Moody's Approach to Rating U.S. Auto Loan-Backed Securities

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CONTENTS

- I. Introduction
- II. Overview of the U.S. Auto Loan ABS Sector
- III. Projecting Losses on the Securitized Auto Pool
- IV. Assessing the Potential Variability of the Auto Pool's Losses
- V. Determining the Bond Ratings
- VI. Conclusion

I. INTRODUCTION

Securities backed by U.S. auto loans are a major segment of the U.S. asset-backed securities (ABS) industry, accounting for roughly $89 billion of issuance in 2006. This segment of the market encompasses a broad range of securities, with widely varying asset credit quality, types of originators, and structural features. Moody's has been rating auto loan-backed securities since their inception more than 20 years ago. This article presents an updated overview of the approach that Moody's employs in rating the transactions, starting with an overview of the U.S. auto loan ABS sector in Section II.

Moody's rating approach is a probability-based, expected loss approach, which involves weighting the investor losses incurred in future scenarios by their probabilities and summing the weighted losses. One of the primary drivers of the potential outcomes for investors is the set of possible net asset write-offs that may be realized on the pool of auto loans. Section III describes how Moody's uses historical loan performance information to project those possible pool losses. The particular issues we explore in that section include: (1) some of the advantages of using historical performance data on loans originated at similar times - "static pool" data; (2) extrapolating incomplete historical data; (3) adjusting for the differing speeds with which pools pay down; (4) adjusting for differences between the characteristics of the historical pools and the pool being securitized; and (5) adjusting for the amount of time the loans have been outstanding before securitization - the "seasoning" of the pool.

The general expected loss approach typically relies on estimates of the expected value and variance of the pool losses to derive the full probability distribution of the pool losses. In Section IV, we describe some of the difficulties in estimating the pool loss variance and how Moody's bypasses a direct estimate of the variance, substituting a benchmarked "Volatility Proxy **Aaa** Level" in inferring the variability of the distribution and establishing the overall probability distribution. In that section we also discuss some of the factors that affect variability, including servicing quality; concentrations within the pool; the quality, quantity and relevance of data; and prefunding and revolving structures in which some of the loans may not be identified at the start of the transaction.

In Section V, we describe how the expected pool loss and the Volatility Proxy **Aaa** Level are combined to obtain the pool's specific probability distribution, and how that distribution is used to determine the ratings on the individual transaction tranches. We illustrate the approach by demonstrating the inputs and outputs for a stylized transaction in one of Moody's spreadsheet-based rating models. As part of the illustration, we show some of the adjustments to the model's output that we make to account for special factors, such as potential reductions in the loan pool's average interest rate, rapid loan paydowns, and credit enhancement "leakages" that can reduce its potential to act as credit enhancement against future losses.

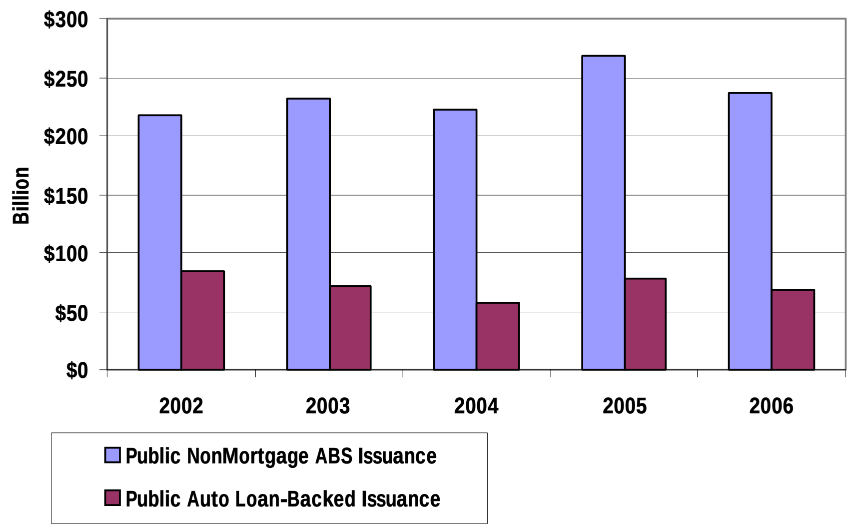
We conclude in Section VI with the acknowledgement that this article seeks to present the critical aspects of Moody's quantitative framework for rating U.S. auto loan-backed securities and that additional pieces will be published to discuss other quantitative and qualitative considerations in Moody's rating of these transactions. In addition, potential changes to the methodology that are under consideration will be discussed in one or more follow-on pieces, the first of which will be published as a call for comment later in 2007.

II. OVERVIEW OF THE U.S. AUTO LOAN ABS SECTOR[1]

The level of issuance in the U.S. of public securities backed by auto loans has remained relatively stable over the past five years (see *Figure 1*). Approximately $68 billion of public securities backed by auto loans were issued in 2006, roughly 29% of total public nonmortgage ABS issuance. An additional $21 billion of private[2] securities backed by auto loans was also issued in 2006.

Figure 1

Public NonMortgage and Auto Loan-Backed Issuance



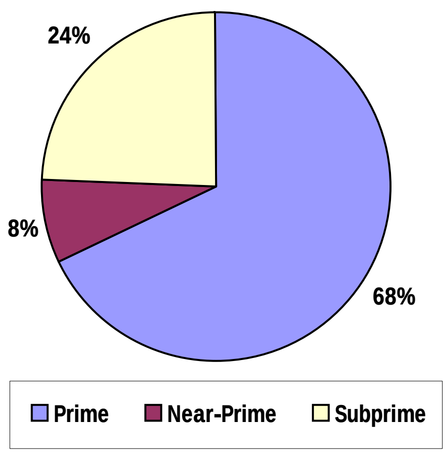
Moody's classifies U.S. auto loan issuance into prime, near-prime, and subprime categories based primarily on the cumulative net losses expected over the life of the underlying pool of loans. Prime loans generally have less than 3% cumulative net losses on a static pool basis and consist of high-quality, low-risk obligors. Near-prime pools have expected cumulative net losses between 3% and 7%. Pools with cumulative net losses greater than 7% are classified in the subprime category. Sometimes referred to as the "C and D" sector, subprime loans have been originated to high-risk obligors, including those with thin or poor credit histories.

1 For more detail on trends in issuance and performance, see Moody's Special Comments, "2006 Review and 2007 Outlook: Vehicle-Backed Securities -- Continued Strength Amid Crosscurrents," January 19, 2007 and "2006 Review and 2007 Outlook: Subprime and Near-Prime Auto Credits -- Big Wheels Keep On Turning," January 19, 2007.

2 The term 'private' refers to transactions that were rated by Moody's which were not SEC-registered, i.e., were 144A transactions or other private offerings. Moody's has no reliable method to track unregistered offerings which are not rated by Moody's.

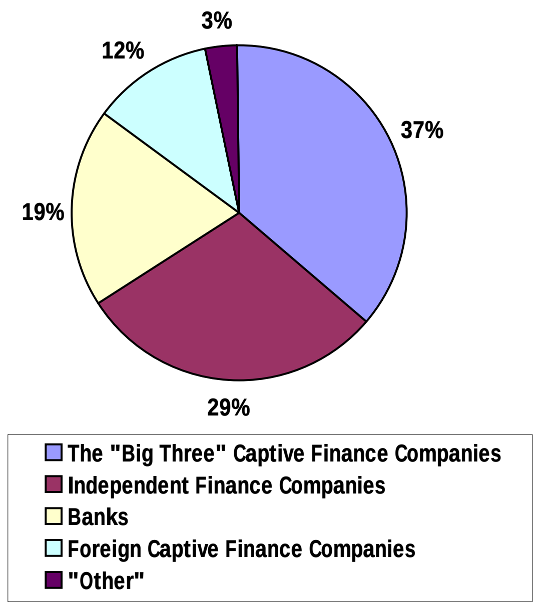
Looking at public and private issuance combined, the prime sector makes up the largest proportion of auto loan-backed securities. It accounted for $61 billion or 68% of public and private issuance across the three credit categories for 2006. Subprime is the second largest sector and near-prime is third having approximately $22 billion (24%) and $7 billlion (8%) of Moody's public and privately rated deals in 2006, respectively. Prime auto-loan backed securitizations are typically senior-subordinated structures while near-prime and subprime transactions have more often been wrapped by highly rated financial guarantors.

Figure 2
2006 Issuance By Credit Quality



Moody's groups sponsors of auto loan securitizations into several major categories: The "Big Three[3]" captive finance companies, foreign captive[4] finance companies, banks, independent finance companies and "other[5]." The Big Three captives were the largest category or sponsor, accounting for 37% of the 2006 issuance rated by Moody's, while the second largest category were the independent finance companies at 29% (see *Figure 3*). In 2006, as in prior years, prime issuance was dominated by the Big Three, foreign captives, and banks, while subprime issuance was dominated by independent finance companies.

