Moody's Modeling Approach to Rating Structured Finance Cash Flow CDO Transactions

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CONTENTS

SUMMARY

This special report describes Moody's new quantitative modeling approach for structured finance cash flow CDO transactions[1]. This approach utilizes the correlated binomial method, the CBM, in which the correlation among the identical representative assets, the single asset correlation, is an explicit modeling parameter. The other CBM parameters are the number of representative assets, the common default probability and the common recovery rate. The newly introduced single asset correlation parameter is derived based on the loss distribution of the actual portfolio simulated from Moody's CDOROM™ using a moment matching scheme. The correlated binomial default distribution generated from the CBM is applied in cash flow models to calculate the expected losses for CDO notes.

1 While the new approach is developed for rating cash flow CDO transactions globally, in some cases alternatives to the CBM may be considered given unique structural features. Furthermore, synthetic structured finance CDO deals can also employ the CBM if the deal has a payment algorithm that is too complex to use the CDOROM™ directly for the rating purpose.

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I. Introduction

To stay at the forefront of the CDO market, Moody's strives to develop new and refine existing rating methodologies as the market evolves and our understanding on the nature of the financial products expands. Over the past year and half, the structured finance cash flow CDO transactions have seen an increased concentration in a single asset sector, mainly RMBS, in the collateral pools. The highly concentrated collateral pools normally leads to a fat-tailed loss distribution, i.e. larger probability associated with high multiple defaults scenarios due to the correlation among collateral assets. To better assess and capture this fat-tail effect, Moody's introduced a new modeling framework in August last year, the Correlated Binomial Method (the CBM[2]), in order to achieve a more accurate evaluation of the credit risk embedded in this category of CDO transactions.

The CBM is an enhancement over Moody's traditional Binomial Expansion Technique (the BET[3]) as it incorporates the correlation among the representative assets as an explicit modeling parameter. The CBM was initially used with Moody's default correlation assumptions for structured finance instruments to parameterize the single default correlation number for representative assets. Recently, Moody's revised its correlation assumptions and published a new framework[4] that consists of a set of underlying asset correlation assumptions for structured finance securities. The new framework has been incorporated in CDOROM™, Moody's analytical tool used in rating synthetic CDO transactions. This special report describes a new approach for rating structured finance cash flow CDOs that utilizes the correlated binomial method and incorporates Moody's new asset correlation assumptions by estimating a single asset correlation number, Moody's asset correlation, using CDOROM™ . Specific steps involved in the application of the new approach are also illustrated.

II. A Review of Moody's Rating Methodology: the Correlated Binomial Method

Moody's General Rating Approach To CDOs: Expected Loss Framework

Moody's approach on rating CDOs[5] is based on the evaluation of expected loss of CDO notes under multiple potential collateral loss scenarios, consistent with the one used for all other types of structured finance securities rated by Moody's. Estimating the expected loss of a CDO note is fundamentally a three step process:

1. Specify the probability of each level of loss of the underlying assets
2. For each level of asset loss, calculate the loss of the CDO note
3. Average the product of (a) the probability of each level of asset loss from step one and (b) the loss to the CDO note from step two.

The CBM, similar as the traditional BET, fits into this general expected loss framework. The CBM differs from the BET in the step 1, the method to specify the probability of each level of loss of the underlying assets, with the introduction of the correlation as an explicit modeling parameter.

Correlated Binomial Method: Modeling the Correlation Explicitly

As in the traditional BET, the correlated binomial method creates a model portfolio consisting of identical, representative assets in order to mimic the actual portfolio underlying a CDO[6]. In contrast to the BET, where the representative assets are assumed to be independent, the CBM incorporates the correlation among the representative assets as a modeling parameter. Explicitly modeling the correlation enables the CBM to generate a much wider range of fatter-tailed loss distributions and a more stable modeling result than the BET[7], an important enhancement, especially for CDOs with high sector concentrations. This enhancement also largely removed the necessity to run multiple-CBM in most of the cases where the traditional multi-BET is required[8].

