
- A summary of cash flow results showing the "Break-even Default Rate" (BDR) (i.e., maximum gross default rate that the rated tranche can withstand under each cash flow scenario). To pass the rating, the modeled BDR must be higher than the Scenario Default Rate;
- A full and detailed print outs of at least two of the most stressful cash flow runs for each rating level;
- The actual cash flow model in a working Excel model, or if not programmed in Excel, the actual cash flow model on a laptop.(Standard & Poor's will return the laptop after looking at the model.);
- An accountant's reliance letter for each substantially different deal structure or model; and
- A listing of scenarios that failed with the present value at tranche interest rate for failed runs.
Hedging Considerations

As discussed in the "CDO Structural and Collateral Considerations" section, many CDO structures use swap agreements to transform the cash flow characteristics of the issuer's assets into payment terms sought by investors. Most commonly, the CDO will use some combination of interest rate swap and cap agreements to hedge its risks against interest rate mismatches between fixed rate assets and floating rate liabilities, or visa-versa. Similarly, it may be necessary to employ a basis-risk swap where the collateral consists of floating-rate assets linked to one index, while the liabilities pay interest based on another.

In addition to these interest-rate and basis-risk swaps, a transaction may employ currency hedges where assets and liabilities are paid in different currencies to protect against foreign-exchange risk. The overwhelming majority of these hedges are documented using the master agreement prepared by the International Swap Dealers Association, Inc. (ISDA). Set forth below is a discussion of the criteria that Standard and Poor's applies in transactions with "AAA" rated tranches for determining which parties are eligible to be swap counterparties and the provisions that are acceptable under the ISDA documentation.

Interest Rate and Basis Risk Swaps

Hedge Counterparties Ratings Requirements
Entities rated with a short-term rating of 'A-1' or better may serve as swap counterparties in interest-rate and basis-risk hedges. To the extent that a potential counterparty does not have a short-term rating (or prefers to use a long-term rating to satisfy the ratings requirement), the entity must have a long-term rating of 'A+' or higher to be an acceptable interest-rate and basis-risk hedge counterparty. (These rating requirements may be satisfied by the rating of a guarantor of the swap counterparty's obligations under the hedge agreement, provided that such guarantor is identified under the ISDA documentation as a Credit Support Provider.)

Requirements Upon Downgrade
Should the rating of the counterparty (or the rating of its guarantor, if satisfaction of the ratings requirement is dependent upon the rating of such guarantor) fall below the 'A-1' or the 'A+' thresholds discussed above, the swap counterparty will then have an obligation to find a substitute counterparty that satisfies these rating requirements. All costs associated with finding such a replacement and assigning the agreement shall be borne by the "downgraded" swap counterparty. In the event that the agreement has not been assigned to a new counterparty within 30 days, the swap counterparty will be required to post collateral in amount equal to the greater of the market-to-market value of the swap, the amount of the next payment due, or 1% of the outstanding notional amount of the hedge agreement. These amounts should be posted in accordance with the collateral posting requirement set forth below.

Regardless of the fact that the counterparty may have posted such collateral in accordance with Standard & Poor's criteria after 30 days, the obligation of the swap counterparty is to find a replacement swap counterparty to which it may assign its rights and obligations under the agreement, which will remain in effect. In the event the swap is not replaced within this 30-day period, then a rating action may be taken. Standard & Poor's will weigh the following: the swap maturity; the market value of the swap; the market for similar swaps; the current rating of the transaction; and the rating outlook of the swap provider.

Collateral Posting Requirements
All collateral should be pledged to the trustee or other independent third party acting as agent for investors. The collateral should be segregated and pledged under normal ISDA requirements and in the possession of the trustee or some other fiduciary third party.

Collateral is to be invested in eligible investments (other than debt of the counterparty) in the currency of the rated securities and should be deposited in an account in the name of the trustee or issuer. The funds should be invested with an eligible institution other than the swap provider. If the funds do not mature before the next interest payment due on the rated securities, additional collateral may be required. The costs associated with posting the collateral should be borne by the swap provider.

Swap providers will have to mark the swap to market and post collateral on a weekly basis, with a cure period of three days. The mark-to-market valuation should reflect the higher of two bids from counterparties that would be eligible and willing to provide the swap in the absence of the current provider. Annual audits
should be amended to specifically verify a sample of swap calculations and collateral postings.

First loss classes should absorb any loss due to the failure of a swap counterparty. Transactions will need to explicitly state that all subordinated cash flows will be diverted to make up any shortfalls. Claims resulting from insufficient swap payments, a counterparty default, or insufficient collateral necessary to find a replacement counterparty will be the obligation of the first loss class.

Foreign Currency Swaps

Hedge Counterparties Ratings Requirements
For currency hedges, entities with short-term ratings of 'A-1 +' may serve as counterparties in 'AAA' -rated transactions if they agree to post collateral or replace themselves upon downgrade to a rating of 'A-1'. Similarly, entities with a short-term rating of 'A-1' (or 'A+' if a long-term rating threshold is used) may participate in a 'AAA' -rated transaction if they agree to post collateral at the beginning of the transaction and agree to replace themselves upon downgrade from the 'A-1' or 'A+' threshold.

The collateral posting triggers for currency hedges are more stringent than those for interest rate and basis risk hedges. Standard & Poor's believes that the market for interest rate and basis risk hedges enjoys less price volatility and has more liquidity, thus allowing for a lower-rated counterparty without increasing the overall risk to the transactions. The thresholds and the collateral posting requirements set forth herein are limited to those currencies recognized by ISDA.

Calculation of Required Collateral Posting Amounts
For currency swaps in permitted currencies, 'A-1+' rated counterparties do not have to post collateral. For 'A-1' and 'A+' rated entities, the new collateral levels will equal the greater of zero or the mark to market of the swap plus the amount equal to the appropriate value as a percentage of the notional value of the swap.

The specifics of calculating the required collateral posting amount for foreign currency swap counterparties is presented in Appendix B. The required collateral amounts should be posted in the manner discussed above under "Interest-Rate and Basis-Risk Hedges, Collateral Posting Requirements".

Requirements for 'AAA' Rated Swap Transactions
As a result of the growing and increasingly liquid market for swaps, Standard & Poor's will rate structured finance transactions with swaps from 'AAA' rated derivative product companies. The derivative product company will be required to post additional collateral with the trustee to ensure sufficient funds are available to replace the swap during market swings. The collateral posting requirements for 'AAA' counterparties are discussed in Appendix C.

Terminating derivative product companies are rated based on their ability to pay the mark to market at termination. Structured financings, however, need additional protection against movement in swap values between termination and replacement. These collateral amounts should be posted in the manner discussed above under "Interest-Rate and Basis Risk Hedges, Collateral Posting Requirements".

Swap Agreement Criteria For CDOs
This section substantively restates the swap criteria for structured finance transactions that were originally published in Standard & Poor's 1995 publication Global Synthetic Securities Criteria. Structured finance transactions frequently include swap agreements that transform the cash flow characteristics of an issuing special-purpose entity's (SPE's) assets into payment terms desired by investors. The swap agreement criteria for a particular issue depend on the applicable rating approach. There are three rating approaches that reflect the differing roles of swap agreements in transaction structures: the swap-dependent approach, the asset-independent approach, and the swap-independent approach.

A majority of the swap agreements reviewed by Standard & Poor's are contracted under the ISDA agreement forms. The ISDA documentation for a swap transaction consists of a swap master agreement and a schedule and confirmation that modify the terms of the master agreement. The schedule and confirmation should modify the master agreement to reflect Standard & Poor's swap agreement criteria based on the applicable rating approach.
This section discusses specific sections of the 1992 ISDA multi-currency Cross Border Master Agreement as it pertains to Standard & Poor's swap agreement criteria. This '1992 agreement' updates the 1987 ISDA form documents. The discussions of criteria that follow are cross-referenced to the appropriate section of the 1992 agreement. Separate comments are provided when the "1987 agreement" treats a topic differently. Although the ISDA form agreements are most frequently used to document a swap transaction, other forms of agreements may be used provided that the comparable sections incorporate Standard & Poor's swap agreement criteria.

**Rating Approaches**

In both the swap-dependent rating approach and the asset-independent rating approach, the issuer's credit rating of the swap counterparty, or its guarantor, is a supporting rating and may be the weak-link rating if its rating is the lowest of all the supporting ratings in the transaction. In addition to evaluating the creditworthiness of the swap counterparty or its guarantor, the swap-dependent approach reflects the creditworthiness of the issuing SPE's other assets. The asset-independent approach reflects only the creditworthiness of the swap counterparty or its guarantor.

**Swap-Dependent Approach**

When the issuing SPE's other assets also are a supporting rating, the issue credit rating addresses the credit risk of the swap counterparty, the other assets, and the transaction's structure. Each element affects the issuing SPE's ability to provide transformed cash flows to holders of the rated securities in a full and timely manner.

In many of these transactions, as well as in most asset- and mortgage-backed issues, the counterparty does not expect to take the credit risk of the issuing SPE's other assets. Therefore, the counterparty desires a swap contract that deviates as little as possible from the market standard. Investors in rated securities, however, also need reasonable assurance that the swap counterparty will not cause an early termination of the swap. An early termination of the swap may result in a termination payment by the issuing SPE to the swap counterparty out of funds that otherwise would be payable to the holders of the rated securities. A list of acceptable default and termination events that would enable the swap counterparty to terminate the swap agreement in securities in which the swap counterparty and the issuing SPE's other assets are supporting ratings is included here.

Analysts will assume that the issuing SPE would not have an incentive, or the ability, to terminate the swap agreement absent a default on its other assets, and then only if it is in the best interests of investors and is generally subject to their vote. The criteria for securities in which the swap counterparty and the issuing SPE’s other assets are supporting ratings, as the criteria apply to specific sections of the 1992 agreement, are discussed below. These criteria are applicable to synthetic securities and asset- and mortgage-backed transactions. The provisions of the 1992 agreement that are not referenced below are acceptable provided that they are not modified. The swap dependent ISDA Cross References are presented in Appendix D.

**Asset-Independent Approach**

Rated securities can be structured so that the issuing SPE’s other assets will not be a supporting rating and thus achieve a rating that is higher than, or irrespective of, the issuer credit rating of these other assets. This can be accomplished by including a swap agreement that commits the counterparty to make payments to the issuing SPE even if there has been a default on the issuing SPE’s other assets. In effect, the swap agreement becomes the issuing SPE’s only asset from a rating perspective. The swap counterparty is still a supporting rating, but the other assets are not.

Default and termination events for swaps in these transactions are more flexible than they are in transactions in which the issuing SPE’s other assets are also a supporting rating. Recent structures have included the following default and termination events under the swap agreement:

- Failure to pay,
- Misrepresentation,
- Bankruptcy,
- Merger without assumption,
- Illegality, or
- Events of default under the indenture.
Events of default under the indenture include failure to pay interest on any note when due, failure to pay
principal on any note when due, an event of default or early termination of the swap agreement, and the
bankruptcy of the issuing SPE.

If the swap is terminated for any of the above reasons, however, the swap counterparty would make a
termination payment to the issuing SPE equal to the principal of and accrued interest on the rated securities
minus proceeds from sale of the issuing SPE’s other assets. In other words, investors in the rated securities
are paid full principal and interest up to the redemption date even if the swap is terminated. In this structure,
the formula for calculating the termination payment will have to be amended accordingly.

If no withholding tax currently applies to swap payments by the swap counterparty and its guarantor, if any,
Standard & Poor’s will generally request legal opinions from counsel confirming that under current law no
such tax applies, and that there is no pending legislation to create such a tax.

**Swap-Independent Approach**

These types of securities also use swaps to transform the cash flows generated by the assets as an
accommodation to investors. A Standard & Poor’s issue credit rating, however, does not address the
swapped cash flow, only the likelihood of payment on the issuing SPE’s other assets. If the swap
counterparty defaults for any reason, either the transaction terminates and investors receive their pro rata
share of the assets, or the investors agree to accept the cash flows on the other assets without the benefit of
the swap and the transaction continues.

The swap counterparty’s issuer credit rating is not a supporting rating. Therefore, default and termination
events under the swap agreement are more flexible than those for swap-dependent securities in which the
issuing SPE’s other assets are also a supporting rating. The following events have been included in swap-
independent structures:

- Failure to pay,
- Breach of agreement,
- Credit support default,
- Misrepresentation,
- Default under specified transaction or swaps,
- Cross default,
- Bankruptcy,
- Merger without assumption,
- Trust termination, and
- Default on the issuer’s other assets.

**Additional Criteria**

Section 11 of the 1992 agreement provides that the defaulting party will pay certain reasonable out-of-
-pocket expenses incurred by the other party related to the enforcement and protection of that party’s rights
under the swap agreement or any credit support document. This section should not apply to the issuing SPE
for asset-independent or swap-independent structures because swap agreements employed by these
structures may terminate as a result of non-credit events. The occurrence of an event of default under the
swap agreement for an asset-independent transaction should not create a liability for the issuing SPE that
will result in payment shortfalls to investors. In the case of swap-independent structures, since the swap
provider is not a supporting rating, the occurrence of an event of default should be transparent to the issuing
SPE and not result in the creation of an expense under this section.

For all swap agreements, the swap counterparty should agree that it will not petition the issuing SPE into
bankruptcy, or join in any petition to file the issuing SPE, during the term of the rated securities and for a
period equal to the preference period plus one day applicable to the issuing SPE after all outstanding rated
securities have matured.

In transactions where the issue credit rating is dependent on a swap agreement and guarantee, if any, Standard & Poor's generally requests the following legal opinions for the swap counterparty and guarantor, as applicable, under the law of the jurisdiction of organization of the relevant entity and under the governing law of the swap agreement and guarantee, as applicable:

- An enforceability opinion in connection with the swap agreement and guarantee against the swap counterparty and the guarantor, as applicable, according to their respective terms;
- A pari passu opinion stating that payments due under the swap agreement and the guarantee, as applicable, rank at least pari passu with the unsecured and unsubordinated obligations of the swap counterparty and the guarantor, as the case may be;
- A choice of law opinion stating that local courts in the jurisdictions of the swap counterparty and the guarantor, as applicable, would recognize the choice of law in the swap agreement and the guarantee, as the case may be, and the choice of law is prima facie valid and binding under such local law;
- A recognition of claim opinion stating that local courts in the jurisdictions of the swap counterparty and the guarantor, as applicable, would recognize and enforce as a valid judgment any final and conclusive civil judgment of a court of competent jurisdiction for monetary claims under the swap agreement and the guarantee, as the case may be; and
- Relevant withholding tax opinions on payments under the swap agreement and the guarantee, as applicable. Standard & Poor's will also typically request from counsel for the issuer the relevant withholding tax opinions on payments by the issuer under the swap agreement.

Standard & Poor's may waive the enforceability opinion described above for swap counterparties and guarantors if Standard & Poor's previously has received similar opinions under the same governing law in similar transactions. (For a fuller discussion of these rating approaches, see Standard & Poor's Legal Issues In Rating Structured Finance Transactions, "Criteria Related to Global Synthetic Securities.")

In addition, for CDO transactions and given the nature of the asset pool and transaction specifics, Standard & Poor's allows the termination of the swap with the SPE being at fault. This could occur if the majority noteholders of each class of notes vote to materially amend the indenture or other transaction documents once they are notified that the swap counterparty has not consented to the change, and by them voting "yes" proceed with the amendments, causing the swap to terminate. Such material amendments typically are changes to the rights of the swap counterparty, changes to the priority of payments above the swap counterparty's position, and changes to the reinvestment criteria.

**Termination Payments in the Priority of Payments**

Given the uncertainty associated with precisely predicting future interest rates, and the fact that structure finance SPEs are special purpose vehicles that only have a limited amount of assets and no borrowing power, it is not feasible to accurately model termination payments or require the SPE to pay such an amount above the rated noteholders, should the swap counterparty default. For these reasons Standard & Poor's requires the swap counterparty to subordinate its claim of termination payments below investment grade rated tranches should the cause of the termination be due to its own default.

If the SPE defaults, Standard & Poor's allows the swap counterparty to get termination payments pari passu with the senior noteholders. In such cases, one of the above-mentioned events of default has occurred and the rating of the senior notes has already been compromised.

**Legal Considerations For CDO Transactions**

CDO transactions are rated primarily on the basis of the credit quality of the assets supporting the rated securities. The analysis of legal documents and, where appropriate, receipt of opinions of counsel that address insolvency and other issues, can resolve most legal concerns. Understanding the implications of assumptions made and criteria used enables an issuer to anticipate and resolve most legal concerns early in
the rating process. (For a more detailed analysis of some of the issues discussed in this section, see Standard & Poor's April 2002 publication "Legal Issues in Rating Structured Finance Transactions.")

It is beyond the scope of this publication to describe in depth the CDO criteria used in each of the jurisdictions that has one or more rated transactions. Rather, this chapter broadly describes the methodology used in reviewing the legal aspects of CDO securitization structures and the application of that methodology to the most commonly used U.S. structures. Nevertheless, it provides a useful guide to structuring CDO transactions in non-U.S. jurisdictions. Sponsors looking to structure non-U.S. transactions should discuss their transactions with Standard & Poor's early in the rating process, in order to resolve jurisdiction-specific legal and structural issues.

CDO Transactions
In CDO transactions, the issuing SPE purchases a pool of loans and bonds. In general, Standard & Poor's criteria for CDO transactions include the following considerations.

If the issuing SPE purchases the bonds in open market transfers, Standard & Poor's generally will not require a true sale opinion. If the bonds had been held in the transferor's portfolio for more than approximately three months, or they had been reported by the transferor other than as assets held for resale, Standard & Poor's generally will require a true sale opinion from the transferor to the issuing SPE.

As in structured transactions involving other asset types, Standard & Poor's generally will require inclusion of the applicable Uniform Commercial Code (UCC) Representations and Warranties in the relevant security agreement or, in specific circumstances, a security interest opinion in connection with the grant of a first priority perfected security interest from the issuing SPE to the indenture trustee/collateral agent for the benefit of the CDO holders and an entity-level tax opinion.

CLO Transactions
In balance sheet CDO transactions, the transferor, generally a bank, wishes to securitize direct loans made to its customers (either term or revolving loans), or syndicated loans on which the bank has a funding obligation. To date, Balance Sheet CDO transactions have been structured by both FDIC-insured banks and by the U.S. branches of foreign banks.

If the loan being securitized is freely assignable, then the transaction is structured the same (and Standard & Poor's criteria are the same) as other asset-backed transactions. In most transactions, however, the loan agreement contains restrictions or limitations on the outright sale of the loan to a third party. Because of these restrictions and limitations, most of the balance sheet CDO transactions rated by Standard & Poor's to date have been structured as participations. However, the July 2001 revisions to Article 9 of the UCC providing for the override of certain contractual anti-assignment clauses in UCC 9-408 may be helpful in the structuring of future deals. Standard & Poor's continues to examine issues related to the override of restrictions on the sale of loans to CDO vehicles.

**True Sale.** As noted above, most of the Balance Sheet CDO transactions rated by Standard & Poor's to date have been structured as participations. In these transactions the transferor is either an FDIC-insured bank or a U.S. branch of a foreign bank. In the case of participations from FDIC-insured banks, the transfer generally would not need to qualify as a true sale. Instead, Standard & Poor's obtains comfort that a security interest granted by the bank in the loans would not be avoidable in the event of the bank's insolvency. An opinion regarding creation and perfection of the security interest, as well as an FDIC opinion to the effect that the security interest in the loans will be enforceable notwithstanding the insolvency of the transferor is required. (For a discussion of Standard & Poor's criteria with FDIC-insured banks, see section on Securitizations by SPE Transferors and Non-Code Transferors; in Standard & Poor's April 2002 publication "Legal Issues in Rating Structured Finance Transactions").

In the case of participations from non-FDIC-insured banks, the participation must be structured as a true sale and appropriate opinions confirming such characterization must be provided at closing. In addition, appropriate regulatory comfort that, in an insolvency of the bank, the state banking regulator will treat the participation as a sale of the loans and will not treat the loans as property of the bank is required.

Although the case law in this area is limited, Standard & Poor's believes that participations can be structured
and documented such that the transfer can be viewed as a sale of an equitable interest in the underlying loans. Thus, in an insolvency of the transferor, the transferor as the holder of bare legal title, would have no property interest in the loans. The participation agreement should include the following provisions:

**Segregation of funds.** If the transferor is rated 'A-1' or higher, loan receivables should be deposited into a segregated custodial account within two business days of receipt, where the funds may be held for 30 days. Within the 30-day period, the receivables should be transferred to the issuing SPE. If the transferor's rating falls below 'A-1', loan receivables should be deposited upon receipt directly into either a separate trust account in the name of the issuing SPE in the transferor's trust department (where funds may be held for 30 days), or a lockbox arrangement with another depository institution that is rated 'A-1' or higher.

During the revolving period, collections may be transferred from these segregated custody accounts or obtained from the issuing SPE for the purpose of making new loans, with the issuing SPE receiving an equivalent dollar amount of loan participations. The issuing SPE should have no obligation to purchase further receivables in the event of a receivership or conservatorship of the transferor.

**Document segregation.** The loan agreements that are part of the securitized pool should be physically segregated from other transferor loan or participation agreements. These loan or participation agreements should be held in custody by the transferor and clearly segregated in files conspicuously labeled to show that the loans or participations are held by the transferor as custodian for the issuing SPE and for the transferor as lender. The portion of each loan or participation transferred to the issuing SPE at any point in time (which may vary during the revolving period) should be specified in the loan or participation files.

**Recordkeeping and reporting requirements.** The transferor should keep complete, accurate, and separate records for each loan, including records sufficient to monitor the amount of each loan that is transferred to the issuing SPE, the transfers of loan receivables from the transferor's general and custody/trust accounts to the issuing SPE and the use of the receivables for reinvestment during the revolving period.

Documentation of the transaction should delineate clearly the transferor's various roles and its duties. In particular, documentation should reflect the extent to which the transferor remains in the role of a lender for some portion of the participated loans. In addition, the transferor's duties as the lender of record and servicer of the loan participations should be governed by a formal written agreement.

The agreement should either specify that the transferor shall not, without written consent of the participant:

- Make or consent to any alteration of the terms of the underlying loans;
- Undertake to release any of the collateral or security (if any) for the underlying loans;
- Accelerate or retard the maturity of the underlying loans;
- Alter or amend the underlying loan; or
- Waive any claim upon the borrower or any guarantor in connection with the underlying loans; or

state clearly that the transferor's duties, as servicer (and lender of record) of the loans, to the issuing SPE are equivalent to the fiduciary obligations that a trustee owes to its beneficiaries.

If applicable, the documentation also should reflect the transferor's acting as a custodian for the loan receivables for the 30-day period before the transfer of the funds to the issuing SPE. The transferor's fee for acting as custodian should be separate from any servicing fees. All fees should be established on an arm's-length basis.

Standard & Poor's generally requires that, as a backup position, the participation be analyzed also as a borrowing by the transferor from the issuing SPE, secured by the underlying loans. This requires the transferor to grant to the issuing SPE a first priority perfected security interest in the underlying loans and loan receivables and to file UCC financing statements or execute one or more control agreements to perfect the security interest.

- To obtain legal comfort regarding both the true sale and backup security interest discussed above,
Standard & Poor's typically requests the following legal comfort:

- A true sale opinion to the effect that the sale of loan participations in accordance with the transaction documents and the procedures required to be followed thereunder will effect a sale to the issuing SPE of the full equitable interest in the portion of the loans represented by the participations;
- A nonconsolidation opinion, if applicable, between the transferor and the issuing SPE; and
- Inclusion of the applicable UCC Representations and Warranties in the relevant security agreement or, in specific circumstances, a statement to the effect that, if a court reviewing the transaction does not characterize the transaction as effecting a sale of a beneficial interest in the loans or participations, the transfer of loan participations in accordance with the transaction documents and the procedures required to be followed thereunder nonetheless would create a first priority perfected security interest in favor of the issuing SPE in the underlying loan receivables.

**Set-off.** Standard & Poor's examines the risk of borrower set-off in all balance sheet CDO transactions, regardless of whether the transfer of loans is structured as a participation or an outright assignment. If the borrower is not notified of the sale of, or granting of a participation in, the loan by the transferor, it would continue to have set-off rights against the transferor. Accordingly, in an insolvency of the transferor, the borrower may reduce its loan payments by the amount of any deposits held with the transferor or any amounts otherwise owed by the transferor to the borrower. If the loan agreement contains an explicit waiver of set-off by the borrower, reserves for borrower set-off are generally not required. In certain jurisdictions, opinions of counsel that the waiver of set-off provisions would be enforceable against the borrower in an insolvency of the bank may be required. If, on the other hand, the documents do not contain a waiver of set-off provision, the transaction should provide sufficient credit support (either as a reserve fund or a transferor's interest) to cover potential set-offs by the borrower. The transferor should have the capability to monitor borrower deposits on a periodic basis (generally weekly for lower-rated institutions and monthly for higher-rated ones). The transferor also should agree to be liable for any losses caused by borrower set-off.

Therefore, as a general matter, Standard & Poor's requires either that loans being securitized have a full waiver of set-off by the borrowers (this waiver of set-off would also prohibit a borrower under a revolving credit agreement from setting off payments due on drawn amounts against the portion of the revolving commitment that had not been drawn), or if the loan agreements do not include a waiver of set-off, that a reserve fund be established to cover (or that the transferor's interest cover) the amounts deposited by the borrower with the financial institution in full.

For FDIC-insured institutions, Standard & Poor's also is concerned that the FDIC, as a receiver or liquidator of an insolvent bank, would have the incentive to mandate a borrower set-off even if the borrower had waived its right to set-off against the bank. In asking the borrower to set off against the loan any amounts that the borrower has on deposit with the bank, the FDIC would maximize the amount available for distribution to the depositors and would also comply with the depositor-preference statutes. Accordingly, in the case of CLO transactions out of FDIC-insured banks, additional credit enhancement to cover set-off risk will generally be required (even if the loan agreements contain a waiver of set-off), unless the transfer of loans from the bank is structured as a true sale and an appropriate true sale opinion is given at closing.

**Lender liability.** For revolving loans, whether or not an institution transfers the unfunded commitment obligation to the issuing SPE, the question arises whether the issuing SPE could be held liable for the failure of the institution to lend to the borrower when the borrower requests a future draw. Standard & Poor's believes that lender liability claims, although possible in theory, are unlikely to affect the issuing SPE's ability to pay the rated securities in a full and timely manner. First, the financial institutions undertake to service the transferred loan or participation in the same prudent manner as the remainder of its portfolio. Second, if the borrower is insolvent, or there is a material breach of covenant under the loan, the financial institution is not obligated to lend.

As a corollary, if the borrower is financially sound, but the financial institution will not lend, the borrower would be able to find financing elsewhere. Thus, the borrower would be unable to show it was damaged by the financial institution's failure to lend. If the borrower is able to show damage, and the financial institution is solvent, then the financial institution has breached its covenant to the issuing SPE and is obligated to the issuing SPE for the damages. Third, if the financial institution is insolvent, Standard & Poor's is comfortable that the receiver or liquidator will repudiate the obligation to make further advances.

If the unfunded commitment is transferred to the issuing SPE, Standard & Poor's typically will evaluate
whether the issuing SPE has the funds necessary to make funds available to the borrower, in a full and timely manner, when requested. Standard & Poor's also will typically require that any negative carry or basis risk be covered to a level commensurate with the rating of the highest rated tranche issued by the issuing SPE. This can be accomplished through a variety of credit supports, including, for example, loans from appropriately rated banks, swaps, and reserve funds.

As with other asset types, the issuing SPE in a CDO transaction is required to grant to the indenture trustee/custodian, on behalf of the holders of the rated securities, a first priority perfected security interest in its assets, the participations and any collateral securing the participations (that is, the underlying loans) and to file UCC financing statements to perfect the security interest of the indenture trustee/custodian. To obtain legal comfort regarding the indenture trustee/custodian's first priority perfected security interest in the participations, Standard & Poor's generally will request inclusion of the applicable UCC Representations and Warranties in the relevant security agreement or, in specific circumstances, a security interest opinion.

**CDO Surveillance**

Surveillance of the ratings assigned to CDO transactions has become increasingly important as ratings migration and increased default rates among obligors in the speculative-grade credit markets, combined with lower recovery rates realized on collateral post default, has demonstrated the potential for volatility on the ratings assigned to these transactions. At the same time, features inherent to CDO transactions make the surveillance of the ratings assigned to these transactions more challenging relative to the surveillance of ratings assigned to other types of structured finance transactions.

Standard & Poor's ABS Surveillance monitors the ratings assigned to every Standard & Poor's rated CDO tranche throughout the lifetime of the rated notes, and initiates CreditWatches, upgrades, and downgrades to ensure that the ratings assigned to the notes continue to reflect the transaction's performance, the credit enhancement available, and the likelihood of receipt of timely interest and ultimate principal payments by the noteholders.

CDO transactions are typically collateralized by small to medium-sized pools of rated debt obligations issued by corporate obligors or by structured finance entities. Unlike a typical ABS or RMBS transaction in which the collateral pool is large and diverse and contains unrated obligations from thousands of individual obligors, a typical CDO collateral pool contains debt obligations from 75 to 150 obligors.

Other things being equal, the smaller the number of individual obligors within a collateral pool, the larger the potential impact the credit migration or default of any individual obligor on the overall credit quality and par value of the collateral pool securing the rated notes. Since the downward credit migration or default of only a handful of obligors in a CDO transaction can have a material impact on the credit enhancement available to support the rated notes, CDO surveillance necessarily relies on an asset-specific approach in monitoring the performance of CDO transactions, dependent upon the ratings assigned to the individual obligors or bonds found within the pools.

Additionally, obligor, industry, and geographic concentrations within CDO collateral pools mean that transactions can be subject to event risk. The default of a corporate obligor, an economic downturn and increased credit risk in an industry category, and the downgrade of the sovereign rating assigned to an emerging market country can all prompt a re-evaluation of and potential rating actions on multiple CDO transactions.

Also differentiating the surveillance of CDO transactions from that of other structured finance transactions is the fact that most CDO transactions allow for active discretionary management of the asset pool by a collateral manager. While this can be beneficial for the transactions, such as in the case of a credit-risk asset being sold prior to downgrade or default, it increases the complexity of monitoring the transactions.

While new assets added to the pool are subject to eligibility criteria, obligor, industry, and geographic concentrations may change significantly after the transaction has closed. In addition to concentration risk,
the surveillance analyst for a CDO transaction monitors changes which may occur in the collateral pool's overall credit quality, par value, and for cash flow deals weighted-average coupon or weighted-average spread, due to active management of the portfolio, and determine the impact of these changes on the credit enhancement available to support the rated notes. In addition, even without extensive sales or substitution of assets, a portfolio's characteristics may change as assets mature and are replaced with new assets during the transaction's reinvestment period.

**Primary Causes of Ratings Volatility in CDO Transactions**

While the ratings assigned to a CDO transaction can be impacted by a change in the rating of a dependent entity such as a swap counterparty or a monoline insurer, to date virtually all performance-related downgrades on CDO transactions are preceded by some combination of three problems affecting the transaction and negatively impacting the amount of credit enhancement available to support the rated notes:

*Credit migration*, or the reduction in the overall credit quality of the performing assets contained within the collateral pool. Even if a CDO transaction has not experienced the default of any of the assets within its collateral pool, rating volatility can still occur if significant numbers of the performing obligors or assets within its collateral pool have their ratings downgraded or placed on CreditWatch with negative implications. All else being equal, the lower the average credit quality of the performing assets within a CDO transaction’s collateral pool, the more credit enhancement is required in order to maintain a given rating on the notes.

*Par erosion*, or the reduction in the overall amount of the principal assets available within the collateral pool. Higher than expected levels of assets defaulting within the collateral pool, sales of credit risk assets at highly distressed prices, or lower than expected recoveries upon sale or workout of defaulted assets can all lead to a deterioration in the amount of principal assets available to support the rated notes. While a cash flow CDO transaction's overcollateralization ratio tests will force the transaction to divert interest and pay down the senior notes if the ratio of assets to liabilities deteriorates too much, a CreditWatch placement or downgrade of the ratings assigned to the CDO may still be required if continued asset defaults or other factors cause the par erosion of the collateral pool to outpace the ability of the transaction's coverage tests to de-lever the transaction and restore credit enhancement.