Figure 3
Auto Loan-Backed Securities Issuance By Sponsor Type, 2006



3 DaimlerChrysler Financial Services Americas LLC, Ford Motor Credit Company, and GMAC LLC.
4 Captive finance companies of non-U.S. manufacturers
5 Sponsors who purchased their auto loan assets in "whole loan sale" transactions.

III. PROJECTING LOSSES ON THE SECURITIZED AUTO POOL

In rating an auto ABS transaction, Moody's analyzes historical data on groups of loans from the originator (and/or other similar originators) to establish the loss expectation for the transaction's underlying pool of assets. This "actuarial" approach[6,7,8] is similar to that taken with most major ABS asset classes. Ideally, the sponsor of the transaction would present a substantial time series of historical data relating to similar receivables originated by that originator and serviced by the same servicer.

The major task in implementing the actuarial approach is to estimate the range of possible losses and corresponding probabilities of these events - in effect, to infer a probability density function for future losses for the pool. To shed light on the distribution generating portfolio losses, an expected loss is estimated, which serves as a measure of the central tendency of the losses on the assets. In addition to central tendency, an understanding of asset variability is necessary.

Static Pool Analysis - Introduction

Sponsors of auto loan securitizations usually provide two types of data to Moody's for analysis. *Portfolio loss data* typically tracks the losses that occur in each period as a percentage of that period's loan balance of the sponsor's overall portfolio, whose composition is changing over time. *Static pool data*, on the other hand, shows the ratio of cumulative losses to original loan balance for a static pool of assets that was originated over a relatively short time period, or vintage[9]. Static pool data, since it is derived from following a fixed pool of loans over their lives, is more directly applicable to projecting the potential losses for a new pool of assets over its life. In cases where there is insufficient static pool data and hence where Moody's needs to rely on portfolio loss information to project losses for the securitized pool, adjustments and assumptions need to be added to the analysis to account for factors such as: (1) growth in the portfolio[10], (2) a mixture of credit quality in the overall portfolio resulting from changes in underwriting standards over time, and (3) mismatches between the timing of defaults and recoveries. In addition, portfolio loss data, by its nature, does not provide direct information on the timing of losses and on the variability of cumulative losses. Each of these factors can make portfolio loss numbers difficult to interpret, adding uncertainty to the analysis, and therefore increasing the risk of the transaction (everything else being equal).

The projection of the expected loss for the auto pool is typically based upon the static pool analysis of the following two performance measures[11]:

- Cumulative Net Loss (CNL)
- Cumulative Net Loss-to-Liquidation (CNLTL)

6 For more detail on general ratings approaches, see Moody's Special Comments, "Introduction to Moody's Analysis of Securitization Transactions and Structures," April 2, 1993 and "The "C" Tranches of Credit Card-Backed Securities: Credit Risks for Investors Vary," November 11, 1994.

7 The actuarial approach rather than the loan-by-loan approach is generally used to evaluate auto ABS securitizations. The actuarial approach is based on an analysis of historical data from the originator regarding the credit performance of similar receivables rather than on the credit strength of the individual loan obligors. The focus of this approach is on the default or loss rate of the overall pool (or large subcomponents of the pool). Data regarding credit performance of the historical originations by the sponsor are analyzed and an expected loss for the underlying pool of auto loans is established along with an estimate of the degree of variability of loss. Ideal conditions for implementing the actuarial approach are: (1) a large pool with no significant borrower concentrations (i.e., a "granular" pool) and (2) abundant data regarding historical credit performance of pools that have characteristics similar to the proposed pool. A granular pool ensures that default of any given credit will not have a material detrimental impact on the overall pool; therefore, determining the credit quality of each individual credit is less important. Abundant historical performance data of pools with similar characteristics provides a strong basis for the estimation of the expected loss and variability of the securitized pool throughout various business conditions. Typical securitized auto pools are very granular with pool balances of at least $100 million and average loan balances of around $20,000 (0.02% of the overall pool).
For more background on the actuarial rating approach, see Moody's Special Comment, "Moody's Approach to Rating Securities Backed by Equipment Leases and Loans," April 2, 2007.

8 The use of a meaningful loan-by-loan approach has been precluded for the auto loan asset class to date because sufficiently robust loan-by-loan performance data has not yet been provided by any originator/sponsor as an input to the rating process. The provision of such data can have a beneficial impact on credit enhancement levels for a given rating as outlined in Section IV under the heading "Factors Driving the Volatility Proxy **Aaa** Level -- Historical Performance Data: Quantity, Quality, and Relevance".

9 For repeat issuers, Moody's also performs static pool analysis based on prior securitized pools.

10 In order to understand how the "true" loss rate can be masked by the growth in a portfolio, consider the following example:
If a portfolio grows from $2 billion to $3 billion from month zero to month six, and if the portfolio experiences $5 million in net losses in month six, then the typically calculated net loss rate in month six would be 2% per annum ($5 million x 12 / $3 billion). However, if the servicer charges-off loans after six months, then none of the loans originated between month zero and month six could be subject to loss at month six -- instead, only the $2 billion balance at month zero could be subject to loss at month six, and this can be thought of as the true "balance-at-risk". Therefore a better measure of the "true" portfolio loss rate would be to divide the monthly losses by the balance-at-risk, yielding an adjusted loss rate in month six of 3% per annum ($5 million x 12 / $2 billion).

11 Other measures such as cumulative gross loss (CGL), cumulative gross loss-to-liquidations (CGLTL), recovery rate, prepayment rate, and various delinquency rates may also be analyzed on a static pool basis to the extent the data is made available.

Static Pool Analysis - Cumulative Net Loss (CNL) Analysis

In theory, static pool information gives us a set of cumulative losses on historical pools of loans comparable to the pool being securitized, so that we can derive estimates of the expected loss on the pool and its variability. In practice, however, the static pool data usually is somewhat fragmentary and not completely comparable to the securitized pool. For example, only some, if any, of an originator's prior static pools may have gone through their entire life cycle, so that we need a technique to reasonably project the final cumulative losses that we would expect on those "incomplete" pools. In the remainder of this section, we describe the way in which Moody's develops a loss timing curve using a "delta" loss technique to project an expected loss from static pools with incomplete data. In subsequent sections, we describe other techniques to adjust for differences in principal repayment speeds, seasoning, and credit characteristics.

The starting point in projecting losses based on the static pool cumulative net loss data is creating a loss timing curve for the originator. The loss timing curve provides the percentage of the overall lifetime losses likely to be incurred by the receivables at various intervals of the pool's life.[12] The loss timing curve can then be used to extrapolate the cumulative losses on a static pool of receivables from its current level to the expected level at maturity.

The "delta" net loss curve method is one approach Moody's employs to construct the CNL timing curve. This method analyzes the incremental ("delta") net losses experienced by the vintages from period to period, as illustrated in *Figures 4* through *7*. The first step is to calculate the average incremental losses across vintages for each period (see "Avg Delta Loss" column in *Figure 4*).[13] For example, the average incremental loss experienced across all vintages in the example illustrated in *Figure 4* during the first three months after origination is 0.03% and the incremental loss incurred between the third and sixth months after origination, 0.17%. (The delta losses shown in the bottom panel of *Figure 4* are based on the levels of the loss rates in each period, shown in the top panel.)

Figure 4

Delta Net Loss Timing Curve Method - Calculating Average and Cumulative Delta Loss

OrigBal	$597m	$363m	$455m	$489m	$626m	$889m	$972m
CurrPF	31%	36%	44%	50%	55%	64%	74%
Wac	6.65	6.77	6.83	6.87	6.80	6.87	6.77
Wam	54	56	56	56	57	57	59
Month							
3	0.01	0.03	0.03	0.03	0.04	0.03	0.02
6	0.16	0.15	0.21	0.25	0.21	0.22	0.19
9	0.27	0.34	0.36	0.37	0.44	0.45	0.43
12	0.43	0.50	0.46	0.50	0.63	0.65	0.61
15	0.55	0.60	0.58	0.64	0.83	0.77	
18	0.67	0.74	0.75	0.82	0.98		
21	0.75	0.87	0.89	0.94			
24	0.83	1.01	1.00				
27	0.95	1.07					
30	1.07						
33							
36							

Month								AVG DELTA LOSS	CUM DELTA LOSS
3	0.01	0.03	0.03	0.03	0.04	0.03	0.02	0.03	0.03
6	0.15	0.12	0.18	0.22	0.17	0.19	0.18	0.17	0.20
9	0.11	0.19	0.15	0.12	0.23	0.23	0.24	0.18	0.38
12	0.16	0.16	0.11	0.14	0.18	0.20	0.18	0.16	0.54
15	0.13	0.10	0.12	0.13	0.21	0.13		0.14	0.68
18	0.12	0.13	0.16	0.18	0.15			0.15	0.83
21	0.08	0.14	0.14	0.12				0.12	0.95
24	0.08	0.14	0.11					0.11	1.06
27	0.12	0.06						0.09	1.15
30	0.11							0.11	1.26
33									

Delta calculation: 0.27 minus 0.16 = 0.11

Average calculation: Average of month 3 = 0.03

Cumulative calculation: 0.03 plus 0.17 = 0.20

12 Although loss timing curves can vary from pool to pool, they are generally more stable across pools than is the absolute levels of losses, However, despite that relative stability, the loss timing curve that is used for making projections needs to be adjusted to account for any changes in underwriting, servicing/collections, and economic conditions that may make the timing of future losses different from the historical loss timing curve.