2 See "Moody's Correlated Binomial Default Distribution" *Moody's Rating Methodology*, August 2004.
3 See "The Binomial Expansion Method Applied to CBO/CLO Analysis" *Moody's Special Report*, December 1996
4 See "Moody's Revisits its Assumptions Regarding Structured Finance Default (and Asset) Correlations for CDOs" *Moody's Rating Methodology*, June 2005.
5 This report focuses on the quantitative modeling method in Moody's CDO rating approach. Qualitative analysis on structured finance CDOs related to the documentation and the collateral manager are not covered here. For a more comprehensive discussion, see "Moody's Approach to Rating Multisector CDOs" *Moody's Rating Methodology*, September 2000.
6 As most SF CDOs have assets of similar credit quality, representing them as portfolios of identical assets allows for a parsimonious representation of the portfolio (four CBM parameters to describe the loss distribution) with minimal sacrifice of accuracy.
7 In the BET, the D-score, defined as the number of independent representative assets, is much smaller than the number of actual assets since the representative assets are independent while the actual assets are correlated. However, in the CBM, the number of representative assets is usually close to the number of the actual assets due the introduction of the additional correlation parameter, leading to a larger number of binomial scenarios and a loss distribution with fatter tails.
8 For pools with an extremely barbelled distribution on asset ratings, Moody's may conduct case-specific analysis. If necessary, a multiple-CBM or some additional adjustment will be used.

CBM Parameters: Asset Correlation v.s. Default Correlation

To define the model portfolio consisting of the representative assets in the CBM, four parameters are needed: the number of representative assets, the common default probability of each asset, the common recovery rate of each asset and the single asset correlation between each pair of assets. The model parameters are typically determined using a moment matching scheme[9] so that the loss distribution generated by the CBM closely mimics that of the actual or expected portfolio.

When the CBM was initially developed last August, the single default correlation was parameterized based on Moody's old default correlation assumptions for structured finance securities. Moving from the single default correlation parameter to the single asset correlation parameter is consistent with Moody's new asset correlation framework[10]. The asset correlation based approach is also seen in many credit risk models used in both industry and academia[11].

Evaluating CDO Losses in Multiple Default Scenarios

Once all the parameters are specified, the probability associated with each level of the loss of the underlying assets, corresponding to the number of defaulted representative assets, can be calculated using a relatively simple algorithm. This correlated binomial default distribution can be used with a cash flow model that explicitly incorporates the CDO waterfall structure to estimate the probability-weighted loss for each CDO note across all the default scenarios.

III. Moody's New Modeling Approach to Rating Structured Finance Cash Flow CDOs: the CBM Based on the New Underlying Asset Correlation Assumptions

Evolution of Moody's Rating Methodology

As structured finance cash flow CDOs evolve towards transactions with increasingly concentrated collateral pools, mostly pools with more than 50% of the assets in the RMBS sector, it is important to have a modeling method that can accurately capture the correlation among the underlying assets and the inherent tail loss risk in the collateral pools. As discussed in the section above, the CBM is better suited for this task than the BET.

As a direct extension from the traditional BET, the CBM also preserves features in the existing rating framework that are familiar to the market and are important for managing the transactions. Similar as the BET, the CBM has a set of well-defined parameters that drive the model results and can be easily covenanted in the deal document (see *figure 1*). This set of parameters can be used as trading guidelines by the collateral manager and reported on a regular basis to monitor the performance of the underlying assets. When the deal is rated, the covenanted levels should be used with the payment algorithm to generate the potential default distribution and estimate the expected loss for each CDO note.

Figure 1
Extension from the BET to the CBM

BET Parameters	CBM Parameters
Common Default Probability *	Common Default Probability*
Common Recovery Rate	Common Recovery Rate
Diversity -Score	Number of Representative Assets
	Moody's Asset Correlation **

* The common default probability is often derived based on the covenant for weighted rating factor, weighted average life and weighted average recovery rate.
** The single asset correlation is usually referred to as Moody's asset correlation in the deal documents.