For *cash flow CDOs*, spread deterioration, or the overall reduction in the interest cash flow generated by the performing assets within the collateral pool. Since interest cash flow generated by a CDO transaction's assets is available to pay down the principal on the senior notes when the transaction's coverage tests are breached, excess weighted average coupon or weighted averaged spread above and beyond the levels assumed in the cash flow runs when the transaction was initially rated can provide a buffer against ratings volatility should the transaction experience credit migration or par erosion within its collateral pool. Similarly, if the weighted-average coupon or weighted-average spread generated by the performing assets in the pool decline to below the levels assumed in the closing cash flow runs, this will reduce credit enhancement relative to the levels contemplated when the transaction was initially rated and may cause volatility on the ratings assigned to the transaction's notes.

**Leading Indicators of Ratings Volatility in Cash Flow CDO Transactions (Red Flags)**

In order to monitor its rated CDO transactions for impairment of credit enhancement and potential ratings volatility due to credit migration, par erosion, and spread deterioration, CDO Surveillance monitors each rated CDO transaction for signs of stressed performance throughout the lifetime of Standard & Poor's rated liabilities. The monthly trustee reports for the transactions, in conjunction with monthly electronic data files sent by the trustees, are used to track the current composition of each transaction's collateral pool, any purchases or sales of assets that have occurred during the month, current liability and principal and interest cash balances, and the transaction's performance relative to its required benchmarks. Among the primary key risk indicators focused on by the surveillance group as leading indicators of distressed performance and potential ratings volatility are the following:

- Failure of Standard & Poor's Trading Model or CDO Monitor test;
- Large numbers of downgrades to the ratings of obligors or assets within the collateral pool;
- Higher-than-expected levels of assets defaulting;
- Lower recoveries upon sale or workout of defaulted assets than assumed in the closing cash flow runs;
- Very low market value of defaulted assets still held within the collateral pool, potentially indicating low
future recoveries;

• Significant par loss due to credit risk sales at highly distressed prices or large volume of credit risk sales;

• Substantial deterioration in the overcollateralization ratios relative to the transaction’s effective date;

• Significant overconcentrations of obligors in a single industry category, or, for an emerging market transaction, a single country or geographic region; and

• Reduction of the weighted-average coupon or weighted-average spread generated by the performing assets to levels beneath those assumed in the closing cash flow runs.

Certain qualitative factors may also lead to a detailed review of a transaction, such as a change in the management team responsible for the portfolio, or unusual trading patterns such as negative selection, and the purchase of assets at discounted prices prior to a payment date in order to avoid breaching the minimum overcollateralization test and de-levering.

The Ratings Review Process

While the signs of distressed performance listed above may point to transactions at risk of ratings volatility, the final decision to adjust the ratings assigned to a transaction will only be made after a full performance review and current cash flow analysis is presented to a ratings review committee. The process leading up to a ratings review committee is comprised of the following steps:

• Initial identification of a transaction with the potential for ratings volatility;

• Placement of the transaction on an internal review list following an informal analysis of the stability of the ratings assigned;

• Rerunning the portfolio through the CDO Evaluator on a routine basis to track migration in the collateral credit quality and evaluate the impact on the transaction's ratings;

• Contact the collateral manager for the transaction to communicate concerns and obtain insight into their plans for the portfolio;

• Placement, if warranted, of some or all of the transaction's ratings on CreditWatch and the completion of a full set of cash flow runs to formally evaluate the stability of the current ratings assigned; and,

• Detailed presentation of transaction's structure, performance, current portfolio and cash flow results if needed to a ratings review committee comprised of senior surveillance and new deal analysts.

For cash flow CDOs, the cash flow analysis presented to the ratings review committee is similar to the cash flow analysis completed for a new CDO transaction. The cash flow model runs for the transaction determine the level of asset defaults each tranche can withstand under various stressed default timing and interest rate scenarios, while still paying all of the rated interest and principal due on the notes.

These cumulative amounts of future asset defaults a tranche can withstand under different scenarios, or break-even default rates, are compared to the array of scenario loss rates generated by Standard & Poor's CDO Evaluator. The scenario loss rates indicate the level of gross defaults a tranche must be able to withstand in order to maintain a given rating, based on the credit quality of the performing assets in the current portfolio.

If the scenario-loss rate generated by the CDO Evaluator at the current rating level for a tranche exceeds the break-even default rate for any of the cash flow run scenarios for that tranche, the rating assigned to the tranche will generally need to be lowered by the committee to a rating at which level the scenario loss rate again falls under the all of the break-even default rates generated by the cash flow runs for that tranche under the various stressed default timing and interest rate scenarios.

While the surveillance cash flow analysis completed to evaluate the stability of the ratings currently assigned to a transaction is similar to the cash flow analysis done for the initial rating and operates under the same default-timing and interest-rate scenarios, some differences do exist between the initial and surveillance cash flow runs. These differences are primarily related to the treatment of currently defaulted assets in the portfolio and in the treatment of the recovery rate and spread assumptions used to generate the cash flow runs.
Treatment of Currently Defaulted Assets in the Portfolio
Since it is difficult to input currently defaulted assets into most cash flow models, and since most distressed CDO transactions have at least some defaulted assets in their collateral pools, some assumption must be made for these assets when re-running cash flows. In general, when doing surveillance cash flow runs, Standard & Poor's will treat any assets from obligors rated "CC", SD, or D as defaulted. Assets from these defaulted obligors will be assumed to be liquidated at current market values, and the proceeds assumed to be used to pay down the senior notes or used to purchase new collateral at representative ratings and spreads as appropriate.

Recovery Rate Assumptions
Based on the historical recovery rates achieved upon sale or workout of defaulted collateral, and on the current market prices of defaulted assets still held in the collateral pool, Standard & Poor's may adjust the recovery rate assumptions used for a transaction as appropriate when re-running cash flows for a transaction.

Spread Assumptions
While the initial cash flow runs for a CDO transaction will generally make an assumption that reinvestment will occur at the minimum weighted-average coupon or weighted-average spread rate, the surveillance cash flow runs presented to the ratings review committee will generally give full credit for the weighted average coupon generated by the performing fixed-rate collateral in the pool, and the weighted-average spread generated by the performing floating-rate collateral in the pool.

The surveillance of synthetic CDOs that do not have a cash flow concept is identical to the surveillance of cash flow CDOs, with the only exception being that the cash flow analysis is not run to come up with the actual break-even default rate that the transaction can sustain. The analysis focuses on the credit quality of the pool, defaults incurred to date, recoveries achieved to date, and manager performance. In light of these factors, the level of credit support in the transaction is compared to the level of credit support needed at various rating levels, and an appropriate rating is derived.

The decision for upgrading, maintaining, or downgrading the rating of the transaction is still done through a committee process similar to the way in which the original rating of the transaction was assigned. Once the committee has finished its review, a press release is prepared, the collateral manager or sponsor is notified, and the rating action is immediately announced. The affected CDO tranches are generally taken off CreditWatch once the ratings have been changed or affirmed, but given the dynamic nature of CDOs, it is possible that rating actions are taken and the tranches are still maintained on CreditWatch.

Special Topics
Master Trust Structures
Overview
The properly implemented master trust structure should allow an issuer to sell multiple series from the same trust, with each series sharing the credit risk and cash flow from one large pool of assets. This structure is attractive to issuers because it is cheaper to issue an additional series out of a master trust than it is to create a new, discrete trust. Investors often benefit as well. Depending on the issuer, securities issued out of a master trust may be backed by one large, diverse pool of assets containing a mix of seasoned and newly originated loans. Master trusts may contain other features that benefit investors, such as the sharing of excess principal and excess finance charge collections among series.

Each series of certificates issued from a master trust represents an undivided interest in the trust's receivables and an allocable interest in the collections on the receivables based on the invested amount of such series. There is also an interest in the trust assets that has not been allocated to any series, known as the seller's interest. The seller's interest is equal to the amount of trust receivables, which is not matched with corresponding certificated liabilities.

For example, assume a master trust contains $107 of receivables and it has issued one series, which has a
The certificate balance of $100. The seller's interest is defined as the positive difference, if any, between the receivables and the certificated interest in the master trust. In this example, the seller's interest would be $7. The size of the seller's interest will change with fluctuations in either the amount of trust certificates issued or in the balance of principal loans in the trust. In the absence of defaults and dilutions, during any month if draws on revolving assets exceed payments on all assets, the pool of assets and the seller's interest will grow. Conversely, if account payments exceed account draws, the seller's interest will shrink.

**Relevant Periods**

*Revolving Period.* All master trust series have three main periods: the revolving period, the controlled amortization period, and the rapid amortization period. Each begins with the revolving, or interest-only, period. During this period, which has ranged from two to ten-plus years depending on the issuer's preference, investors receive interest-only payments each month. Principal collections are paid back to the seller for reinvestment in additional assets. The seller's interest is reduced by the amount of principal collections paid back to it, and it is increased by any additional loans that are conveyed to the trust. Unlike mortgage-backed securities or auto loan securities, bonds issued from master trusts are not intended to amortize during the revolving period. This interest-only period mirrors the interest-only period found in many corporate and municipal bonds.

*Controlled Amortization Or Controlled Accumulation Period.* Typically, in a master trust, if the transaction performs as the issuer expects, the revolving period is followed by a period in which principal is returned to investors pursuant to a predetermined schedule. CLO master trusts have widely adopted this mechanism. The period during which principal is returned to investors is referred to as the “controlled amortization period.” During a controlled amortization period, investors receive a partial amortization payment each month until the bonds are retired at the end of the specified period. The date on which the issuer intends to return all principal to investors is called the expected final payment date. Any principal in excess of this partial amortization payment will be shared with the other series issued out of the master trust.

By contrast, during a controlled accumulation period, principal is not used to amortize investor certificates; rather, it is trapped in a trust account for the benefit of investors and held there until the expected final payment date. Cash will be trapped in this account, which is called a principal funding account or PFA, until its balance equals the face value of the rated certificates. At the expected final payment date, the funds in the PFA will be swept out and paid in a lump sum to investors. This one-time payment is called a soft bullet. As cash accumulates in the PFA, credit risk to investors declines but negative carry risk grows. If reinvestment income on the PFA balance is less than the coupon payments due on the notes, full and timely interest payments will not be made. In order to mitigate this risk, most structures employ either a reserve fund or a swap from a highly rated counterparty.

*Early Amortization Period.* The final period common to all master trust structures is the early amortization period. There are certain events, many of which relate to the performance of the assets or the selling bank, which will prematurely amortize the bonds. These early amortization events can occur at any time during the revolving, controlled amortization, or controlled accumulation periods. All these events share a common theme: something has occurred that may threaten the interests of certificateholders. Rather than subject certificateholders to additional risk, all principal collections that are allocated to investors are used to amortize the bonds as quickly as possible.

Examples of early amortization events include the dollar amount of credit enhancement falling below its required level, the seller's interest falling below the required level, failure of the seller to make a required payment, the insolvency of the seller, the failure to retire rated notes by their expected final payment dates and the failure or inability of the seller to transfer receivables to the trust. The rating assumes that each transaction will enter early amortization at some time during its life. Consequently, if a transaction enters early amortization, this does not necessarily mean that the rating will be affected.

**Allocation Methodologies**

Regardless of whether the transaction is in its revolving, controlled amortization, or early amortization period, three things must be allocated between the certificate interest and seller's interest every month: finance charge collections, principal collections, and defaults. These items are allocated in different ways depending on the period (see table 1).
Table 1

<table>
<thead>
<tr>
<th>Master Trust Allocation Methodologies</th>
<th>Revolving</th>
<th>Controlled Amortization</th>
<th>Rapid Amortization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest collections</td>
<td>Float</td>
<td>Float</td>
<td>Float</td>
</tr>
<tr>
<td>Defaults</td>
<td>Float</td>
<td>Float</td>
<td>Float</td>
</tr>
<tr>
<td>Principal collections</td>
<td>Float</td>
<td>Fix</td>
<td>Fix</td>
</tr>
</tbody>
</table>

During all periods, interest collections and defaults are allocated in the same manner. They are allocated to each series on a pro rata basis; that is, based on the current month's invested amount. This is commonly referred to as the "floating" allocation percentage as a particular series amortizes, its pro rata share of the trust declines, or "floats" down. By the same token, within each series, interest collections and defaults are allocated among the classes on a pro rata basis.

For example, if a series enters rapid amortization with $100 in certificates and $107 in receivables in that month it will be allocated 100/107 of both interest collections and defaults and the seller's interest will be allocated 7/107. If the series amortizes down to $70 in the second month and the receivables balance remains constant, the certificates will be allocated 70/107 of interest collections and defaults and the seller's interest will be allocated 37/107 of those amounts.

Unlike interest collections and defaults, principal collections during the early amortization period are allocated on a "fixed" basis. That is, each series is allocated principal based on its aggregate invested amount as of the end of the revolving period. In the example above, although the certificate balance has amortized down to $70 in the second month, certificateholders will still be entitled to 100/107 of all principal collections that enter the trust. In some scenarios, this fixed percentage will amortize certificates more rapidly, subjecting them to asset deterioration over a shorter period of time.

Distributions and Priority of Payments

*Interest Waterfall*. Traditional master trust structures use the "fixed" and "floating" allocation percentages described above to initially split or "bifurcate" interest collections from principal collections. Interest collections are then used to cover fees, certificate interest and defaults (interest waterfall) and principal collections, during the amortization periods, are used to retire certificates (principal waterfall).

Every month, each series in a master trust receives its "floating" or pro rata share of asset interest collections (available funds). If the structure contains a swap and a net swap receipt is due to the trust, the net swap receipt is also included in available funds. Available funds are then allocated to all classes within a series on a pro rata basis. Class A available funds will be used to pay class A interest, servicing fee, and defaults. Any remaining class A available funds will be used in the secondary or "excess spread" waterfall. Class B available funds will be used to pay class B interest and servicing fees. Any remaining class B available funds will be allocated to the excess spread waterfall. In structures that do not utilize a swap, the subordination of class B defaults creates better liquidity in the excess spread waterfall and, consequently, improves the probability that the class A certificates will receive timely interest payments.

In some master trust structures, class C available funds are used to pay only class C's share of the servicing fee and any remaining class C available funds are allocated to the excess spread waterfall. The subordination of the class C interest entitlement achieves two things. It improves liquidity in the excess spread waterfall, and it creates additional credit enhancement in the deal. Any interest collections which may have been used to pay the class C coupon are available to pay interest on the class A and B certificates and to cover defaults. Additional credit enhancement is created because class C available funds are not used to pay the class C coupon but instead are used to cover class A and B defaulted amounts. If defaulted amounts are covered by current monthly cash flow, subordinated certificates are not written down. While such a structure benefits the class A and B certificates, the class C certificates suffer because their interest entitlement is subordinated in the excess spread waterfall and, as a result, there is no guarantee that they will receive timely interest payments.
Required Amounts. If available funds are insufficient to pay the costs of interest, servicing fees, and investor defaults as outlined above, a shortfall or "required amount" exists. Required amounts are paid from the following sources, in priority:

- Any interest collections available in the excess spread waterfall,
- If the deal contains a cash collateral account, withdrawals from it, and
- Reallocated principal from the subordinated classes.

As described above, master trust structures initially bifurcate interest and principal collections. However, if interest collections are insufficient to satisfy all required amounts in any period and the cash collateral balance is zero, principal collections that have been initially allocated to the subordinated certificates will be recharacterized as interest collections available to cover required amounts. The most subordinated certificate in the capital structure will be reduced by the dollar amount of reallocated principal collections used to cover required amounts. The ability to reallocate principal collections is the main reason why principal collections are allocated every month to each series even if a series is in its revolving, "interest-only" period. If required amounts exceed interest collections, cash collateral amounts and reallocated principal amounts, the most subordinated certificate in the capital structure will be reduced by the dollar amount of uncovered defaults.

Principal Waterfall. During the controlled and rapid amortization periods, each series is allocated principal as described in "Allocation Methodologies" above. The amount of series' principal collections available to amortize the certificates will be reduced by the amount of reallocated principal collections used to cover required amounts, and it will be increased by the amount of shared principal collections from other series. Other series will share principal collections if they are in their revolving periods or their principal collections exceed their respective scheduled amortization amounts.

Available principal collections will also be increased by the amount of defaults that have been "covered" in the interest waterfall. When defaults are "covered" in the interest waterfall, interest collections are re-characterized as principal collections.

For example, if defaults are covered by interest collections during an amortization period, the bucket of available principal collections will grow and, as a result, the most senior certificates will amortize more quickly. If defaults are covered with current monthly interest collections, the most subordinated certificates will not be written down.

Once the available principal collections have been defined, the traditional master trust structure will apply them in a sequential fashion: first to the class A certificates until the class A certificate balance has been reduced to zero, then to the class B certificates until zero, and finally to the class C certificates until zero.

Master Trust Structural Issues

Seller's Interest
The seller's interest is equal to the amount of trust receivables that is not matched with corresponding certificated liabilities. In commercial loan securitizations, the seller's interest provides a buffer against two major potential risks: loan amounts which an obligor may set off and loan amounts which exceed obligor or industry concentration limits.

In any pool of commercial loans, there may be some obligors that have additional contractual relationships with the lender. For example, ABC Bank may have extended a loan to a XYZ Financial Inc. XYZ Financial Inc. may also have cash on deposit at the bank, or it may be a party to a derivatives contract with the bank. If ABC Bank goes insolvent and it does not perform on the derivatives contract, or the cash deposit is stuck in the bank's receivership estate, XYZ may choose to "set off" or reduce the balance of its commercial loan by the value of the derivatives contract, or the dollar amount of the cash deposit (see "Set-off" section in "Legal Considerations").

Within the securitization context, statutory and equitable set-off may create the risk that some borrowers would be entitled to set-off against amounts transferred to the trust, thereby affecting amounts available to
pay the rated securities. If the loan documents contain provisions waiving set-off, the analyst will examine the enforceability of those provisions. If the loan documents do not contain these provisions, the seller's interest must be sized to cover set-off risk. For deposit-taking financial institutions, additional coverage may be needed for insurable amounts. For example, for FDIC-insured institutions in the U.S., even if the loan agreements have full waiver of set-off or counterclaim, a reserve fund or the seller's interest should cover at least $100,000 for each loan securitized.

Standard & Poor's does not provide specific obligor concentration guidelines. Obligor concentration guidelines, however, strengthen the credit risk profile of the pool because they limit loss exposure per obligor. Likewise, a pool of bonds or loans with industry concentrations restricted to 8% of assets per industry is fairly diversified. Once an issuer establishes overconcentration parameters, if an obligor or industry exceeds them, the dollar amount of loans in excess of the limitation must be allocated solely to the seller's interest. In addition, the analyst may increase default probabilities to adjust for industry overconcentrations in the CBO/CLO default model and assessment of credit enhancement (see "Level of Credit Enhancement" section in "Evaluating Credit Risk"). Any defaults with respect to these overconcentration amounts will not be allocated on a "floating" basis between the seller's interest and the invested amount; rather, 100% of the excess loss amount will be allocated to the seller's interest.

The minimum required seller's interest in a CLO master trust securitization should equal the following: 5% of the aggregate principal receivables in the trust plus obligor overconcentration amounts plus industry overconcentration amounts plus unwaived set-off amounts, which should include $100,000 for all U.S. FDIC-insured depositors regardless of the waiver. The main reason for the 5% buffer is that set-off exposures are dynamic and difficult to track on a daily basis. In any month, if assets are insufficient to service the aggregate invested amount plus the minimum required seller's interest, the seller should be required to add assets. Any shortfall in the seller's interest below the minimum should trigger early or rapid amortization.

In addition to the minimum required seller's interest, periodic monitoring and reporting of exposures to those borrowers that have not waived their right to set-off are required. If a bank maintains a short-term rating of A-1 or higher, quarterly monitoring and reporting is required. If the bank's short-term rating falls below 'A-1', monitoring and reporting increases to a monthly basis. If cash is released to the seller more frequently than monthly, banks rated below 'A-1' should monitor and report this set-off exposure as frequently as the intended distribution.

Collateral Additions
There are three ways to add collateral to a master trust: a required addition, a permitted addition, and an automatic addition. As described previously, a required addition will occur if there are insufficient assets to support the aggregate invested amounts issued out of the trust plus the minimum required seller's interest.

The second way to add collateral to the master trust is through a permitted addition. In this case, the seller will present a computer file that contains the current pool of loans plus the proposed addition. The analyst will run the pro forma pool through the applicable default model. Cash flow runs need to be done to determine whether the proposed addition negatively impacts the credit risk profile of the pool. If the risk profile remains within acceptable boundaries, the analyst will approve the addition.

Collateral may also be added to a master trust automatically subject to a number of conditions that include the following:

- The aggregate balances of loans added during any 12-month period shall not exceed 10% of the aggregate loan balances at the beginning of such a 12-month period, and the aggregate commitments under such loan facilities added during any 12-month period shall not exceed 10% of the aggregate commitments under covered loan facilities at the beginning of such a 12-month period;
- Each obligor should meet some minimum ratings threshold;
- Each obligor shall have agreed to make payments without set-off against the lender(s);
- After giving effect to the additional loan, the trust is in compliance with any maturity distribution test;
- The scheduled maturity of the additional loan may not exceed the series termination date of any outstanding series; and
- After giving effect to the addition, minimum requirements for revolving credit facilities, secured loans, and industry and obligor concentrations are satisfied.
The preceding list is not exhaustive and proposed automatic addition constraints will be reviewed on a deal-by-deal basis.

Not all transactions allow permitted or automatic additions. Instead, the sellers in these deals use the applicable CBO/CLO model, either the single-jurisdictional or multi-jurisdictional version, when they contemplate adding collateral (see "Cash Flow Analysis" in the "Evaluating Credit Risk" section). If the proposed addition plus the current pool results in an expected default percentage that is less than the maximum expected default percentage established at closing, the seller will add the loan without prior review. If, however, the additional loan causes the expected default percentage to exceed the maximum expected default percentage, the seller will notify Standard & Poor's and subsequently, if these loans are added, the validity of the ratings on the notes will be re-evaluated.

**Series Termination Date**

In master trust structures, there are two important payment dates: the expected final payment date and the series termination date. The expected final payment date is the date on which certificateholders expect to receive their final payment of principal. Sometimes, however, certificate balances may extend beyond the expected final payment date. This can occur, for example, if the total sum of principal payments received by the expected final payment date is less than the certificate balance to be retired. This extension risk is present in any securitization where there is a mismatch between the tenor on the assets and the tenor on the notes. The series termination date, which occurs months after the expected final payment date, is the date on which all rated notes must be retired. After the series termination date, investors have no legal right to cash flows from the assets in the trust.

An actuarial method cannot be applied to pools of commercial loans because these pools are heterogeneous in nature. Pools of commercial loans have some of the following characteristics:

- Relatively small number of obligors;
- High loan balances, which can be hundreds of millions of dollars;
- Highly customized loan documentation;
- Wide variance in maturity profiles; and
- Pools contain revolving and term loans, each of which perform very differently.

To date, most master trust CLOs have combined three structural mechanisms in order to meet series termination date requirements: A maturity distribution test, a minimum payment rate test, and a minimum number of months between the expected final and the series termination date. The maturity distribution test measures the aggregate amount of scheduled amortization payments due between the current month and the series termination date for the class in question. Unlike credit card pools, since the payment characteristics of this asset type are so unpredictable and "lumpy," no credit is given to principal prepayments. In order to satisfy the test, each month the scheduled amortization payments must equal the principal balance of the class in question plus all maximum expected losses for that rating category.

If the maturity distribution test is applied to Class A, on each monthly testing date, scheduled principal payments must equal to $100. Since there is no discernible loss curve with respect to this asset, we must assume that the $10 of 'AAA' credit enhancement may disappear at any time between the testing date and the series termination date. When 'AAA' defaults do occur, $10 of scheduled principal payments will vanish. If the maturity distribution test is not satisfied, principal collections that would have been paid back to the seller are trapped in a trust account called an excess funding account.

While the maturity distribution test is the most important structural feature when determining the series termination date, a minimum payment rate test and a minimum number of months between the expected final and the series termination date provide additional comfort. If the minimum monthly payment rate test (which has typically been around 4%) is tripped, principal collections that would have been paid back to the seller are trapped in the excess funding account. In some structures, failure to meet the minimum payment rate test will also result in an early amortization of the bonds. Finally, with respect to the required number of months between the expected final and series termination date, 36 months has been the norm.

Currently, none of the CLO master trusts have issued a subsequent series. Upon the issuance of a subsequent series, each trust will have to arrive at a series termination date for the second series.
principal in a master trust is allocated among series on a pro rata basis, the maturity distribution test as described above will not work for a second series. A number of solutions exist.

First, the seller can represent that none of the assets has a longer maturity than the shortest series termination date for any series. This solution, however, severely limits the funding flexibility inherent in a master trust. Alternatively, an issuer may establish “firewalls” among pools of assets in a master trust, so that each series that is issued from the master trust is backed by cash flows from a discrete pool of assets. Ironically, this solution converts a master trust into a number of discrete trusts. If this solution is implemented, investors lose one of the main advantages of a master trust: obligor diversity. These and other proposals will be reviewed on a case-by-case basis (see table 2).

<table>
<thead>
<tr>
<th>Class</th>
<th>Rating</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>AAA</td>
<td>90</td>
</tr>
<tr>
<td>B</td>
<td>NR</td>
<td>10</td>
</tr>
</tbody>
</table>

**Modified and Restructured Loans**

During the life of a securitization, a percentage of loans supporting certificateholders will be modified or restructured. Often a loan is restructured with respect to payment terms and tenor when the obligor is having difficulty performing under its original terms. Frequently the obligor's creditworthiness has declined and it wishes to extend its repayment schedule. Since the analyst makes certain assumptions as to the tenor of each loan and the creditworthiness of each obligor, any variance in these two variables should be constantly monitored.

This issue has been addressed in two ways. Some structures automatically remove a modified loan and add it back into the securitized pool subject to rating agency review. This is the preferred method because it causes the recalculation of default percentages based on the current pool and the terms of the modified loan. Other structures notify certificateholders and Standard & Poor's when any loan is modified or restructured. If an issuer chooses the notification option, the following conditions must be satisfied:

- Tenor of the loan may be extended only once, subject to a maximum extension cap of six months;
- If tenor is extended, the maturity distribution test must be satisfied on a pro forma basis;
- No modification can reduce the principal amounts owed; and
- Monthly servicer report must track aggregate amounts that are being restructured.

Other modifications (for example, interest rate reductions) can be made with notification as long as they are consistent with the seller/servicer's practices, and the appropriate coverage or spread tests in the securitization are met.

**Commingling**

As discussed above, unlike other assets, commercial loans are characterized by "lumpy" payment rate behavior. Thus, on any given day, the seller may receive a large dollar amount of loan repayments. If the seller goes insolvent shortly after receiving a large amount of repayments, that money may be trapped in the seller's receivership estate and it may be unavailable to service the interest and principal payments on rated notes. For this reason, each CLO securitization should limit the circumstances under which the seller may "commingle" or hold cash payments in its own account. The commingling restrictions should tighten depending on the seller's credit rating as follows:

- If the seller maintains a rating of 'AA-/A-1+' or higher, it may commingle all collections for 30 days and deposit collections into an eligible deposit account at the end of the month. (An eligible deposit account can either be a segregated trust account held in the name of the transferor or SPE on the corporate trust side of a federal or state chartered depository institution, or an account in the name of the SPE maintained with a federal- or state-chartered institution rated 'A-1+'). If the seller maintains a rating of 'A-/A-1', it may commingle collections up to 20% of the outstanding principal balance of rated notes for 30 days. All collections above the 20% limitation must be
deposited into an eligible deposit account within two business days of receipt.

• If the seller maintains a rating of 'BBB/A-2', all collections must be deposited into an eligible deposit account within two business days of receipt.

• If the seller's rating falls below 'BBB/A-2', it must notify each obligor to remit all payments directly to an eligible deposit account maintained by an institution that has a rating of 'AA-/A-1+'. This requirement applies even if the account had been held in the corporate trust department of the seller.

In the U.S., these requirements apply to both FDIC and non-FDIC insured institutions.

Credit Considerations

Tenor
A mixture of term and revolving asset collateral backs most CLOs. With respect to term loans, no prepayment credit will be given. Simple amortizing term loans may be entered into the model in one of two ways:

• Each amortization payment is entered into the model as a separate loan, or
• The loan is entered as one line in the model, using its weighted average life to establish its tenor.

With respect to revolving loans, it is assumed that each is retired in a bullet payment at its facility maturity date. Unlike term loans, which are typically used as long term funding mechanisms, many companies use revolving loans as short-term liquidity facilities that are drawn upon and repaid frequently. As an empirical matter, as long as the seller remains solvent, its portfolio of revolving commercial loans will experience a much higher percentage of prepayments than its term-loan portfolio. For this reason, on a case-by-case basis, the analyst will give a small amount of revolving-loan prepayment credit only at each tranche rated at or below the long-term unsecured rating of the seller. This prepayment credit is linked to the rating of the sponsor because bank regulators will probably negate the unfunded portion of revolving commercial loans if the sponsoring bank goes insolvent. If this occurs, any obligor which still has a relationship with the bank will have no incentive to prepay its loan, and its revolving loan will have effectively been transformed into a term loan.

Prepayment credit for revolving commercial loans will be given only if there is clear and thorough disclosure in the offering document that the rating on each tranche rated at or below the rating of the sponsoring bank is directly linked the financial health of the bank. With adequate disclosure and extensive portfolio performance data, the following prepayment credit may be given (by tranche):

• "A", the lesser of 1.5% monthly or 15% of the issuer's historic net prepayment rate;
• "BBB", the lesser of 3.0% monthly or 33% of the issuer's historic net prepayment rate; or
• "BB", the lesser of 6.0% monthly or 50% of the issuer's historic net prepayment rate.

If prepayment credit is given, it will be used to shorten the tenor of each revolving loan as it is entered into the applicable CBO/CLO default model. This credit will be based on an analysis of the historical payment rate in the issuer's portfolio, net of intra-month draws. Prepayment rate proposals for tranches rated higher than 'A' will be reviewed on a case-by-case basis.

Utilization Rate
As discussed above, two of the key variables that determine the probability of default for a loan are the creditworthiness of the obligor and the tenor of its obligation. A third variable is also important: the loan amount at the time of default. Term loans have fixed amortization schedules that can be entered into the CBO/CLO default model. As such loans amortize, obligors cannot make additional draws. By contrast, obligors under revolving facilities differ because an obligor may pay down and redraw the loan at any time prior to the loan's facility maturity date, resulting in a vacillating utilization rate. On any day, a revolving loan facility's utilization rate is determined by dividing its current loan balance by its maximum loan cap. As utilization rates fluctuate, the rating distribution in a pool of securitized loans can differ significantly from the rating distribution at closing.
Research indicates that as an obligor's credit quality deteriorates, its utilization rate climbs. In fact, defaulted obligors, on average, have utilization rates that exceed 75%. For these reasons, multiple-default model iterations are required when analyzing a pool that contains both term and revolving commercial loans. The iterations may include some or all of the following:

- The closing date portfolio with closing date balances;
- The closing date portfolio, assuming all revolvers have 100% utilization rates (subject to obligor concentration limits);
- The closing date portfolio, assuming all revolvers are drawn down on a pro rata basis until the aggregate pool balance equals the aggregate investor interest plus the minimum seller's interest;
- The closing date portfolio, assuming the most highly rated revolvers are drawn down until the aggregate pool balance equals the aggregate investor interest plus the minimum seller's interest;
- If applicable, a hypothetical pool based on the automatic loan addition parameters in the indenture; and
- If applicable, a hypothetical pool which assumes all highly rated loans are replaced through the automatic addition mechanism and all lower-rated loans remain at their loan caps.

Also, pools of assets that contain 100% unfunded revolvers have been reviewed by analysts. For these proposals, a combination of industry research and issuer-specific portfolio analysis will be used to establish a utilization rate for each of the rated tranches.

**Draw Rate**
An obligor under a revolving credit facility can increase its utilization rate in any given month by making additional draws under its facility (subject to its maximum loan cap). As long as the seller is solvent, obligors will be able to continue to draw upon their facilities. If these additional loans are transferred to the trust and in any given month, the aggregate amount of draws exceeds the aggregate amount of payments, the asset pool will grow. These additional draws are a benefit to any securitization, because certificateholders are entitled to their allocable share of any payments on these additional draws.