13 Alternatively, one could use the average of the absolute level of losses. However, the timing of the incremental losses tends to be more stable than the absolute levels and is thus preferable for projection purposes.

Next, the cumulative average "delta" loss is calculated. (In this example, the cumulative "delta" net loss after six months is 0.20%.)

Figure 5

Delta Net Loss Timing Curve Method - Projecting the Anchor

OrigBal	$597m	$363m	$455m	$489m	$626m	$889m	$972m			
CurrPF	31%	36%	44%	50%	55%	64%	74%			
Wac	6.65	6.77	6.83	6.87	6.80	6.87	6.77	AVG	CUM	6MO
Wam	54	56	56	56	57	57	59	DELTA	DELTA	DELTA
Month								LOSS	LOSS	LOSS
3	0.01	0.03	0.03	0.03	0.04	0.03	0.02	0.03	0.03	
6	0.15	0.12	0.18	0.22	0.17	0.19	0.18	0.17	0.20	0.20
9	0.11	0.19	0.15	0.12	0.23	0.23	0.24	0.18	0.38	
12	0.16	0.16	0.11	0.14	0.18	0.20	0.18	0.16	0.54	0.34
15	0.13	0.10	0.12	0.13	0.21	0.13		0.14	0.68	
18	0.12	0.13	0.16	0.18	0.15			0.15	0.83	0.29
21	0.08	0.14	0.14	0.12				0.12	0.95	
24	0.08	0.14	0.11					0.11	1.06	0.23
27	0.12	0.06						0.09	1.15	
30	0.11							0.11	1.26	0.20
33										
36								30-36 PROJECTION		0.16
42								36-42 PROJECTION		0.11
48								42-48 PROJECTION		0.06
54								48-54 PROJECTION		0.01
60								54-60 PROJECTION		0.00
									ANCHOR 1.60	

Anchor calculation: 1.26 + 0.16 + 0.11 + 0.06 + 0.01 + 0.00 = 1.60

In this example the static pool performance history encompasses 30 months of data for the oldest vintage, which has paid down to a pool factor of 31%. Given that the pools in the example have weighted average maturities (WAMs) of close to 60 months at inception and are not fully paid-down, there are more losses to be incurred in these static pools over their remaining life. Therefore, the next task is to determine the "anchor" or terminal value of the cumulative delta loss curve. There are various methods for forecasting the anchor value, and one such method is illustrated in *Figure 5*. In this case the trend line of six-month deltas[14] is analyzed[15] to determine the projected six-month deltas over the remaining life. Those projections are added to the life-to-date losses in order to determine the anchor or terminal loss. In the *Figure 5* example, the five remaining projected six-month deltas (0.16%, 0.11%,0.06%, 0.01%, and 0.00%, respectively for months 30-36, 36-42, 42-48, 48-54, and 48-60) are added to the life-to-date losses at month 30 (1.26%) to give an anchor value of 1.60%.

14 Six-month deltas are the incremental losses incurred in each consecutive six-month period, namely months 0-6, months 6-12 and so on.
15 The remaining six-month deltas could be determined through quantitative techniques, or, as in this example, on a qualitative basis.

Figure 6

Delta Net Loss Timing Curve Method - Projecting the Cumulative Net Loss

OrigBal	$597m	$363m	$455m	$489m	$626m	$889m	$972m	AVG DELTA LOSS	CUM DELTA LOSS	DELTA LOSS %
CurrPF	31%	36%	44%	50%	55%	64%	74%			
Wac	6.65	6.77	6.83	6.87	6.80	6.87	6.77			
Wam	54	56	56	56	57	57	59			
Month										
3	0.01	0.03	0.03	0.03	0.04	0.03	0.02	0.03	0.03	2%
6	0.16	0.15	0.21	0.25	0.21	0.22	0.19	0.17	0.20	12%
9	0.27	0.34	0.36	0.37	0.44	0.45	0.43	0.18	0.38	24%
12	0.43	0.50	0.46	0.50	0.63	0.65	0.61	0.16	0.54	34%
15	0.55	0.60	0.58	0.64	0.83	0.77		0.14	0.68	42%
18	0.67	0.74	0.75	0.82	0.98			0.15	0.83	52%
21	0.75	0.87	0.89	0.94				0.12	0.95	59%
24	0.83	1.01	1.00					0.11	1.06	66%
27	0.95	1.07						0.09	1.15	72%
30	1.07							0.11	1.26	79%
33										
36										
42										
48										
54										
60										
Projection:	1.35	1.50	1.52	1.60	1.90	1.83	1.81			

ANCHOR	Average		StDev
1.60	1.64	All	0.21
	1.85	Last 3	

Loss curve calculation: 1.26 / 1.60 = 79%

Loss projection: 1.07 / 79% = 1.35

As seen in *Figure* 6, the average loss timing curve can be created by dividing the average cumulative "delta" net losses in each period by the anchor amount. This is shown in the last column of *Figure 6*. For example, according to this loss timing curve, these static pools on average are expected to experience 79% (1.26 divided by 1.60) of their net losses in the first 30 months after origination. The loss timing curve can then be used to project the cumulative loss for each of the vintages by dividing the life-to-date loss for any vintage by the corresponding value of the loss timing curve. For example, the oldest vintage has a cumulative loss projection of 1.35% (1.07% divided by 79%).

In some cases where lengthy static pool information for a particular originator is unavailable, information on the loss timing curves based on more complete information from other, comparable, lenders can be incorporated to project the life-time cumulative losses of the originator's static pools. For example, in *Figure 7* we have substituted the loss timing curve from a peer group of comparable sponsors. The comparable sponsors are selected based on those that have similar collection and chargeoff policies as well as similar pool characteristics.[16] In the example presented in *Figure 7*, the value of the loss timing curve at month 30 is 75% instead of the 79% shown in *Figure 6*, which had been based on assumed projected six-month deltas used to complete the fragmentary data provided by the originator.

16 One such characteristic is the weighted average maturity (WAM) of the pool, which is an important determinant of shape of the loss timing curve. See Moody's Special Comment, "Loss Curves in Automobile ABS: How are they Shaping Up?", January 12, 2001.

Figure 7

Delta Net Loss Timing Curve Method - Alternative Method for Determining Anchor

OrigBal	$597m	$363m	$455m	$489m	$626m	$889m	$972m			
CurrPF	31%	36%	44%	50%	55%	64%	74%			
Wac	6.65	6.77	6.83	6.87	6.80	6.87	6.77	AVG	CUM	DELTA
Wam	54	56	56	56	57	57	59	DELTA	DELTA	LOSS
Month								LOSS	LOSS	%
3	0.01	0.03	0.03	0.03	0.04	0.03	0.02	0.03	0.03	2%
6	0.16	0.15	0.21	0.25	0.21	0.22	0.19	0.17	0.20	12%
9	0.27	0.34	0.36	0.37	0.44	0.45	0.43	0.18	0.38	23%
12	0.43	0.50	0.46	0.50	0.63	0.65	0.61	0.16	0.54	32%
15	0.55	0.60	0.58	0.64	0.83	0.77		0.14	0.68	40%
18	0.67	0.74	0.75	0.82	0.98			0.15	0.83	49%
21	0.75	0.87	0.89	0.94				0.12	0.95	56%
24	0.83	1.01	1.00					0.11	1.06	63%
27	0.95	1.07						0.09	1.15	68%
30	1.07							0.11	1.26	75%
33										
36										
42										
48										
54										
60										
Projection:	1.42	1.57	1.59	1.68	1.99	1.93	1.90		ANCHOR 1.68	

Anchor choice: 1.26 / 75% = 1.68

Static Pool Analysis - Cumulative Net Loss-to-Liquidation Analysis

One potential shortcoming in using cumulative losses as a percentage of original pool balance as the basis for projecting losses over the life of a security - as we did, for example, in *Figures 4-7* - is that it does not adjust for the speed with which the pool has been repaid to date. For example, two pools with identical original pool balances and cumulative loss rates to date (as a percentage of the original balance) may have very different future loss "content" if they have different remaining balances. For a pool that has been repaid relatively quickly (through all forms of liquidation -- amortization, prepayments, and losses), there may be relatively few loans remaining that can default; therefore, its projected cumulative loss rate over the life of the pool (as a percentage of the original balance) might be expected to be lower than another pool that has had the same cumulative losses, but less liquidations to date. To fine-tune its projection of lifetime cumulative losses for a vintage that has not yet gone through its entire life-cycle, Moody's supplements its analysis of the cumulative loss rate with an analysis of the ratio of cumulative losses to cumulative liquidations. Thus, in addition to looking at a pool's cumulative loss rate,

Cumulative net loss (CNL) (%) = Cumulative net loss ($) ÷ Original pool balance ($),

Moody's also analyzes the cumulative loss-to-liquidation rate,

Cumulative net loss-to-liquidation (CNLTL) (%) = Cumulative net loss ($) ÷ (Original pool balance ($) - Current pool balance ($))

Generally, the results of a cumulative net loss analysis and a cumulative net loss-to-liquidation analysis are expected to be similar. To the extent there is a divergence, Moody's may place more weight on the CNLTL analysis, given the increased forecast accuracy of that approach[17].