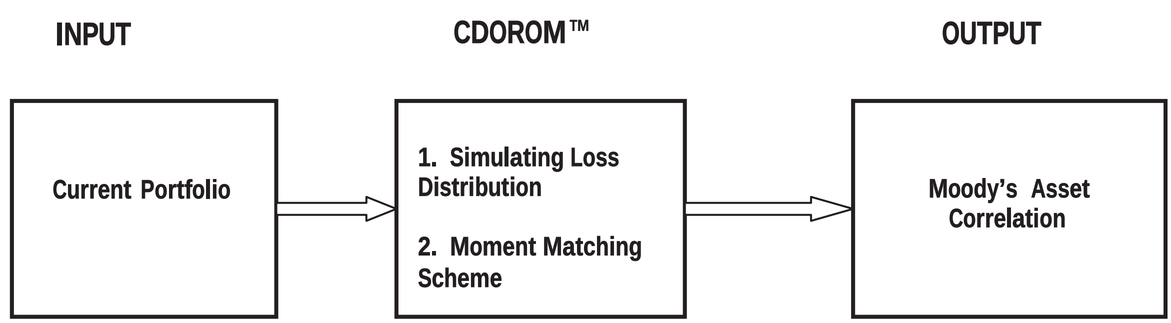
9 The moment matching scheme refers to the method under which the parameters for the model portfolio are chosen so that the first and higher order moment of its loss distribution match that of the actual portfolio. See Appendix I for a more detailed discussion.
10 For a more detailed discussion on why the asset correlation is chosen over the default correlation, see "Moody's Revisits its Assumptions Regarding Structured Finance Default (and Asset) Correlations for CDOs" Moody's Rating Methodology, June 2005.
11 For a more detailed discussion on various techniques used in credit risk models, see Schönbucher, Philipp J. 2003, "Credit Derivatives Pricing Models" John Wiley & Sons, Chapter 10.

Incorporating Moody's New Underlying Asset Correlation Assumptions for Structured Finance Instruments

Moody's recently published asset correlation assumptions for structured finance securities have been embedded in CDOROM™ that is used to rate synthetic CDO transactions. CDOROM™ first simulates the joint default distribution of actual assets, taking into account the new correlation assumptions among them. A loss distribution is then generated for the collateral pool to evaluate the loss of each CDO note.

Incorporating the new underlying asset correlation assumptions into the CBM can lead to more accurate credit risk assessments and achieve analytical consistency in rating the cash flow and synthetic CDOs. For this purpose, the single asset correlation parameter, represented by Moody's asset correlation, is chosen so that the third moment, or the skew, of the CBM loss distribution matches that of the loss distribution simulated from the CDOROM™[12]. This step (see *figure 2*) can be applied to the initial portfolio to provide a benchmark for the collateral manager to decide on an appropriate covenanted level for this parameter. Additionally, it can be used in the transaction monitoring to check the covenant compliance.

Figure 2
Estimating Moody's Asset Correlation from the CDOROM™



Major Modeling Steps in Rating CDO Transactions with the New Approach[13]

In general, the new CBM approach to rating structured finance cash flow CDOs involves the following steps:

1. Determine the four parameters needed to define the representative assets.
   a. *Common Default Probability*: Normally calculated based on the covenants for the weighted average rating factor (WARF), the weighted average life (WAL) and the weighted average recovery rate (WARR).
   b. *Number of Representative Assets:* A constant number of representative assets[14] needs to be specified in the governing documents and is a separate input into CDOROM™ to derive Moody's asset correlation. This number[15] is usually set to the expected number of assets in the collateral pool.
   c. *Common Recovery Rate*: Use the covenanted weighted average recovery rate in the indenture.
   d. *Moody's Asset Correlation*: Use the covenanted correlation factor in the indenture.