While new draws benefit a securitization, if the issuer becomes insolvent it may no longer have the financial resources to fund additional draws. The draw rate will probably equal zero upon the seller's insolvency. For this reason, a small amount of draw credit in the cash flows will be given only at each tranche rated at or below the long term unsecured rating of the seller. Similar to the methodology applied for prepayment credit, draw rate credit for revolving commercial loans will be given only if there is clear and thorough disclosure in the offering document that the rating on each tranche rated at or below the rating of the seller is directly linked the financial health of the bank. With adequate disclosure and extensive portfolio performance data, the following draw rate credit may be given (by tranche):

- 'A', the lesser of 1.5% monthly or 15% of the issuer's historic net draw rate;
- 'BBB', the lesser of 3.0% monthly or 33% of the issuer's historic net draw rate; or
- 'BB', the lesser of 6.0% monthly or 50% of the issuer's historic net draw rate.

**Obligor and Industry Concentration Risks**
Although specific obligor concentration guidelines are not provided, the applicable default model accounts for the relative size of each asset. In addition, adjustments are made to some of the information entered into the model to analyze industry concentration risk. Since obligor and industry concentration limits diversify the pool and decrease loss exposure per obligor, they can strengthen a CLO from a credit standpoint (see "Obligor and Industry Concentration Risk" in "Evaluating Credit Risk" section, and Multi-jurisdiction/Emerging Market CBO Criteria section).

**Default Timing**
Once the CBO/CLO model has calculated a default frequency for a pool of loans, the default frequency will be multiplied times the initial invested amount of the certificates, resulting in the cumulative dollar amount of defaults that the transaction must withstand in the cash flow runs. The cumulative default rate should be applied across different timing vectors. The analyst will review cash flow runs with many different default curves (see table 5, "Examples of Default Scenarios, and Credit Enhancement Level: Default Estimation", in "Evaluating Credit Risk" section).
Different default curves test the sufficiency of the capital structure to absorb losses and still pay timely interest and ultimate principal to the rated liabilities. The default timing scenarios will be customized for each CLO in order to capture its specific structural characteristics.

For example, changes in credit support over the life of a transaction may make certain default timing scenarios more stressful than others. If a transaction traps excess spread as additional credit enhancement, front-ended defaults may stress the transaction ability to pay rated liabilities. Alternatively, if a transaction allows early repayment of subordinated tranches, a back-ended default scenario may be more appropriate.

Recoveries
It is generally assumed that the recovery rate on defaulted commercial loans will be higher than recovery rates on defaulted corporate bonds (see table 1, "Recovery Range Assumptions, and Recovery and Loss Severity Assumptions" in "Evaluating Credit Risk" section). With respect to the timing of recoveries, the analyst assumes that recoveries on defaulted loans will occur over a three year work out period, with half of the recovery received after the second year and half received at the end of the third year. If the bond indenture requires that a defaulted loan be sold within less than three years after it defaults, the recovery rate on the loan will be discounted to reflect a forced-sale scenario.

### Table 3

<table>
<thead>
<tr>
<th>Recovery Range Assumptions As A Percent Of Default Amount*</th>
<th>Recovery range assumptions (%)</th>
<th>Recovery Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior secured bank loans</td>
<td>50 to 60</td>
<td>2-3 years after default</td>
</tr>
<tr>
<td>Senior unsecured bank loans</td>
<td>25 to 50</td>
<td>2-3 years after default</td>
</tr>
<tr>
<td>Subordinated loans</td>
<td>15 to 28</td>
<td>2-3 years after default</td>
</tr>
<tr>
<td>Bonds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior secured bonds</td>
<td>40 to 55</td>
<td>1 year after default</td>
</tr>
<tr>
<td>Senior unsecured bonds</td>
<td>25 to 44</td>
<td>1 year after default</td>
</tr>
<tr>
<td>Subordinated bonds</td>
<td>15 to 28</td>
<td>1 year after default</td>
</tr>
</tbody>
</table>

*In this table, the default amount is assumed to equal $100 million in collateral. If all collateral consisted of senior secured bonds, then the assumed total recovery amount could range from $40 million to $55 million, depending on the recovery time period and sponsor workout history.

Interest Rate Risks
Commercial loans are carefully customized, and may have underlying interest rate bases or indices, and/or payment terms different from those of the rated debt. To mitigate such interest rate risks, various hedging and structural solutions are available. It is important to note that if a swap potentially provides credit support to a transaction, the swap counterparty must be rated as high as the highest rated tranche on a long-term basis. A swap can be deemed to provide credit support if, for example, it continues to pay to the trust interest due but not received from delinquent or nonperforming obligors.

Bivariate Risk
Bivariate risk occurs when a loan is subject to the non-payment risk of more than one counterparty. For example, this risk occurs whenever a bank (Bank A) makes a loan and then sells a participation interest in that loan to another entity (Bank B). Bank B does not have a relationship with the obligor; there is no privity of contract between Bank B and the borrower because Bank B was not a party to the loan agreement. Bank B, therefore, must rely on Bank A to pass through any repayments from the borrower. If either the borrower or Bank A does not perform, Bank B will not receive repayment on its participation.

Sovereign risk can also subject a CLO to bivariate risk. Sovereign risk is defined as the likelihood that actions by a sovereign government might directly or indirectly affect the ability of an obligor to meet its obligations in a timely fashion. Direct foreign risk encompasses intervention by a foreign government that
directly impedes the obligor's capacity to meet its financial obligations on time. Examples include the imposition of foreign exchange controls, restrictions on the cross-border transfer of funds (transfer risk), or a moratorium on the repayment of foreign debt.

The analyst is able to quantify bivariate risk in a portfolio, by using the multi-jurisdictional CBO/CLO model. The multi-jurisdictional version of the CBO/CLO model is essentially the same as the single-jurisdictional CBO/CLO model, except that the multi-jurisdictional CBO/CLO model can assess bivariate risk. Since this model incorporates multiple default probabilities with respect to each obligation, the resulting default frequency for a pool of these assets will be more conservative than the default frequency for a pool that does not contain bivariate risk, all other things equal. If a seller promises to limit bivariate risk to a certain percent of the asset pool, the single-jurisdictional CBO/CLO model may be used. Such limits will be evaluated in combination with collateral eligibility rating and diversification guidelines for bivariate risk exposures, on a case-by-case basis (see "Emerging Market CDO" section below).

Data Requirements
If the seller provides a thorough, accurate and complete data set, the future performance of the asset pool can be more accurately gauged. If a data set is poor in quality or sparse, accuracy may be compromised, and the analyst will be more conservative when estimating credit enhancement. In order to facilitate the rating process, the issuer should provide the information outlined in the "Rating Process, Asset Management and Surveillance" section, primary among which is the closing portfolio profile including the following characteristics:

- Number of loans and obligors;
- Concentration of each obligor, industry, and foreign obligor (if any) including country of domicile;
- Individual loan balances, amortization schedules, and tenor or term to maturity;
- Rating distributions;
- Utilization rates on revolvers;
- Description of any derivative instruments in the portfolio;
- Setoff amounts;
- Secured vs. unsecured; and
- Bivariate exposures

In addition, at least the following data for the CLO should be provided:

- Historical net prepayment rates and net draw rates on revolvers. If loan-by-loan prepayment and draw-rate behavior are not available, this can be derived by comparing the differences between the aggregate revolving loan balances at the beginning of the month and the end of the month.
- Percentage of loans that have not waived the right of set-off, and calculation of potential set-off liability.
- Information on "secured loans", namely, how they are defined, the type of collateral used to secure a loan, and the percentage of the loan balance secured.
- Percentage of loans that are bilateral versus syndicated.

Surveillance of the transaction after it is rated calls for updates of the above information (see "CDO Surveillance" section). In addition, the servicer should run the applicable CDO Evaluator or default model at least on a quarterly basis and give the results to the Structured Finance Surveillance Group. This requirement may be satisfied if there has already been an addition during the quarter that was also subject to rating agency review. If a bank has correlated its own risk grade system to the ratings scale, this correlation must be refreshed annually.

CDOs of Structured Finance Securities
Beginning in late 1999, the CDO market evolved to include the repackaging of structured finance assets, such as ABS, RMBS, CMBS, and CDOs. The more illiquid nature of structured finance paper with its associated liquidity premium made these resecuritisations attractive from an issuer perspective, and, as a result, such transactions quickly became one of the fastest growing segments of the CDO universe. While the main driver for this market is arbitrage, a good number of deals have also been done for balance sheet
reasons and risk management. The issuer, investor and manager motivations driving these transactions are generally the same as for regular CDOs.

Based upon the asset types collateralizing the transaction, such deals are commonly referred to as CDOs of ABS, CDOs of Real Estate, and CDOs of CDOs. Assets typical to such deals include, but are not limited to, credit card ABS, student loan ABS, aircraft lease ABS, auto loan ABS CMBS, RMBS, Manufactured Housing ABS, REIT securities, and high-yield corporate CBOs. More esoteric assets such as the interest-only tranches of CMBS deals have also been introduced into these transactions.

While Standard & Poor's general approach to repackaging CDOs of structured finance and real estate securities and CDOs, closely parallels that for the traditional CBO product, the introduction of these asset types necessitated the refinement of criteria to address new concerns such as default correlation between assets, applicable recovery rates, and underlying default probability assumptions. Criteria were also formulated to address new cash flow timing uncertainties such as those created by assets with significant prepayment sensitivities or assets with the ability to defer interest payments. Criteria refinement also involved differentiation of structured assets from corporate credits, by adjusting the default probabilities and the default correlation among different asset classes. Such adjustments are incorporated in the CDO Evaluator and discussed in the "Sizing Defaults and Monitoring Portfolio Quality" section. The bulk of these transactions are done as cash flow deals, but synthetic CDOs of ABS have also been done and will also likely grow over time. The major risks associated with these transactions and the criteria developed to address them are described in the following sections.

Default Correlation
As is the case with corporate bonds and loans, it is evident that default correlation varies between certain asset types. For instance, Standard & Poor's views credit card ABS, auto loan ABS, and student loan ABS as strongly correlated because defaults on such assets are closely tied to household income stresses and major life events. Conversely, credit card ABS are viewed as less correlated with commercial ABS assets such as aircraft leasing or mutual fund 12(b)(1) fees.

In an effort to capture this credit risk correlation, Standard & Poor's broadly classifies all structured finance securities into 14 sectors as listed below in table 4. Assets within each of the sectors are viewed as strongly correlated while assets across different sectors afford some diversity credit and are treated with a lower correlation penalty. Using the above example, credit card ABS, auto loan ABS, and student loan ABS are all placed into the consumer ABS sector. Conversely, aircraft leasing ABS are placed into the commercial ABS sector because we view a much weaker correlation with the three former asset types.

<table>
<thead>
<tr>
<th>Standard &amp; Poor's Structured Finance Sectors</th>
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<tbody>
<tr>
<td>1 Project finance</td>
<td></td>
</tr>
<tr>
<td>2 CDO</td>
<td></td>
</tr>
<tr>
<td>3 ABS consumer</td>
<td></td>
</tr>
<tr>
<td>4 ABS commercial</td>
<td></td>
</tr>
<tr>
<td>5 CMBS diversified (conduit and credit tenant leases)</td>
<td></td>
</tr>
<tr>
<td>6 CMBS (large loan, single borrower, and single property)</td>
<td></td>
</tr>
<tr>
<td>7 REITs and REOCs</td>
<td></td>
</tr>
<tr>
<td>8 RMBS A</td>
<td></td>
</tr>
<tr>
<td>9 RMBS B&amp;C, HELs, HELOCs, and tax lien</td>
<td></td>
</tr>
<tr>
<td>10 Manufactured housing</td>
<td></td>
</tr>
<tr>
<td>11 U.S. agency (explicitly guaranteed)</td>
<td></td>
</tr>
<tr>
<td>12 Monoline/financial enhanced rating (FER) guaranteed</td>
<td></td>
</tr>
<tr>
<td>13 Non-FER company guaranteed</td>
<td></td>
</tr>
<tr>
<td>14 U.S. FFELP student loans (over 70% FFELP)</td>
<td></td>
</tr>
</tbody>
</table>

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Transactional documents are thoroughly sprinkled with restrictive language and a series of portfolio parameters limiting concentrations. Examples of such restrictions are limitations on the percentage of assets in any particular asset type and limitations on the percentage of assets below a certain credit rating. Such limitations are generally not driven by Standard & Poor's. Instead, Standard & Poor's addresses the default correlation issue through application of correlation in the calculation of portfolio default probability in the CDO Evaluator and CDO Monitor.

While almost all of the structured finance assets repackaged within the CBO structure to date have been collateralized by domestic U.S. assets, Standard & Poor's expects the inclusion of more foreign structured finance assets as this market matures. We believe that distinct regulatory, cultural, and economic differences between countries in various regions of the world provide diversity benefits. As an example, the correlation in default probabilities of an ABS collateralized with U.S. auto loans is weakly correlated with an ABS collateralized by European auto loans. Standard & Poor's provides such diversity credit by presently dividing the world into five geographic regions based on the underlying assets in the collateral pool. These regions are:

- North America,
- Western Europe,
- Latin America,
- Pacific Rim, and
- Other.

Thus, diversity credit is given between structured finance securities whose underlying cash flows are derived from different geographic regions.

The concentration of assets issued by the same issuer or trust in a collateral pool is also a concern. Standard & Poor's believes that the default of assets issued by the same issuer or master trust are strongly correlated. The default of one asset will increase the likelihood that other assets issued by the issuer or master trust will subsequently default.

In the case of discrete trust, Standard & Poor's methodology accounts for the conditional default of assets from the same discrete trust backed by a common pool of assets. Conditional default exists because the defaults of two assets from different tranches issued by the same discrete trust are not independent of one another. For instance, in a sequential pay structure, when an 'AA' rated tranche of a particular CMBS deal defaults then, by definition, all of the tranches subordinate to it have already defaulted. When the same issuer or discrete trust issues two or more assets in the collateral pool, the default model effectively looks at all possible default outcomes created by defaulting each class of the same trust and sequential combination. Having different tranches from the same trust creates increased obligor concentrations.

In addition to correlation of assets among different asset types, regions, and classes, Standard & Poor's is sensitive to concentrations related to same originator, servicer/manager, and vintages. Each transaction typically limits such concentrations based on investor requirements and manager considerations. Standard & Poor's reviews the proposed limitations and factors them in the analyses as required. Sponsors are encouraged to review this with Standard & Poor's early in the transaction process.

**Recoveries on Defaulted Assets**

Recoveries on defaulted structured finance securities are based on the rating of the structured securities and are tiered to the rating of the liability. A full discussion of recoveries on ABS is presented in the section titled "CDO Recovery Levels". Unlike the recoveries extended to corporate bonds or loans, recoveries on structured products are not assigned a range based on the manager's ability to work out such securities. Standard & Poor's expects managers to use their best judgment in maximizing recoveries on defaulted securities. Principal to this is also the issue of what constitutes a defaulted security in structured finance, where many of the subordinate tranches simply stop paying for some period of time without necessarily being in default. A discussion of default definitions of structured assets is presented in the "CDO Structural and Collateral Considerations; Defaulted Obligations" section.

Recoveries in structured finance may be achieved either through workout or by selling the securities,
depending on case specific considerations. Standard & Poor's, however, may adjust recoveries downwards if the collateral manager is forced to sell defaulted structured obligations within a short period following default, especially since the distressed structured finance market is less liquid than the distressed corporate securities market.

In most transactions, the weighted-average recovery for the collateral pool is then computed based on the recoveries assigned to each of the assets and this single recovery number is utilized in the cash flow modeling for each tranche. The exception to this is for pools of assets that are "bar-belled" in terms of credit rating. Bar-belled means that, for example, the portfolio may have a 50% concentration of, say, 'AA' rated and a 50% concentration of 'B' rated assets. In such cases, the recovery number is calculated on a risk-weighted basis by defaulting assets from the lowest rating to the highest rating. Standard & Poor's will determine the appropriate treatment upon review of the collateral constraints and communicate its concerns to the sponsor.

Prepayment Sensitivity

Most structured finance products (including RMBS, auto loan ABS, manufactured housing ABS, and student loan ABS) are collateralized with loans or mortgages that include provisions, which allow the borrower to make unscheduled payments without penalty. These prepayments affect the timing and magnitude of the cash flow available to pay off the liabilities on the structured finance instrument. As a result, these instruments are priced based on an assumed prepayment speed that reflects beliefs of borrower spending and repayment behavior and the nation's economic state. Over time, the actual prepayment speed experienced might differ from the assumed speed as actual behavior diverges from these beliefs. The level of prepayments experienced by the asset pool in the transaction affects the cumulative excess spread generated. Since excess spread is often used to cover losses, prepayments affect the ability of the transaction to support losses and must be considered in the cash-flow runs.

Standard & Poor's recognizes that the prepayment sensitivity to interest rate movement varies between asset types. The underlying mortgage loans that collateralize RMBS securities have historically displayed particular sensitivity to interest rate movements. These borrowers tend to refinance their home mortgages as interest rates decrease past the point where interest savings exceed closing costs. In contrast, other ABS securities such as those collateralized with credit cards, student loans, or auto loans are supported by relatively stable cash flows. Prepayments on these asset types are generally low, are insensitive to market interest rate movement and are instead tied to microeconomic factors such as household income. With this variance in prepayment sensitivity across product types in mind, Standard & Poor's generally limits prepayment stress scenarios to those assets that have historically exhibited higher prepayment sensitivities, namely RMBS A and RMBS B/C securities. Depending on the composition of the asset pool, Standard & Poor's may include additional assets in the prepayment stress analyses.

Therefore, Standard & Poor's requires the collateral cash flow to be sufficient to make the liability payments under several prepayment scenarios. The three prepayment scenarios typically modeled include:

- At the market prepayment speed,
- At an accelerated prepayment speed of 150% of the market prepayment speed, and
- At a decelerated prepayment speed of 50% of the market prepayment speed.

For new issuances, the market prepayment speed is the pricing speed of the transaction and for seasoned issuances it is the average of the actual market prepayment speeds over the past six months.

Interest-Only Securities

Interest-only securities (I/Os), a common component of the capital structure of a number of structured finance products including CMBS, RMBS, and Franchise Loan ABS, are often included in the collateral pool of CBO of ABS transactions. The inclusion of these securities has been motivated by the desire to add excess spread to a transaction, particularly those asset pools composed primarily of investment grade assets which pay low coupon rates. This excess spread provides additional interest to cover the interest payments of the liabilities and enhances the potential return to the equity holders.

The inclusion of these securities presents a challenge because the cash flow generated tends to be less predictable and is dependent upon the stability of the notional balance of the issuance. Factors such as
prepayment protection, the credit quality of the underlying assets collateralizing the issuance, and the capital structure of the issuance affect this notional balance and are items Standard & Poor's analyzes in approximating the expected cash flow contribution from the I/O. The effects of these factors vary between individual I/Os and, as a result, the cash flow benefits allowed by Standard & Poor's for these assets are determined on a case-by-case basis.

For purposes of the Standard & Poor's CDO Evaluator, I/Os are generally excluded from the calculation of the cumulative default rate. As noted earlier, while an interest-only security is rated 'AAA', payment of the interest is dependent upon the notional amount of all of the securities in the issuance and therefore does not truly represent a 'AAA' credit risk. Furthermore, the inclusion of the notional balance purchased is misleading because this instrument only provides benefits in the form of interest payments. For this same reason, interest only securities are excluded for purposes of calculating the overcollateralization ratio. However, credit is extended for the interest actually received on such securities in the calculation of the interest-coverage ratio.

Lastly, because the cash flows from I/Os are relatively volatile and therefore difficult to predict, Standard & Poor's generally does not give significant credit to such securities if they represent more than a small percentage of the total asset pool. It is possible to include larger amounts of I/Os in transactions but, such a structure requires very detailed analyses of the underlying instruments, and structural enhancements.

**PIK Securities**

Some structured securities, such as the mezzanine tranches of CDOs have the ability to defer the payment of interest when there is insufficient collateral cash flow available. This deferred interest along with interest incurred on the deferred interest is paid on subsequent payment dates when sufficient cash flow becomes available. While not a technical default, the deferral of interest payments along with the additional interest incurred reduces the excess spread available in the CBO structure. At some point, the assets and any excess spread remaining would no longer be sufficient to cover the liabilities. Though Standard & Poor's does not typically assign a 'D' to this security until the asset pool is severely depleted, over time it becomes apparent that the ability of the security to return the full principal balance along with capitalized interest becomes less likely.

To capture the deleterious impact of negative amortization in the deferred interest feature, Standard & Poor's treats assets that have been deferring interest for 12 or more consecutive months as defaulted securities solely for purposes of the overcollateralization ratio calculation. The securities are assigned a recovery rate based on the applicable recovery rate and the outstanding principal balance, exclusive of accrued interest. Prior to the 12th month, the deferred interest should not be included in the numerator of the O/C ratio. Doing so would give credit for an increase in par value due to a failure to pay timely interest and run counter to the intent of the O/C test. A more full discussion of liquidity stress on transactions with PIK assets is presented in Section 8C.

**Collateral Manager**

The repackaging of ABS presents numerous challenges for prospective collateral managers. Because of the correlation among different structured finance asset classes, credit collateral managers may find themselves managing a structure that includes asset classes which are outside their area of expertise. A collateral manager's experience managing the various asset sectors proposed for inclusion in the collateral pool is accordingly evaluated early in the transaction review process. The depth and breadth of management experience in different market conditions and hiring and retention of qualified credit analysts must indicate a level of sophistication appropriate for the complexity of the structure.

Experience along the credit spectrum, such as collateral managers historically trading 'AAA' and 'AA' paper but now looking to buy lower-rated securities for this transaction, is also highly relevant. Standard & Poor's looks at the experience and resources of the asset manager and compares that with the requirements proposed by the structure. For Standard & Poor's to rate the transaction, the collateral manager must demonstrate that he or she has sufficient knowledge and resources. A comprehensive description of the CDO manager review process is found in the "CDO Manager Quality" section.

**Static Collateral Pools**

While the majority of the CDO of ABS transactions to date have been structured as managed CDOs,
wherein the manager has some discretionary trading ability, several transactions backed by static collateral portfolios have entered the marketplace. This structure was driven by traditional real estate investors who viewed the CDO of real estate products as an alternative investment and based their investment decision more on the strength of the collateral pool and less on the ability of the collateral manager. These deals eliminate the manager's ability to purchase assets after the closing date and place significant limitations on the manager's ability to sell assets. Such sale of collateral is typically limited to defaulted securities and credit risk securities, and all sales proceeds are applied to the paydown of the outstanding liabilities. Pure static deals go even further by completely eliminating both the sale and purchase of assets.

The risk in these deals is that should the collateral pool experience higher-than-expected defaults, it is effectively impossible for the collateral manager to build back par into the deal. The absence of a trading mechanism reduces the role of the collateral manager to one of loss mitigation. The ability of the collateral manager (properly referred to as the collateral administrator) to select quality, stable collateral before closing and to quickly identify troubled securities as the deal progresses and then realize maximum recoveries are thus key to the success of static CBOs. Because the "fixed" collateral pool is identified at the start of the transaction, it is possible to better scrutinize the anticipated payment characteristics of the asset pool, and model the transaction based on the actual pool date as opposed to the average pool characteristics specified by the transaction documents for a revolving asset pool.

**Synthetic Structures**
A number of CDOs of structured finance transactions have been done in a synthetic form. This structure was selected primarily for the same reasons as traditional CDOs are done synthetically, i.e. to avoid legal transfer, multiple legal jurisdictions, and availability of assets. Synthetic structures have additional considerations in regard to the definition of credit events and the manner in which recoveries are handled through the settlement process.

**Project Finance CDOs**
Project financing has long been focused on two chief ways of raising debt capital: project loans backed by the revenue of individual project facilities and project developer debt backed by cash flow from leveraged and unleveraged ownership interests in a number of projects. At the present time, lenders and sponsors are increasingly looking to a third way to raise debt and equity capital for project financing in the form of securitized project collateralized loan obligations (CLOs) and collateralized bond obligations (CBOs). Bonds are now being issued to fund closed-end defined pools of project loans made by banks and multilateral/expert credit agencies, and 1999 saw the first open-ended pooled financing for infrastructure facilities. To date, several types of securitization structures and features have been used. These include closed-end defined pools of project loans and open-end financings. Sponsors have used both true sale of assets and setting up a portfolio where credit risk has been synthetically transferred to the CDO securities.

Under a CLO or CBO structure, capital market bonds are paid by cash flow generated from a pool of project loans or bonds. The credit strength of the bonds generally will be stronger than the credit strength of any individual loan, to the extent that the pooled cash flows diversify the default risk and principal loss potential inherent in the loan making up the pool. In addition, the bonds may benefit from overcollateralization by loans and loan cash flows. Typically, these bond issues use tranching to give separate series of bonds priority claims on the pools' cash flows. Standard & Poor's stresses that this type of securitization does not constitute any credit alchemy-rating elevation and results only from specific credit strength provided by diversification, subordination, and overcollateralization. However, Standard & Poor's believes that CLO/CBO securitization does represent one of the most significant ways that borrowers likely will tap the broader market for project debt. It brings significant advantages for borrowers, capital market investors, and bank lenders.

For borrowers, it offers a way to raise debt capital at lower costs and with more attractive terms and tenor than those available for individual projects.

For investors, it represents an efficient way to diversify the risks inherent in individual project loan or bond investments. In addition, CDOs may offer substantially greater liquidity than single-asset project investments, especially those that do not carry credible ratings.

For bank and agency lenders, project CDOs provide a way to liquefy one of the largest illiquid components
of bank loan portfolios. Thus, lenders benefit from regulatory capital relief, as well as expanded lending capacity. One of the chief motivations for many bank lenders is the immediate opportunity to improve profitability by redeploying capital.

Standard & Poor's believes the growth of project CLOs and CBOs will be an important step in expanding the participation of portfolio investors in the broader infrastructure debt markets. However, potential issuers should recognize that effective use of rated project CLO and CBO structures will require sponsors to address key credit questions inherent in this type of securitization as it applies to infrastructure, notably:

- How do post-default recovery rates compare for projects, especially in the emerging and developed countries, where project loans are increasingly being originated?
- How diverse are project risks really likely to be across sectors and regions—particularly, should project debt experience some generic challenges such as construction, operating, or political risks across a number of countries?
- How does default likelihood change over the life of a loan? For amortizing loans, there is evidence, for example, that loans are less likely to default after they have amortized a substantial amount of debt.

Initial information indicates that answers to these questions are favorable for pooled-project debt issues. For example, recovery rates may be higher than those on comparable corporate loans, where project loans are appropriately secured and economic incentives strongly support project debt. However, much will depend on the ability of project sponsors and sponsors of project portfolios to document the key project data on which credit assessment of portfolios will necessarily rest, in particular, project-specific information on default timing, duration, and recovery rates.

For many types of project loans, default and loss severity experiences are still fairly limited. This is especially true for cross-border project loans, such as infrastructure projects raising capital in hard currency and repaying the loans from local currency tariffs or governmental support payments. Because the data on default timing, recovery, and loss severity does not have a statistically significant track record, ongoing surveillance is important to maintain ratings on the CDO securities, especially for the ratings on the subordinated and junior tranches. Standard & Poor's expects the ratings on the junior and subordinated tranches of project finance CDOs to be more dynamic than typical structured finance securities. Until statistically significant data are available, any assessment of default rates and loss severity and how they affect the ratings on the CDO securities needs to be monitored closely on an ongoing basis. Standard & Poor's believes it will be some time before actuarial assumptions will be established for the key credit risk factors that drive a project finance CDO rating.

In view of these uncertainties, lenders and borrowers who are contemplating this type of financing will be well served to focus on the specific pool of assets supporting a given transaction, as Standard & Poor's does in establishing its CBO and CLO ratings. It is the credit-profile loans supporting a given asset-backed debt issue rather than any generic assumptions about global loan performance that will determine whether a project CLO or CBO issue will pay out.

**Standard & Poor's Project Finance CDO Rating Criteria**

In a CDO transaction, payments to the CDO noteholders are derived from the cash flows realized from the underlying pool of loans in the securitized portfolio. While most of the CDO transactions rated to date involve the repackaging of corporate loans, the rating process for a transaction with project loans as the underlying asset class is similar. Rating any CDO transaction requires a linear approach with distinct levels of analysis. The first level of analysis is an assessment of the credit quality of the underlying assets. The second level of analysis focuses on the default and loss severity characteristics of the pool. The third level of analysis involves cash-flow forecasts, and the last level examines the structural features of the transaction.

In preparation for rating CDOs with project loans as the underlying assets, Standard & Poor's researched the loan structure and behavior of project loans and concluded that project loans have different fundamental characteristics than corporate loans. As a result, the criterion inputs needed to perform the analysis of a CDO transaction with project loans as the underlying assets will differ from those for transactions with corporate loans. Through internal studies and conversation with external parties, Standard & Poor's has concluded that the key differences between project loans and corporate loans result from:
• Different credit profiles,
• Different loan structures, and
• Different behavioral characteristics.

Different Credit Profiles
Project financing is normally used for large, capital-intensive assets. Usually, the inherent risks of an asset using this financing structure are easily identified. Through the rating process, Standard & Poor's can determine if the project's risks are mitigated and to what extent the risks are residing with the lenders. The types of assets that have availed themselves of this financing technique include power plants, pipelines, toll roads, mines, energy facilities, and infrastructure projects. These types of assets are rated by Standard & Poor's following an established criteria framework.

The analysis of any project financing takes a bottom-up approach, focusing on project-level risks, institutional risks, currency risks, sovereign risks, and any credit enhancements structured into the transaction. Typically, the financial profile of a rated project appears weaker than that of a similarly rated corporation in the same industry. For example, the initial debt leverage for a 'BBB' rated power project is generally higher than that of a 'BBB' rated utility company. Despite the weaker financial measures, Standard & Poor's may be able to assign the same rating to the project as it does to the corporation if the predictability of the project's cash flows is greater.

Project finance transactions are usually made up of a single asset, are owned by the private sector, and are dependent solely on the performance of the project (nonrecourse to the owners) for repayment of any debt issued at the project level. In addition, the structural, legal, and financial features incorporated into most project transactions to protect and enhance the cash flow make it easier to predict a project's cash flow stream and to determine the project's ability to service its debt obligations.

Different Loan Structures
Project loan structures differ from corporate loan structures in that projects typically have amortizing debt, tailored debt service payments, stricter covenants, and cash traps. Amortizing debt mitigates refinancing risk. Refinancing risk is usually present in corporate financings and forces Standard & Poor's to look beyond the tenor of the debt to assess the ability of the corporation to repay its obligations. In contrast, the lack of refinancing risk in most project financings allows Standard & Poor's to focus purely on the project in relation to the tenor of the rated debt. Amortizing debt also leads to decreasing debt leverage over time, which is beneficial from a credit perspective.

Tailored debt service payments are also a strength of project financings. Project financings usually pay down principal as time progresses. However, there is no limitation on how the schedule of principal repayments can be designed. Therefore, projects can match repayment of debt with cash flows expected from project operations.

Covenants and cash traps within the financing documents of the transaction also lead to a better ability to monitor projects. The better ability to monitor transactions can help the lenders be more active in their dealings with the project's owners and management. While differences in the loan structure can affect the underlying rating on a project, these differences are also the primary reasons why corporate and project bonds behave differently as stress situations develop and as defaults and restructurings take place.

Different Behavioral Characteristics
Most corporate financings typically issue unsecured debt. In contrast, most project financings pledge to lenders both the physical assets and the revenues to be derived from operations. The secured nature of project loans provides the lenders with a different type of claim on a borrower's assets, which, in the event of a stress scenario, may be a better incentive to project sponsors to carry or fund a project's obligations through a short-term anomaly. In addition, the project financing structure is generally used for infrastructure and other essential assets. The type of assets that avail themselves to a project finance structure has led Standard & Poor's to conclude that defaults with ensuing restructurings, rather than liquidations, will likely be the norm for project finance transactions experiencing stress. This assumption is based on an analysis of troubled project finance transactions in both the bank and capital markets.

While construction, technical, operating, or market difficulties have caused projects to experience problems,
overleverage is usually the primary reason for a project financing to get into financial trouble. Most project financings are highly leveraged transactions, and therefore, the debt-expense component of total expenses will likely be higher when compared to that of a similarly rated corporate financing. Excess leverage has caused many defaults of both projects and corporations. However, Standard & Poor's believes that project financings have a larger capacity than corporations to carry high leverage. Although high debt levels will negatively affect the underlying rating on a project financing, most projects generate higher cash flows than cash expenses from operations, which means that some level of debt can be supported. Therefore, in a stress scenario, a restructuring can take place that lowers the yearly debt service requirements but extends the maturity of the project loan.