17 For more information on the merits of CNLTL analysis, see Moody's Special Comment," Use of Loss-to-Liquidation Analysis in Assessing Loss Performance of Auto Loan Securitizations," March 23, 2005.

Static Pool Analysis - Adjusting for the Characteristics of the Securitized Pool

As discussed above, static pool analysis can be performed on any number of performance variables -- CNL and CNLTL being prime examples -- in order to forecast the expected credit loss performance of the various vintages or static pools that have been presented for analysis. However, in order to conclude the static pool analysis, the loss projections for the various vintages needs to be synthesized into a single loss projection for the pool to be securitized.

If the various vintages that have been analyzed have similar credit characteristics to the securitized pool and if the time period of analysis encompasses an economic environment (e.g., unemployment rate, bankruptcy filings, used car prices, gas prices, etc.) that is generally consistent with the expected environment during the life of the securitized pool, then the loss projection for the securitized pool can be derived as the average of the projection for the various analyzed vintages.

If only some of the analyzed vintages have similar credit characteristics to the securitized pool then the loss projection for the securitized pool can be derived as the average of the projection for those representative vintages. Revisiting the example in Figure 6, it may be the case that the relatively weak performance of the three most recently originated vintages was driven by changes in the originator's underwriting standards that also are likely to impact the performance of the securitized pool. In that case, the projected loss of the securitized pool might be derived as the average of the three representative vintages, i.e. 1.85% = (1.90% + 1.83% + 1.81%) divided by 3.

The impact of differences in credit characteristics among the analyzed vintages and the securitized pool can be addressed more accurately in situations where static pool information is provided on vintages that are subdivided into buckets based on the most pertinent credit characteristics. For example, an originator may have tracked the performance of vintages broken down by FICO bucket, and for each of those FICO buckets, by loan-to-value. Therefore, if there were, say, five FICO buckets and four loan-to-value (LTV) buckets, there would be 20 total vintage-buckets for which historical vintage performance data would be provided. If such vintage-bucket performance were provided, then Moody's analysis would project the loss of the securitized pool based on the performance of the disaggregated buckets weighted by the bucket-mix of the securitized pool. We refer to the re-weighting of disaggregated performance data based on the bucket-mix of the securitized pool as a "Mix Neutral Analysis,[18]" as the impact of mix changes over time are neutralized by holding the mix constant in the analysis.

Seasoning Adjustment

Another set of adjustments to the use of historical performance data from vintage pools should be considered when analyzing new securitizations backed by "seasoned" pools of loans[19]. That is because vintage static pool performance is generally presented from the origination of the vintage, while the loss projection for the securitized pool is concerned with the expected performance only during the life of the securitization, which excludes those losses on a new pool that would normally occur while the loans "seasoned" prior to the securitization closing. Often the impact of seasoning can be taken into account by analyzing the performance of prior securitizations that have similar pool characteristics and similar seasoning to those of the securitized pool being analyzed. However if there is an insufficient number of such representative securitized pools to rely upon, Moody's loss projection for the securitized pool would be based on the analysis of the performance of the unseasoned vintages with certain adjustments made for the impact of seasoning[20].

The need for adjustment arises principally from the need to account for (1) the amount of amortization that has occurred on seasoned pools, (2) the typical exclusion of certain delinquent loans in the securitization of seasoned pools and (3) the effects of lags in recoveries on defaulted loans.

For relatively unseasoned securitization pools, each of the effects will be relatively small so that the net effect is expected to be negligible. Therefore, for pools with less than 12 months seasoning, Moody's generally makes no change to the "unseasoned" expected loss derived from vintage performance, unless sufficient data is available to make a more refined adjustment.

18 For a more detailed explanation of Mix Neutral Analysis, see Moody's Special Comment, "U.S. Auto-Backed Securities: Moody's Approach to Using Stratified Data to Improve the Precision of Loss Analysis in Auto Loan Securitizations (Mix-Neutral Analysis)", May 8, 2007.

19 Moody's typically considers a pool to be "seasoned" if the weighted average age of the pool since origination is at least twelve months. By this measure, most U.S auto loan securitizations are backed by "unseasoned" pools.

20 For a more detailed explanation of the adjustments for seasoning, see Moody's Special Comment, "Adjusting for the Seasoning of Pools in Projecting Auto Loan Losses", March 5, 2007.

For more seasoned securitization pools, the net effect of seasoning is generally expected to lead to a lower CNL rate compared to the rate for a comparable unseasoned pool. However in some instances, particularly for superprime and some prime pools where the benefit of delinquency exclusion is minimized - because there are very few delinquent loans to be excluded - the CNL rate for a seasoned pool may actually be higher than the rate for a comparable unseasoned pool. The actual adjustment or credit for seasoning given, if any, for such seasoned securitization pools is dependent on the quality of the data provided that allows the interplay of the various factors to be analyzed.

IV. ASSESSING THE POTENTIAL VARIABILITY OF THE AUTO POOL'S LOSSES

After the expected cumulative net loss of the pool is estimated, Moody's evaluates the variability of that loss estimate. For the example shown in *Figure 6*, the standard deviation of the projected losses is 0.21%. However, the use of that standard deviation may be misleading if it is based on performance data that does not run through several business cycles and, as a result, does not reflect the true volatility of credit performance over a long-term horizon.

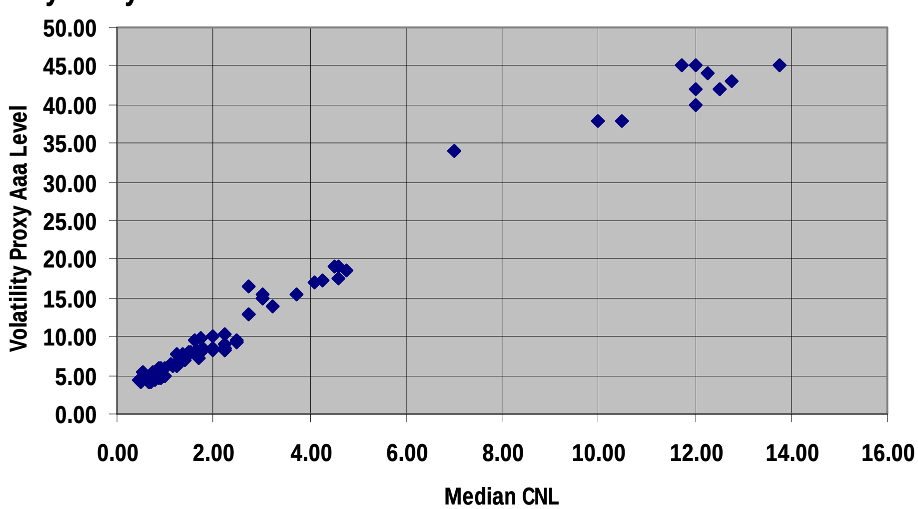
Generally, originators provide no more than ten years of performance data, which is a time span too short to be representative of all future loss possibilities. As the ratings are forward looking, Moody's believes that the variability of loss should contemplate more stressful environments than those experienced generally over the past ten years, including severe recessions, industry turmoil, and servicer instability. Therefore, we typically adjust the observed variability of loss to consider these potential events.

One approach to determining the variability of the loss estimate is to take the historical standard deviation and to multiply it by a stress factor to account for the more stressful environments that are missing from the historical data. The level of the stress factor would need to be determined on a qualitative basis due to the absence of data from which to make a quantitative determination.

An alternative approach, and the one currently employed by Moody's in its rating of U.S. auto loan ABS transactions, is to determine the variability of the loss estimate indirectly. In this approach, the judgment of a rating committee is used to assess the level of credit enhancement that would be consistent with a **Aaa** rating for the given asset pool, thereby expressing a view on the variability of loss of the asset pool. The rating committee assessment, hereafter referred to as the "Volatility Proxy **Aaa** Level[21]", can then be utilized to infer the standard deviation of the loss distribution as described later[22]. The relationship between Moody's committeed median cumulative net loss (CNL) and the Volatility Proxy **Aaa** Level for U.S. auto loan transactions closed in 2005 and 2006 is shown in *Figure 8*. For a given median CNL, the higher the Volatility Proxy **Aaa** Level, the higher is the implicit standard deviation of the loss distribution.