12 In contrast to the existing BET where the D-score is calculated to match the second moment of the loss distribution of the actual portfolio, the single asset correlation parameter in the CBM is parametized based on the third moment matching. This refinement is based on Moody's recent research that shows matching the third moment provides a better fit to the tail losses. In addition, the common default probability and the recovery rate in the CBM are chosen to match the first moment of the loss distribution: the common recovery rate is set equal to the weighted-average recovery rate of the actual pool and the common default rate is calculated by dividing the first moment of the simulated loss by (1- common recovery rate).

13 The procedure described here is mainly applicable to actively managed CDO deals. For fully ramped static transactions, the portfolio loss distribution could be estimated directly from the CDOROM™ output and then be used in cash flow models.

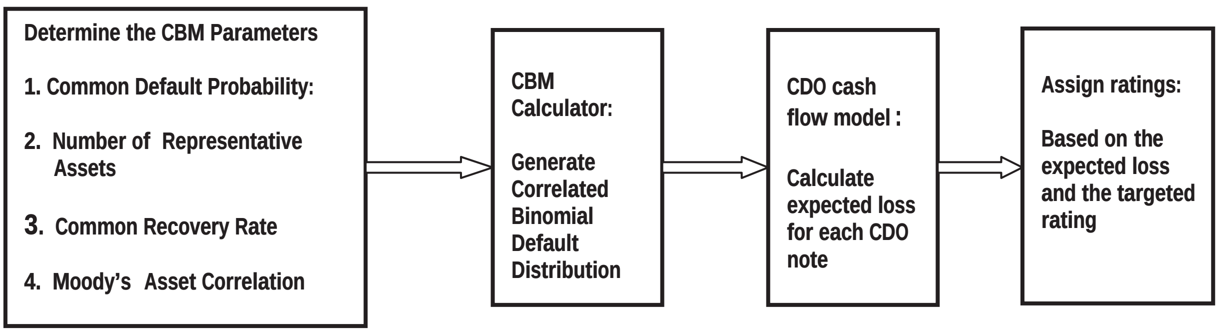
14 Unlike the trigger level for the portfolio WARF, WARR, Moody's asset correlation and the like, the number of representative assets is not a transaction covenant. Regardless of the number of the representative assets used, Moody's asset correlation derived from the CDOROM™ will vary based upon the attributes of the actual portfolio so that the model portfolio has a similar loss distribution as that of the actual portfolio. As a result, using a constant number of representative assets enables Moody's asset correlation to fully reflect the effective diversification of the portfolio as of each measurement date and to be used to determine compliance with the covenanted level for the correlation factor. For example, when the number of actual assets in the pool increases, Moody's asset correlation generally decreases if it is generated using the constant number of representative assets. A more detailed explanation is presented in Appendix I.

15 This constant number is simply a modeling parameter in the CDOROM™ for the purpose of calculating Moody's asset correlation. For the avoidance of doubt, the collateral manager for the deal is not committed to make sure that the actual number of assets is close to this number.

2. Use Moody's CBM calculator to specify the probability for each level of the default distribution, i.e the correlated binomial default distribution[16].
3. Apply the default distribution derived from the step 2 to a cash flow model that incorporates transaction waterfall features and the common recovery rate to calculate the expected loss for each of the CDO notes.
4. Compare the expected loss for each of the CDO notes to the Moody's idealized loss level associated with the targeted rating to assign an appropriate rating.