Due to the differences in credit profile, loan structure, and behavioral characteristics, Standard & Poor's has concluded that project loans act differently and are structurally different from corporate loans. As a result, Standard & Poor's has modified the necessary inputs in the CDO rating process to better reflect the characteristics of project loans. Each stage of the established CDO rating criteria has been modified to properly reflect the underlying fundamentals of project finance loans. Specifically, the areas that have been modified include:

- Credit assessments of a pool's underlying assets,
- Default model characteristics,
- Cash flow analysis characteristics, and
- Diversity characteristics.

**Credit Assessment of a Pool's Assets**
The primary change in this stage of the CDO analysis has to do with the credit assessment of the loans in the proposed pool of loans. Due to the uniqueness of each individual project, Standard & Poor's will perform credit assessments for each loan in the proposed pool. If the size of the proposed pool of project loans makes an actual analysis unwieldy, Standard & Poor's may rely on sampling techniques.

If the number of project loans in the pool is approximately 25 or less, Standard & Poor's will assign an actual credit assessment to each individual loan. Generally, if the number of loans in the pool is more than 25, Standard & Poor's will assign credit assessments to some subset of the portfolio, as long as a sampling technique can be utilized.

As part of the sampling process, Standard & Poor's interviews the lending institution's personnel to gain insight into its credit origination, surveillance, and workout procedures. The sampling process will also place constraints on the lending institution to avoid "cherry-picking" and the substitution of weaker credit quality loans for stronger credit quality loans once the portfolios have initially been designed. Standard & Poor's requires the lending institution to provide the documentation needed to properly assess the credit quality of the underlying loans.

**Default Model Characteristics**
The result of the credit assessment process will give a rating distribution on all the assets in the portfolio. The default frequency of a project and corporate loan with the same rating is statistically equivalent. Therefore, the proprietary Standard & Poor's default model used for other CDO transactions can be used for portfolios with project loans as the underlying asset. The default model estimates how many loans in the portfolio will experience a default based on each loan's credit rating and payment characteristics.

As with other types of CDO transactions, Standard & Poor's employs either a "traditional" single-jurisdictional default model or a multijurisdictional default model to assess the default probability of a pool of project finance loans. The specific version of the model used is dependent on the characteristics of the asset portfolio. The single-jurisdictional model is used for transactions that do not have a significant level of projects concentrated within the same sovereign country. The multijurisdictional model is used when multiple projects are concentrated within the same country. The multijurisdictional model factors into the default probability the likelihood of default on all the projects situated in the same country, caused by the actions of the sovereign government (for example, exchange controls affecting all projects). Standard & Poor's will work with the issuer to establish which default model must be used, based on the characteristics of the project portfolio.
One critical area in the default analysis is the assessment of diversification penalties. Diversification penalties are reductions in a loan's implied ratings due to high degrees of correlation between assets in the portfolio. The correlation analysis between individual project finance loans in a pool will be done at the beginning of the rating process to give the sponsor the ability to alter the portfolio to make it as efficient as possible. The correlation between the same type of infrastructure assets will depend on the specific characteristics of each individual loan and the interplay of each loan within the overall pool. The correlation between similar types of project loans could actually be minimal because of the unlikely chance of experiencing credit deteriorations. Two examples illustrate this point.

First, the financing of a toll road in Arizona will have very little positive correlation to a toll road financing in Florida. Second, a power plant selling power to a New York utility has very little positive correlation to a power plant selling power to a Brazilian utility. In both cases, the reason for the default would be specific only to that asset. Standard & Poor's, however, believes that diversification penalties should be assessed for project loan CDO transactions that have high degrees of obligor and/or geographic correlations. The current Asian crisis and the Latin America crisis of the 1980s show that geographical correlation extends to entire regions and is not limited to single country correlations.

Standard & Poor's has divided the world into 16 regions, as shown in table 5.

<table>
<thead>
<tr>
<th>Table 5</th>
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<tbody>
<tr>
<td>Standard &amp; Poor's Geographic Regions for CDOs Mexico</td>
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<tr>
<td>Mexico</td>
</tr>
<tr>
<td>Other Central American and Caribbean countries</td>
</tr>
<tr>
<td>Andean South America</td>
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<tr>
<td>Mercosur/Southern Cone South America</td>
</tr>
<tr>
<td>Southeast Asia and Korea</td>
</tr>
<tr>
<td>India and Pakistan</td>
</tr>
<tr>
<td>Sri Lanka, Bangladesh, and Nepal</td>
</tr>
<tr>
<td>China, Hong Kong, and Taiwan</td>
</tr>
<tr>
<td>Russia and the CIS</td>
</tr>
<tr>
<td>Greece, Malta, Cyprus, Hungary, Czech Republic, Poland, Slovenia, and Estonia</td>
</tr>
<tr>
<td>Other Eastern Europe, including Turkey</td>
</tr>
<tr>
<td>Gulf States</td>
</tr>
<tr>
<td>Sub-Sahara Africa</td>
</tr>
<tr>
<td>South Africa and Botswana</td>
</tr>
<tr>
<td>Other Africa and Middle East</td>
</tr>
<tr>
<td>Australia, New Zealand, and other Pacific Islands</td>
</tr>
</tbody>
</table>

The economic environment of countries situated in each region are likely to be correlated, and as such, economic difficulties may be experienced by a number of the countries at the same time. This correlation may lead to increased pressure on the projects and lead to higher defaults. To account for this correlation in determining the default probability, Standard & Poor's will notch down the rating of each project in a given region as shown in table 6.

<table>
<thead>
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<th>Table 6: Rating Notch Down by Regional Concentration</th>
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<tbody>
<tr>
<td>Regional concentration</td>
</tr>
<tr>
<td>Less than 15%</td>
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<tr>
<td>15% to less than 25%</td>
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<tr>
<td>25% to less than 30%</td>
</tr>
<tr>
<td>30% to less than 35%</td>
</tr>
<tr>
<td>Above 35%</td>
</tr>
</tbody>
</table>
In addition to diversification penalties for obligor and geographic concentrations, these penalties will also be assessed if there are significant concentrations and correlations in critical project finance aspects. Critical aspects include a purchaser of projects’ products, key suppliers to projects, technology supporting projects, and a provider of project-level credit enhancements. Standard & Poor's analysis will explore these relationship types for any proposed CDO project loan transaction. If there is a significant concentration (for example, a high portion of the projects sell electricity to one utility), Standard & Poor's will assess additional diversification penalties for all the noncomplying project loans.

The level of a correlation penalty will be determined on a case-by-case basis. However, Standard & Poor's will use the criteria already established as a guideline. The severity of the diversification penalty is based on the overall level of concentration and normally ranges from a one- to three-notch downward adjustment from the original project loan credit assessment.

**Cash Flow Analysis Characteristics**

In a CDO transaction, Standard & Poor's assumes a certain number of the underlying pool's assets will default. The amount of defaulted loans will be specified by the default model. Therefore, assumptions surrounding loan restructurings are critical to the rating analysis of the CDO transaction. Specifically, for CDOs with project loans as the underlying pool assets, Standard & Poor's must determine how the underlying loans will act in terms of timing of default, timing of recovery, and loss severity.

**Default Timing**

To rate a CDO made up of project loans, Standard & Poor's will run a number of sensitivity analyses, varying default timing. The standard default scenarios include concentrations of defaults throughout the transaction. In each of these cases, the rating will be determined by the transaction's ability to make every scheduled debt-service payment. Standard & Poor's has concluded that when there is a pool of amortizing loans, running back-end stress scenarios, typical for corporate loans, may be unnecessary. In the case of a pool of amortizing loans, a project loan nearing the end of its term is probably less likely to default when compared to a loan facing a bullet or balloon payment due to the amount of equity accretion in the project. Similar to a mortgage on property, it is in the owner's interest to make scheduled loan payments on project debt to avoid the loss of a project that has been significantly paid for. Consequently, given the lower likelihood of default late in the project loan life, the need for a back-ended loss scenario is minimal.

**Recovery Timing**

The established CDO criteria states that there is a one-year no-pay period followed by two successive years in which 50% of the total amount to be recovered is received at the end of each year for the loans chosen to default in the cash flow analysis. After researching project finance loans, Standard & Poor's concluded that the timing of recovery on project loans will, on average, be shorter than the recovery timing on comparable corporate loans. While Standard & Poor's still anticipates a period where no interest or principal is received, the recovery of the estimated recovery percentage may occur faster than for corporate loans, depending on the structure of the projects and where they are domiciled. A faster recovery is generally due to the structural protections incorporated into project financings and the fact that borrowers are more likely to be aware of and can react to the negative situations in a more timely fashion. These protections include:

- Distribution/dividend blocks;
- The need to use the debt service reserve;
- Items that trigger an event of default, even when there may be enough cash flow to pay debt service; and
- The ease of monitoring these transactions.

**Loss Severity**

Standard & Poor's has identified a number of items that illustrate why project finance loans are fundamentally different from corporate finance loans in the area of loss severity. These items include:

- Project debt secured by both physical assets and the contracts underlying the transaction;
- Larger step-in rights of lenders to projects;
- Clear contractual obligations, penalties, and remedies incorporated into project transactions;
- Decreasing leverage overtime;
• Essential nature of many infrastructure projects;
• Linked inputs and outputs; and
• Vested interests of counterparties.

The presence of these items causes Standard & Poor's to conclude that the recovery rate for project loans on average will be higher than that of corporate loans. However, empirical evidence on the actual history of loss recovery for project loans is lacking, and it is likely that the actual recovery rates will differ based on the asset type and where the asset is domiciled. Therefore, Standard & Poor's will assign a recovery value for each loan that has received a credit assessment in an effort to determine an average pool recovery rate. The range of recovery rates assumed for individual project loans in a CDO transaction is expected to fall in the 30%-70% range.

Structured Finance Issues
Once Standard & Poor's completes its analysis of the underlying pool of loans and determines the total amount of losses required to support each rating level, an analysis of the transaction's cash flow and structure is performed. Factors such as the priority of payments, servicing fees, interest coverage, the transaction's liquidity, and the legal final payment date of the rated securities are all considered in the analysis.

Priority of Payments
The priority of payments or cash flow "waterfall" refers to the manner in which the transaction pays its obligations under the governing indenture. In most CDO transactions, cash flows are allocated to pay the senior class of notes before the subordinated or junior classes are paid. Shutting off principal payments to the junior notes in favor of the senior notes acts as credit enhancement. Credit enhancement in a structured financing is a mechanism that protects a class of notes against a payment default. Consequently, those notes in the senior position in the priority of payments will receive a higher rating, since junior securities and/or overcollateralization assume a first loss position.

Servicing Fee
The servicing fee must be sized and quantified to ensure that not only the initial servicer is adequately compensated, but also that a successor servicer or backup servicer would be able to service the pool of project finance loans given the level of compensation. Standard & Poor's will require either a "hot" backup servicer that can immediately assume the role of servicer or the submission of a detailed plan that can readily be implemented if the initial servicer is unable to carry out its required responsibilities. As part of Standard & Poor's servicer review, the successor or backup servicer must provide a detailed history of its experience in servicing project finance loans. During this review, the potential successor servicer must demonstrate to Standard & Poor's satisfaction that it has the capability to service not only project loans, but also the relevant industries that encompass these financings.

Among its duties, such as ensuring that all investors receive their payments, it is the responsibility of the servicer to manage the restructuring process for troubled loans. Since the servicer's role is the linchpin in ensuring repayment of the debt securities, Standard & Poor's believes that servicing and administrative fees should be paid prior to any payment to noteholders. This will protect investors against potential disruption of payments caused by workouts on problem project loans.

Interest Coverage
The timely repayment of interest must be ensured by structural features that protect against a mismatch of interest earned on the project finance loans compared with the interest owed on the CDO liabilities. Therefore, an interest-coverage covenant must be incorporated into the transaction that states that the interest earned on the assets (project loans) is greater than or equal to the interest on the securities plus servicing fees. If an interest-rate swap were to be incorporated in a transaction to cover the risks associated with a pool of fixed-rate loans paying floating-rate interest or vice versa, then the cost of the swap must be included in the interest-coverage test.

Transaction Liquidity
While a transaction may be tranched sufficiently to ensure noteholders' repayment of their investment, the transaction may not have sufficient internal liquidity to make such payments on a timely basis. Therefore, a liquidity reserve funded either at the inception of the transaction or over time, if there is sufficient cash
generated or excess spread during the initial life of the transaction, can be utilized to ensure timely repayment of principal and interest in a liquidity squeeze.

Once the transaction's structure and cash flows are reviewed, Standard & Poor's will then stress losses, determined by the CDO model, over the tenor of the transaction. As mentioned earlier, Standard & Poor's will focus the stress analysis on front- and middle-end scenarios for a pool of amortizing project loans. However, if balloon or other nonamortizing loans were included in the portfolio, a back-ended stress scenario would be more heavily weighted. After reviewing the various stressed cash flows, Standard & Poor's will determine if the proposed capital structure or credit enhancement is sufficient to meet the desired rating. Credit enhancement usually takes the form of subordinated securities (tranching) and/or overcollateralization, but does not preclude other forms of enhancements such as an LOC.

Set-off Risk
Set-off risk arises when the project obligor may have other contractual relationships with the sponsor or lender. If the sponsor or lender goes insolvent or cannot perform, the obligor may chose to set off or reduce the balance of the project loan by the amounts on which the sponsor or lender have not performed.

Depending if the loans documents contain provisions against set-off, Standard & Poor's will examine the enforceability of the provisions and size a commensurate amount of credit support or seller's interest in master trust structures to cover such risk.

Legal Final Dates
The legal final payment date for the rated debt must either be the date on which the last payment of the last loan outstanding is paid or some subsequent point. The importance of having an extended legal final payment date should not be understated. It is expected that defaults will occur over the life of the transaction. Those loans that do default will either be liquidated or restructured in such a way as to provide cash payments to the transaction, although likely at reduced levels. The terms of this restructured loan must have repayment occurring before the termination of the transaction. Any project loan restructuring that would extend the life of the loan beyond the final payment date of the transaction, and not structurally mitigated, would cause a reduction in the transaction's cash flows and be considered a representation and warranty violation with the potential of causing a default on the rated securities.

Interest Rate Basis
Many project finance loans allow the obligor to select and change the index on which interest accrues. For example, the obligor may have the option of selecting three-month LIBOR, six-month LIBOR, or perhaps any other index, as the index. This option can create a basis risk in the transaction if the liabilities of the trust pay interest based on a different index than that of the assets.

The level of risk presented by this is based on the characteristics of the assets included in the trust and the transaction structure employed. To overcome this risk, the transaction sponsor should consider including in the transaction a basis swap or matching the interest basis characteristics of the liabilities with the assets.

When the interest basis of the assets and the liabilities is different, Standard & Poor's will stress the transaction by running multiple cash flow scenarios under different interest rate paths.

Alternate Loan Amortization Schedules
Some project finance loans allow the obligor the option of deferring principal payments or changing the principal payment amortization schedule. If such loans are to be included in the securitization, the sponsor must notify Standard & Poor's of these features and provide the appropriate details. Standard & Poor's will analyze these loans and assume that the obligor will chose the payment options that will maximize the default probability of the loan. Clearly, a 10-year level pay amortizing loan has a different probability of default as compared with a 10-year bullet amortization.

Modified and Restructured Loans
During the life of the securitization, it is possible that some project finance loans are modified or restructured. The loans may be restructured with respect to payment terms, interest rates, and tenor. Because the new terms might not be consistent with the structure of the securitization, any variance in the maturity and payment characteristics of the loans will be addressed during Standard & Poor's surveillance of
the transaction rating. The transaction structure must be sufficiently robust to allow some potential changes in the nature of the collateral. Standard & Poor's will work with the sponsor in addressing these risks in the proposed structure.

**Closed and Open Collateral Pool Considerations**

The majority of project finance transactions that Standard & Poor's has been asked to evaluate so far consist of closed pools of assets, where all loans have already been originated and fully funded. Over the last year, however, Standard & Poor's has received inquiries from a number of sponsors wishing to structure transactions with an open pool of project finance loans. The sponsors already have a critical core of assets but wish to structure a transaction that is larger than the current asset pools. By over-issuing liabilities, such transactions may offer more efficient execution and the opportunity to fund future projects.

Regardless of which approach is used, Standard & Poor's must evaluate and rate each project as it is included in the asset pools. Additionally, Standard & Poor's must establish a specific recovery estimate for each project, should it default.

Establishing the capital structure for a closed asset pool transaction is relatively straightforward since the uncertainty regarding the characteristics of the assets has been removed. Standard & Poor's analyzes the pool of project-finance loans to establish the rating on each project, its post-default recoveries, and the expected default rate for the pool. The capital structure for the transaction is then established by running cash flows proving that the notes can withstand the level of stress commensurate with the rating.

Structuring open asset pools transactions is possible but must incorporate features to control how far the collateral pool characteristics may migrate. As in all structured transactions, Standard & Poor's main concerns with open asset pools are driven by how subsequent asset additions will affect the following features of the final asset pool:

- Default frequency,
- Recovery rate, and
- Cash-flow characteristics.

In closed-pool transactions, all of the characteristics of the assets are essentially locked in at closing and are used to establish the capital structure needed to achieve the required rating. In open pool transactions, the characteristics of the collateral will change; hence, the capital structure for the transaction must be sufficiently robust to withstand such potential changes.

Most CBO/CLO transactions structured with corporate loans and bonds incorporate an open pool concept. The transactions typically start with 50% to 60% of the asset pool already purchased at closing and typically have a 30- to 90-day ramp-up period to fully acquire all the collateral assets. The transaction then enters a reinvestment period during which any principal collected is not used to repay the investors, but rather is held and used to purchase new collateral assets. Following the end of the reinvestment period, the transaction enters an amortization period during which principal collections are used to repay the investors.

The same approach may be employed in project finance CDOs. However, since the universe of project finance loans is less broad and less liquid than the universe of corporate loans, the risks associated with open asset pools may be more acute since they also include the following risks:

- The sponsor may not be able to underwrite or purchase project loans eligible for inclusion in the transaction, and
- Principal collections may not be able to be reinvested quickly in new projects.

The inability to quickly invest the issuance proceeds from the bond offering or the principal collections from performing projects creates a negative carry on the transaction. The funds not invested in project loans are typically held in other types of eligible deposits generally yielding less than the project loans, and possibly less than the interest payable on the bonds.

To overcome these risks, the sponsors have proposed longer ramp-up and reinvestment periods than
traditionally seen in corporate loan CLO transactions. To rate such structures, Standard & Poor’s must not only be convinced that the capital structure is sufficiently robust, but must also get comfortable with the sponsors’ ability to continue participating in the project finance market and to underwrite transactions in the future. The longer the ramp-up period and reinvestment period, the more likely it is also that market conditions would change and not allow the sponsor to fully acquire all the needed assets.

Sizing Capital Structure for Open Asset Pools
The first step in establishing the capital structure for a project finance CDO transaction is to size the default frequency expected for an open pool of assets. To do so, Standard & Poor's used the following two approaches:

- Active use of the default model with cash flow modeling, or
- Sizing the capital structure of the transaction assuming a "worst-case portfolio."

Standard & Poor’s will work with each sponsor to customize one of the above two approaches based on the transaction requirements, and the sponsor’s capabilities and area of operations. Discussed below is a general description of each approach.

Active Use of the Default Model With Cash Flows
Under this approach, the issuer gets credit for the quality of the existing asset portfolio. The default model is run prior to setting the capital structure of the transaction by using a combination of the actual existing portfolio ratings and an estimate of the ratings and cash flow characteristics of the future projects, that will be added. This establishes an expected default frequency. The same is done to establish an expected recovery rate for the portfolio. Standard & Poor's will work with the sponsor to make sure that the characteristics of the future projects are realistic and achievable by the sponsor.

The capital structure of the transaction is then set based on the cash flow results achieved using the expected default probability and recovery rates. Obviously for this to work, the default frequency and recovery rate of the loan portfolio available at closing must be better than the expected rates, otherwise interim credit support solutions must be incorporated in the transaction.

After the transaction closes, projects may be added to the transaction as long as the resultant expected default and recovery rates are not violated. The collateral manager must run the default frequency model using the existing portfolio and substituting the details of the planned acquisitions for the ones input as the expected projects. If the results of the default model are at or below the default frequency used in sizing the capital structure, then the acquisition can take place. Additionally, recovery rates and the cash flow characteristics of the planned acquisition are reviewed to insure that they do not violate the earlier assumptions.

The main advantage of this approach is that it generally results in more cost-efficient capital structures for the issuer. The main disadvantage is that it may exclude certain projects from being added because the resultant expected default frequency and recovery rates would violate the assumptions under which the capital structure for the CDO transaction was formulated. Additionally, the sponsor must be able to run cash flow simulations to confirm that the planned acquisition does not breach the capital structure of the transaction.

For this approach to work, the collateral manager must be fairly certain that it can fund or acquire loans that meet the expected characteristics, and Standard & Poor's must be comfortable that the procedure and underwriting standards employed by the originator will fund projects that are eligible for inclusion in the CDO asset pool.

Worst-Case Portfolio
Under this methodology, the CDO collateral pool at the end of the ramp-up period is assumed to be one of the worst possible pools of assets, as allowed under the Project CDO collateral pool eligibility criteria detailed in the transaction documents. Under this approach, Standard & Poor's must still rate and assign a recovery rate to each project. But projects may be included into the asset pool of the transaction as long as the "worst-case" collateral pool criteria is not violated.
This approach is viewed as being a worst-case scenario because it does not take into account that the actual expected project portfolio, at the end of the ramp-up period, will likely have characteristics that yield a lower default frequency. The benefit of this approach is that it gives maximum flexibility to adding projects as long as the worst-case collateral debt security parameters are not violated. The drawback is that it typically results in a higher level of credit support needed for the CDO transaction since it assumes that all projects addition have effectively brought the portfolio to the worst possible portfolio, as allowed by the transaction eligibility criteria. Some issuers may find capital structures achieved by this approach to be more costly. Additionally, this approach is difficult to implement in transactions that require the use of the multi-jurisdictional default model, since additional specifications must be made in regards to the sovereign ratings and maximum concentrations allowed within any one country.

To model this worst-case portfolio, the collateral eligibility criteria must incorporate a Standard & Poor’s ratings distribution, a maturity distribution, a maximum obligor concentration, and a minimum recovery percentage. The Standard & Poor’s ratings distribution specifies the maximum amount of collateral allowed at each rating level. The maturity distribution specifies how much of the collateral matures during each year in the future. The maximum obligor concentration specifies the amount of loans that may be due from the same borrower.

Standard & Poor’s would then build a worst-case theoretical portfolio assuming that the obligor with the highest concentration will also be the one that is the lowest rating and have a loan out with the longest maturity. These assumptions would be repeated on a loan-by-loan basis to construct a portfolio that meets the ratings distribution, maturity distribution, and maximum obligor concentration as specified by the eligibility criteria. This theoretical portfolio would then be run through the Standard & Poor’s CDO Evaluator to establish a worst-case default frequency.

The capital structure of the transaction would then be set by running cash flows using the above worst-case default frequency and the minimum recovery percentage specified for the pool.

**Reinvestment Period**

During the reinvestment period of the transaction, principal collections are held and used to fund or purchase new project-finance loans. Such reinvestment is generally permitted as long as the transaction performs as expected and meets certain structural covenants and triggers. Typical covenants include interest coverage ratios, asset overcollateralization ratios, and total loss triggers. If these covenants or triggers are breached, reinvestment is stopped and principal proceeds are used to pay down the rated tranches either in full or until the covenants are brought back into compliance.

**Surveillance**

Regardless of which approach is used to size that capital structure, Standard & Poor's will maintain active surveillance not only on the underlying project loans, but also on all CDO transactions involving such loans. The main concern is that the default frequency, recovery rates, and cash-flow characteristics used to establish the commensurate ratings are still valid. As ratings migrate and the collateral changes, Standard & Poor's may request that additional cash-flow runs be made to determine that the transaction still performs at its assigned ratings. Because statistically significant data on default timing, timing of recoveries, and loss severity are still being gathered, on-going surveillance is important to maintain correct ratings on the CDO securities, especially for the ratings on the subordinated and junior tranches. Standard & Poor's expects the ratings on the junior and subordinated tranches of project finance CDOs to be more dynamic than typical structured finance securities due to the nature of the loans and structure of the CDO transactions.

Standard & Poor's will look at the trustee reports and monitor the default probability and the cash-flow characteristics of the assets, the structural covenants, and the ability of the transaction to perform as structured.

**Hybrid- Project Finance CDOs**

To overcome some of the concerns surrounding long ramp-up periods and negative carry on the transaction, some sponsors have proposed combining high-yield corporate loans or bonds with project-finance loans. The liquidity of the corporate market and the known cash-flow characteristics of the assets make this attractive. Nevertheless, Standard & Poor's has some general concerns with this approach. The primary concern focuses on the ability of the sponsor to manage both type of assets. The project-finance loan market is substantially different than the high-yield corporate loan market. Success in one does not
guarantee success in the other. Thus, this approach must be viewed with caution.

Second, if the strategy is to hold the high-yield corporate loans and bonds until project loans become available then to re-deploy into such, this concept introduces market risk into the transaction. The sponsor may not be able to re-deploy because market conditions may not allow the sale of corporate loan or bond assets and reinvestment into project-finance loans without breach of the transaction covenants and triggers.

Master Trust Considerations
To securitize project finance loans, some sponsors are interested in structuring transactions using a master trust structure. This structure is attractive to some issuers because it is potentially more cost-effective to issue an additional series of bonds, rather than create a new trust. Depending on the issuer, securities issued out of a master trust may be backed by one large, diverse pool of assets containing a mix of seasoned and newly originated loans. Master trusts may contain other features that benefit investors, such as sharing of excess cash flows and reserve accounts among the different series of issued bonds.

In structuring master trust transactions backed by project finance loans, the sponsors should consider the following:

- **Seller's Interest.** The seller's interest is equal to the amount of trust assets that are not matched by the correspondent trust liabilities. The sellers interest provides a buffer against two major potential risks: amounts that may be set-off and amounts that exceed obligor and industry concentration limits. Depending on whether or not the loans documents contain provisions against set-off, Standard & Poor's will examine the enforceability of the provisions and size a commensurate amount of sellers interest to cover such risk. The sellers interest is also used to protect noteholders from obligor and industry concentrations. If certain projects exceed obligor or industry concentration limits, such overconcentrations are allocated to the sellers interest to limit the potential exposure.

- **Collateral Additions.** Master trust structures for different asset types typically have a number of ways in which collateral can be added to the trust. They include required additions, automatic additions, and permitted additions. Since project finance loans are not homogenous assets, such required and automatic additions of collateral can not be used in project finance CDO. Standard & Poor's must rate and give expected recovery values for each project finance loan included in the master trust.

- **Series Termination Date.** In master trust structures there are two important payment dates for each series: the expected final payment date and the series termination date. The expected final payment date is when a series of notes are expected to be paid out. The series termination date is the date after which the series of notes has no legal rights to any additional cash flows. Since project finance loans are not homogenous in nature, care must be used in setting the payment date for each series to cover extension risk on the loans. Standard & Poor's will work with the sponsor to set these dates to mitigate such risk.

Future Developments
It is expected that the criteria presented here will continue to evolve to reflect ongoing changes in and nuances of project finance CDO transactions. Standard & Poor's is open to examining proposals containing new structural mechanisms and will consider each CDO transaction on a case-by-case basis.

Distressed Debt CDOs
In December 2000, Standard & Poor's assigned confidential ratings to Ark CLO 2000-1, an issue backed by cash flows from a pool of distressed and defaulted bank loans from Fleet Boston Corp. As reported in the national press, Fleet Boston sold in excess of $1.5 billion of its problem loans to a bankruptcy-remote, special-purpose entity that financed the purchase by issuing notes into the private ABS market. Interest and principal on the rated notes will be paid from the cash flows, including recoveries, generated by these distressed loans and from the transaction's cash reserves.

Since the news of the Ark CLO appeared in the press, Standard & Poor's has received a number of inquiries about the details of this transaction and the approach we will use for rating similar transactions. Due to the confidential status of the Ark CLO ratings, Standard & Poor's is not at liberty and will not disclose any
information pertaining to the specifics of the transaction. However, Standard & Poor's believes that it would be beneficial for the market to highlight our general rating methodology for this asset class, distressed loan CDOs, and for the more inclusive class, distressed debt CDOs.

**New Structures for New Times**

Ark CLO marks the first time in over a decade since Standard & Poor's has rated a nonperforming bank CLO on a cash flow basis. The previous rated issue was in the late 1980s, when Standard & Poor's rated the Grant Street Bank transaction.

The re-emergence of a distressed debt CDO comes at a time when the credit market is once again paying closer attention to corporate defaults. Corporate defaults have been on the rise since late 1998 after years of strong credit availability, especially to noninvestment-grade or leveraged companies. As a result, banks are becoming concerned that their percentage of problem loans may begin to creep upward and harm their financial performance.

Securitizing distressed assets provides a method by which a financial institution can limit its exposure to further losses. Through the capital markets, the risks and rewards of these problem debt instruments can be transferred to CDO investors. By structuring a transaction with different levels of subordination, reserves, and tiered repayment priorities, different ratings can be achieved for different classes of notes, attracting investors with different risk appetites. Of course, in these transactions as in all securitizations, investors expect that the asset pool, coupled with the ability of the collateral manager to recover sufficient value from the defaulted loans, will provide an attractive reward for the risk they undertake.

**Distressed Debt Differs From Performing Debt**

In analyzing prospective distressed CLOs, Standard & Poor's will carefully consider the specific attributes that characterize distressed loans and differentiate them from ordinary bank loans. A credit is considered distressed if the borrower's financial ability to honor its obligations and payments comes into question. Common indicators that a borrower may have financial difficulty in repaying its debt include a breach of financial covenants, a payment or technical default of other debt obligations, or a trading value for their debt significantly below other debt with similar coupon and maturity features. The critical "distressed event" occurs when a financial trigger is breached, which allows the lending group to become involved with the borrower's financing activity. The borrower then is dependent upon the lending group for forbearances, waivers, and amendments. In that case, borrowers must work closely with the lenders to cure their financial problems.

As suggested by the above definition, not all distressed debt is in default. The distressed debt of an issuer may be current on its bank loan obligations, while being in technical or financial default on its other subordinated debt. However, in this situation, there is significant near-term risk that the borrower will ultimately default on its obligations. Distressed borrowers who are rated by Standard & Poor's will likely not be assigned ratings much higher than 'CCC'. Given their poor credit profile, it is reasonable to expect that a significant portion of a distressed loan pool will eventually default.

**Overview of Standard & Poor's Methodology**

Standard & Poor's methodology for rating cash flow distressed debt CDOs focuses on the same fundamental parameters as on a cash-flow CDO backed by high-yield or investment-grade assets. The fundamental parameters driving all CDOs are: default rates and timings, recovery levels and timings, transaction structure, portfolio manager capabilities, and legal analyses. But while the fundamentals are the same, the analytical emphasis and the assumptions used differ considerably from the traditional CDO. This is in response to the specific characteristics of distressed debt.

The Standard & Poor's approach to rating distressed CDOs consists of the following:

- Quantitative and qualitative analysis of the obligor's creditworthiness;
- Model- driven analysis of the probability distribution of defaults for the loan portfolio, based on the rating or creditworthiness of the obligor;
- Detailed analysis of the debt instruments, including an understanding of their position in the capital structure and the degree of subordination available;
- Determination of potential recovery rates for the portfolio, given the detailed analyses of the debt
instruments;
• Quantification of liquidity needs;
• Cash-flow modeling of the proposed transaction, stressing defaults and their timing, recovery rates and their timing, and liquidity needs;
• Evaluation of the transaction's structure and covenants;
• Review of the experience and capabilities of the collateral manager, who is crucial to the success of the transaction;
• Determination of the market value of the portfolio; and
• Legal analysis.

Creditworthiness of Obligors
For CDOs generally, the determination of each obligor rating is a key component of Standard & Poor's rating exercise. Without obligor ratings, it would be difficult to calculate the expected default rate for the pool. Many distressed obligors, however, do not have credit ratings, especially if they are primarily dependent on one financial institution for their funding.

To estimate the credit quality of the unrated borrowers, Standard & Poor's Corporate Ratings group and others with specific knowledge of the companies, industries, and economic trends provide valuable insight on the general credit quality of these borrowers. As ratings migrate from investment grade to high-tier noninvestment grade, and from high-tier noninvestment grade to low-tier noninvestment grade, the ratings become less scientific and more qualitative as to whether the rating will ultimately become a default (‘D’ rated).