Figure 8

Relationship Between Moody's Committeed Median Cumulative Net Loss (CNL) and Volatility Proxy Aaa Level for U.S. Auto Loan Transactions Closed in 2005 and 2006



21 In transactions where the rating of the senior class is not **Aaa** based on asset performance (e.g. monoline insured deals where the shadow rating on the senior class is typically in the **Baa** category), the volatility proxy enhancement level for the desired rating of the senior class is assessed by a rating committee in a similar fashion.

22 See Section V: Determining the Bond Ratings -- Translating the Expected Loss and Volatility Proxy **Aaa** Level into a Lognormal Distribution of Pool Losses.

Factors Driving the Volatility Proxy Aaa Level

The Moody's Volatility Proxy **Aaa** Level for a given auto loan asset pool is driven by a number of factors. The important drivers are discussed below:

1) The Expected Level of Losses

Generally, the higher the level of losses expected on the pool, the higher the credit enhancement necessary to be consistent with a particular rating.

2) Historical Performance Data: Quantity, Quality, and Relevance

All else being equal, the higher the historical volatility of CNL experience, the higher is the Volatility Proxy **Aaa** Level; however, the specific relationship is dependent on the quantity, quality, and relevance of the data.

The longer the time period covered by the historical performance data, the more relevant is the historical volatility in determining the Volatility Proxy **Aaa** Level. However, a large quantity of performance data is not too helpful unless the data is also of a sufficient quality and relevance.

The quality of the data can be thought of in terms of the type of data provided. As discussed earlier, static pool data generally contains more applicable information than data from a dynamically changing portfolio, and stratifying the static pool data can provide the means to an even closer match to the securitized pool. Furthermore, additional data on variables such as gross losses, recoveries, delinquencies, and pool factors, can provide for a more robust analysis, reducing the volatility associated with the data. Ultimately, the strongest quality of data would be when the credit performance and characteristics of historical loan originations is provided on a loan-by-loan basis[23], allowing the net loss performance of a new asset pool to be forecasted based on the characteristics of the loans in the pool via quantitative modeling techniques.

The relevance of the data is dependent on whether the factors that drove the historical performance are representative of the factors that are expected to drive the performance of the asset pool being securitized. One consideration is whether the historical performance reflects the impact of an economic environment that is representative of the environment that the securitized asset pool is expected to experience or whether it is biased by either a benign or a stressful economic environment. Another consideration is whether the underwriting, servicing, and collection policies and practices that led to the historical performance are consistent with those that would apply to the securitized asset pool.

3) Servicer Quality[24]

The ability of the servicer to collect on the loans, mitigate losses, and maximize recoveries has a direct impact on the loss performance of a pool; consequently, all else being equal, an asset pool serviced by a servicer of stronger quality should have a lower expected loss and Volatility Proxy **Aaa** Level than a similar pool serviced by a servicer of weaker quality. The degree of impact of the servicer quality is dependent on the credit quality of the asset pool: high-credit-quality (e.g., "super prime") pools require less collection efforts and hence the servicer's quality is less important for those pools than for low-credit-quality (e.g., subprime) pools that require more intense collection efforts.

The stability of the servicer, both from a financial strength and operational perspective, is important because ultimately the quality of a servicer can be hampered when its stability is impaired. Typically historical performance data may not reflect the impact of any periods during which the servicer's stability - and hence its quality -- was impaired by financial stress. Moody's ratings analysis considers the possibility that such financial stress may occur during the life of the rated securities with the likelihood of such an occurrence being linked to the financial strength of the servicer. As a result, for pools of comparable expected loss, all else being equal, one serviced by a higher quality servicer should have a lower Volatility Proxy **Aaa** Level than one serviced by a lower quality servicer.

23 As noted earlier, the provision of such data can have a beneficial impact on credit enhancement levels for a given rating.
24 For information on Moody's servicer quality rating scale and related research, see Moody's Special Comment, "Updated Moody's Servicer Quality Rating Scale and Definitions," May 10, 2005.

In addition, if a servicing transfer is necessitated during a period of servicer financial stress then the servicer's operational structure, such as a centralized versus decentralized structure, can affect the degree to which a dislocation in the servicing operations impacts the pool's loss performance. Historical experience with servicing dislocations has shown that performance deterioration can be greater when the dislocation occurs with a decentralized operation[25]. Considering that risk, all else being equal, the Volatility Proxy **Aaa** Level should be higher when the asset pool is serviced by a lower quality servicer whose servicing operations are decentralized than by one whose operations are centralized.

4) Pool Characteristics: Concentrations and Quality of Information

If the asset pool is geographically concentrated in a few states or zip codes, then it could be more prone to the impact of regional economic shocks. Similarly, if the vehicles securing the loans are concentrated in a single manufacturer or in a few models or vehicle types (e.g. SUVs) then the pool performance could be affected by more volatile recovery values. Other concentrations such as a concentration of originations from a few dealerships or a concentration of the obligors' employers or employment types can also lead to an increased volatility in performance. Therefore, concentrations such as those discussed above can contribute to an increased Volatility Proxy **Aaa** Level.

In addition to concentrations, the availability of critical information relating to the credit characteristics of the pool is another important driver of the Volatility Proxy **Aaa** Level. The critical credit characteristics include those relating to the obligors' creditworthiness (e.g. FICO score), their capacity to repay (e.g. payment-to-income ratio), and key loan characteristics (e.g. loan-to-value ratio, loan term, whether the underlying vehicle is new or used, etc.). All else being equal, the availability of such information for the historical static pools and for the securitized asset pool can help reduce the potential variability around the loss estimate for the securitized pool and can therefore lead to a lower Volatility Proxy **Aaa** Level.

5) Structural Features: Prefunding and Revolving Periods[26]

The potential for pool composition to change due to the addition of receivables during a prefunding or revolving period can add uncertainty to the loss estimate of a securitized pool and hence can lead to a higher Volatility Proxy **Aaa** Level than for a similar transaction with no such features. The increase in the Volatility Proxy **Aaa** Level resulting from such features can be mitigated for originators who show a long track record of consistent originations and where there is a representation that there will be "no adverse selection[27]" employed in selecting the additional receivables to be added to the trust. In addition, the risk could also be mitigated through a requirement for third-party approval of additions (e.g. by the bond insurer in monoline-wrapped deals) or through stringent criteria placed on the characteristics of the additional receivables in the binding transaction documents.

V. DETERMINING THE BOND RATINGS

Using an Expected Loss Framework[28]: Probabilistic Approach with a Lognormal Distribution[29]

Once the expected loss and Volatility Proxy **Aaa** Level for a securitized auto loan asset pool have been established through a rating committee process, Moody's employs an expected loss framework to evaluate the related bond ratings, using a lognormal probability distribution for the asset pool's cumulative net loss. Within that framework, the rating on the security is assigned based on a table that shows the relationship between a bond's probability-weighted expected loss and a Moody's rating.

25 For more information, see "1998 Year in Review and 1999 Outlook: Subprime and Near-Prime Auto Credits: Travelers' Advisory: Wrecks Pile Up But Clearer Roads Ahead," January 22, 1999.

26 Prefunding and revolving periods both allow for additional receivables to be added to the trust after the closing date: in a "prefunded" transaction, some of the proceeds from the closing of the transaction are set aside in a prefunding account to be used to purchase additional receivables during the prefunding period; in a "revolving" deal, principal collections from the loans can be used to purchase additional receivables during the revolving period.

27 Loans that meet certain basic eligibility criteria are typically selected at random from an aggregate portfolio for consideration to be included in a securitized transaction.

28 See Moody's Special Comments, "Subordination, Diversification, and the Expected Loss Approach to Credit Risk", February 1,1997, and "Rating Mezzanine Securities in Structured Finance Transactions: The Impact of an Expected Value Approach", February 25,1999.

29 See Moody's Special Comment, "The Lognormal Method Applied to ABS Analysis", July 27, 2000.

Translating the Expected Loss and Volatility Proxy Aaa Level into a Lognormal Distribution of Pool Losses

The lognormal probability distribution of asset pool losses can be derived once the expected loss and Volatility Proxy **Aaa** Level have been established. This is done by making simplifying assumptions (e.g. assuming that principal collections and losses on the asset pool occur on a "bullet" basis at the approximate average-life of the asset) and then "solving" for the standard deviation of the lognormal distribution that results in a bond expected loss that is commensurate with a **Aaa** rating when the credit support for the bond is set equal to the Volatility Proxy **Aaa** Level.

A tool called "Moody's Analytical Rating Valuation by Expected Loss" ('MARVEL')[30], which is available for download at http://www.moodys.com, allows the user to solve for a specific lognormal probability distribution of asset pool losses in this manner; with inputs of the expected cumulative lifetime losses on the pool of assets, the average life of the security, and the Volatility Proxy **Aaa** Level, the user can derive the standard deviation of the distribution such that the bond has an expected loss consistent with a **Aaa** rating. The tool uses Moody's lookup table for translating the bond expected loss to a bond rating, and is similar to a tool that Moody's uses in its rating of auto loan ABS transactions.