Figure 3

Procedure in Applying the New Rating Approach



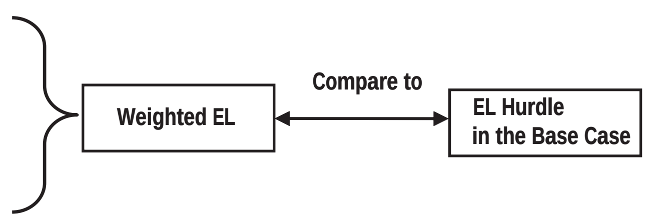
Evaluate the Losses of CDO Notes under Three Amortization Profiles Using One Default Probability

Similar to the existing BET, the expected loss for each of the CDO notes needs to be evaluated under three different amortization profiles of the underlying assets in order to account for the potential risk associated with uncertain prepayment rates. The common default probability, derived based on the covenant for the weighted average rating factor, the weighted average life and the weighted average recovery rate, is applied to all three amortization profiles. A weighted average expected loss for each of the CDO notes, with the weight of 50%, 25% and 25% assigned to the base, slow and fast amortization profile respectively, is calculated for each of the thirty interest rate and default timing scenarios currently used in the BET method. The resulting expected loss is then compared with the expected loss hurdle, calculated for each CDO note in the base amortization profile based on Moody's idealized loss table, in order to determine appropriate ratings for the CDO notes.

Figure 4

Calculating Weighted EL for CDO Notes Across Three Amortization Scenarios

Profile	Use Common Default Probability	Calculate Expected Loss	Weights for EL
Fast	Same as Base	E(Loss I Fast)	25%
Base	Based on WARF, WAL, WARR	E(Loss I Base)	50%
Slow	Same as Base	E(Loss I Slow)	25%



16 Since the CBM captures the tail loss risk much more accurately than the BET, no stress factor will be applied to the common default probability in this step.

Transaction Monitoring and Covenant Compliance Checking

For each reporting period after the deal closing, Moody's asset correlation parameter can be generated by running CDOROM™ for the actual collateral portfolio. This calculated Moody's asset correlation, together with other relevant reported collateral parameters, including the average rating factors and the average recovery rates, can be used to perform the collateral quality test and check for the covenant compliance. If there is a significant deviation from the covenanted level, the deal may need to be re-examined by repeating the above steps to check the validity of the current ratings.

Analytical Tools from Moody's to Facilitate the Implementation of the New Approach

Moody's has developed new and refined its existing analytical tools in order to facilitate the implementation of the new modeling approach both internally and externally.

The CDOROM™ currently used for rating synthetic CDO transactions incorporates the moment matching algorithm and can output Moody's asset correlation for a given collateral portfolio. In addition, a new CBM calculator is created to generate the correlated binomial default probability distribution for a given set of parameters - the number of assets, the common default probability and Moody's asset correlation. The calculator is available to be released to the market.

IV. Conclusion

This report presented a new modeling approach for rating structured finance cash flow CDO transactions. The new approach, which effectively integrates the Correlated Binomial Method with CDOROM™, provides a consistent rating framework with the one applied to synthetic CDOs by incorporating the same set of newly developed underlying asset correlation assumptions for structured finance securities.

The Correlated Binomial Method introduces the asset correlation as an explicit modeling parameter and matches its loss distribution closely with the simulated one from the CDOROM™, leading to significantly improved analytical precision in credit risk evaluation. In addition, the new approach retains important features in the current BET framework that are useful for monitoring and managing CDO transactions. A similar set of parameters such as the weighted average rating factors, the weighted average recovery rates, as well as Moody's asset correlation, can be used to monitor the performance of the underlying collateral and covenanted to serve as trading guidelines for collateral managers.

As always, quantitative models are important tools used by Moody's analysts in the complicated rating process. A final rating decision for a CDO transaction is reached after thorough evaluation of the legal documents and the collateral manager, in combination with the quantitative analysis.

APPENDIX I

Correlated Binomial Method

This appendix describes the correlated binomial method and the moment matching scheme used to choose the parameters in the CBM. In the CBM approach, a model portfolio of idealized assets which are correlated and identical is created to represent the actual portfolio. The parameters that characterize the idealized assets are chosen so that the first and the third moment of the loss distribution from the model portfolio match that of the loss distribution from the actual portfolio.