Based on consultation with the Corporate Ratings group, an assessment will be made of the rating of these borrowers for modeling purposes. From a practical point of view, distressed borrowers that have not yet defaulted are most often lowly rated, often not better than 'CCC'. To the extent that it is difficult to obtain a well-grounded rating due to the lack of documentation on the borrower, its business profile, or its size, the lowest possible rating will be assumed.

The Standard & Poor's CDO Evaluator
Standard & Poor's utilizes its proprietary CDO Evaluator to determine the probability distribution of default rates for the loan portfolio (For a more detailed discussion of the Standard & Poor's Default Evaluator, please see Section 6). Given the low-tier noninvestment-grade ratings of the distressed debt obligors, it is not surprising that the resultant default rates for the asset pool can be quite high. These results are consistent with the nature of distressed debt. However, given the precarious position of most of these obligors, the Evaluator may not capture all elements of risk in the pool. Thus the results from the default model will serve as a floor to the magnitude of the default rate that a tranche for a given desired rating should be able to sustain without defaulting. Typically, the magnitude of this default rate should be adjusted upward to reflect the many qualitative risk concerns.

Recoveries
Since a majority of the loans in a distressed debt CLO are either in default or will be in default, the key performance variable is recoveries. In analyzing recoveries, Standard & Poor's may draw upon the proprietary database of its wholly owned subsidiary, Portfolio Management Data (PMD). This database of defaulted and/or bankrupt debt instruments contains public bankruptcies dating back to 1987 and currently consists of approximately 375 bankruptcies and 1,400 instruments. The database tracks progress of the entire debt structure from default through bankruptcy/restructuring and values the debt at emergence, including cash to holders as dictated by the bankruptcy court documents, and a valuation of emergence instruments based on their cash flows and ultimate disposition value, either through a refinancing or a secondary sale.

The PMD recovery database has given Standard & Poor's the ability to examine the degree to which some borrower and loan characteristics affect recovery rates. These characteristics include coupon, collateral type, and origination date. Standard & Poor's has determined that once a default occurs, a primary predictor of recovery is the position of the loan in the capital structure. If the loan is collateralized by all assets and there is a significant amount of subordinated debt, then the recovery rate on the senior loan is likely to be high. Statistical analysis has allowed Standard & Poor's to determine a matrix of recovery distributions for some key prediction factors.
After reviewing the information gathered from the PMD database, Standard & Poor's will work with the information supplied by the issuer and craft a detailed recovery analysis of the loans in the prospective portfolio that is to be securitized. Part of this process will be to look at the recovery history available from the originating institution, either to confirm or to modify the recovery patterns and levels indicated by the PMD database.

The resulting loan-by-loan analysis is utilized in assigning to each loan a recovery distribution, which estimates the likelihood of recoveries at a number of different levels. From these loan specific estimators, a recovery probability distribution is obtained for the entire portfolio.

In contrast to a CDO based on performing collateral, Standard & Poor's stresses the recoveries in a distressed debt CDO. The rationale is that in a distressed debt CDO the large majority of loans are expected to be eventually in default and therefore stressing defaults alone does not properly stress the performance of the portfolio. Rather, recoveries, which are the primary driver of performance, are also stressed, with the level of stress depending upon the credit rating desired.

The type of methodology used in a distressed debt CDO to stress recoveries is similar to the type of methodology used in a performing debt CDO to stress defaults. In particular, for a distressed debt CDO, an initial lower bound for portfolio recoveries is determined for each CDO tranche such that the probability of receiving recoveries less than that lower bound is sufficiently small. For example, suppose that a CDO tranche is to be sized to earn an 'AA' rating and it is desired that the probability of default due to insufficient recoveries should be no greater than 1.99%, which is also the historical probability of default of corporate 'AA' bonds. Using the portfolio's estimated probability distribution for recoveries, a stressed level of recoveries is determined such that the probability of experiencing less than that stressed level is 1.99% or less. This approach implies that if the CDO tranche can survive at the stressed 'AA' recovery level so determined, then its probability of default is no greater than the historical probability of default of corporate 'AA' bonds.

To take into consideration qualitative factors, these lower bounds may be stressed further. Thereafter, the resulting stressed recoveries levels, tiered by rating category, are used in the subsequent cash flow analysis. Tiering recoveries allows Standard & Poor's to use for the lower rated CDO tranches recovery rates that are likely to be significantly higher than the recovery rates that are normally assumed.

**Quantification of Liquidity Needs**

Liquidity risk for distressed debt CDOs is a critical aspect of these transactions, and it must be quantified and addressed. The greatest need for liquidity will be caused by significant loan defaults and/or restructures. Defaults typically cause an immediate cessation of promised loan payments by the borrower. In addition, restructures, bankruptcies, and distressed exchanges may result in a write-down or extension of the original loan terms to alleviate the borrower's financial burden. In any of these cases, the timing of collections to meet the current-debt service requirements of the securitization will be negatively impacted. In the case of distressed debt CDOs, the magnitude of this problem creates the need for significant reserve accounts to fill the shortfall gap.

Additional liquidity problems arise with revolving loans. When distressed revolving bank loans are sold to the securitization issuer, both the rights to receive borrower payments and the obligation to fund borrower draws are transferred to the securitization. The securitization should ensure that it would always have sufficient cash available to honor its commitment to fund any future borrower draws. Any failure to do so may give the borrower a right to claim damages against the securitization for failing to honor the terms of its lending contract.

However, the terms of most revolving facilities loans allows the lender to suspend borrower draws if there is any significant deterioration or material change in the borrower's financial condition. To the extent that these borrowers are already distressed or defaulted when transferred to the securitization, their rights to draw funds on their revolving facility may have already been suspended and the potential for draws may be significantly reduced. Nonetheless, Standard & Poor's requires that a distressed CDO have sufficient liquidity to meet potential revolving loan draws.

Liquidity needs also occur with respect to debtor-in-possession (DIP) financings. Upon filing for bankruptcy, the borrower's access to its credit facilities, as well as cash, are frozen. The bankruptcy court will determine...
whether or not the bankrupt borrower should have access to its cash, which in essence has become the property of the pre-petition lenders. DIP financings are necessary in order to provide the company with liquidity during the bankruptcy proceedings. Without DIP financing, the borrower will likely not be able to maintain a viable business during the bankruptcy proceedings.

It is generally believed to be in the best interest of the pre-petition lenders to provide the DIP financing. This is because the DIP loan functions as a "carrot" during bankruptcy, fortifying the lenders' influence over the borrower's restructuring plans and potentially maximizing recoveries. DIP loans take a special, senior position over all pre-petition debt and, historically speaking, DIP loans have been repaid at 100% of interest and principal at the conclusion of bankruptcy proceedings.

In addition to the above liquidity needs, the transaction must provide for sufficient cash flow to pay periodic fees. Among these are the collateral manager, trustee, and accounting fees. In addition, for the collateral manager to maximize recoveries, it must have the flexibility to get assistance from third parties such as financial advisors and legal experts. This generates new professional and services fees that must be paid by the transaction and, in turn, pose liquidity drains on the transaction. The inability to absorb such costs may lead to less-than-maximum recoveries.

Standard & Poor's requires that all of the above liquidity requirements are provided for. As mentioned above, one method of fulfilling the shortfalls is to create one or more cash-reserve accounts, which are adequately sized to meet the inevitable demands.

**Cash-Flow Analysis**
Cash-flow analysis is the core analytical methodology that allows Standard & Poor's to bring together the major components of its analysis to evaluate the transaction's subordination levels and structure. The objective of the analysis is to demonstrate that the transaction is sufficiently robust to meet timely payment of interest and principal, as set forth in the indenture.

To accomplish this goal, Standard & Poor's will test a myriad of stress scenarios to ensure, to a level of probability required by the rating, that sufficient cash flows will be available to service the rated notes. Transaction cash flows are most sensitive to the rate of defaults, the timing of when the defaults occur, the magnitude of the loan recoveries, and the timing of when the recoveries are realized. Additional sources of sensitivity include the magnitude and timing of cash draw needs, such as meeting periodic transaction fees, DIP financing, and fulfilling revolver financings. The effect of these elements can be ameliorated or exaggerated by structural features of the transaction. Each of these will be discussed below.

**Cash Flow Defaults**
The level of asset defaults that a CDO tranche must be able to sustain without defaulting is determined by the CDO Default Model, as discussed previously. Standard & Poor's recognizes that the timing of defaults is apt to be substantially different from the timing assumed for traditional CDOs. When the transaction closes, virtually all of the collateral is already distressed, if not defaulted. Thus, it is anticipated that most defaults of the nondefaulted collateral are likely to occur in the first few years of the transaction. As a result, Standard & Poor's requires that scenarios be run that front-load the defaults in the first quarters of the transaction's life. In addition, Standard & Poor's requires that a number of delayed-shock runs with sudden concentrated peaks be modeled, as well as some of our traditional default runs to test the transaction behavior in the more unlikely event that defaults do not occur until near the end of the loan's tenor.

**Cash Flow Recoveries**
Since the magnitude of recoveries at each rating level is tiered, it moves off the mean based on standard deviations. The time to recovery, another key component in modeling cash flows, consists of two time segments: the time in bankruptcy and the time to liquidity or cash. Many creditors receive cash at emergence from bankruptcy. However, equally many receive restructured bank loans, bonds, or stock. We define liquidity as the earliest possible point in time that those "exit instruments" can be converted to cash either through secondary trading markets or refinancings.

Based on PMD data, the average time from bankruptcy to emergence is 18 months. With illiquid instruments such as bank loans, PMD has also shown that, on average, it takes 20 months for refinancing of the exit facilities, though their contractual terms are the standard five to seven years. Together, the time from bankruptcy to recovery averages 38 months in the PMD database. Recovery time frames assumed in the
cash flow runs are based on PMD data, but will also depend upon any additional recovery time frame data
provided by the issuer for similar assets. Based on this, all recovery times are also stressed, yielding a
distribution with a weighted-average time in excess of those found in the PMD database.

Other Liquidity Needs
Through stressed cash flow runs, the adequacy of the transaction in meeting other liquidity needs is tested.
Specific draws are made upon the various reserve funds as the requirement for funding arises. For example,
Standard & Poor's stresses the liquidity demands of DIP financing requirements, by assuming that a
substantial portion of the distressed obligors will require DIP financing upon default. In stressing revolver
draws, Standard & Poor's assumes that virtually all revolvers are drawn down to the extent legally permitted.
The recovery rate for them will be the same as for the original loan. Professional fees, including the cost
necessary to attract a replacement manager, are also modeled.

Legal Final Maturity
The legal final maturity of the CDO notes should be set to allow for all cash-flows from recoveries to be
realized. Any cash flows received after the legal final maturity of the notes cannot be credited in the cash
flow analysis. Consequently, Standard & Poor's requests that the final maturity be at least equal to the sum
of the tenor of the longest maturing asset plus the longest modeled time from bankruptcy to recovery.

Structural Considerations
Structural features are an important component in a performing collateral CDO transaction and serve to
safeguard the performance of various tranches. The same is true of a distressed debt CDO, but the
possibilities are more limited due to the specific characteristics of distressed debt. Below we consider the role
of sequential pay, reinvestment, and interest coverage and overcollaterization ratio triggers.

The sequential-pay structure assures that the most highly rated tranches are paid down first. Given that
defaults do not occur in a set pattern, recoveries lag for long periods, and the collateral becomes lumpier
over time (that is, fewer obligors with a larger percentage of the total), Standard & Poor's is of the opinion that
the alternative of a pro rata payment structure is not well suited for distressed debt transactions.

The typical performing collateral CDO is also structured with a reinvestment period during which principal
proceeds are reinvested in new assets. The same may be employed in a distressed debt CDO, but it is very
difficult to effectively achieve the desired result, given the liquidity issues, the specific collateral
characteristics, and the collateral specific default and recovery rate analyses required by Standard & Poor's
in these types of transactions. Moreover, given the liquidity concerns associated with these transactions, it is
difficult to establish that an appropriate use of recovery proceeds after a lengthy workout is to reinvest them
in the same type of distressed asset, rather than paying down the rated notes.

In a typical performing collateral CDO the interest coverage and overcollaterization ratios control the
asset/liability balance of the transaction and the amount of excess spread that will be trapped to pay down
the rated notes. In a distressed CDO, the potential use of interest coverage and overcollaterization tests is
more limited. The primary reason is that the debt is distressed and its principal balance does not adequately
reflect its ultimate value in the transaction.

Standard & Poor's has found that structural innovation is a key driver in fully developing the potential of new
asset classes and will be pleased to evaluate new methods for securitizing distressed debt. Transaction
features that have been shown to have a positive effect on achieving the required ratings include
overcollaterization of the liabilities, reserve accounts to cover liquidity risks, turbo cash flow features that
retire the rated debt as fast as possible, and the subordination of various liability tranches.

Market Value Cap
In rating a distressed CDO transaction, Standard & Poor's will take into account the current market value of
the portfolio being securitized and limit the advance rate based on the portfolio's market value. The advance
rate refers to the maximum amount of investor notes that can be issued, expressed as a percentage of the
market value of the asset pool.

There are two reasons for placing a market value limitation on liabilities issued. First, collateral managers
often use the sale of a distressed asset as a means for realizing cash recoveries. The distressed debt
manager generally participates in all negotiations with the borrower and is generally the best judge of future recovery values. Based upon that information, selling an asset may be the best strategy for maximizing ultimate recoveries. Restrictions or elimination of this option for realizing recoveries can adversely impact the performance of the CDO. Consequently, the market value of such sales must be considered.

Second, Standard & Poor's believes that for diverse pools of distressed debt, market value is an indicator of the ultimate value of those assets. While pricing of any specific asset may overstate or understate the ultimate recovery, the market is reasonably diligent in valuing the risks in portfolios. Part of that evaluation is the degree of illiquidity and the degree of volatility in the amount and timing of the recoveries. While these elements may have a negative impact on the market's evaluation of distressed debt and may lead to an underestimation of the ultimate recovery, Standard & Poor's believes that it is prudent to require a discount to market value to reflect the higher uncertainty of future cash flows on the asset pool relative to the securities being offered. As the ratings requested rise, the discount to fair market value required by Standard & Poor's also rises.

**Collateral Manager Review**
The importance of the collateral manager to the success of a distressed debt CDO cannot be overemphasized. They are responsible for selecting and monitoring the securitized bonds and/or loans, and, in the event of an asset default, they will take the best course of action to maximize recoveries for the benefit of the transaction. Unlike performing asset CDO managers, the emphasis is not one of selecting and monitoring loans that are expected to be performing. Instead, the emphasis is on selecting weak loans with good recovery prospects and in actively working with the defaulted borrowers, the lending group, bankruptcy court, and any other parties to generate the necessary cash flows to service the required CDO note payments. As the representative of the securitization's claims against the borrowers, collateral managers are expected to review, deliberate, and lead workout plans and proposals in the best interest of the securitization investors.

As part of Standard & Poor's rating process, we will conduct a review of the transaction's appointed collateral manager. The goal of the review is to gain insight into the manager's experience in the distressed debt market, and to determine how well prepared it is for managing a cash flow-based distressed loan securitization.

In a typical high-yield CDO, the main focus of the review is the ability of the manager to select assets, monitor their performance, and take remedial action in the event of a change in the credit risk of the assets. As implied by previous discussion, in a distressed debt CDO, the focus is more on the ability of the manager to successfully work out a distressed or defaulted asset. Some of the basic questions that are addressed during the review are as follows:

- How much experience does the manager have in working out distressed or defaulted debt and how good is its track record?
- What are the key loan selection criteria for selecting the loans that are included in the securitized pool?
- Has the collateral manager done its own due diligence review of each borrower/loan?
- Based on its review, does the collateral manager have a well-defined exit strategy for each potential problem loan?
- Does the exit strategy aim to maximize recovery values?
- Is the collateral manager relying on restructuring, liquidating, or refinancing of the troubled debt in its recovery maximization strategy?
- Is the manager anticipating selling the distressed loan under some circumstances?
- Does the manager have a controlling interest in the loan or will it be relying on following the majority of the credit group’s decisions?
- Does the manager understand the cash flow requirements of a securitized transaction and is its strategy compatible with those requirements?
- What are the expected third-party professional fees and expenses?
- How will third-party fees be managed?
- Are the collateral manager's financial incentives aligned with the interests of the securitization investors?
Additionally, as part of the review, Standard & Poor's will look at the infrastructure resources and support that the collateral manager has in place. Given the work-intensive nature of distressed loan workouts, the collateral manager must have adequate support and infrastructure to be able to stay focused and to maximize recoveries. Based on the review of the collateral manager, Standard & Poor's will fine-tune the expected recovery levels to reflect these capabilities.

Whether the distressed debt collateral manager is rated or not is also a consideration. Unless the distressed debt collateral manager is itself highly rated, Standard & Poor's believes that a highly rated backup manager should be contracted to take over the management of the securitization if the original manager is unable to perform. The credit rating of the manager or backup manager will be a consideration in the rating Standard & Poor's will assign to the senior-most tranche of the structure.

Typically, in a traditional cash flow CDO the withdrawal of the collateral manager and the inability to contract a suitable replacement will cause the transaction's trustee to step in as the backup collateral manager. For a distressed debt CDO, this same arrangement implies that the trustee would be required to take on an active role in managing the pool of distressed/defaulted assets.

However, managing a pool of distressed bank loans requires specialized knowledge and experience with distressed bank loans. Therefore, relying solely on the trustee to act as the backup collateral manager for distressed debt securitization is in itself not a solution. For this reason, Standard & Poor's expects that a highly rated back-up manager will be contracted to take over the management of the securitization if the original manager is unable to perform.

Legal Analysis
The legal analysis employed to evaluate a distressed debt CDO mirrors exactly the legal analyses used in high-yield CDO transactions (see Section 11). The main features are the ability to separate the assets from the originator, to insulate the assets against other claims, and to meet the required legal, accounting, and tax regulations. Key elements are assignability of the assets, lender liability, waiver of set-off, perfection, and the creation of the special-purpose entity and its bankruptcy remoteness. The Standard & Poor's rating staff work very closely with both internal and external legal advisers to make sure all legal requirements of the transaction are satisfied.

Market Outlook
Given the keen level of interest exhibited in distressed debt CDOs over the past few months by investment bankers, distressed debt funds and financial institutions, Standard & Poor's believes that more distressed debt CDO will materialize this year. With defaults having increased over the past few years and with a current economic slowdown, there appears to be an ample supply of distressed debt that can be securitized. The near-term outlook is that there will be a flurry of activity and issuance of distressed debt CDOs, followed by a lower but steady volume of issuance. The actual volume of transactions, of course, will ultimately be determined by the investor's willingness to invest in this asset class.

A potentially interesting ancillary development may be the effect that distressed debt CDOs will have on the secondary market prices of distressed debt. Experienced workout managers may use distress debt CDOs as a vehicle to assemble pools of distressed assets from various sources. It remains to be seen if such vehicles will be created, and how they will compete with "vulture funds" for distressed assets.

It should be noted that the development of CDOs of ABS had a profound effect on the liquidity of lower rated ABS tranches, which prior to the advent of the CDOs of ABS were difficult to place.

Standard & Poor's will work with all interested parties toward rating distressed debt CDO transactions, regardless of whether it is balance sheet or arbitrage. Given the nature of the assets and the level of analyses required to rate such transactions, it is important to involve Standard & Poor's as early as possible in the process. The key factors for success in distressed debt CDOs are the following: an experienced workout collateral manager with solid backup, an asset pool with good recovery prospects, adequate reserves that can meet liquidity needs until workouts reach fruition, a robust structure that focuses on paying the rated debt, and an experienced banker/structuring team that can effectively work through the many difficult issues that arise in such novel and asset-specific transactions.
Emerging Markets/Multi-Jurisdiction CDOs

Multi-jurisdiction CDO portfolios may include both sovereign and corporate debt obligations from various countries. In general, a transaction is considered an Emerging Markets CDO (EMCDO) if the asset portfolio has substantial (generally more than 20%) exposure to countries rated lower than 'AA', and to currencies that are not the currency of the rated liabilities. To date, the country exposures have predominantly been limited to emerging markets or developing nations. As a result, we will refer to multi-jurisdiction CDOs and emerging market CDOs interchangeably.

The rating methodology for emerging markets CDOs is analogous to traditional corporate CDO transactions. Exclusively corporate bonds and loans from a single country, such as the U.S. or other developed countries, typically collateralize traditional corporate CDOs. The analysis includes the following:

- A credit analysis of the collateral portfolio;
- A structural analysis, focusing on the payment priority and the proposed capital structure;
- A cash flow or default/recovery analysis to size credit support and transaction structure;
- A legal analysis of the transaction assets, the transfer of the assets, and the formation of the issuer.

There are, however, additional factors that need to be taken into account when analyzing emerging markets CDOs. Direct sovereign risk can adversely affect the default risk on individual obligations in the portfolio, and there may also be a significant correlation of defaults among obligors from the same country or geographic/economic regions. Additionally, the characteristics and the existing market for the emerging market debt requires modifications to the standard CDO criteria developed for industry concentrations and for recovery rates applied to defaulted obligations.

The primary credit risk in the EMCDO's portfolios emanate from the risk of default by the obligors of the underlying securities. However, another substantial element of credit risk in EMCDOs relates to the risk that sovereign entities, where the underlying obligors reside, may:

- Take actions to restrict convertibility of the local currencies into hard currencies;
- Specifically direct borrowers to default on all or some of their cross-border obligations; or
- Require that all hard currencies held be converted into local currency.

Such actions would effectively restrict the corporate entities' ability to make repayment of their debt obligations denominated in U.S. dollars or other hard currencies. Since the rated liabilities of the EMCDOs are generally denominated in U.S. dollars and other hard currencies, any such action will have an adverse impact on the credit performance of the portfolio. As a result, in transactions that involve substantial emerging market corporate exposures, the portfolio is exposed to bivariate credit risks, which consist of corporate default risk and sovereign risk.

Sovereign Risk

Sovereign risk is defined as the likelihood that actions by a sovereign government might directly or indirectly affect the ability of an obligor to meet its obligations in a timely fashion. Direct and indirect sovereign risks vary by country, by the obligation's currency of denomination, and by obligor. Direct sovereign risk encompasses intervention by the sovereign government that directly impedes the obligor's capacity to meet its financial obligations on time. The timely servicing of foreign currency debt is typically more vulnerable to direct sovereign risks. However, direct sovereign risks may also affect local currency debt obligations because the potential for acute monetary or political instability creates the possibility of a government-mandated restructuring of not only its own local currency obligations, but also those of the banking system.

While higher-rated sovereigns are not expected to interfere with an issuer's ability to meet its offshore foreign currency denominated obligations, the same cannot be said for obligors domiciled in lower-rated emerging market sovereigns. The exception would be obligors that are domiciled in certain "dollarized" economies (see Standard & Poor's CreditWeek, April 30, 1997, "Less Credit Risk For Borrowers In 'Dollarized' Economies").

Indirect sovereign risks are sometimes referred to as country or economic risks. These are broadly described as actions by the government that may adversely affect the economic environment in which the
obligor operates and, in turn, may negatively impact the obligor’s capacity to meet its obligations in a timely fashion. Country or economic risks incorporate the impact of government policies that influence the business and financial environment facing the obligor, including uncertainties related to the exchange rate, interest rates, labor market conditions, taxation, regulation, and infrastructure. Such policies may impact an obligor’s cost of debt service, the availability and costs of inputs, and the demand for its products. Accordingly, both foreign and local currency obligations are affected by indirect sovereign risks.

Local currency obligations are those that are denominated in the home currency of the obligor. For example, Mexican peso debt is a local currency obligation for a Mexican company, while U.S. dollar debt is a foreign currency obligation for that company. An obligor’s foreign currency rating may be lower than its local currency rating due to direct sovereign risks.

Direct sovereign risk may also affect the debt rating assigned to a CDO. If the obligors represented in the collateral pool are all from the same country, the issuer credit rating assigned to that sovereign government will most likely limit the CDOs rating to that of the sovereigns. The impact of direct sovereign risk, however, can be substantially reduced if the obligors hail from many geographically diverse countries.

For obligations of a sovereign government, which figure prominently in many emerging markets CDOs, the sovereign’s foreign currency issuer credit rating should be used to gauge default risk if the obligation in the collateral pool is denominated in a foreign currency (for example, a U.S. dollar bond of the Brazilian government). The sovereign’s local currency rating would be used for a local currency obligation. When the pool consists exclusively of sovereign debt from various countries, the sovereign issuer currency ratings can be applied to the "traditional" single-jurisdictional CDO Evaluator model. There is generally no incremental bivariate risk component, and therefore no additional adjustments are required.

For an emerging market corporate obligor, the default risk of its foreign currency debt should combine the company’s independent probability of default (as indicated by the company’s local currency issuer credit rating) with the incremental risks of direct sovereign intervention. The latter can be estimated as the risk differential between the sovereign’s local and foreign currency ratings. As one would expect, this risk is more evident in low investment-grade and speculative-grade countries. Consequently, an emerging markets corporate portfolio will usually have higher estimated losses and, therefore, require greater credit enhancement than a similarly rated portfolio of U.S. obligors.

In order to factor the incremental effects of sovereign risk to the credit performance of an emerging markets CDO portfolio, analysts use the multi-jurisdictional CDO model. This model is an enhanced version of the "traditional" single-jurisdictional CDO Evaluator model, taking into account both sovereign risk and concentrations. Unlike the CDO Evaluator model, the multi-jurisdictional model does not use a Monte Carlo simulation with correlation, but rather is based on the analytical method, and uses rating notching to account for correlations. As a result, the multi-jurisdictional model requires more portfolio data. Specifically, the input file should specify the countries that the portfolio is exposed to and the foreign and local currency ratings of those countries. Additionally, the ratings of the sovereign and the obligor must be manually notched as explained later, before they are input in the model.

To calculate the default rate of an EMCBO portfolio, the multi-jurisdictional CBO/CLO model requires the following information:

- Number of obligations/number of data lines to be read (each installment of an amortizing loan is treated as a separate obligation of the same issuer),
- Date of determination or closing date,
- Rating requested on the liabilities,
- Country in whose currency the rated liabilities will be/are issued,
- Obligor concentration for each obligor,
- Maturity date of each obligation,
- Standard & Poor’s foreign currency issuer credit rating of each obligor,
- Standard & Poor’s local currency issuer credit rating of each obligor,
- Sovereign identification,
- Standard & Poor’s foreign currency issuer credit rating of the country of each issuer's domicile,
• Standard & Poor’s local currency issuer credit rating of the country of each issuer’s domicile.

This information is entered into the computer program for each obligation in the portfolio. The model then calculates an expected default rate based on historical default data (see default model in Evaluating Credit Risk section).

Bivariate credit risk refers to the possibility that credit events relating to one entity may adversely impact the ability of another entity to service its debt. In terms of the emerging markets CBO, bivariate credit risk refers primarily to the default probability of a corporate bond issued by a corporate entity domiciled in an emerging markets country, and is affected by:

• The likelihood of a default by the corporation, and
• The likelihood of a default that could be caused by the actions of the sovereign (for example, by imposing exchange controls).

Similarly, bivariate credit risk is also present in credit-linked swaps, synthetic securities, loan participations, and securities lending, etc. In the case of credit linked notes, for example, the transaction is generally exposed to the credit risk of the referenced obligor as well as credit linked swap counterparty. Bivariate risk, however, is not present in an emerging market CBO whose liabilities are collateralized solely by obligations issued by sovereigns, since the only risk of default is that of the sovereigns.

In any transaction that has substantial total bivariate risk-including the exposures mentioned above and corporate obligations from obligors in countries rated lower than the senior most tranche-the multi-jurisdictional CBO/CLO model is used for estimating default risk. Chart 1 illustrates an example of the input file for the multi-jurisdictional CBO/CLO model.

### Chart 1
**A SCII Data File Format For Multi-Jurisdictional CBO/CLO Model**

<table>
<thead>
<tr>
<th>Number of data lines to be read</th>
<th>Expected closing or trade date, whichever is later</th>
<th>Rating requested on the liabilities</th>
<th>Country in whose currency the rated liabilities will be issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>09/30/1999</td>
<td>AAA</td>
<td>USA</td>
</tr>
<tr>
<td>000001</td>
<td>1/31/2007</td>
<td>BBB-</td>
<td>Country1 A</td>
</tr>
<tr>
<td>000002</td>
<td>2/25/2008</td>
<td>BB+</td>
<td>Country2 BB+</td>
</tr>
<tr>
<td>000003</td>
<td>8/12/2007</td>
<td>BB-</td>
<td>Country2 BB-</td>
</tr>
<tr>
<td>000004</td>
<td>2/02/2004</td>
<td>B+</td>
<td>Country2 BB+</td>
</tr>
<tr>
<td>000005</td>
<td>3/15/2002</td>
<td>BB-</td>
<td>Country3 BB-</td>
</tr>
<tr>
<td>000006</td>
<td>7/09/2001</td>
<td>B</td>
<td>Country4 BB-</td>
</tr>
<tr>
<td>000007</td>
<td>7/26/2013</td>
<td>B-</td>
<td>Country4 BB-</td>
</tr>
<tr>
<td>000008</td>
<td>2/21/2009</td>
<td>B-</td>
<td>Country5 BBB</td>
</tr>
<tr>
<td>000009</td>
<td>3/15/2005</td>
<td>B-</td>
<td>Country6 BBB</td>
</tr>
<tr>
<td>000010</td>
<td>8/07/2004</td>
<td>B+</td>
<td>Country6 BBB</td>
</tr>
<tr>
<td>000011</td>
<td>8/04/2003</td>
<td>BB-</td>
<td>Country7 BB+</td>
</tr>
<tr>
<td>000011</td>
<td>9/03/2007</td>
<td>BB-</td>
<td>Country7 BB+</td>
</tr>
</tbody>
</table>

- Number of data lines to be read
- Expected closing or trade date, whichever is later
- Rating requested on the liabilities
- Country in whose currency the rated liabilities will be issued
Concentration Risks

Country Concentration
In emerging market countries, where corporate obligors are exposed to direct sovereign risk, these risks can be compounded if the CDO portfolio contains a concentration of obligors from the same country. Economic difficulties encountered during the past few years by countries such as Brazil, Russia, Thailand, Indonesia, Korea, and Mexico, clearly illustrated the correlation of credit risk among obligors from the same country or region.

Some national risk correlation exists among large mature economies, such as the U.S., Japan, and Germany, but it is much more pronounced in developing countries. Thus, a CDO requires more credit enhancement when the portfolio contains certain country concentrations in the emerging markets. The multi-jurisdictional CDO model takes country concentration into account when calculating a portfolio’s potential loss or default rate.

Concentrations in ‘AA’ or higher countries are less of a concern because direct sovereign risk in those countries is much less meaningful.

Adjustment for Regional Concentration
Based on the high degree of credit correlation experience between emerging market countries, emerging market regions have been classified into 16 categories (see table 7 for Emerging Markets Regions). Any emerging market cash flow CBO portfolio that is exposed to less than 15% in any of these categories is considered fairly diversified. Adjustment for the additional risks posed by regional concentration is factored by adjusting the credit assigned to each country in that concentrated region as if it had a lower rating, that is, higher default risk.

<table>
<thead>
<tr>
<th>Table 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard &amp; Poor's Geographic Regions for CDOs</td>
</tr>
<tr>
<td>Mexico</td>
</tr>
<tr>
<td>Other Central American and Caribbean</td>
</tr>
<tr>
<td>Andean South America</td>
</tr>
<tr>
<td>Mercosur/Southern Cone South America</td>
</tr>
<tr>
<td>Southeast Asia and Korea</td>
</tr>
<tr>
<td>India and Pakistan</td>
</tr>
<tr>
<td>Sri Lanka, Bangladesh, and Nepal</td>
</tr>
<tr>
<td>China, Hong Kong, and Taiwan</td>
</tr>
<tr>
<td>Russia and the CIS</td>
</tr>
<tr>
<td>Greece, Malta, Cyprus, Hungary, Czech Republic, Poland, Slovenia, and Estonia</td>
</tr>
<tr>
<td>Other Eastern Europe, including Turkey</td>
</tr>
<tr>
<td>Gulf States</td>
</tr>
<tr>
<td>Sub-Sahara Africa</td>
</tr>
<tr>
<td>South Africa and Botswana</td>
</tr>
<tr>
<td>Other Africa and Middle East</td>
</tr>
<tr>
<td>Australia, New Zealand, and other Pacific Islands</td>
</tr>
</tbody>
</table>

The higher default risk posed by higher regional concentrations can be accounted for as follows (see table 8).
If concentration in a particular emerging markets region equals or exceeds 15% of the pool but is less than 25%, adjustment for the additional risk will consist of assuming a rating level one notch lower than the actual foreign currency rating for each sovereign within that region.