For example, if the pool presented in *Figure 6* were to be analyzed in MARVEL, it might be done in the following manner (see *Figure 9*):

Average Loss of Representative Pools (Last 3 pools in this case) = 1.85%
Input 1 -- Committeed Mean Loss = 2.00% (Note: This would be based on the judgment of a rating committee. The "committeed" mean loss may be higher than the average of the representative pools to account for the impact of more stressful and severe economic scenarios that are not reflected in the historical data and could result in a higher mean in the long run.)
Input 2 -- Committeed Volatility Proxy **Aaa** Level = 8.00%
Input 3 -- Asset Average Life = 2 years
Output 1 -- Standard Deviation of Asset Pool Loss = 0.84%

The probability density function (PDF) and cumulative distribution function (CDF) associated with the lognormal distribution derived in the example presented in *Figure 9* is shown in *Figure 10*.

30 See Moody's Special Comment, "A Users Guide for 'Moody's Analytical Rating Valuation by Expected Loss' (MARVEL) - a Simple Credit Training Model", May 31, 2001.

Figure 9

Example Use of Moody's "MARVEL" Tool to Derive an Implied Standard Deviation of Asset Pool Loss

MARVEL - A Credit Rating Educational Tool — **Results**

("Moody's Analytical Rating Valuation by Expected Loss") — **Option 2**

Option 2: User sets the credit rating & enhancement for the Senior Note Tranche

Step 1 - Input details of the Assets

Assets		
Expected Loss	Mean	2.00%
	Median	1.85%

Input 1: Committeed Mean Loss

Step 2 - Input the Credit Enhancement for the Notes being issued

External credit enhancement	
Cash Reserve	8.00%
Captured Excess Spread	
Total	8.00%

Input 2: Committeed Volatility Proxy Aaa Level

Input 3: Asset Average Life

Total credit enhancement

Tranche	Tranche Size	Average Life (years)	Class Specific Enhancement	Enhancement by Subordinated Tranches	External Credit Enhancement	Total Enhancement
- A	100.00%	2		0.0%	8.00%	8.0%
- B						
- C						
- D						
Total (should be 100%)	100%					

Step 3 - Select the credit rating for the Senior Note Tranche in Step 2

Rating of the Senior Note Tranche: Aaa

Step 4 - Calculate

Calculate standard deviation

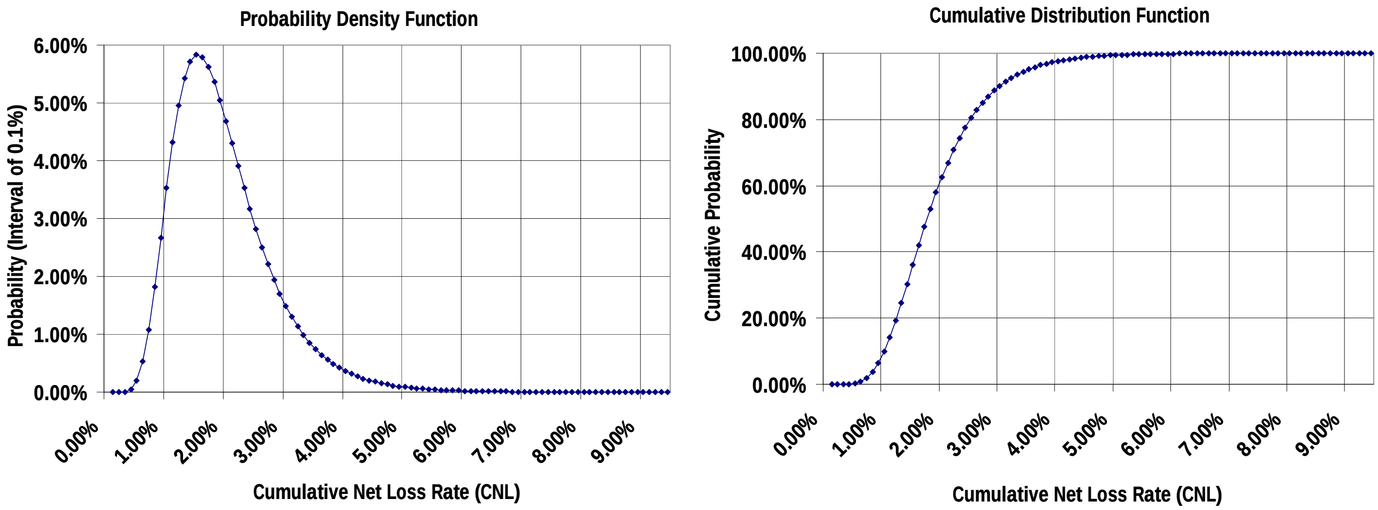
Standard Deviation of the Assets' Expected Loss: **0.84%**

Step 5 - Read off the Notes' results

Tranche	Actual loss (as a % of tranche)	Note Results
- A	0.000110%	**Aaa**
- B		
- C		
- D		

Output 1: Standard Deviation of Asset Pool Loss

Figure 10
Probability density function (PDF) and cumulative distribution function (CDF) associated with the lognormal distribution derived in the example presented in *Figure 9*



Modeling the Bond Structure and Cashflow Waterfall to Assess the Amount of Credit Enhancement Supporting Each Class of Rated Securities

After the lognormal probability distribution of asset pool losses has been established, in order to determine the bond ratings based on an expected loss framework, the asset performance needs to be fed into a model of the bond structure and the cashflow waterfall. There are numerous ways to implement such an approach but the method currently used by Moody's in rating U.S. auto loan-backed securities involves the following steps:

(i) run "WAC Deterioration" stress for the Weighted Average Coupon (WAC) of the Asset Pool;

(ii) calculate the breakeven loss[31] for the rated bonds using Moody's bond cashflow model using the stressed pool WAC and a stressed prepayment speed;

(iii) input the bond breakevens into Moody's probabilistic bond rating model; and

(iv) take the suggested bond ratings outputs from the probabilistic bond rating model as inputs to the rating committee process.

These steps are discussed in more detail below.

Running the WAC Deterioration Stress

Moody's analysis of the WAC changes over time of auto loan pools has shown that the WACs of higher-credit-quality pools tend to increase over time, while the WACs of lower-credit-quality pools tend to decrease over time. More specifically, on average the prime pools that were studied experienced a WAC increase of 0.23% from the cutoff date to the point of reaching a 15% pool factor, while near-prime and subprime pools experienced a WAC decrease of 0.14% and 0.48% respectively[32].

The results of the analysis highlight the average or expected changes in WAC in those types of pools, given the actual prepayments and defaults that occurred on the pools. However, in calculating the value of excess spread as credit enhancement, we are more concerned about how much excess spread will be available when it is needed - that is, in high asset-loss scenarios - than in the average, or expected, case. Consequently, we focus on the WAC of the pool in a high-loss, or "stressed," scenario.

The WAC deterioration stress is implemented by assuming that the highest-interest loans prepay immediately. *Figure 11* shows the percentage of the highest-interest loans that are assumed to prepay and the impact on the WAC for the typical stress assumptions applied by Moody's. The table shows ranges for the percentage of high-interest loans assumed to prepay; the specific assumption used for a transaction depends on the historical

31 The breakeven loss for a given class of rated bonds is the level of pool losses above which those bonds will suffer a loss of principal or interest.
32 See Moody's Special Comment, "The Effects of Pool WAC Changes on Excess Spread in U.S. Auto ABS Transactions", October 7, 2005.

WAC deterioration experience for that issuer's prior pools. Issuers with higher WAC deterioration or with limited historical information would tend to have assumptions at the higher end of the range.

Figure 11

Typical WAC Deterioration Stress Assumptions

Category	Highest Coupon Prepayment Percentage[1]	Typical WAC Deterioration
Prime	2 to 5%	0.10 to 0.30%
Near-prime	5 to 10%	0.40 to 0.50%
Subprime	10 to 20%	0.50 to 1.00%

1 This percentage of the highest coupon loans are assumed to prepay immediately at the outset of the transaction for the purpose of calculating the WAC deterioration.

The implementation of the WAC deterioration stress for a prime auto loan ABS deal example is illustrated in *Figure 12*, where the 3% of the loans with the highest interest rates are assumed to prepay immediately, causing a decline in the WAC of nine basis points.