1. A model Portfolio of Idealized Assets and Correlated Binomial Probability

Assume an idealized portfolio of n representative assets that have identically distributed default distributions with these three properties:

Assumption (1): Each asset has default probability p and recovery rate r, the common default probability and the common recovery rate.

Assumption (2): Each pair of assets has asset correlation ρ_{asset} between them, the single asset correlation.

Assumption (3): The default correlation between asset j+1 and asset j+2 remains equal to ρ regardless of the number of known defaults among the other j assets for j = 1 to n-2, where the constant default correlation ρ is converted from the default probability p and the asset correlation ρ_{asset} based on the normal copula.

Conversion Between the Asset Correlation ρ_{asset} and the default correlation ρ:

The joint probability of two asset defaults can be written as: $f(p,\rho) = p^2 + \rho * p * (1-p)$

Let n_1 and n_2 be two standard normal variant with a correlation ρ_{asset}. Define k as: $probability(n_i < k) = p$ *for i=1, 2*

Then, the joint cumulative probability, $N = probability(n_1 < k, n_2 < k)$, should satisfy:

$$N(k,k,\rho_{asset}) = f(p,\rho) = p^2 + \rho * p * (1-p)$$

The conversion between ρ_{asset} and ρ can be performed based on the above equation.

Assumption (3) can be expressed mathematically as:

$$p_{j+1} = p_j + (1-p_j)\rho \quad for\ \ j = 1,..,n-1$$

where p_{j+1} is the default probability of asset j+1 conditional on j defaults.

For the model portfolio defined above, the correlated binomial probability, which is the probability associated with the k defaults and n-k survivals (analogous to the binomial probability used in the traditional BET), can be calculated as:

$$C(n,k)\sum_{j=0}^{n-k}\left[(-1)^j C(n-k,j)\prod_{i=1}^{j+k} p_i\right]$$

and the probability of no defaults and n survivals is

$$1+\sum_{j=1}^{n}(-1)^j C(n,j)\prod_{i=1}^{j} p_i$$

where C(,) represents the combinatorial function $C(n,m)=\frac{n!}{m!(n-m)!}$ and the conditional default probability p_j can be calculated sequentially based on the assumption (3) or in closed form:

$$p_j = 1-(1-p)(1-\rho)^{j-1} \quad j=2,..,n$$

2. Moment Matching Scheme and Parameter Estimation

Let $x_1, .., x_n$ be random indicator variables representing the default behavior of the assets where $x_j=1$ indicates the default of asset j. The first and the third moment of the loss distribution of the model portfolio, corresponding to the expected loss, EL, and the, skew, $SKEW$, of the loss distribution respectively, can be expressed as a function of the parameters that define the representative assets:

$$EL = E\left[\sum_{i=1}^{n} x_i\right]*(1-r)/n = p*(1-r)$$

$$SKEW = E\left[\sum_{i=1}^{n} x_i*(1-r)/n - EL\right]^3 = E\left[\sum_{i=1}^{n} x_i/n - p\right]^3 *(1-r)^3 = f(n,p,\rho)*(1-r)^3$$

where $f(n,p,\rho)$ is a polynomial function of n, p, ρ that can be derived based on the assumption 1, 2 and 3 for the representative assets.

Let EL_a and $SKEW_a$ be the first moment and the third moment of the loss distribution of the actual portfolio. In addition, let r_a be the weighted average recovery of the actual assets in the portfolio. The moment matching scheme leads to the following two equations:

$$EL = EL_a \Rightarrow p*(1-r) = EL_a \qquad \text{(a)}$$

$$SKEW = SKEW_a \Rightarrow f(n,p,\rho)*(1-r)^3 = SKEW_a \qquad \text{(b)}$$

The parameters for the model portfolio can be estimated based on the above two equations. The default probability is chosen to match the first moment of the loss distribution between the model portfolio and the actual portfolio.

$$r = r_a$$

$$p = EL/(1-r) = EL_a/(1-r_a)$$

For a given $n = N$, the default correlation ρ can be chosen to match the third moment of the loss distribution by solving the following equation using a numerical method:

$$f(N, EL_a/(1-r_a), \rho)*(1-r_a)^3 = SKEW_a \qquad \text{(c)}$$

Once the ρ is chosen, it can be converted to the asset correlation parameter ρ_{asset} using the normal copula. For a given $SKEW_a$, there could be multiple combinations of n and ρ (hence ρ_{asset}) that satisfy the above equation since $SKEW$ is a function of both the n and ρ. In general, the larger the n, the higher the ρ.