If concentration in a particular emerging markets region is 25% or more but less than 30%, adjustment for the additional risk will consist of assuming a rating level two notches lower than the actual foreign currency rating for each sovereign within that region.

If the concentrations in a particular emerging markets region is 30% or more but less than 35%, adjustment for the additional risk will consist of assuming a rating level three notch notches, or one full rating category, lower than the actual foreign currency rating for each sovereign within that region.

Transactions that involve a concentration in one emerging markets region of 35% or more are reviewed on a case-by-case basis. In these cases, the additional risk is analyzed based on a number of factors including the number of obligors and industry diversity within the region.

It should be noted, however, that in portfolios to which the multi-jurisdictional model applies, any rating adjustment for excess regional concentration should only be made to the sovereign foreign currency ratings. No adjustment is necessary to the ratings of the corporate obligors unless unmitigated industry concentration exists (as described below). If the sovereign obligations are also included in a region with excess concentration, the ratings would be adjusted just like the ratings of the corporate obligations. It should also be noted that any sovereign or corporate obligor from a country rated 'AA' or higher may be excluded from the calculation of a portfolio’s regional concentration.

**Adjustment For Industry Concentration**

Emerging markets CDO portfolios are also sensitive to the risks of regional and industry concentration. Economic downturns can affect a large number of corporate and sovereign obligors within the same region as well as corporate obligors within the same industry.

In a U.S. domestic CDO the new CDO Evaluator uses a built-in correlation within industry to account for increased defaults across the same industry (see “CDO Evaluator” in “Sizing Defaults and Monitoring Portfolio Quality” section). In a multi-country CDO portfolio, a global industry analyses must be done for the entire portfolio and the portfolio notched appropriately. Some industries, such as oil and paper are global in nature, while others are not. For example, the credit risk of retailers in Indonesia is not correlated with the credit risk of retailers in Poland. In general, industry concentrations are measured regionally and are assumed to be adequately sized within the methodology for penalizing excess regional concentration. Industry concentration will be measured globally, however, for industries that are globally correlated such as energy exploration and production and metal mining that are driven by global supply and demand.

**Recovery And Loss Severity Assumptions**

Recovery assumptions for defaulted emerging markets assets are 25% for defaulted sovereign debt, and 15% for defaulted corporate debt, in most jurisdictions (see table 8). Due to the peculiar nature of emerging markets and potential obstacles to the recoveries of defaulted assets, no credit is given to the position of the debt in the obligor's capital structure. These recovery rates are applicable to fairly diversified emerging markets bond portfolios. Recovery rates applicable to portfolios that exhibit high regional concentration or
consist predominantly of loan obligations will be assigned on a case-by-case basis. As in traditional single jurisdiction CDOs, the cash flow analysis assumes that recoveries on defaulted assets will be realized one year after default through secondary market liquidation of bonds. For the less-liquid loans, recovery is assumed to occur after a protracted workout period. Therefore, in cases where the analyst has reason to believe that the secondary market for an asset (such as emerging markets bank loans) is less liquid than for emerging markets bonds, the recovery timing may be extended beyond one year.

Generally, assumed recovery levels for defaulted emerging markets assets are more conservative than they are for U.S. obligors, reflecting both a record of lower ultimate recovery and less assured liquidity for emerging markets obligations. As in the case of U.S. domestic CDOs, recoveries may be assumed to be lower if the terms of the transaction require sale of defaulted assets within a period shorter than one year after default.

Depending on the terms of the transaction, the analyst may employ an appropriate discount factor for recovery rates in cases where the asset manager may be required to sell assets within a short time after default. Further modification, to the ratings methodology employed for EMCDs and CDOs will no doubt continue to be made in the light of newly available market information, continuously evolving nature of the transaction structures and dynamic portfolio characteristics (see table 9).

<table>
<thead>
<tr>
<th>Table 9: Emerging Markets Recovery Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Sovereign obligations</td>
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<tr>
<td>Corporate obligations</td>
</tr>
<tr>
<td>% of par</td>
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<tr>
<td>25</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>Timing of recovery</td>
</tr>
<tr>
<td>One year after default</td>
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</tbody>
</table>

Rating Municipal Collateralized Debt Obligations

Standard & Poor's has been approached by a number of issuers interested in initiating CDOs using tax-exempt municipal bonds as the collateral for the issuance of rated pass-through certificates. The development of a municipal CDO product will likely add substantial liquidity to the municipal bond market place, as it has for the structured finance market. While the CDO market has become very active in the corporate and asset-backed areas, no large municipal CDOs have been issued yet, primarily due to issues in finding and structuring an appropriate vehicle which would allow the pass-through of the tax-exempt interest from the underlying collateral using a CDO structure. Now, a number of issuers believe that they have devised tax-exempt pass-through structures and have approached Standard & Poor's about rating tranched municipal CDO transactions. Issuers of municipal CDOs are interested in transactions involving for both arbitrage and balance sheet. The motivation for sponsors, arrangers, and investors are very similar to the motivation behind the other types of CDOs. They range from managing risk and streamlining balance sheets, to investing in new asset classes at different risk profiles, to benefiting from the arbitrage opportunities and increasing assets under management.

The major steps in rating a municipal CDO is the same as rating any other CDO and include:

- Determining the credit rating or making a credit assessment of any bonds not rated by Standard & Poor's for all of the underlying assets in a CDO;
- Determining the gross default rate for the assets in a CDO, which is a combination of the default rate of the individual bond issues in the CDO;
- Making an estimate of recovery and loss severity upon default;
- Reviewing the assets and liabilities of the transaction to determine what, if any, interest-rate risk or credit risk must be dealt with in the transaction;
- A review of the asset manager/servicer and management procedures, investment/underwriting guidelines and operational aspects of the transaction; and
- A legal review of transaction documents to evaluation the legal risk of the transaction.

While the major steps are the same, some of the specifics will likely need to be adjusted to account for the characteristics of the assets in regards to structure, legal and taxation issues. Standard & Poor's will work with each sponsor to analyze these requirements and will reflect such changes in its methodology.
Municipal Default Rates
The default rate histories for each rating are a critical part of the CDO rating analysis. Standard & Poor's has already published its default study for corporate bonds. The default rates derived from our corporate default study are used in determining assumed gross default rates for corporate CDOs. Standard & Poor's has recently completed a similar default study of municipal bonds rated by Standard & Poor's and will be using default rates from this default study in determining the assumed default rates to be used in the municipal CDO rating methodology. The default rates used in municipal CDO analysis are based upon the type of municipal credit and rating category. Given the default patterns, additional stresses will be placed on the model to ensure appropriate levels of security are provided for highly rated transactions. There is very little data on defaults for non-investment grade rated municipal bonds; therefore the municipal CDO rating analysis will only use municipal default rates for investment grade rated municipal bonds. Corporate default rates will be used for non-investment grade municipal bonds. See the municipal default study for further information on rated municipal default rates.

Concentration Risk in Municipal CDOs
Sector, geographic, and obligor diversification provide limited exposure to any particular municipal sector and thus limit the potential loss exposure in a given economic environment.

Corporate CDO default methodology involves factoring in a correlation among assets in the same industry to account for an increase in the risk of default as more defaults occur in that particular industry. For rating municipal CDOs, Standard & Poor's will also include correlation among asset portfolios that have significant geographic and/or municipal sector concentrations. Currently Standard & Poor's is studying the correlation between municipal defaults, and uses a ratings notch down methodology, as explained below, to account for correlation. Standard & Poor's has devised 57 unique sectors for applying concentration risk factors to municipal CDOs that should help mitigate risk correlation among municipal sectors (see chart 1 for municipal sector classifications).

<table>
<thead>
<tr>
<th>Chart 1: Municipal Bond CBO Concentration Sectors</th>
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<tbody>
<tr>
<td>Alabama</td>
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<tr>
<td>Alaska</td>
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<td>Arizona</td>
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<tr>
<td>Arkansas</td>
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<td>California</td>
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<td>Colorado</td>
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<tr>
<td>Connecticut</td>
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<tr>
<td>Delaware</td>
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<tr>
<td>District of Columbia</td>
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<tr>
<td>Florida</td>
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<tr>
<td>Georgia</td>
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<td>Hawaii</td>
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<tr>
<td>Idaho</td>
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<tr>
<td>Illinois</td>
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<tr>
<td>Indiana</td>
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<tr>
<td>Iowa</td>
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<tr>
<td>Kansas</td>
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<tr>
<td>Kentucky</td>
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<tr>
<td>Louisiana</td>
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<tr>
<td>Maine</td>
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<td>Maryland</td>
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<td>Massachusetts</td>
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<td>Michigan</td>
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<td>Minnesota</td>
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<tr>
<td>Mississippi</td>
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<tr>
<td>Missouri</td>
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<tr>
<td>Montana</td>
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<tr>
<td>Nebraska</td>
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<tr>
<td>Nevada</td>
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<tr>
<td>New Hampshire</td>
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<tr>
<td>New Jersey</td>
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<tr>
<td>New Mexico</td>
</tr>
<tr>
<td>New York</td>
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<tr>
<td>North Carolina</td>
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<tr>
<td>North Dakota</td>
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<tr>
<td>Ohio</td>
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<tr>
<td>Oklahoma</td>
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<tr>
<td>Oregon</td>
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<tr>
<td>Pennsylvania</td>
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<tr>
<td>Puerto Rico</td>
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<tr>
<td>Rhode Island</td>
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<tr>
<td>South Carolina</td>
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<tr>
<td>South Dakota</td>
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<tr>
<td>Tennessee</td>
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<tr>
<td>Texas</td>
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<tr>
<td>Utah</td>
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<tr>
<td>Vermont</td>
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<tr>
<td>Virginia</td>
</tr>
<tr>
<td>West Virginia</td>
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<tr>
<td>Letter of credit backed</td>
</tr>
</tbody>
</table>
Standard & Poor's municipal sector classifications are primarily state-driven. The credit performance of municipal bonds is highly correlated with either:

- The individual state economic environment, which provides the fundamental credit strength and tremendously affects tax and revenue collections for the payment of debt service on a wide range of bonds; or
- Changes in individual state laws or regulations, which can have either structural or economic impact on the ability of bond obligors to pay debt service.

Standard & Poor's sectors, however, also acknowledge that many municipal credits involve bonds with enhancement either through bank letters of credit, federally insured mortgage debt, or private municipal bond insurance or are structured asset backed transactions. These bonds, along with health care issues, have been segregated into separate sectors of their own for risk correlation reasons.

It is likely that tax exempt CDOs will include industrial development or pollution control bonds with a private obligor and a conduit municipal issuer. For these types of securities, Standard & Poor's will use the 39 industry sectors used in the corporate CDOs, and industry codes for the individual obligations will need to be provided (see chart 2 for corporate industry classifications).

<table>
<thead>
<tr>
<th>Aerospace and defense</th>
<th>Food/drug retailers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air transport</td>
<td>Food products</td>
</tr>
<tr>
<td>Automobile</td>
<td>Food service</td>
</tr>
<tr>
<td>Beverage and tobacco</td>
<td>Forest products</td>
</tr>
<tr>
<td>Radio and television</td>
<td>Health care</td>
</tr>
<tr>
<td>Brokers, dealers, and investment houses</td>
<td>Home furnishings</td>
</tr>
<tr>
<td>Building and development</td>
<td>Lodging and casinos</td>
</tr>
<tr>
<td>Business equipment and services</td>
<td>Industrial equipments</td>
</tr>
<tr>
<td>Cable and satellite television</td>
<td>Insurance</td>
</tr>
<tr>
<td>Chemicals and plastics</td>
<td>Leisure goods/activities/movies</td>
</tr>
<tr>
<td>Clothing/textiles</td>
<td>Nonferrous metals/minerals</td>
</tr>
<tr>
<td>Conglomerates</td>
<td>Oil and gas</td>
</tr>
<tr>
<td>Containers and glass products</td>
<td>Publishing</td>
</tr>
<tr>
<td>Cosmetic/toiletries</td>
<td>Rail industries</td>
</tr>
<tr>
<td>Drugs</td>
<td>Retailers (except food and drug)</td>
</tr>
<tr>
<td>Ecological services and equipment</td>
<td>Steel</td>
</tr>
<tr>
<td>Electronics/electrical</td>
<td>Surface transport</td>
</tr>
<tr>
<td>Equipment Leasing</td>
<td>Telecommunications</td>
</tr>
<tr>
<td>Farming/agriculture</td>
<td>Utilities</td>
</tr>
<tr>
<td>Financial intermediaries</td>
<td></td>
</tr>
</tbody>
</table>

In the municipal model, the higher default risk posed by higher sector-concentration risk is accounted for as follows:

- Information on both security and geographic location will be required to be provided on each obligation. Given the likelihood of single-state CDOs, our policy based on geographic concentration is under analysis and will include analysis of the securities within the state. If concentration in a particular municipal sector is 25% or less, no direct notching will be applied. If concentration in a particular municipal sector exceeds 25% of the pool, analysts will adjust for the additional risk by assuming a rating level one notch lower than the actual ratings for each obligor in that sector, provided the concentration does not exceed 40%.
For concentrations between 40%-75% of the pool, analysts will adjust for the additional risk by assuming a rating level two notches below the actual ratings for each obligor within that sector.

Transactions that involve a concentration in one municipal sector in excess of 75% and transactions that involve a high concentration of one municipal security sector (e.g. health care, housing, and land-backed bonds, etc.) will be reviewed on a case-by-case basis.

In general, however, a notching floor of 'BBB-' will be set for traditional municipal bonds such as general obligation, water and sewer revenue, and special tax bonds. Bonds that have Fannie Mae, FHLMC, and FHA credit enhancement or federally backed lease debt will also benefit from a notching floor of 'BBB-'.

Municipal credits rated below investment grade will be stressed at the corporate default rates, since the universe of below-investment-grade credits is too small to be statistically significant. No notching floors will be set for bonds in the health care, housing/structured, or industrial development bond sectors. Because industrial development bond sectors are perceived to follow default patterns more closely related to their underlying industrial sectors notching rules for industrial development bonds will generally also follow those for corporate bond CDOs.

**Municipal CDO Recoveries**

Recovery assumptions on defaulted collateral for corporate CDOs vary by debt type and security, with exact recovery assumptions reflecting the sophistication of the collateral manager and their willingness to hold defaulted collateral through workouts. Municipal recovery assumptions follow a similar structure, with recovery rates being (on average) higher than corporate recoveries, while recovery timing assumptions are longer. In addition, further adjustments may be made due to the diversity of structures even within the defined concentration categories. As a result, recovery ranges are generally broader than those for corporate transactions.

Many municipal obligors can be expected to have higher recoveries after default due to their essential purpose nature, which makes successful workouts more likely due to strong market access and more likely assistance from other entities. State and local governments generally exist to provide essential or legally mandated services to citizens, and often enjoy a monopoly status in providing such services. The public sector's interest in keeping governments stable can be evidenced from, in many cases, state governments' willingness to assist or even assume control of a local entity in order to insure continued stability. Some states go so far as to enact provisions to ensure full repayment of local government defaults, especially for school districts.

While little data on municipal recoveries exists due to the infrequency of municipal defaults, similar trends can be seen in the high recovery rates for corporate utilities. Many of these private sector entities do perform essential purpose roles within their service areas. Government oversight boards exist to ensure the continued provision of these services at reasonable costs, which in most cases results in the government approving actions which keep the utility out of extreme financial distress.

Many community needs such as infrastructure and housing are financed through non ad valorem mechanisms such as consumption-based taxes and benefits-based charges, thus insulating the administering government from the risk of insolvency which could occur with a GO pledge or, in the case of a utility, a senior lien pledge of its principal revenue source. However, the needs for these programs are such that the administering government or a related entity will often work to keep a troubled program (and its related debt) afloat in the face of adverse conditions. The same can be said for some public universities or hospitals, although the degree to which such support exists can vary.

When compared to bankruptcy provisions for corporate entities, laws generally give municipal entities considerably more flexibility in workouts. While this increases the likelihood of higher recoveries for defaults, it also allows for a longer time period during which workout provisions may be negotiated before settling on a complete plan. Whereas corporate default assumptions provide for 100% of the recoverable amount to be realized in the year following a bond default and 100% of the recoverable amount two years after a loan default, Standard & Poor's assumes that tax-backed municipal recoveries will take four years, consistent with its long standing criteria for municipal pools and state revolving funds. Standard & Poor's considers this timeframe conservative, given that the same market access and other factors which contribute to municipal entities' low default rates usually also aid them in achieving better recoveries. However, the timing for
recovery on private-activity bonds, industrial-development bonds, and other types of municipal bonds with no tax-backed support or municipal government backing or subsidies will be treated the same as in corporate CDOs. The existence of debt-service reserve funds may be used to mitigate the timing for recovery in situations where the municipal bond has a debt-service reserve fund (see chart 3 for recovery rate assumptions).

<table>
<thead>
<tr>
<th>Corporate</th>
<th>Bonds</th>
<th>Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Secured</td>
<td>40%-55%</td>
<td>50%-60%</td>
</tr>
<tr>
<td>Senior Unsecured</td>
<td>25%-44%</td>
<td>25%-50%</td>
</tr>
<tr>
<td>Subordinated</td>
<td>15%-28%</td>
<td>15%-28%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Municipal</th>
<th>GO/Sr lien</th>
<th>Appropriation-backed/subordination lien</th>
</tr>
</thead>
<tbody>
<tr>
<td>GO, utilities &amp; federally backed</td>
<td>80%-95%</td>
<td>70%-85%</td>
</tr>
<tr>
<td>Special tax, transportation, non-utility revenue</td>
<td>70%-85%</td>
<td>60%-75%</td>
</tr>
<tr>
<td>Municipal structured &amp; pools</td>
<td>70%-85%</td>
<td>60%-75%</td>
</tr>
<tr>
<td>Land-backed</td>
<td>Case-by-case</td>
<td></td>
</tr>
</tbody>
</table>

As exceptions, the following are analyzed with corporate recovery assumptions:
- Public power
- Health care
- Housing
- Private Higher Ed
- LOCs
- IDBs
- Bond insured transactions

**Other Municipal CDO Rating Factors**
As with corporate CDOs, a number of other factors will be involved in rating municipal CDOs, including tenor of debt, weighted average maturity, stated interest rate, fixed- or floating-interest rate structures, embedded options (including variable rate debt obligations with puts), senior or subordinate creditor status, and CDO management procedures and capacity. It is beyond the scope of this article to discuss the impact of all factors in rating a municipal CDO, but the analysis for these rating factors track the existing structured finance global CDO criteria.

**Bank Tier 1 and Trust Preferred CDOs**

**Introduction**
CDOs backed by pools of bank-trust preferred securities account so far for a small portion of the overall CDO market. These securities are issued by wholly owned trust subsidiaries of bank and thrift holding companies. Subject to certain regulatory restrictions, these debt-like securities provide additional regulatory capital to the banks affiliated with the issuing trust. Such securities have been issued by banks of all sizes, but smaller, unrated banks have benefited the most from the securitization of these assets, as the CBO structures provide a ready investor base that makes their smaller issuances economical feasible. The entry of these securities into the realm of securitizable assets does raise certain issues, particularly given the limited amount of data on long-term regional bank defaults. In the U.S., the FDIC has been tracking bank defaults for decades, but this data cannot be directly used to size defaults given that it is not analyzed on a static pool basis. In addition, the combination of the regulatory restrictions imposed on the assets for favorable capital treatment, and the size and unrated nature of the small issuing banks into a single industry pool, create special challenges in securitizing such pools. Pools containing Tier 1 assets of large multi-
national banks are somewhat easier to analyze given that most such assets are rated.

Set forth below is a brief discussion of the most salient issues impacting these transactions, based upon the nature of the assets. Included in the discussion is a synopsis of the criteria imposed to address such concerns.

**Long Terms**
The assets in the pool will generally have a 30-year term or could be perpetual securities with step-up calls. Because of this, the transaction structures are generally 30 years, differing from the typical high-yield bond or leveraged loan CDO with a 12-year maturity. As a result, the default patterns and timing will be different from a standard CDO. To retain some consistency and to stress possible shocks to the banking system, Standard & Poor's does however use many of standard stresses across the life of the deal. In addition, "saw-tooth" default patterns will be used to lump defaults across the life of the transaction. This is consistent with the economic scenarios that banks typically have experienced, when the entire industry is under pressure. In addition, the longer tenor will require that the interest-rate curves used in a standard transaction to be modified to undertake the appropriate cash flow analysis.

**Deferral**
The assets have the ability to defer payment at any given time, and may do so multiple times over the life of the asset. In addition there is uncertainty that the securities will not be called on the step-up date given that such calls are subject to regulatory oversight. Thus, even if the institution wants to call the debt, the regulators may not allow it. The challenge of measuring the risk to the timely payment of interest on the liabilities of the CBO is complicated by the fact that there is very little historical data on the frequency and lengths of such deferrals. As a result, Standard & Poor's has taken the conservative position that any asset that is currently deferring interest must be treated as a defaulted asset for purposes of any overcollateralization test and any other de-levering in the waterfall based on defaulted assets.

**Recoveries**
Similar to the absence of reliable data on long-term static pool bank defaults, there is limited information on the recoveries that may be expected in the case of a default. As the regulators' primary focus will most likely be on the protection of depositors' claims, it is difficult to assume a substantial recovery. While the definition of asset default in the CDOs governing documents will be broadly defined to include even deferrals which may ultimately generate a recovery of 100% if the asset were to resume payment, Standard & Poor's believes that a recovery of 10% is appropriately conservative. Such recoveries will likely not come as lump sum, but rather as a payment stream over a period of time.

**Issuer Features and Ratings**
The nature of the unrated issuers as generally small entities raises particular issues in estimating default probabilities in a single industry pool. For the reasons set out below, Standard & Poor's requires that each issuance be assigned a credit estimate for purposes of determining the default probability.

Given the specialized nature of such debt issuance, ratings are required to estimate the default probabilities. If unrated, each asset included in the pool must usually be reviewed by analysts from the Standard & Poor's Financial Institutions Ratings Group and assigned an estimated credit rating.

Given the low position of the trust-preferred security in the capital structure, Standard & Poor's is of the belief that the credit rating assigned to the issuance, as opposed to the issuer credit rating (ICR), is the more appropriate measure for determining the default probability on these specific assets. This is due to the features of such instruments and the fact that the institution may stop making payment altogether on the trust preferred while maintaining an ICR grater than 'D' or 'SD' and servicing their senior debt. These issues ratings should therefore be used as the rating inputs for running the Standard & Poor's CDO Evaluator in structuring the transaction, representing a significant difference between the manner in which traditional corporate CDO default analyses are evaluated.

**Industry Concentration**
An obvious difference in bank trust-preferred CDOs from a more traditional CDO, is the lack of industry diversification. This diversification is used to limit the correlation of default among assets when the pool is subject to same macro-economic conditions. In a single industry pool, this diversity is, of course, absent, and it is reasonable to assume a high correlation of default between the assets in the pools issued by these
banks and thrifts, should the industry experience a stressful economic period.

This concern is addressed in two ways. First, as mentioned above, the issue rating is used as the data input in the Standard & Poor's CDO Evaluator, as opposed to the issuer credit rating of the respective bank. While dependent on the actual estimate of the issuance, it is expected that the issue rating will be several notches below the issuer credit rating. The result is that the Standard & Poor's CDO Evaluator will generate a scenario-default rate substantially higher than would be expected with the issuer credit rating. Thus, to receive a given rating, a tranche must be able to survive this higher cumulative default rate. In Standard & Poor's judgment, this higher threshold represents a conservative estimation of default, one sufficiently conservative to address the additional correlation presented by a single industry pool. Given this fact, in transactions backed solely by pools of bank trust preferred securities, the Standard & Poor's CDO Evaluator may be run without applying any of the industry correlation that would be used in a traditional CDO.

**Geographic Diversity**

The second method used in addressing the single industry concern is increased geographic diversity. While certain studies do exist showing that a pool of bank and thrift assets diversified across five regions across the U.S. is no more correlated than any five industries, in Standard & Poor's view, issues exist as to value of these studies in truly predicting future default rates for regional banks and thrifts as a whole. As a result, while Standard & Poor's believes geographic diversity to be of value, it reviews each pool on a deal-by-deal basis and evaluates what steps, if any, should be taken to address the relative level of correlation across regions.

Standard & Poor's will work with all potential sponsors to review their transactions and apply the most appropriate analyses. While bank Tier 1 debt transactions have been most prevalent to date, other entities, such as insurance companies, can also issue Tier 1 capital securities, and such instrument may also find their ways into CDOs. The analysis for such instruments is very similar to what is outlined above, but adjustments must be made to take into account the regulatory regime for such securities and industry specific considerations.

**CDO Combination Securities**

CDO combination securities have become an integral part of the CDO market as arrangers look for different ways of creating securities that will appeal to different investors. Standard & Poor's has been rating these securities since they were first introduced and has a number of methodologies for analyzing such securities, as explained below. A combination security is generally structured by combining two or more different primary tranches issued by a CDO. For example, an 'A' rated tranche can be combined with the equity tranche or with a 'BB' rated tranche to create a new rated security that has different characteristics from the primary tranches issued by the CDO. In addition, combination securities can also be structured by combining tranches of different CDOs, but this practice so far is not very widespread.

The main use of such securities is to create instruments that have different risk/reward profiles from the underlying securities. While an investor may be tempted by the high returns that can be achieved by the equity tranche, they might not want to jeopardize the payback of principal by directly buying the equity. Such an investor might prefer to buy a combination note that has an 'AAA' rated principal feature and equity-like returns. The returns will be realized if the transaction does not suffer substantial defaults, and the principal will be paid back with a given level of certainty. Such a combination note can be achieved by purchasing an 'AAA' rated, zero-coupon tranche combined with part of the equity tranche.

Many structural features are possible for combination notes depending on the wishes of the investors, the specifics of the transaction, and the expertise of the arranger. The broad classes of combination notes, however, fall within the following structures.

**Combining Two Rated Tranches**

This combination consists of a combination of the two different classes of rated notes. By changing the percent contribution from each class, the rating and coupon on the security can be changed. For instance, combining an equal amount of 'AA' and 'BB' rated securities may yield something in the 'BBB' range that is not directly issued by the trust. This would allow the transaction to appeal to a 'BBB' investor who would otherwise not have invested in the deal.
Combining a Rated Tranche With an Equity Tranche
The most popular type of combination note is to combine a rated tranche with the equity tranche of the deal. This can be done in different ways as explained below, based on the desired effect. By simply combining the notes, the investor would achieve a higher yield while knowing its principal and regular coupon is protected up to the component of the higher-rated tranche. This allows the investor to participate in the upside potential of the equity without risking a large amount.

Combining Tranches and Increasing the Rated Par
This can be achieved by combining a higher-rated tranche with an equity tranche and lowering the stated coupon on the higher tranche. For instance, a $100 'A'-rated security paying 8% can be combined with an equity tranche to possibly result in a $120 'A'-rated security that pays 6%.

Combining Tranches and Providing Principal Protection
In certain cases, part of the proceeds of the deal issuance is used to buy high-quality, zero-interest securities as assets for the trust. Such securities are pledged to a specific investor class and, at maturity, are used to repay the stated principal. By adding this feature to combination notes, either directly or as part of one of the underlying securities, the combination note investors can have high upside returns with very low risk of not getting back their principal.

Securitizing Early Equity Distributions
By creating a combination note that takes any primary equity distribution (typically excess interest) and using it to payback principal on the combination notes, it may be possible to issue additional par of rated notes. This is due to the fact that transactions typically do not experience massive defaults upfront and allow some level of excess spread to be paid to the equity.

Depending on the specifics of the transaction and how the combination notes are structured, Standard & Poor's may be able to rate the combination notes to full, timely payment of interest and ultimate principal, or to only ultimate payment of principal. In the majority of cases, such combination notes are assigned regular ratings without any modifiers, but in certain cases Standard & Poor's may attach an Y subscript to the rating, indicating that the return to investors may be volatile. To rate combination notes, Standard & Poor's uses one of three different rating methodologies, as outlined below, depending on the structure being proposed and what the arranger is looking for.

CDO Cash Flow Method
This methodology is most commonly used for combination notes and mirrors the typical CDO cash flow methodology for analyzing primary CDO tranches. The cash flow analyses must prove that the combination note can pay out to the stated terms at the commensurate rating level. The cash flow model for the combination notes is typically an extension of the model used to analyze the primary deal. The model is modified to take the cash paid out to each primary component of the securities making up the combination notes and apply it to the combination notes. Defaults and recoveries would then be modeled, and the results achieved by the combination notes would be observed. If the combination note is then paid under its stated terms, then the rating can be assigned to such notes.

General Method
This new methodology combines multiple-obligor cash flows into that of a single hypothetical benchmark obligor and assigns a credit rating based on the probabilities of the cash-flow losses corresponding to all possible default scenarios. This methodology represents a conceptual enhancement from the "weak-link" approach and may be used on a number of assets, including partially guaranteed, synthetic, and derivative securities. While the methodology is more powerful than the weak-link approach, it does require detailed knowledge of the cash flow generated by the different securities under different stresses.

Weak-Link
As its name implies, under this methodology, the combination notes are rated as high as the weakest component of its structure. This methodology is most prevalent in cases where a monoline insurance company guarantees the combination notes. Given the uniqueness of each CDO transaction and the fact that combination notes are tailored to the specific needs of each investor group, it is hard to comment specifically about the best approach to be used in rating combination notes. As a result, Standard & Poor's analyzes each rating request on its merits,
suggests the most appropriate rating approach, and works with the issuer and arrangers towards achieving the desired goals. Arrangers are encouraged to discuss with Standard & Poor's the rating of combination notes as early in the rating process as possible.

**Sizing Default Risk**

Analysts use various techniques to determine the potential loss characteristics of an asset pool in a structured financing. The analytical method may vary, depending on the size of the pool being examined. For example, the "weak-link" approach, which assumes the default of all assets rated lower than the structured financing, is often employed when the asset pool is comprised of a small number of credits. By contrast, an actuarial approach may be appropriate for extremely large asset pools that have relatively homogenous performance characteristics.

Traditionally, analysts have used an obligor-specific approach when analyzing the small to medium-sized asset pools found in many CDO transactions. The obligor-specific asset analysis accounts for the distribution of any combination of potential obligor defaults that may occur in the collateral pool. In this approach, each obligor in the asset pool has a separate credit assessment—if not an actual rating, than any of the "surrogate" measures described above, even in combination. These ratings or assessments, along with the size, tenor, and amortization schedule for each loan or bond in the pool, are the key inputs into Standard & Poor's CDO Evaluator (see "CDO Evaluator" in the "Sizing Defaults" section). The Evaluator produces appropriately stressed default scenarios for different rating levels.

**Asset Credit Risk Measures**

Standard & Poor's has developed several options to allow an asset to be assessed for securitization. The following is a brief description of six different methodologies used to quantify a portfolio's credit risk. The approaches are discussed in descending order in terms of analytical knowledge of the assets being sold. In a given transaction, there can be a combination of methods applied to different pieces of the portfolio.

*Ratings on each obligor.* The rating on each asset's underlying obligor is considered. The level of credit quality of the obligor is expressed as an issuer credit rating (ICR), rather than a rating on a specific debt issue. The assigned ICR should be used as the measure of that obligor's creditworthiness, instead of the debt-specific senior secured rating or subordinated rating. The ICR is the functional rating for the default and rating transition studies that underlie the calculations used in the CDO Evaluator for estimating cumulative default rates in the portfolios and requisite credit support levels.

The asset's rating and position within the obligor's debt capital structure are taken into account in assessing its recovery level. To the extent that analysts have assessed an individual asset to have superior recovery characteristics, they would assign the higher end of the recovery level range (see table 3, "Recovery Range Assumptions" above). The issuer credit rating would still be used as the measure of the obligor's default risk. If the structure allows for addition and replacement of assets, the new assets must have similar recovery characteristics; that is, if the recovery assumption for the CDO had been enhanced due to the presence of rated or well-secured assets.