Figure 12

Example of Prime Auto Loan ABS Deal WAC Deterioration Stress

Sample Prime Auto Loan Deal WAC Deterioration Stress

Input: WAC Deterioration Assumption: 3.00%

Enter Ranges or Actual WACs

APR Bucket Ranges	APR Bucket Actual WACs	$ Balance	% of Aggregate Balance	Weighted APR		$ Balance	% of Aggregate Balance	Weighted APR
6.00 to 6.49		50,100,000	5.01%	0.31%		50,100,000	5.16%	0.32%
6.50 to 6.99		78,400,000	7.84%	0.53%		78,400,000	8.08%	0.55%
7.00 to 7.49		92,100,000	9.21%	0.67%		92,100,000	9.49%	0.69%
7.50 to 7.99		217,800,000	21.78%	1.69%		217,800,000	22.45%	1.74%
8.00 to 8.49		103,400,000	10.34%	0.85%		103,400,000	10.66%	0.88%
8.50 to 8.99		186,200,000	18.62%	1.63%		186,200,000	19.20%	1.68%
9.00 to 9.49		80,000,000	8.00%	0.74%		80,000,000	8.25%	0.76%
9.50 to 9.99		100,000,000	10.00%	0.98%		100,000,000	10.31%	1.01%
10.00 to 10.49		43,500,000	4.35%	0.45%		43,500,000	4.48%	0.46%
10.50 to 10.99		31,000,000	3.10%	0.33%		18,500,000	1.91%	0.21%
11.00 to 11.49		8,300,000	0.83%	0.09%		0	0.00%	0.00%
11.50 to 11.99		4,700,000	0.47%	0.06%		0	0.00%	0.00%
12.00 to 12.49		1,500,000	0.15%	0.02%		0	0.00%	0.00%
12.50 to 12.99		1,300,000	0.13%	0.02%		0	0.00%	0.00%
13.00 to 13.49		700,000	0.07%	0.01%		0	0.00%	0.00%
13.50 to 13.99		400,000	0.04%	0.01%		0	0.00%	0.00%
14.00 to 14.49		100,000	0.01%	0.00%		0	0.00%	0.00%
14.50 to 14.99		200,000	0.02%	0.00%		0	0.00%	0.00%
15.00 to 15.49		200,000	0.02%	0.00%		0	0.00%	0.00%
15.50 to 15.99		100,000	0.01%	0.00%		0	0.00%	0.00%
			0.00%	0.00%		0	0.00%	0.00%
			0.00%	0.00%		0	0.00%	0.00%
		1,000,000,000	100.00%	8.38%		970,000,000	100.00%	8.29%
						97.00%		

Unstressed Pool WAC: 8.38%

Output: Stressed Pool WAC: 8.29%

Calculating the Breakeven Loss for the Rated Bonds

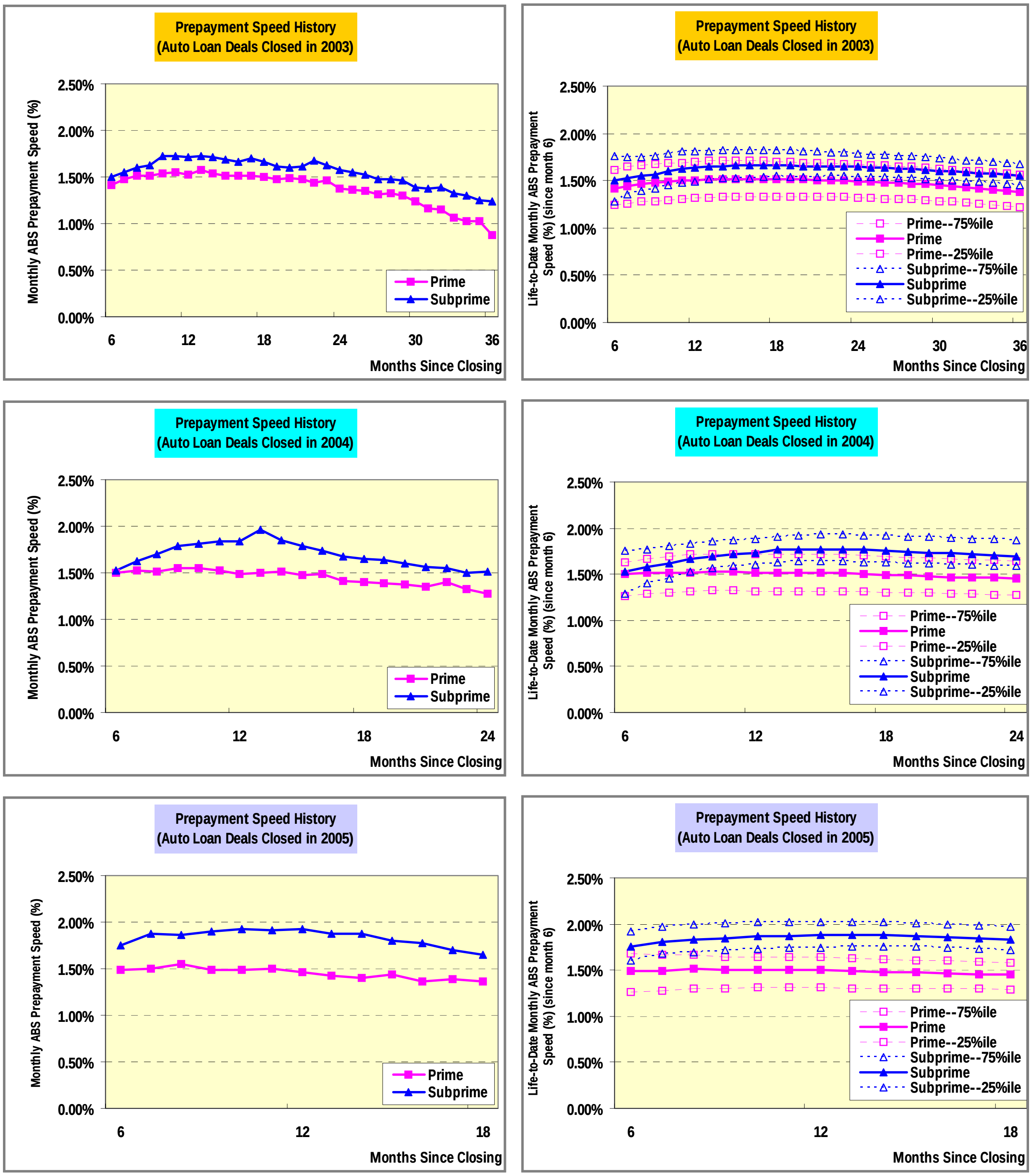
The stressed WAC generated from Moody's WAC deterioration stress is used as an input in Moody's cashflow model for determining the breakeven loss for the rated bonds. That cashflow model incorporates the following additional stresses in determining the breakeven loss:

1) Prepayment Speed[33] Stress

The absolute prepayment speed (ABS) of auto loans is typically expected to be in the range of 1.50% of the initial contracts per month. This is borne out by Moody's analysis of the prepayment experience of auto loan deals closed between 2003 and 2005 as shown in *Figure 13*. For example, the life-to-date prepayment speed of prime deals closed in 2003 has been roughly 1.37% ABS and 75% of those prime deals have had a life-to-date prepayment speed of less than 1.57% ABS. Similarly, the life-to-date prepayment speed of subprime deals closed in 2003 has been roughly 1.55% ABS and 75% of those subprime deals have had a life-to-date prepayment speed of less than 1.68% ABS.

Figure 13

Total ABS Prepayment Speed Experience for U.S. Auto Loan ABS Deals Closed Between 2003 and 2005[34]



33 The prepayment speeds discussed in this section are the "total" prepayment speeds that include the effect of both voluntary prepayments and involuntary prepayments (defaults).

34 Subprime, for this analysis, includes both near-prime and subprime deals.

In calculating the breakeven loss for the bonds, the prepayment speeds are generally stressed from the expected prepayment levels as follows:

Figure 14

Moody's Typical Stressed Total ABS Prepayment Speed Assumptions

(i) For deals with deminimus or no subvened[35] loans
A single loan (repline) cashflow model is typically run at the following stressed prepayment speeds:

Bond Rating	Stressed Prepayment Speed (% ABS)		
	Prime	Near-prime	Subprime
A3 and above	2.25%	2.25%	2.50%
Baa1 to **Baa3**	2.00%	2.00%	2.25%
Ba1 and below	1.80%	1.80%	2.00%

(ii) For deals with subvened loans
A single loan (repline) representing nonsubvened loans is typically run at the following stressed prepayment speeds:

Bond Rating	Stressed Prepayment Speed (% ABS)		
	Prime	Near-prime	Subprime
A3 and above	2.25%	n/a	n/a
Baa1 to **Baa3**	2.00%	n/a	n/a
Ba1 and below	1.80%	n/a	n/a

A single loan (repline) representing subvened loans is typically run at the following stressed prepayment speeds:

Bond Rating	Stressed Prepayment Speed (% ABS)		
	Prime	Near-prime	Subprime
A3 and above	0.25%	n/a	n/a
Baa1 to **Baa3**	0.50%	n/a	n/a
Ba1 and below	0.75%	n/a	n/a

2) Credit Enhancement Leakage Stress

Another stress incorporated into Moody's bond breakeven analysis is to account for the possibility that, even in high-loss breakeven scenarios, some of the credit enhancement may not be utilized to support the rated bonds but rather may have been released or "leaked" to the unrated bonds or residual interest because of the specific time path of loan losses. For example, excess spread and other cash (e.g. prorata principal allocations and reserve account releases) may be released to junior interests in the early months of a transaction before losses have reached a sufficiently high level to utilize that credit enhancement.