3. Using a Constant Number of Representative Assets to Estimate the Single Asset Correlation

As discuss above, multiple combinations of n and ρ can be chosen to match the third moment of the actual loss distribution. However, for a given collateral portfolio, different combinations of n and ρ lead to similar expected losses for CDO tranches as long as the combinations result in the same skew of the loss distribution for the model portfolio as that for the actual portfolio.

To illustrate this point, a model portfolio is created for each of the three combinations of n and ρ shown in *table 1*, with p, r , and $SKEW$ set equal to 1.5%, 30% and 0.001370% respectively. A hypothetical CDO with the capital structure indicated in table 2 is evaluated assuming it is backed by the model portfolio. The expected losses for CDO tranches under all three combinations of n and ρ are summarized in *table 1*.

Table 1

Expected Losses for CDO Tranches Under Different CBM Parameters

Parameters				**Expected**	**Losses**		
n	ρ	ρ_{asset}	$SKEW$	**Class A**	**Class B**	**Class C**	**Class D**
70	2.74%	18.56%	0.00137%	0.00014%	0.0914%	0.5813%	2.3851%
100	3.04%	20.00%	0.00137%	0.00015%	0.0942%	0.5908%	2.3211%
130	3.21%	20.76%	0.00137%	0.00016%	0.0964%	0.5920%	2.2889%

Table 2

Capital Structure for a Hypothetical CDO

	Class A	**Class B**	**Class C**	**Class D**
Upper Attachment	100.00%	18.50%	9.75%	8.25%
Lower Attachment	18.50%	9.75%	8.25%	4.50%

The results in *table 1* show very little difference on the expected losses across the three combinations of n and ρ for each of the CDO tranches. Consequently, ρ (hence ρ_{asset}) can be estimated from the equation (c) by simply setting n equal to a selected constant. In the case of a CDO transaction, the n is usually set equal to the expected number of actual assets in the collateral pool at the closing time. When the collateral pool changes after the closing, the current number of assets could differ from n, which is fixed at the expected number of assets. However, the estimated ρ_{asset}, will change accordingly to fully reflect the impact of the current portfolio diversification on the skewness of the loss distribution since the equation (c) is still satisfied under the new ρ_{asset} and the constant n .

APPENDIX II

Moody's Asset Correlation for Hypothetical Structured Finance Collateral Pools

1. The impact of Sector Concentration on Moody's Asset Correlation

To illustrate the impact of the pool diversification on the level of Moody's asset correlation, two hypothetical structured finance collateral pools with different sector concentrations are created. The percentage of the assets in the RMBS sector is 75% and 50% for pool 1 and pool 2 respectively. Each pool is assumed to have 100 assets with identical sizes. Both pools have the same rating distribution with a weighted average rating factor of 428. The assets are distributed among various structured finance sectors to achieve a sector concentration similar to those seen in the current structured finance CDO market. Other correlation-related collateral factors such as the key agent and the vintage are also chosen to be close to those seen in actual transactions. *Table 3* lists the statistics for these two pools.