*Public information ratings and credit estimates.* In the absence of issuer credit ratings, Standard & Poor's may still provide analytic products or use its own resources to assess the loans in the portfolio. In some countries, public information ('pi') ratings are assigned, which may rely entirely on publicly available information. These are always identified with the 'pi' subscript, and do not have the plus/minus refinements within rating categories.

Alternatively, in most countries, rating or credit estimates, commonly referred to as "shadow ratings," can be provided. Based on essential data about the operations and finances of the borrower, which the bank could provide, the analyst would estimate what ratings would likely result if the entire rating process were carried out. The assignment of credit estimates is a very abbreviated process. While a credit estimate is not the equivalent of a rating, the estimate can be used appropriately in the context of assessing a commercial loan portfolio. An annual update is necessary as long as that obligor remains in the securitized portfolio. It may be possible to assign an estimate on a no-name basis. However, if the specific name is not known, analysts would probably be more conservative, which could be reflected in a lower estimate.

*Ratings from other nationally recognized statistical rating organizations* (NRSROs). If ratings from other
rating agencies—specifically, NRSROs designated by the U.S. Securities and Exchange Commission—are available, they may be usable. However, Standard & Poor's distinguishes among rating agencies and rating products, based on its own knowledge and perception of the standards of other rating agencies. Those with similar standards are accepted in certain cases with a small reduction, depending on the different rating type and asset class.

Rating or credit estimates, or public information ratings of other rating agencies, generally receive a significant adjustment downward. It is not clear what the standards of due diligence are with respect to such ratings. Since some rating agencies assign unsolicited ratings without disclosing the distinction from ratings requested by the obligor, it may be hard to discern if a rating is based only on public information. Nonetheless, analysts would ordinarily be aware of such situations.

Quantitative models. Quantitative models have been available for many years, are widely in use, and can be deployed to assess obligor default risk. Applications and extensions to default estimation models employ regression analysis, discriminant analysis, or neural networks. Quantitative model output should be correlated with the Standard & Poor's ratings scale. Generally, the correlations of these models with Standard & Poor's ratings, plus or minus two rating notches, range from 75%-90%, depending on the quality of the model and the breadth of application to various industries.

For portfolio assessments, the rating analyst is prepared to accept the output of these models with an appropriate downward adjustment. Correlation with ratings for the specific model must be established, which is not an insignificant task. At that point, a discount to reflect the extent of the correlation and the comfort with the model can be calculated.

Bank internal credit scoring systems. Most banks have a credit scoring or rating system that reflects a combination of ratio evaluation and qualitative assessment. If a bank wants rating analysts to rely on its credit scoring, as opposed to assessing each obligor name, then its internal credit scoring system may be "mapped" or correlated to equivalent ratings. The process of determining the "mapping" requires a team of corporate and bank analysts endeavoring to learn, in depth, the bank's credit-underwriting capabilities. This involves understanding the resources, organization, and processes used. A team of corporate and bank analysts reviews the depth of credit reviews and the extent of surveillance. The team aims to determine the selectivity of the process in terms of rejection rates at the various approval stages. Random sampling of credit files helps to provide a sense of how stated policies are implemented.

However, this review in and of itself is insufficient to gauge the credit quality of the portfolio. A "mapping" exercise is conducted to establish correlation between the bank's credit assessments and those of Standard & Poor's.

In general, a statistically significant random sample of corporate borrowers who have both a bank rating and an ICR is examined, and the bank's ratings are compared with Standard & Poor's ratings or credit estimates. This exercise can be used to compute rating equivalents at various confidence levels. As the percentage of the portfolio that relies on this method increases, so does the level of conservatism introduced into the calculation.

If a bank simply employs NRSRO public ratings, in lieu of independent credit scoring, the mapping exercise would be meaningless. But the very existence of public ratings on the borrower could also bias the bank's credit evaluation. Accordingly, the bank must demonstrate that its judgment is independent. In the end, evaluation through multiple economic cycles indicates the consistency and robustness of the bank's scoring system.

The result of the mapping exercise allows analysts to rely on the bank's internal assessments. Furthermore, there may be no need to even identify the specific loans that are being sold into the securitization, but merely the bank's rating for the particular asset, its size, and its tenor. However, this assessment usually would apply only to the type of loan and only to the office or country that was involved in the exercise, and could not be transferred to the bank's other units. Indeed, it might be difficult to perform the necessary sampling and mapping exercise for portfolios that include middle-market loans or loans to borrowers in countries where there was an insufficient universe of ratings to form a reliable comparison. If the bank's internal credit scoring system is relied upon in the CLO, the "mapping" exercise must be repeated at least annually to monitor the consistency of the bank's credit scoring or rating system over the life of the
Securitization.

Bank track record. Some issuers have proposed relying on extrapolation from the sponsoring bank's historical record for loan losses and charge-offs. Some have dubbed this the "actuarial method." However, this analytical approach raises certain issues in its application to relatively heterogeneous assets such as corporate loans.

Typically, the record for the bank's portfolio in its current configuration does not extend over a long enough timespan. Accordingly, this track record may not cover any serious stress period, and may be misleadingly benign. In addition, the bank's overall results may not be representative of its experience with the subportfolios that will be securitized.

Moreover, banks have demonstrated great flexibility and creativity regarding the recognition of loan quality problems. For example, a bank may avoid classifying a loan by practicing forbearance-extending additional credit that allows the borrower to remain current. Apart from the difficulties this poses for getting an accurate view of the past, the presumption is that the bank would be less inclined in the future to bail out or rescue borrowers whose loans have been sold into the securitization. Finally, the rating on the securitization would inevitably be closely linked to the bank's rating on an ongoing basis.

Nonetheless, the potential for rating a transaction on this basis has not been ruled out. However, several important conditions must be met with respect to the applicable loan book and securitized portfolio, in terms of size and diversification, uniformity, and historical performance data. Specifically, the conditions that must be met include:

- The number of individual obligors in the pool exceeds 500, and no single obligor accounts for more than 1% of the pool balance.
- The pool is meaningfully diversified, and the bank demonstrates that the pool is fully representative of the loan book "subportfolio" that is analyzed. In order to avoid the potential for adverse selection, the pool would likely have to include all of the bank's loans of a certain type, or a random share of those loans.
- The loan characteristics of the portfolio are relatively uniform in terms of amount, tenor, amortization, pricing, collateral security, and covenants.
- The institution provides accurate, detailed, and extensive historical information that demonstrates a long track record for its specific line of business. This information includes monthly and annualized delinquency, default, recovery, and charge-off amounts and rates. Similar information would be needed for payment, purchase, and draw rates. Static pool analysis that tracks credit performance and payment history for specific loan pools by date of origination is strongly preferred. The data must be detailed enough to show the differences, if any, between the amount of loans that were nonperforming versus the amounts actually charged off.
- The number of years of history provided is sufficient to demonstrate the credit and payment performance of the portfolio through different economic cycles, and that history spans a time period (or periods) of stress for each particular loan or asset type and its market. The bank's loss performance for the loan type covers an extended period, and includes at least one serious stress period for the particular asset class and market sector. As a result, historical data requirements on the performance of particular loan or asset types will be case-specific. In general, analysts rely on information on the bank's historical loss experience for a minimum of 10 years, and for a number of years sufficient to demonstrate the performance of the portfolio through a full economic cycle of the bank's gross provisioning, releases, and actual write-offs. A detailed account of any relevant losses suffered by the bank on its corporate loans in the last five years should also be provided.
- Historical information on the specific loan type is disaggregated and categorized in a meaningful way for risk analysis, at least in terms of industry, size, and risk classification. The extensive performance, delinquency, and loss data mentioned above should be similarly disaggregated for risk analytical purposes.
- Management has applied transparent and consistent underwriting standards and write-off policies throughout the period(s) being analyzed. The impact of bulk asset sales and acquisitions on the historical performance data, as well as bailout practices that might obscure the numbers, can be ascertained.
- There are no fundamental changes occurring in the environment that might adversely affect the
willingness or ability of financial institutions to service the loans in the same manner as they have in the past.

It has been difficult for sponsoring banks to meet the extensive information standards necessary to implement the actuarial approach with a high degree of confidence. To date, most loan portfolios securitized have been relatively heterogeneous and small in size, and typically contain some large obligor concentrations. Some institutions are not able to provide more than five years of detailed historical portfolio performance data. In general, the information management systems most institutions have in place to capture portfolio performance data have not been designed with securitization in mind.

If an institution is able to meet these conditions, however, it is not clear that an actuarial approach will yield a lower default rate versus the obligor-specific approach used in the CDO Evaluator. The combination of an asset portfolio’s characteristics, applicable historical data limitations, and actual historical performance could well result in a higher default rate and credit support level under the actuarial approach.

When an actuarial approach is used in rating a CDO, the historical loss experience of the institution is an important consideration. In addition, securitized portfolio and structural strengths will be important complements to the underwriting and credit policy factors in the CDO rating. Examples include short tenor asset portfolios, as there is a lower probability that losses will arise in such a short time, or the provision of liquidity facilities or advance mechanisms. In the end, however, it is important to note that should there be a change in the bank’s underlying underwriting or credit management policies, this could have an impact on the potential loss level and CDO rating. Given the complexity of actuarial analysis, the scarcity of requisite data, and the nature of bond/loan assets, analysts will generally apply the actuarial approach in conjunction with the more traditional obligor-specific approach.

Assets of obligors that cannot be evaluated under the six methodologies outlined above may be treated as ‘CCC-' assets. This simplifying assumption can work in portfolios with a very small portion of such assets, although it can quickly become prohibitively expensive. Apart from the six main methodologies, there will always be unique situations that analysts will evaluate on their particular merits.

**Mapping Internal Scores to Standard & Poor's Ratings**

If an institution maintains an internal scoring system that meets the requirements outlined above in the Bank Internal Credit Scoring Systems section, it may be beneficial and cost effective to map such a score to a Standard & Poor's rating.

The first such requirement for doing a mapping is that there is a sufficient overall number of Standard & Poor's ratings for each credit score that the institution maintains. For example, if a bank uses a 1 through 10 credit scoring system, there must be a statistically significant number of Standard & Poor's ratings for each of the bank's 10 rating categories in order to succeed. If, for example, the bank has 100 obligors scored as 3, but only one has a Standard & Poor's rating, then a mapping exercise would not be feasible without additional work, such as credit estimates on the underlying assets. But if the bank had, say, 10 to 30 obligors that had Standard & Poor's ratings and they were all scored as 3, and this level of ratings overlap was present for each level of the bank's scoring system, then a mapping will likely be feasible. In the above example 10 to 30 is just an illustrative range. The minimum number of Standard & Poor's ratings that must be present within an institution's scoring system will depend on the portfolio population and the dispersion of Standard & Poor's ratings within the same internal score. Standard & Poor's will work with all sponsors in analyzing the portfolio and establishing if there are a statistically significant number of Standard & Poor's ratings present to map the portfolio.

If there are not sufficient Standard & Poor's ratings, the first priority is to obtain these. Standard & Poor's has a number of tools and methodologies that can be used for this. They range from doing private shadow-rating assessments on each credit, to using credit models and implied ratings. In deciding how to obtain ratings, the cost benefit analysis is not always easy. For instance, the most accurate ratings are obtained by performing a private credit assessment on each credit. This is done following the same procedures and analytical work as if issuing a public rating. The results are most accurate, but unfortunately this is also the most time consuming and costly process. However, the results obtained will in all likelihood produce a more accurate mapping that will translate in a much more efficient capital structure for the CDO transaction.
The efficiency of the capital structure may in the long run offset the costs of the shadow rating estimates many times over. Thus, even though shadow-rating estimates are time consuming and costly, they can render the most cost-effective results. On the other hand, using a credit model or other proxies may be more cost efficient up front, but because these ratings may be more dispersed, the mapping exercise will render less precise results resulting in a more inefficient and costly structure. Because of this, it is important for the sponsor to take time and work with Standard & Poor's at evaluating the different options, the likely results, and the cost/benefits associated with each alternative.

Once the best way to proceed has been established, the next step is to perform the analyses and provide Standard & Poor's with the data necessary for mapping. The mapping data required is a simple Excel spreadsheet that shows the obligor, internal-rating and Standard & Poor's rating. An example of this is shown in table 10.

<table>
<thead>
<tr>
<th>Obligor #</th>
<th>Internal score</th>
<th>Standard &amp; Poor's rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>123</td>
<td>1</td>
<td>AA</td>
</tr>
<tr>
<td>234</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>345</td>
<td>2</td>
<td>A+</td>
</tr>
<tr>
<td>235</td>
<td>3</td>
<td>A-</td>
</tr>
<tr>
<td>875</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>346</td>
<td>3</td>
<td>BBB+</td>
</tr>
<tr>
<td>326</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>876</td>
<td>2</td>
<td>A+</td>
</tr>
</tbody>
</table>

The institution must provide data for all obligors even the obligors that do not have Standard & Poor's ratings in order to account for sample size within the total obligor population. In addition, one such table must be provided for the entire borrower pool where the institution is holding the loans, and an additional table for the pool that will be securitized. This is needed to ensure that the securitized portfolio is not materially different from the bank's overall portfolio.

Once Standard & Poor's has this information, Standard & Poor's will perform the rating mapping and provide the institution with the mapped results. In general, Standard & Poor's will use the mapping approaches highlighted in Appendix A to perform the actual mapping. In some cases, however, the mapping approaches may be modified to be more fully applicable to the particular portfolio.

Once the mapping exercise is completed, Standard & Poor's will provide the institution with a mapped rating table that shows the equivalent Standard & Poor's rating for the institution's score. Examples of the mapped scores are shown below (see table 11). In order to maintain surveillance on transactions, especially where substitution of collateral is allowed, Standard & Poor's will repeat the mapping exercise on a periodic basis, but no less than once a year. The re-mapping will also have to be redone if the institution makes any material changes to its internal scoring system.
Appendix A
Mapping Bank Loan Scoring Models to Standard & Poor's Ratings in CBO/CLO Transactions

The author of this research report is Francis Parisi, director, Structured Finance Research Group. The report was previously published in November 1998.

Recently, there has been heightened activity in the CBO/CLO market. As a result of this growth in activity, an increasing number of bank loan scoring systems must be mapped into Standard & Poor's ratings. To date, this has been achieved by fitting regression models to the scored loan data in order to produce an estimate of the mapping, and with that a quantification of the associated errors. While fundamentally sound, this method becomes less effective with pools that are not well distributed.

This research report presents an alternative method of mapping bank scores. This new approach improves upon the accuracy of this mapping and adjusts for sample size and distribution. It is based on sampling theory, and estimates the true mean of the credit score being mapped. It makes use of all the information available from the data, and reduces the arbitrariness often encountered in the present regression method.

Linear Regression Approach to Mapping Scores To Ratings
To date, more than 10 bank loan scoring systems have been mapped to Standard & Poor's ratings. The data sample consists of a set of mutually rated loans. First, Standard & Poor's ratings are converted to default rates from its annual corporate default study. The default rates are regressed against the bank loan scores. Using the regression, an estimate of the default rate and a 95% prediction interval is estimated. Finally, the upper and lower bounds of the prediction interval are converted back into Standard & Poor's ratings. However, this approach has three weaknesses.

A characteristic of every system is that there is greater variability of Standard & Poor's ratings at the lower bank scores than at the higher bank scores, which is built into the fitted model. The result is that the estimated ratings for the higher (better) scores have greater variance than that actually observed. This results in wide confidence bands for these scores.

The rating assigned for CBO modeling purposes is selected from the range estimated from the regression.

No explicit consideration is made for the sample size with ratings within scores, and the sample size with ratings overall.

The first weakness sometimes leads to conservative and unsubstantiated results. For example, the rating corresponding to the upper bound of the default rate estimate is lower than the lowest observed rating in the data set for a given score.
The second weakness could lead to errors in assessing the risk. For example, suppose there are 20 loans at a given score with ratings and only five without ratings. We would assume adverse selection and pick a lower rating for the five loans. What if there were five with ratings and 20 without ratings? The average result from the five would be used to infer something about the 20 on the basis that the 20 will behave like a portfolio and tend to average out. However, in the first case the sample of 20 gives a better estimate than the second sample of five. In the first case, there is less chance of being wrong, and if we are wrong we have made an error on five loans. In the second case, there is a greater chance of some error in the estimate, and applying a less reliable estimate to a larger number of loans. Therefore, there is a greater risk of being wrong in the estimate and applying it to more loans.

The third weakness is that no explicit adjustment is made for the Standard & Poor’s rated and unrated proportions, except that the overall sample size determines the number of standard errors for the confidence interval.

**Sampling Approach to Mapping Scores**

An alternative method to the regression approach is one based on sampling theory. Using this method, given a sample of loans with scores and ratings, inferences are made about the population mean. In this case, the population is the overall class of loans at a given score. This method is simpler conceptually and more intuitive to someone who is not a statistician. Additionally, an adjustment factor is used to account for the rated and unrated portions.

The first step of this sampling approach is to assign default rates to the scored loans as in the regression approach. Then we compute the mean default rate and variance for each score. Finally we estimate the population mean by adding a number of standard errors of the mean to the sample mean, to give us a one-tailed 95% confidence interval. The risk is “one-sided” in that we are not concerned about overstating the default rate estimate, as this would give a more conservative mapping.

The one-tailed 95% confidence interval for an estimate of the population mean \( \bar{p} \) is

\[
\bar{p} + t \sqrt{\frac{s^2}{n}}
\]

- \( \bar{p} \) is the sample mean default rate;
- \( t \) is the number of standard errors of the mean, which is a function of the sample size \( n \), and the level of significance; and
- \( s^2 \) is the sample variance.

The square root of the sample variance divided by the sample size is the standard error of the sample mean.

While this gives an estimate based on the sample with Standard & Poor’s ratings, the estimate is adjusted for the proportion of unrated loans at a given score and the proportion of unrated loans in the whole portfolio to be rated. Therefore, we introduce the Standard & Poor’s adjustment factor \( \hat{r} \), which is defined as:

\[
\hat{r} = \sqrt{\left(1 + \frac{n_u}{n_r}\right) \left(1 + \frac{N_u}{N_r}\right)}
\]

and we have as the estimate
In the adjustment factor, \( n_u \) is the number of unrated loans at a given score and \( N_u \) is the total number of loans at a given score. Similarly, \( N_u \) is the number of unrated loans in the portfolio, and \( N_f \) is the total number of loans in the portfolio. In the estimate, \( n_f \) is the number of rated loans at a given score.

In the adjustment factor, the first term under the square root is increasing when the number of unrated loans within a score increases, thereby, penalizing the issuer because an inference must be made for a larger number of loans from a given sample size. Similarly, the second term increases as the proportion of unrated loans in the whole portfolio increases. We take the square root of the product as a geometric average of the two factors.

Results of Using Sampling Approach to Mapping Scores
Using this method yields several general results. For large samples with ratings, we have greater confidence in the estimate and need to add fewer standard errors to our sample mean. Conversely, smaller samples will require more standard errors to achieve the same level of confidence.

The "within score" and portfolio factors add comfort in several ways. There may be a large number of rated loans within a score, but if overall (at the portfolio level) we have a small proportion of loans with ratings, we adjust for the overall portfolio uncertainty. Conversely, we may know a lot about the overall portfolio, but have a few rated loans within a given score, so again the two factors balance each other. At the extremes, we know a lot (little) about the portfolio and within a given score, therefore, we have greater (less) certainty in our estimate. For example, if 30% of the loans are unrated at a given score; and overall 40% of the loans in the portfolio are unrated, the adjustment factor is

\[
\sqrt{1.3 \times 1.4} = 1.35
\]

Thus, the number of standard errors Insert Equation is increased by a factor of 1.35 for that score’s mapping.

Conclusions
In almost all of the mappings done to date using the regression method, the results have generally been conservative. With the sampling method, the mappings are more realistic and in line with the market’s expectations. Standard & Poor’s believes this revised approach will facilitate the issuance of CBOs and CLOs while providing an appropriate level of credit support to the transactions it rates.

Appendix B
Structured Finance Interest Rate and Currency Swap Criteria
This article was previously published in Standard & Poor’s “Structured Finance” in January 1999. New interest rate and currency swap criteria allow ‘A-1’ and ‘A’ rated counterparties with collateral to participate in structured financings. The criteria combine a blend of market risk protection, economic incentives, counterparty credit strength, and the ability to substitute. Together these factors combine to provide the credit strength necessary to maintain the quality associated with the highest ratings.

Under the new criteria:

- ‘A-1+’ rated entities can now provide swaps in ‘AAA’ rated transactions if they agree to collateralize or replace upon downgrade to ‘A-1’.
- ‘A-/A-1’ rated entities together with a pledge of collateral can also participate in ‘AAA’ rated
transactions subject to the conditions below.

- Basis risk swaps, caps, and floors are also eligible under these expanded criteria. Caps and floor collateral levels will need to be developed and are not available at this time.

Total return swaps do not qualify for these criteria.

**Limited to ISDA-Recognized Currencies**
The new criteria are limited to those currencies recognized by the International Swap Dealers Association (ISDA). These include: Australian dollars, Belgian francs, British pounds sterling, Canadian dollars, Danish kroner, Deutschemarks, Dutch guilder, the Euro, European Currency Units, French francs, Hong Kong dollars, Italian lire, Japanese yen, New Zealand dollars, Spanish pesetas, Swedish kronor, Swiss francs, and U.S. dollars.

For interest rate and currency swaps in these currencies, 'A-1+' rated counterparties do not have to post collateral. The new collateral levels will equal the greater of zero or the market to market of the swap plus the amount equal to the appropriate value as a percentage of the notional value of the swap. All collateral should be pledged to the trustee or other independent third party acting as agent for investors. An enforceability opinion indicating that securityholders have full rights in the collateral notwithstanding the insolvency of the swap counterparty should be delivered at closing.

Entities whose ratings fall below 'A-1' commercial paper or 'A-' long-term debt will have to be substituted for.

**Calculating Swap Collateral**
The collateral formula for interest rate (other than basis risk) swaps equals the greater of:
1. MTM + VB = CR
2. 0

The collateral formula for basis risk swaps equals the greater of:
1. MTM + (VB x 0.1) = BRCR
2. 0

Currency swaps will be calculated as:
CR x CM1 x CM2 = CCR
Where:

- MTM = Mark-to-market of the swap.
- VB = Volatility buffer that equals the amount of any given currency derived by taking the appropriate percentage of the swap's notional balance (see tables 1, 2, and 3). If two currencies are in different groups, use the higher of the two buffers.
- CR = Collateral requirement for interest rate swaps.
- BRCR = Basis risk swap collateral requirement
- CM1 = Currency multiplier 1
- M2 = Currency multiplier 2
- CCR = Collateral requirement for currency swaps
- Basis swap = Single currency, floating-to-floating, basis risk swaps. For currency swaps, the derived collateral requirement needs to multiplied by a factor for the appropriate currency (see table 1, Appendix C).

In the event of a downgrade of the swap counterparty, a new required amount of collateral must be calculated and posted within 30 days in order for the rating of the transaction to remain unaffected. Guarantees or third-party credit support may be substituted for collateral at any time.

The collateral should be segregated and pledged under normal ISDA requirements and in the possession of the trustee or some other third party.

Collateral is to be invested in eligible investments (other than debt of the counterparty) in the currency of the
rated securities and should be deposited in an account in the name of the trustee or issuer. The funds should be invested with an eligible institution other than the swap provider collateralizing its obligations. If the funds do not mature before the next interest payment due on the rated securities, additional collateral may be required. The costs associated with posting the collateral should be borne by the swap provider.

Swap providers will have to mark the swap to market and post collateral on a weekly basis, with a cure period of three days. The mark-to-market valuation should reflect the higher of two bids from counterparties that would be eligible and willing to provide the swap in the absence of the current provider. Annual audits should be amended to specifically verify a sample of swap calculations and collateral postings.

First-loss classes should take any loss arising to senior classes because of the failure of a swap counterparty. Transactions will need to explicitly state that all subordinated cash flows will be diverted to make up any shortfalls. Claims resulting from insufficient swap payments, a counterparty default, or insufficient collateral necessary to find a replacement counterparty will be the obligation of the first-loss class. Swap collateral terms may be individually tailored to a transaction, provided that they have been reviewed and approved by Standard & Poor's derivatives group.

<table>
<thead>
<tr>
<th>Counterparty rating</th>
<th>Maturities up to 5 years (%)</th>
<th>Maturities up to 10 years (%)</th>
<th>Maturities more than 10 years (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>0.6</td>
<td>1.05</td>
<td>1.5</td>
</tr>
<tr>
<td>A</td>
<td>0.9</td>
<td>1.10</td>
<td>1.9</td>
</tr>
<tr>
<td>A-</td>
<td>1.2</td>
<td>2.25</td>
<td>4.5</td>
</tr>
</tbody>
</table>

*Group 1 currencies are: Belgian francs, Deutschemarks, Dutch guilders, Euro, European Currency Units, French francs, Japanese yen, Swiss francs, and U.S. dollars. The 'A-' category is limited to 'A-' rated credits or 'A-/A-1' rated credits. If an 'A-' counterparty has an 'A-2' commercial paper rating, it must find an eligible replacement.

<table>
<thead>
<tr>
<th>Counterparty rating</th>
<th>Maturities up to 5 years (%)</th>
<th>Maturities up to 10 years (%)</th>
<th>Maturities more than 10 years (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>1.05</td>
<td>1.75</td>
<td>3.0</td>
</tr>
<tr>
<td>A</td>
<td>1.35</td>
<td>2.45</td>
<td>4.5</td>
</tr>
<tr>
<td>A-</td>
<td>1.5</td>
<td>3.15</td>
<td>6.0</td>
</tr>
</tbody>
</table>

*Group 2 currencies are: Australian dollars, British pounds sterling, Canadian dollars, Danish kroner, New Zealand dollars, and Swedish kronor. The 'A-' category is limited to 'A-' rated credits or 'A-/A-1' rated credits. If an 'A-' counterparty has an 'A-2' commercial paper rating, it must find an eligible replacement.

<table>
<thead>
<tr>
<th>Counterparty rating</th>
<th>Maturities up to 5 years (%)</th>
<th>Maturities up to 10 years (%)</th>
<th>Maturities more than 10 years (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>1.5</td>
<td>2.45</td>
<td>4.5</td>
</tr>
<tr>
<td>A</td>
<td>1.8</td>
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<tr>
<td>A-</td>
<td>2.1</td>
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<td>7.5</td>
</tr>
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</table>

*Group 3 currencies are: Hong Kong dollars, Italian lire, and Spanish pesetas. The 'A-' category is limited to 'A-' rated credits or 'A-/A-1' rated credits. If an 'A-' counterparty has an 'A-2' commercial paper rating, it must find an eligible replacement.
Appendix C
'AAAt' Swaps Approved In Structured Finance Transactions

This article was previously published in Standard & Poor's "Structured Finance" in January 1999.

As a result of the growing and increasingly liquid market for swaps, Standard & Poor's will rate structured finance transactions with swaps from 'AAAt' rated derivative product companies. The derivative product company will have to post additional collateral with the trustee to ensure sufficient funds are available to replace the swap during market swings.

Terminating derivative product companies are rated based on their ability to pay the mark to market at termination. Structured financings, however, need additional protection against movement in swap values between termination and replacement. Volatility buffers for 'AAA' rated transactions are:

- Maturities up to five years: 0.60%
- Maturities up to 10 years: 1.05%
- Maturities more than 10 years: 1.50%

Collateral will be expressed as a percentage of the notional amount. These amounts were derived from data and research pertaining to interest rate and currency fluctuations in the last 7-10 years. They will be updated when currency regimes change.

Single currency, floating-to-floating, basis risk swaps will require only 10% of the above amounts. For currency swaps, the volatility buffer needs to be multiplied by a factor for the appropriate currency (see table 1).

Calculating Swap Collateral

Currency swaps will be calculated as:

\[ VB \times CM1 \times CM2 = CCR \]

Where:

- \( VB \) = Volatility buffer that equals the amount of any given currency derived by taking the appropriate percentage of the swap's notional balance.
- \( CM1 \) = Currency multiplier 1.
- \( CM2 \) = Currency multiplier 2.
- \( CCR \) = Collateral requirement for currency swaps.

The collateral should be segregated and pledged under normal ISDA requirements and in the possession of the trustee or some other third party.

Collateral is to be invested in eligible investments (other than debt of the counterparty) in the currency of the rated securities and held in the name of the trustee or issuer. The funds should be invested with an eligible institution other than the swap provider collateralizing its obligations. If the funds do not mature before the next interest payment due on the rated securities, additional collateral may be required. The costs associated with posting the collateral should be borne by the swap provider.

Derivative product companies will have to post collateral on a weekly basis, with a cure period of three days. Annual audits should be amended to specifically verify a sample of swap calculations and collateral postings. All swaps will be reviewed to ensure that the swap is consistent with the overall risk profile of the derivative product company. Guarantees or third-party credit support may be substituted for collateral at any time.

First-loss classes should take any loss arising to senior classes because of the failure of a swap counterparty. Transactions will need to explicitly state that all subordinated cash flows will be diverted to make up any shortfalls. Claims resulting from insufficient swap payments, a counterparty default, or insufficient collateral necessary to find a replacement counterparty will be the obligation of the first-loss class.
### Table 1

<table>
<thead>
<tr>
<th>Currency</th>
<th>Exchange Rate</th>
</tr>
</thead>
<tbody>
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<td>U.S. dollars</td>
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</tr>
<tr>
<td>Canadian dollars</td>
<td>1.020</td>
</tr>
<tr>
<td>New Zealand dollars</td>
<td>1.020</td>
</tr>
<tr>
<td>Australian dollars</td>
<td>1.030</td>
</tr>
<tr>
<td>Hong Kong dollars</td>
<td>1.030</td>
</tr>
<tr>
<td>Belgian francs</td>
<td>1.040</td>
</tr>
<tr>
<td>British pounds sterling</td>
<td>1.040</td>
</tr>
<tr>
<td>Danish kroner</td>
<td>1.040</td>
</tr>
<tr>
<td>Dutch guilders</td>
<td>1.040</td>
</tr>
<tr>
<td>European Currency Units</td>
<td>1.040</td>
</tr>
<tr>
<td>Euro</td>
<td>1.040</td>
</tr>
<tr>
<td>French francs</td>
<td>1.040</td>
</tr>
<tr>
<td>German marks</td>
<td>1.040</td>
</tr>
<tr>
<td>Japanese yen</td>
<td>1.040</td>
</tr>
<tr>
<td>Italian lire</td>
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</tr>
<tr>
<td>Spanish pesetas</td>
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<tr>
<td>Swedish kronor</td>
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</tr>
<tr>
<td>Swiss francs</td>
<td>1.045</td>
</tr>
</tbody>
</table>

### Appendix D

**Swap Agreement Criteria for CBO/CLO Transactions**

This appendix substantively restates the swap criteria for structured finance transactions that were originally published in Standard & Poor's 1995 publication Global Synthetic Securities Criteria.

Structured finance transactions frequently include swap agreements that transform the cash flow characteristics of an issuing special-purpose entity's (SPE's) assets into payment terms desired by the swap agreement criteria. The swap agreement criteria for a particular issue depend on the applicable rating approach. There are three rating approaches that reflect the differing roles of swap agreements in transaction structures: the swap-dependent approach, the asset-independent approach, and the swap-independent approach.

A majority of the swap agreements reviewed by Standard & Poor's are contracted under the International Swap Dealers Association Inc. (ISDA) agreement forms. The ISDA documentation for a swap transaction consists of a swap master agreement and a schedule and confirmation that modify the terms of the master agreement. The schedule and confirmation should modify the master agreement to reflect Standard & Poor's swap agreement criteria based on the applicable rating approach.

Although the ISDA form agreements are most frequently used to document a swap transaction, other forms of agreements may be used provided that the comparable sections incorporate Standard & Poor's swap agreement criteria.

This appendix discusses specific sections of the 1992 ISDA Multicurrency-Cross Border Master Agreement as it pertains to Standard & Poor's swap agreement criteria. This "1992 agreement" updates the 1987 ISDA form documents. The discussions of criteria that follow are cross-referenced to the appropriate section of the 1992 agreement. Separate comments are provided when the "1987 agreement" treats a topic differently. Although the ISDA form agreements are most frequently used to document a swap transaction, other forms of agreements may be used provided that the comparable sections incorporate Standard & Poor's swap agreement criteria.