The bond breakeven cashflow model incorporates this risk into its analysis by taking the expected credit enhancement leakage in the first 12 months of a deal and multiplying by the probability that the leakage would actually occur in any given month. From the 13th month forward, the model assumes that any remaining credit enhancement will be fully utilized in the breakeven loss scenarios. The probability of credit enhancement leakage schedule used in Moody's breakeven model is dependent on the weighted average remaining maturity (WARM) of the asset pool: pools with longer WARMs are assumed to have a greater probability of CE leakage in the first 12 months than pools with shorter WARMs, reflecting the potential for more back-ended losses in longer WARM pools. The relationship between the asset pool WARM and the probability schedule is shown in *Figure 15*.

35 Subvened loans are defined to be those loans with an APR below the sum of the weighted average bond coupon plus servicing fees.

Figure 15

Relationship Between Asset Pool WARM and the Probability of CE Leakage Schedule in Moody's Bond Breakeven Cashflow Model

	Weighted Average Remaining Maturity (WARM) of Asset Pool						
	>= 57	53 to 56	49 to 52	45 to 48	41 to 44	37 to 40	<= 36
Month	**Probability of Credit Enhancement (CE) Leakage**						
1	100%	100%	100%	100%	100%	100%	100%
2	100%	100%	100%	100%	100%	100%	100%
3	100%	100%	100%	100%	100%	100%	100%
4	90%	89%	88%	86%	83%	80%	75%
5	80%	78%	75%	71%	67%	60%	50%
6	70%	67%	63%	57%	50%	40%	25%
7	60%	56%	50%	43%	33%	20%	0%
8	50%	44%	38%	29%	17%	0%	0%
9	40%	33%	25%	14%	0%	0%	0%
10	30%	22%	13%	0%	0%	0%	0%
11	20%	11%	0%	0%	0%	0%	0%
12	10%	0%	0%	0%	0%	0%	0%

The implementation of the prepayment speed stress and the CE leakage stress within Moody's bond breakeven cashflow model is shown in *Figure 16* for the prime auto loan ABS deal example presented earlier in *Figure 12*.

The example analyzes the breakeven loss for the following sequential-pay senior-subordinated (A/B) bond structure:

Class	Size	Target Rating
A	94%	**Aaa**
B	5%	**A3**
OC	1%	unrated

The asset pool in the example has a WARM of 60 months and the stressed WAC of 8.29% is used from the output of the WAC deterioration stress shown in *Figure 12*. The weighted average bond coupon is assumed to be 4.00% and the servicing fee is assumed to be 1.00%.

The breakeven is calculated for the subordinate Class B bond, which is supported by a nondeclining 0.50% reserve account (input as CE1 in *Figure 16*) and overcollateralization (input as CE2 in *Figure 16*) which is built from 1.00% initially to a target of 2.00% of the outstanding pool, subject to a floor of 0.50% of the initial pool.

Given the target ratings of **Aaa** and **A3**, a stress prepayment speed of 2.25% ABS (see *Figure 14*) is utilized in calculating the stressed average life in the model.

The model calculates a stressed breakeven loss of 5.50% for the Class B bond after deducting 0.90% of expected CE leakage from the potential breakeven loss of 6.40%.

By implication, given the sequential-pay bond structure, the Class A breakeven would be the Class B breakeven plus the size of the Class B. In this case the Class A breakeven loss would be 10.50%, equal to 5.50% plus 5.00%.

Figure 16

Example of Prime Auto Loan ABS Deal Bond Breakeven Model Run

STRESSED BREAKEVEN LOSS CALCULATION

Asset Pool Input

Balance	1,000,000,000
# Cntrcts	50,000
Avg Bal	20,000
WAC	8.29%
WARM	60
Seasoning	-

Bond Coupon and Fee Inputs

Bond Coupon	4.00%
Bond Fees	0.00%
Bond Rate	4.00%
Collateral Fees	1.00%

Prepayment Speed Inputs

PrepABS	1.40%	
TotABS	1.50%	2.25%
	Exp	Stress
Avg Life	1.89	1.49

Credit Enhancement Structure Inputs

	CE1	CE2	CEComb	CE3
Init (% orig)	0.50%	1.00%	1.50%	
Target (% os)		2.00%		
Stepdown (% os)				
Floor (% orig)	0.50%	0.50%		

Cumulative Net Loss and Recovery Inputs

		Year	Loss
CNL	2.00%		
Loss Stres:	1.00	1	32.00%
Adj Loss	2.00%	2	31.00%
Losses	20,000,000	3	22.00%
		4	15.00%
Recov	50.00%	5	0.00%
Rcv Stress	1.00		
Adj Recov	50.00%		

Credit Enhancement (CE) Leakage Calculation

Probability of CE Leakage	Month	Cumulative CE Leakage	Probability Weighted CE Leakage
100%	1	0.00%	0.00%
100%	2	0.00%	0.00%
100%	3	0.00%	0.00%
90%	4	0.14%	0.13%
80%	5	0.38%	0.32%
70%	6	0.60%	0.47%
60%	7	0.82%	0.60%
50%	8	1.03%	0.71%
40%	9	1.23%	0.79%
30%	10	1.42%	0.85%
20%	11	1.61%	0.88%
10%	12	1.79%	0.90%

Output -- Stressed Breakeven Loss Calculation

Annual Excess Spread (ES)	3.29%	
times	1.49	Stressed Average Life
Stressed Lifetime ES	4.90%	
plus	1.50%	Initial CE
Potential Breakeven Loss	6.40%	
minus	0.90%	Expected CE Leakage
Stressed Breakeven Loss	**5.50%**	

Inputting the Bond Breakevens into a Probabilistic Bond Rating Model

The bond breakeven levels and the class splits are entered into a probabilistic bond rating model similar to the "MARVEL" tool described earlier in order to determine the bond ratings suggested by Moody's modeling process. The inputting of the bond breakeven levels into the MARVEL model for the prime auto loan ABS deal example is shown in *Figure 17*. The cash flow modeling indicated a break-even loss level of 5.5% for the B bonds, provided by the 1% overcollateralization amount, the 0.5% reserve account, and the remaining amount, or 4%, covered by excess spread. Those amounts are entered into the MARVEL model in "Step 2" of *Figure 17* under the tranche C size, cash reserve, and captured excess spread, respectively. The breakeven loss levels of 10.5% and 5.5% for the Class A and B bonds respectively, is shown under the "Total Enhancement" column in step 2.

As seen from the results in the "Step 3" box of *Figure 17*, the Class A notes have a suggested rating of **Aaa** and the Class B notes have a suggested rating of **A2-** (informally indicating an expected loss near the bottom of the **A2** range) which would be rounded down to a suggested rating of **A3**.

Figure 17

Example Use of Moody's "MARVEL" Tool to Derive Suggested Bond Ratings

MARVEL - A Credit Rating Educational Tool — **Results**

("Moody's Analytical Rating Valuation by Expected Loss") — **Option 1**

Option 1: User sets the standard deviation of the expected loss on the assets

Step 1 - Input details of the Assets

Assets		
Expected Loss	Mean	2.00%
Standard Deviation		0.84%

Step 2 - Input the Credit Enhancement for the Notes being issued

External credit enhancement	
Cash Reserve	0.50%
Captured Excess Spread	4.00%
Total	4.50%

Total credit enhancement

Tranche	Tranche Size	Average Life (years)	Class Specific Enhancement	Enhancement by Subordinated Tranches	External Credit Enhancement	Total Enhancement
- A	94.00%	2		6.0%	4.50%	10.5%
- B	5.00%	2		1.0%	4.50%	5.5%
- C	1.00%	2		0.0%	4.50%	4.5%
- D	0.00%	2				
Total (should be 100%)	100%					

Step 3 - Read off the Notes' results

Tranche	Actual loss (as a % of tranche)	Note Results
- A	0.000008%	**Aaa+**
- B	0.048933%	**A2-**
- C	0.946044%	**Ba1**
- D		

Taking the Suggested Bond Ratings as Inputs to the Rating Committee Process

The suggested bond ratings derived from Moody's quantitative modeling are important inputs to Moody's rating committee process. However, the actual bond ratings assigned by the rating committee will incorporate both those inputs and numerous other factors, including other quantitative analyses (e.g. investment bank and/or sponsor-supplied cash flow models and analytics, Moody's own additional cashflow analysis etc.) and qualitative analysis relating to factors such as underwriting and servicing practices, and legal considerations, etc.

VI. CONCLUSION

This article has presented the critical aspects of Moody's quantitative framework for rating U.S. auto loan-backed securities. Potential changes to the methodology that are under consideration will be discussed in one or more follow-on pieces, the first of which will be published as a call for comment later in 2007. Additional pieces will also be published to discuss other quantitative and qualitative considerations in Moody's rating of auto loan ABS.

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