Table 3

Two Structured Finance Pools with Different Sector Concentration

Pool 1

Sector	%	Key Agents[17]	Vintage[18]
RMBS Subprime	40%	15%, 15%, 10%	Single
RMBS Midprime	30%	15%, 15%	Single
RMBS Prime	5%	5%	Single
CMBS	15%	N/A	Single
ABS	5%	3%, 2%	Single
CDO	5%	5%	Single
Total	**100%**		

Pool 2

Sector	%	Key Agents	Vintage
RMBS Subprime	25%	15%, 10%	Single
RMBS Midprime	20%	15%, 5%	Single
RMBS Prime	5%	5%	Single
CMBS	30%	N/A	Single
ABS	5%	3%,2%	Single
CDO	15%	5%,5%,5%	Single
Total	**100%**		

Table 4 shows the difference on Moody's asset correlation between the two pools. As expected, pool 1, the more concentrated pool, has a Moody's asset correlation of 23.53%, higher than the 15.63% for pool 2. The minimum, maximum and average[19] underlying asset correlation among the actual assets, together with the diversity score of the pool are also listed in *table 4*. Similar as observed for Moody's asset correlation, the pool with higher sector concentration has a higher average asset correlation and lower diversity score. Also, as indicated in the table, Moody's asset correlation, calculated based on the moment matching scheme, is usually different from the arithmetic average of the underlying asset correlation.

Table 4

Impact of Sector Concentration on Moody's Asset Correlation

	Moody's Asset Correlation	Minimum Asset Correlation	Maximum Asset Correlation	Average Asset Correlation	Diversity Score
Pool 1	23.53%	1.00%	58.00%	14.15%	10.15
Pool 2	15.63%	1.00%	58.00%	10.87%	12.47

17 This column indicates the number of and the percentage concentration for key agents in each asset sector. For example, in the RMBS Subprime sector, there are three key agents, consisting of 15%, 15% and 10% of the total portfolio respectively.
18 All assets have the same closing date.
19 The minimum, maximum and average asset correlation are calculated based on the underlying asset correlation among each pair of actual assets in the CDOROM™.

2. Moody's Asset Correlation for Hypothetical High-Grade and Mezzanine Pools

Most of the collateral pools for CDO transactions are typically classified as a high-grade or a mezzanine pool based on the rating distribution of the assets. *Table 5* shows the asset characteristics for two hypothetical structured finance pools: one mimics a high-grade pool and the other is similar as a mezzanine pool. Moody's asset correlation for both pools are shown in *table 6*.

While this example shows the hypothetical high-grade pool has a slightly lower Moody's asset correlation than the mezzanine pool, it should be noted that this difference is driven by not only the rating distribution but also other relevant asset characteristics such as the sector distribution and underlying asset correlation, on which these two pools also differ. An actual high-grade pool may have a higher or lower Moody's asset correlation than an actual mezzanine pool, depending on all the relevant asset characteristics.

Table 5

Hypothetical High-Grade and Mezzanine Pools

Mezzanine Pool:		**428**	
Average Rating Factor:			
Sector	**%**	**Rating Distribution**	**%**
RMBS Subprime	40%	**A3**	15%
RMBS Midprime	30%	**Baa1**	25%
RMBS Prime	5%	**Baa2**	25%
CMBS	15%	**Baa3**	25%
ABS	5%	**Ba1**	10%
CDO	5%		
Total	**100%**	**Total**	**100%**
High-Grade Pool			
Average Rating Factor:		**32**	
Sector	**%**	**Rating Distribution**	**%**
RMBS Subprime	5%	**Aaa**	5%
RMBS Midprime	10%	**Aa1**	10%
RMBS Prime	35%	**Aa2**	35%
CMBS	30%	**Aa3**	35%
ABS	5%	**A1**	15%
CDO	15%		
Total	**100%**	**Total**	**100%**

Table 6

Moody's Asset Correlation for Hypothetic High-Grade and Mezzanine Pools

	Moody's Asset Correlation	**Minimum Asset Correlation**	**Maximum Asset Correlation**	**Average Asset Correlation**
High-Grade Pool	21.97%	1.00%	58.00%	10.87%
Mezzanine Pool	23.53%	1.00%	58.00%	14.53%

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