### Rating Approaches

In both the swap-dependent rating approach and the asset-independent rating approach, the issuer credit rating of the swap counterparty, or its guarantor, is a supporting rating and may be the weak-link rating if its rating is the lowest of all the supporting ratings in the transaction. In addition to evaluating the creditworthiness of the swap counterparty or its guarantor, the swap-dependent approach reflects the
creditworthiness of the issuing SPE's other assets. The asset-independent approach reflects only the creditworthiness of the swap counterparty or its guarantor.

**Swap-Dependent Approach**

When the issuing SPE's other assets also are a supporting rating, the issue credit rating addresses the credit risk of the swap counterparty, the other assets, and the transaction's structure. Each element affects the issuing SPE's ability to provide transformed cash flows to holders of the rated securities in a full and timely manner.

In many of these transactions, as well as in most asset- and mortgage-backed issues, the counterparty does not expect to take the credit risk of the issuing SPE's other assets. Therefore, the counterparty desires a swap contract that deviates as little as possible from the market standard. Investors in rated securities, however, also need reasonable assurance that the swap counterparty will not cause an early termination of the swap. An early termination of the swap may result in a termination payment by the issuing SPE to the swap counterparty out of funds that otherwise would be payable to the holders of the rated securities. A list of acceptable default and termination events that would enable the swap counterparty to terminate the swap agreement in securities in which the swap counterparty and the issuing SPE's other assets are supporting ratings is included (see *Events Of Default And Termination Events*).

---

**Events of Default and Termination Events**

The following are acceptable default and termination events that would enable the swap counterparty to terminate the swap agreement for rated securities in which the swap counterparty and the issuing SPE's other assets are supporting ratings:

**Events of Default**

- Failure to pay or deliver [Section 5(a) (i)]
- Bankruptcy [Section 5(a) (vii)]
- Merger without assumption [Section 5 (a) (viii)]

**Termination Events**

- Illegality

---

Analysts will assume that the issuing SPE would not have an incentive, or the ability, to terminate the swap agreement absent a default on its other assets, and then only if it is in the best interests of investors and is generally subject to their vote. The criteria for securities in which the swap counterparty and the issuing SPE's other assets are supporting ratings, as the criteria apply to specific sections of the 1992 agreement, are discussed below. These criteria are applicable to synthetic securities and asset- and mortgage-backed transactions. The provisions of the 1992 agreement that are not referenced below are acceptable provided that they are not modified.

**ISDA Cross-References**

**Section 2. Payments**

Netting. The 1992 agreement allows for the party that owes a higher swap payment to the other party to make a net payment to the other party. It does not apply to swapped currency payments. The parties should elect that netting across different series will not apply to vehicles that can issue multiple classes or series of securities and use the same master agreement, to avoid netting across different classes or series. Further, the swap agreement for each class or series must be written as a separate agreement. For a given series, payment netting for that series is acceptable. The parties also should elect that netting will not apply when there are timing gaps between swap payments by the counterparty and the issuing SPE, to avoid the potential for confusion. These gaps generally occur in structures that issue rated securities that pay interest or principal more or less frequently than does the issuing SPE's other assets.

**Deduction or Withholding for Tax**

The 1992 agreement also requires a party to gross up its swap payment if an indemnifiable tax is imposed on
the payment. As in the previous criteria, this definition should not be limited to an indemnifiable tax but should include any withholding taxes. Otherwise, Standard & Poor's treatment of withholding taxes on swap payments is generally broader than it has been in the past.

If a withholding tax already applies to the swap payments to be made by either the swap counterparty or the issuing SPE at the time the transaction closes, Standard & Poor's will continue to require the swap counterparty to accept swap payments from the issuing SPE that are net of tax and make payments to the issuing SPE that are grossed up for tax. If a third party, such as a guarantor or insurer, guarantees the swap counterparty's obligations under the swap agreement, the terms of the guarantee also should provide that swap payments are grossed up for tax.

If no withholding tax currently applies to swap payments, analysts will, in general, require both an issuing SPE swap tax opinion, stating that, under current law, no such tax applies and that there is no pending legislation to create such a tax; and a swap counterparty/guarantor tax opinion to the same effect. This requirement regarding pending legislation arises from a concern that an issue could be adversely affected shortly after its sale date as a result of pending laws that could have been discovered before issuance. Standard & Poor's ratings do not address change-in-law risk, and its criteria recognize that it is up to the parties to fashion the remedies for the eventual imposition of taxes.

A variety of remedies for this are acceptable provided that the risks are properly disclosed to investors. Therefore, the swap counterparty can select one of the following options before a rating is assigned to a transaction to address future imposition of, or an increase in, withholding taxes on swap payments made by itself or the issuing SPE:

- The swap counterparty can gross up payments to the issuing SPE to take into account withholding tax and accept payments from the issuing SPE grossed up for withholding tax. In most cases, however, the issuing SPE will not have the funds to gross up its swap payments to the counterparty. Under this option, if the issuing SPE is able to make grossed-up payments, the swap counterparty will not have the right to terminate the swap if a withholding tax is imposed unless it makes a termination payment to the issuing SPE equal to the principal and accrued interest on outstanding rated securities minus proceeds from the sale or liquidation of the issuing SPE's other assets. In this event, the formula for calculating the termination payment (see section 6(e)) will have to be amended accordingly. If the counterparty knows that the issuing SPE will not be able to make grossed-up payments, as is ordinarily the case for an issuing SPE, one of the remaining options should be selected.
- The swap counterparty can gross up payments made to the issuing SPE to take into account withholding tax and accept payments from the issuing SPE net of tax.
- The swap counterparty can make payments to the issuing SPE net of withholding tax and accept payments from the issuing SPE net of withholding tax.
- The swap counterparty can terminate the swap. It will not be obligated to make investors whole, however, as in the first option. The swap counterparty or the issuing SPE will be owed a termination payment (see section 6(e) below).

If an option will cause investors in rated securities to receive lower payments from the issuing SPE, the transaction documents should adequately disclose that investors' payments from the issuing SPE may be affected if a withholding tax is imposed on swap payments and the counterparty is not obligated to gross up payments to the issuing SPE, or that the counterparty has the right to terminate the swap if a withholding tax is imposed on payments by the issuing SPE to the swap counterparty.

The documents also should provide that, if the swap is terminated, proceeds from the sale of the issuing SPE's assets may not be sufficient to repay the full principal amount plus accrued interest on the outstanding rated securities. In addition, the documents should adequately disclose that part or all of the proceeds from the sale or liquidation of the issuing SPE's assets may be used to make the termination payment due to the swap counterparty.

Section 3. Representations
In an effort to facilitate standardization of the swap agreement, and to allow for proper due diligence, representations may be included in the swap agreement.

Standard & Poor's believes that breach of these representations by the issuing SPE, however, should not constitute an event of default or give the swap counterparty the right to terminate the swap agreement in most circumstances.
Standard & Poor’s will review whether investors are protected from termination events resulting from facts that could have been discovered by the counterparty before entering into the swap. Therefore, some issuing SPE representations may be accepted even if breach of those representations would enable the counterparty to terminate the swap agreement. The likelihood that the issuing SPE’s representations may be inaccurate is the key factor for Standard & Poor’s in determining whether they will be acceptable. In most cases, the swap counterparty should derive significant comfort from the issuing SPE’s status as an SPE created for the transaction at hand.

**Basic Representations**

Part (a) of Section 3 of the 1992 agreement pertains to certain basic representations:

- Status,
- Powers,
- No violation or conflict,
- Consents, and
- Binding obligations.

As an SPE, the issuer typically is not an operating company, but a bankruptcy-remote, structured vehicle that is completely dependent on third parties to perform certain functions. The failure to perform these functions could cause the issuing SPE to breach the basic representations in part (a) of this section of the 1992 agreement. As a general matter, Standard & Poor’s will review the structure to ensure that the proper parties- a manager or administrator-are in place to perform activities needed by the issuing SPE and that the issuing SPE has the ability to pay for the necessary services. Standard & Poor’s analyses and ratings, however, do not address the likelihood or ability of these parties to perform as contracted. Their failure to do so should not cause the swap to terminate in most circumstances, which will be reviewed by Standard & Poor’s. The swap counterparty, as a participant in the transaction, is in the best position to assess the likelihood that the manager or administrator will comply with their respective undertakings in the documents.

Therefore, these representations can be included in the swap agreement for due diligence purposes. However, breach by the issuing SPE should not constitute an event of default or give the swap counterparty the right to terminate the swap agreement unless Standard & Poor’s is comfortable that the likelihood of breach is commensurate with the transaction’s issue credit rating.

**Other Representations**

For representations concerning the absence of certain events [Section 3(b)], the absence of litigation [Section 3(c)] and the accuracy of specified information [Section 3(d)], breach of these representations by the issuing SPE should not constitute an event of default or give the swap counterparty the option to terminate the swap. These representations involve facts that the swap counterparty should have had the opportunity to review for accuracy before entering into the swap agreement with the issuing SPE. Therefore, the swap counterparty will need to perform due diligence to assure itself that these issuing SPE representations are accurate.

The payor tax representation [Section 3(e)] and the payee tax representation [Section 3(f)] will be reviewed on a case-by-case basis. When necessary, Standard & Poor’s may require legal comfort as to the accuracy of the representations. In structures that allow for multiple issuances, payor and payee representations will be revisited before each issuance.

**Section 4. Agreements**

Parts (a) through (d) of this section obligate both parties to agree to:

- Furnish specified information,
- Maintain authorizations,
- Comply with laws, and
- Notify the other party that it breached a payee tax representation under Section 3(f) when the breach occurs.

In general, the issuing SPE’s failure to comply with these agreements should not constitute an event of
default or give the swap counterparty the right to terminate for the reasons stated above (see Section 3. Representations. Basic representations.) Standard & Poor's, however, recognizes that there will be circumstances in which the breach of certain agreements by the issuing SPE should enable the swap counterparty to terminate the swap. These agreements generally will be reviewed on a case-by-case basis.

Concerning payment of stamp tax [Section 4(e)], Standard & Poor's may request a local tax opinion confirming whether any stamp duty or other documentary tax will be payable by the issuing SPE. If so, the issuing SPE should be able to meet this expense.

Section 5. Events of Default and Termination Events

(a) Events of Default

(ii) Breach of Agreement. For the reasons stated above (see Section 3. Representations) the issuing SPE's breach of representations or identified agreements will not be acceptable events that give the swap counterparty the option to terminate the swap agreement unless Standard & Poor's considers that the rating would not be affected by breach of these representations and agreements that may cause the swap to terminate (or the likelihood of termination is a factor in the rating).

(iii) Credit Support Default. The 1992 agreement provides that a credit support default can lead to an event of default under the swap agreement. This provision should be removed from the agreement when the swap counterparty's obligations under the swap agreement are not supported by another entity because it is not relevant in these transactions.

(iv) Misrepresentation. Under this provision, a misrepresentation by either party or its credit support provider, other than a misrepresentation relating to payor or payee tax representations [Sections 3(e) or 3(f)] would enable the other party to declare the swap in default under Section 5(a)(iv). Given the rationale for removing representations from the default and termination events under the swap agreement, as explained above, this provision should be modified to address only those representations with which Standard & Poor's is comfortable. The counterparty is urged to perform whatever due diligence is necessary to become comfortable with the transaction.

(v) Default Under Specified Transaction. This provision allows the nondefaulting party to terminate the swap if the other party defaults under a specified swap or transaction whether or not the swap or transaction is a part of the current swap agreement. Allowing the swap to default for this reason can be used to create a cross default. As noted below, cross-default provisions are not appropriate in structured finance transactions. (In the 1987 agreement, this section is called default under specified swaps. The same comments apply.)

(vi) Cross-Default. The cross-default provision enables a party to declare the swap in default if the other party or its credit support provider defaults on obligations in excess of an agreed-upon threshold amount. Because Standard & Poor's may rate particular categories of debt of an entity differently (for example, senior debt, subordinated debt, preferred stock, etc.) and structured transactions rely on the credit quality of particular assets, this provision should be removed from the swap agreement.

The risk of different ratings on different categories of debt also applies to an issuing SPE with deeply subordinated instruments outstanding, on which the relevant creditor has agreed not to enforce its claim upon a default. Nonetheless, this arrangement could inadvertently trigger the cross-default provision. Cross-default provisions may be acceptable in insured transactions in order to give the insurer more control over the structure.

(vii) Bankruptcy. Under this provision, if a party becomes bankrupt, the other party can declare the swap in default. As it applies to the issuing SPE, this provision generally is acceptable because the issuing SPE is usually structured to be an SPE. A bankruptcy or downgrade of the swap counterparty or its guarantor or insurer, on the other hand, would cause the transaction’s issue credit rating to be lowered accordingly.

Clause (2) of this provision presents an issue because it refers to a party's insolvency, inability to pay its debts, failure to do so, or admission in writing that it cannot pay its debts as they become due. This clause could be triggered by an issuing SPE that has subordinated debt outstanding (rated or unrated) because credit losses on the underlying collateral may cause technical payment default or losses on the subordinated debt. Many transactions use subordinated debt to provide credit support to more senior rated debt. In that event, the definition of bankruptcy in clause (2) should be removed from the swap agreement so that the swap continues even if the issuing SPE is technically insolvent because it cannot pay its subordinated debt, as anticipated by the structure of the transaction.

(b) Termination Events

(ii) Tax Event. Under this provision, the affected party has the right to terminate the swap. The affected party
is the party that is obligated to pay tax or receive a payment net of tax if an indemnifiable tax is imposed on a party's swap payments or is the party that will receive swap payments net of this tax from the other party because a tax is imposed and neither party is obligated to gross up its payments under the swap agreement. This right to terminate the swap should be removed when the swap counterparty is obligated to pay gross and accept net or is otherwise obligated to continue the swap (see Section 2. Payments. Deduction or Withholding for Tax). It may be retained when the swap counterparty has not obligated itself to continue the swap.

(iii) Tax Event Upon Merger. Under this provision, the burdened party has the right to terminate the swap. The burdened party is the party required to pay an amount relating to an indemnifiable tax or receive a payment net of this tax because it or the other party merged and there is no obligation on the burdened party to gross up the swap payments to take this tax into account. This provision should be removed when the swap counterparty is obligated to pay gross and accept net (see Section 2. Payments. Deduction or Withholding for Tax). In all other cases, it may be retained.

(iv) Credit Event Upon Merger. Under this provision, the nonaffected party has the right to terminate the swap if the affected party, its credit support provider, or any entity specified by the affected party merges, which does not constitute merger without assumption under Section 5(a)(viii), and the resulting entity is materially weaker than the affected party, its credit support provider, or other specified entity. If the issuing SPE is not the affected party and is the only party with the right to terminate the swap, the swap agreement can retain this provision. The swap counterparty should not be concerned with its inability to terminate the swap in an issuing SPE merger. The issuer, as an SPE, will be prohibited from merging when doing so would materially prejudice investors.

(v) Additional Termination Event. Standard & Poor's will review any additional termination events to ensure that they comply with criteria within the context of the transaction. In general, Standard & Poor's considers that there will be very few transactions in which additional termination events would be appropriate. (This provision appears only in the 1992 agreement. The 1987 agreement, however, also allows the parties to agree to additional termination events.)

Section 6. Early Termination
(a) Right to Terminate Following Event of Default. The basic agreement allows the non-defaulting party to terminate the swap following an event of default under the swap agreement by the other party. The ability to terminate the swap immediately or automatically after such default should be removed from the agreement in certain circumstances. This provision is generally included to buttress netting in several jurisdictions. Most transactions will waive netting across different swap agreements and, consequently, this provision should not be necessary. One important reason for this criterion is that, in structures where a guarantor or insurer guarantees the swap counterparty's obligations under the swap agreement, automatic early termination may not allow enough time to access the guarantee or insurance policy.

(b) Right to Terminate Following Termination Event
(ii) Transfer to Avoid Termination Event. This provision is acceptable as long as both parties have the right to transfer and any successor counterparty to which the counterparty has transferred its obligations under the swap agreement has a rating at least equal to the then current rating on the issue.

(e) Payments on Early Termination. Provided that the swap counterparty is not otherwise obligated to pay a different amount when the swap terminates (for example, as a result of tax events), Standard & Poor's will generally accept the termination payment agreed upon by the issuing SPE and the counterparty. Market quotation should be the first alternative for payment measure, with a provision for loss if market quotation is not available. Either is acceptable as the payment method. Previous criteria required market quotation and loss primarily to avoid a situation in which the issuing SPE would owe a termination payment to a defaulting swap counterparty. The change in termination payment calculations largely reflects Standard & Poor's recognition of market convention and that the possibility of two-way payments promotes greater market liquidity, which could have beneficial effects on swap pricing and the availability of replacement swap counterparties.

Ranking
Although the 1992 agreement does not stipulate any sharing of proceeds resulting from selling or liquidating the issuer's assets upon a swap termination, Standard & Poor's continues to be concerned with the relative rights of the counterparty and investors in the event of termination. In the context of structured transactions, Standard & Poor's has sought to balance these rights to provide for the fair expectations of the transaction
participants. Therefore, in all circumstances other than default on the issuer's other assets, Standard & Poor's general view is that the swap counterparty should share pari passu and pro rata in all proceeds from selling or liquidating such assets. Thus, the swap counterparty's termination payment will be added to the amount due to investors. This sum will then be shared by the counterparty and investors on a pro rata and proportionate basis. In the event that default on the issuer's assets caused the swap to terminate, the swap counterparty can rank ahead of investors in receipt of its termination payment. Like other modifications to the 1992 agreement, provisions for ranking should be addressed in the schedule and confirmation.

Section 7. Transfer
This section prevents the parties from transferring their rights under the swap agreement to a third party without the prior written consent of the other party to the swap agreement. As under the previous criteria, this section should be modified so that the issuing SPE can assign or mortgage all of its benefit and interest in the swap agreement to a trustee in the context of the structured transaction and so that the issuing SPE may transfer its interest in the swap agreement to avoid a tax event or illegality in its current jurisdiction. Standard & Poor's will generally only allow swap counterparties to be released from their obligations under the swap agreement after they assign the agreement to an entity with a rating at least as high as that currently assigned to the transaction.

Section 9. Miscellaneous
(b) Amendments. Any amendments to the swap agreement reviewed in advance by Standard & Poor's for possible rating action.

Section 10. Multibranch parties
Each party should represent that it is not a multibranch party for purposes of the swap agreement.

Asset-Independent Approach
Rated securities can be structured so that the issuing SPE's other assets will not be a supporting rating and thus achieve a rating that is higher than or irrespective of the issue credit rating of these other assets. This can be accomplished by including a swap agreement that commits the counterparty to make payments to the issuing SPE even if there has been a default on the issuing SPE's other assets. In effect, the swap agreement becomes the issuing SPE's only asset from a rating perspective. The swap counterparty is still a supporting rating, but the other assets are not.

Default and termination events for swaps in these transactions are more flexible than they are in transactions in which the issuing SPE's other assets are also a supporting rating. Recent structures have included the following default and termination events under the swap agreement:

- Failure to pay,
- Misrepresentation,
- Bankruptcy,
- Merger without assumption,
- Illegality, or
- Events of default under the indenture.

Events of default under the indenture include failure to pay interest on any note when due, failure to pay principal on any note when due, an event of default or early termination of the swap agreement, and the bankruptcy of the issuing SPE.

If the swap is terminated for any of the above reasons, however, the swap counterparty would make a termination payment to the issuing SPE equal to the principal of and accrued interest on the rated securities minus proceeds from sale of the issuing SPE's other assets. In other words, investors in the rated securities are paid full principal and interest up to the redemption date even if the swap is terminated. In this structure, the formula for calculating the termination payment [Section 6(e)] will have to be amended accordingly.

If no withholding tax currently applies to swap payments by the swap counterparty and its guarantor, if any, Standard & Poor's will generally request legal opinions from counsel confirming that under current law no such tax applies and that there is no pending legislation to create such a tax.
**Swap-Independent Approach**

These types of securities also use swaps to transform the cash flows generated by the assets as an accommodation to investors. Standard & Poor's issue credit rating, however, does not address the swapped cash flow, only the likelihood of payment on the issuing SPE's other assets. If the swap counterparty defaults for any reason, either the transaction terminates and investors receive their pro rata share of the assets, or the investors agree to accept the cash flows on the other assets without the benefit of the swap and the transaction continues.

The swap counterparty's issuer credit rating is not a supporting rating. Therefore, default and termination events under the swap agreement are more flexible than those for swap-dependent securities in which the issuing SPE's other assets are also a supporting rating. The following events have been included in swap-independent structures:

- Failure to pay,
- Breach of agreement,
- Credit support default,
- Misrepresentation,
- Default under specified transaction or swaps,
- Cross-default,
- Bankruptcy,
- Merger without assumption,
- Trust termination, and
- Default on the issuer's other assets.

If the swap terminates, neither party would be owed a termination payment or swap breakage fees. Generally, the Y symbol is attached to the ratings of these transactions to indicate that investors may be subject to market risk upon termination of the swap.

**Additional Criteria**

Section 11 of the 1992 agreement provides that the defaulting party will pay certain reasonable out-of-pocket expenses incurred by the other party related to the enforcement and protection of that party's rights under the swap agreement or any credit support document. This section should not apply to the issuing SPE for asset-independent or swap-independent structures because swap agreements employed by these structures may terminate as a result of noncredit events. The occurrence of an event of default under the swap agreement for an asset-independent transaction should not create a liability for the issuing SPE that will result in payment shortfalls to investors. In the case of swap-independent structures, since the swap provider is not a supporting rating, the occurrence of an event of default should be transparent to the issuing SPE and not result in the creation of an expense under this section.

For all swap agreements, the swap counterparty should agree that it will not petition the issuing SPE into bankruptcy, or join in any petition to file the issuing SPE, during the term of the rated securities and for a period equal to the preference period plus one day applicable to the issuing SPE after all outstanding rated securities have matured.

In transactions where the issue credit rating is dependent on a swap agreement and guarantee, if any, Standard & Poor's generally requests the following legal opinions for the swap counterparty and guarantor, as applicable, under the law of the jurisdiction of organization of the relevant entity and under the governing law of the swap agreement and guarantee, as applicable:

- An enforceability opinion in connection with the swap agreement and guarantee against the swap counterparty and the guarantor, as applicable, according to their respective terms;
- A pari passu opinion stating that payments due under the swap agreement and the guarantee, as applicable, rank at least pari passu with the unsecured and unsubordinated obligations of the swap counterparty and the guarantor, as the case may be;
- A choice of law opinion stating that local courts in the jurisdictions of the swap counterparty and the guarantor, as applicable, would recognize the choice of law in the swap agreement and the
guarantee, as the case may be, and the choice of law is prima facie valid and binding under such local law;

- A recognition of claim opinion stating that local courts in the jurisdictions of the swap counterparty and the guarantor, as applicable, would recognize and enforce as a valid judgment any final and conclusive civil judgment of a court of competent jurisdiction for monetary claims under the swap agreement and the guarantee, as the case may be; and
- Relevant withholding tax opinions on payments under the swap agreement and the guarantee, as applicable. (See the discussions above under Swap-Dependent Approach, ISDA Cross-References, Section 2, Payments, Deduction or withholding for tax, and under Asset-Independent Approach.)

Standard & Poor's will also typically request from counsel for the issuer the relevant withholding tax opinions on payments by the issuer under the swap agreement. (For the tax opinion requirements, see the discussion above under Swap-Dependent Approach, ISDA Cross-References, Section 2. Payments. Deduction or withholding for tax.) Standard & Poor's may waive the enforceability opinion described above for swap counterparties and guarantors if Standard & Poor's previously has received similar opinions under the same governing law in similar transactions. (For a fuller discussion of these rating approaches, see Standard & Poor's Legal Issues In Rating Structured Finance Transactions, "Criteria Related to Global Synthetic Securities.")

Events of Default and Termination Events
The following are acceptable default and termination events that would enable the swap counterparty to terminate the swap agreement for rated securities in which the swap counterparty and the issuing SPE's other assets are supporting ratings:

Events of Default

- Failure to pay or deliver [Section 5(a)(i)]
- Bankruptcy [Section 5(a)(vii)]
- Merger without assumption [Section 5(a)(viii)]

Termination Events

- Illegality [Section 5(b)(i)]

Appendix E
Interest Rate Assumptions for Structured Ratings
Standard & Poor's interest rate assumptions follow a study that focused on the historical level of rates and the extreme changes in rates to determine interest rate floors and caps, and upward and downward spikes over various periods of time (see Floor and Caps, and Spikes below). Table 1 shows the floors and caps, and the mean plus and minus 1.96 standard deviations, which are the upper and lower bounds of the 95% confidence interval. The table also shows the mean plus and minus one standard deviation for each of the rates studied.

Table 2 shows the assumed spikes over 16 different time horizons. These spikes are multiples of the starting rate. Some of the entries in the table are "floor". These entries indicate that the result of the calculated downward spike was greater than 1.0 times (x) and would result in a negative interest rate. For these few cases, the floor is assumed automatically. Tables 1 and 2 include the more frequently used indexes that are analyzed.

Floors and Caps
To determine the floors and caps, analysts studied the distribution of interest rates over a 22-year period from June 1973 to June 1995. The study examined the historical maximum and minimum values as well as the mean and variance of each rate's distribution. This resulted in a total of more than 5,000 observations. Given this large number of observations, analysts can assume that the sample approaches a normal
distribution and the normal distribution can be used as a good approximation. In the study, the historical maximum and minimum values were compared to the upper and lower bounds of a 95% confidence interval. For each rate, Standard & Poor's chose the floor as the lesser of the actual historical maximum and the confidence interval lower bound. Similarly, the greater of the maximum historical value and the 95% confidence interval upper bound was chosen as the cap.

For example, in an analysis of a transaction based on three-month LIBOR, it would be assumed that the highest the index would go over the life of the transaction is about 22% (see table 1). This value happens to be the maximum historical value for the period studied. Considering the historical distribution of this interest rate, the probability of exceeding 22% is close to zero. By comparison, the 95% confidence interval upper bound is about 15.76%.

**Spikes**

Determining the spikes was more involved. Analysts wanted to determine how much any given rate could change over a number of periods of time. To make these determinations, the same historical data was used for each of the rates, and an average of 21 business days was assumed per month. Working through the data, the percentage change every 21 days was calculated. In other words, the percentage change was calculated from the first day to the 22nd day, from the second day to the 23rd day, and so on. This resulted in a large sample of 21-day percentage changes.

Similarly, for the two-month horizon, the 42-day percentage changes were calculated, 63-day changes were calculated for three months, and so on for the longer periods. Using these sets of data, the extremes and the mean and variance of each distribution were examined. Analysts compared the extremes to the 95% confidence interval bounds. Again, the greater of the historical maximum and the 95% confidence interval upper bound are used for the upward spike. Standard & Poor's uses the lower of the historical minimum and the 95% confidence interval lower bound for the downward spike.

The spikes are constrained by the floors and caps for that particular rate. For example, if today's rate is 8% and the assumed 12-month upward spike is 2.5x, then the product gives a rate of 20%. However, if the cap were 17%, then the spike would be limited and a 17% cap assumed. The spikes were determined for five years out, with monthly steps for the first year. This provides a mechanism for applying the floors and caps over various periods of time. Beyond five years, analysts will use the lifetime floors and caps in table 1. For some of the more volatile indexes and longer horizons, the lower bound of the 95% interval is change greater than 100% that yields nonsensical results. In those cases, the floor will be assumed as the limit.

**Computing Interest Rate Assumptions**

The first step in calculating interest rate assumptions is a function of the time horizon. If the exposure or reset period is more than five years, use the floors, and caps from table 1. If the time horizon is five years or less, find the appropriate multiples from table 2. Multiply today's rate by the up-spike to get the upper limit, and by the down-spike to get the lower limit. Compare these values to the caps and floors in table 1. If the calculated upper value is greater than the cap from table 1, use the cap. Similarly, if the lower limit is lower than the floor from table 1, use the floor as the assumed rate.

As an example, consider sizing a reserve in a transaction with fixed-rate assets, and floating-rate bonds tied to one-month LIBOR. Assume:

- One-month LIBOR equals 6%
- Assets at fixed rate equal 8%
- A four-year transaction

Using table 2 results in a multiple of about 5.0 for this index for four years. Applying this multiple results in a rate of 30% that exceeds the 24% cap from table 1. Therefore, 24% will be used as the cap. In this case, analysts will assume that the liability rate for 50% of the cash flows is equal to the mean plus one standard deviation. For 40% of the cash flows, the assumed liability rate is equal to the mean plus 1.96 standard deviations (the 95% confidence interval upper bound).

Next, assume the rate on the remaining 10% of the cash flows is equal to the cap rate. To avoid weighting the cash flows too heavily, the following assumptions are applied evenly to the beginning and the end of the cash flow stream:
The rate for the first 25% of the cash flows is the mean plus one standard deviation.
The rate for the next 20% is the mean plus 1.96 standard deviations.
The rate for the next 10% is at the cap.
The rate for the next 20% returns to the mean plus 1.96 standard deviations.
For the last 25% the rate is the mean plus one standard deviation.

With the assumed term in this example, there will be 48 payments. For the one-month LIBOR, the cap is 24.06%, the mean plus one standard deviation is 12.10%, and the mean plus 1.96 standard deviations is 15.56%. Therefore, for the first 12 payments the assumed liability rate builds up from today's rate until it reaches 12.10%. For the next 10 payments (payments 13-22) the rate is 15.56%. For the next five payments (payments 23-27) the rate is at the cap of 24.06%. For the next 10 payments (payments 28-37) it again is 15.56%. The rate returns to 12.10% for the last 11 payments.

The discount rate used to compute the present value of the cash flow stream is Standard & Poor's assumed minimum reinvestment rate of 2.5%. The step-up in the rates is limited by the up-spike for the period. That is, if today's rate is 6.0% it would be illogical to assume a rate of 12.1% next month, since the one-month up-spike is 1.65x, giving a rate of 9.90% for the second month. The two-month spike is 1.851x, resulting in a rate of 11.11% the third month. The three-month spike is 2.0694x. Therefore, the rate in the fourth month would be 12.42%, but is limited to 12.10% according to the guidelines described above.

Similarly, for the tail end of the transaction, if a step-down from the cap to the next level rate would result in a change greater than the down-spike, then it would take a few periods to reach the lower rate again.

**Potential Outcomes**

There can be four potential outcomes when determining the rates and what level to use when. The multiple multiplied by today's rate may be:

- Greater than or equal to the cap rate,
- Less than the cap but greater than or equal to the mean plus 1.96 standard deviations,
- Less than the mean plus 1.96 standard deviations but greater than or equal to the mean plus one standard deviation, or
- Less than the mean plus one standard deviation.

For each of these outcomes, determine the rates and levels as follows:

**Outcome 1**
Assume the rate is equal to:

- The mean plus one standard deviation for 50% of the payments (the first 25% and the last 25%),
- The mean plus 1.96 standard deviation for 40% of the payments (the next 20% and second to last 20%), and
- The cap for the middle 10% of the payments.

**Outcome 2**
Assume the rate is equal to:

- The mean plus one standard deviation for 50% of the payments,
- The mean plus 1.96 standard deviation for 40% of the payments, and
- The multiple multiplied by today's rate for the middle 10% of the payments.

**Outcome 3**
Assume the rate is equal to:

- The mean plus one standard deviation for 50% of the payments,
- The multiple multiplied by today's rate for 40% of the payments, and
• The mean plus 1.96 standard deviation for the middle 10% of the payments.

**Outcome 4**
Assume the rate is equal to:

• The multiple multiplied by today's rate for 50% of the payments,
• The mean plus one standard deviation for 40% of the payments, and
• The mean plus 1.96 standard deviation for the middle 10% of the payments.

While the use of this method is not limited to these examples, it may not be applicable in some cases depending on a particular transaction's structure. As transactions are presented using different rates, Standard & Poor's will determine the assumptions for that particular rate or, if necessary, transaction structure. Standard & Poor's may revise its assumptions as necessary based on the availability of new data.

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<td>6-month LIBOR</td>
</tr>
<tr>
<td>90-day CP</td>
</tr>
<tr>
<td>120-day CP</td>
</tr>
<tr>
<td>180-day CP</td>
</tr>
<tr>
<td>270-day CP</td>
</tr>
</tbody>
</table>

Table 2
### Table 3

<table>
<thead>
<tr>
<th>Month</th>
<th>Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.00</td>
</tr>
<tr>
<td>2</td>
<td>9.90</td>
</tr>
<tr>
<td>3</td>
<td>11.11</td>
</tr>
<tr>
<td>4</td>
<td>12.10 (X+Sn)</td>
</tr>
</tbody>
</table>

Moves to cap.