Default Rates on Structured Finance Securities

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Recent rating agency reports attack a long-held assumption of participants in the structured finance market: that asset-backed securities (ABS), commercial mortgage-backed securities (CMBS), and residential mortgage- backed securities (RMBS) have lower historical default rates than equivalently rated corporate debt. The implication of this is important, not only for investors in these assets, but also for investors in structured finance collateralized debt obligations (SF CDOs) backed by these assets.

For example, Goodman and Fabozzi [2002] argue that because the rating agencies ignore the historically low default rate of structured finance collateral, they are more conservative in their ratings of SF CDOs than CDOs backed by corporate bonds, and SF CDOs thus offer investors relative value. If the rating agency reports are accepted at face value, it would appear that the Goodman-Fabozzi conclusion lacks empirical support.

Let's consider one important example for investors in the CDO market—BBB tranches from B and C credit quality first lien residential mortgages (Resi B&C, also known as subprime home equities or home equities). S&P published a statistic recently suggesting that an average of 4.0% of BBB Resi B&C tranches are downgraded to D (S&P's default rating category) over five years (see Hu, Pollsen, and Elengical [2003]). Hu, Cantor, Silver, Phillip, and Snailer [2003] report a statistic suggesting that an average of 13.4% of these tranches suffer "material impairment" (either an uncured payment default or a downgrading to Ca or C) over five years.

Almost all market participants think the default rate for BBB Resi B&C has been much lower than 4.0%, let alone 13.4%. In fact, it is generally taken for granted that these assets default less frequently than corporate bonds, which have 3.2% and 2.3% five-year default rates according to S&P and Moody's. It is common, for example, for SF CDO structurers to use a base case of 0.36% defaults per year, or 1.80% defaults over five years, in their cash flow models of BBB Resi B&C collateral.

Investors care more about *future* default rates than *past* default rates in SF CDOs and we are constantly reminded of the variability in credit quality of assets with the same rating. But still, it would be nice if we could be a lot more certain of the past than is implied by a range of five-year default rates ranging from 1.8% to 13.4%.

We explore the discrepancy between the default rates calculated by the rating agencies and market intuition. We get into the nitty-gritty of how rating agency statistics are constructed before we come to our own conclusions. We find, to take one example, that a more accurate historical default rate for BBB Resi B&C over five years is 1.9% rather than the 4.0% to 13.4% of the S&P and Moody's reports. Our estimate of past performance is in line with the 1.8% default rate that SF CDO structurers commonly use to model the future.

We discuss six rating agency reports. We first focus on three S&P reports from January and February 2003 that show the rate at which different types of structured finance tranches have been downgraded to D (five-year rating transitions). In discussing S&P's results, we explain the advantages of an alternative *matrix multiplying* approach where we extrapolate five-year downgrade rates from short-term average rating changes. We then apply this matrix multiplying technique to two other rating transition studies—a July 2003 S&P rating transition study, and a January 2003 Moody's rating transition study—and we examine the Moody's study that presents material impairment rates for structured finance tranches.

I. PRELIMINARY CAUTIONS

How appropriate are historical results in predicting future credit performance? While rating transition and default studies are necessarily pictures taken of a rear-view mirror, the nature of structured finance makes it hard to get an accurate picture of even the past. In a corporate bond rating transition or default study, the unit of study is the corporate entity. But for structured finance, the object of study is the specific tranche issued by a specific special-purpose entity.

The sheer number of these tranches, each with its own unique credit characteristics, makes the creation of databases difficult. The fact of a default is often ambiguous; a missed coupon may occur unseen, and the lapse may be rectified later. It may also be certain *now*, judging from the state of the special-purpose entity's collateral portfolio, that a tranche will eventually default *later* in its life.

The corporate entity moreover continues on as debt is issued and retired. Each structured finance tranche, however, has a limited life, and in a database of structured finance defaults, withdrawn ratings abound. We shall see that the treatment of withdrawn ratings is an important consideration in assessing structured finance default studies.

The heterogeneity of structured finance assets means that broad categories are made up of assets with disparate performance. For example, in Moody's ABS category, health care, franchise loan, and manufactured housing securitizations have had the highest default rates, as shown in Exhibit 1. When the individual types of deals are aggregated into a broad category, we get a distorted picture of the performance of the whole and of the parts.

The defaults of structured finance tranches are often directly linked to the originators and servicers of the underlying assets. In fact, overall structured finance defaults are driven to a large extent by the idiosyncratic problems of these corporate sponsors. For example, 17% of all ABS defaults are traceable to problems at Conseco/Greentree. Even more dramatic, 62% of all RMBS defaults are traceable to Quality Mortgage. With past defaults so much a function of individual corporate problems, predicting future default rates is problematical. Are we going to have more or fewer Conseco/Greentrees and Quality Mortgages?

Finally, default rates are only half of the credit loss story. Default severity, or loss in the event of a default, is the second part of the credit loss formula. Default severity among structured finance tranches seems to vary by underlying assets and by the seniority and size of the tranche. We do not touch on this important credit factor here.

We thus approach the historical reports of S&P and Moody's with a healthy degree of skepticism about what they can tell us about the future. But maybe they can at least give us a clearer picture of the rear-view mirror.

EXHIBIT 1
Moody's Material Impairment Rates in ABS

Health Care Receivables	40.0%
Franchise Loans	22.8%
Manufactured Housing	12.1%
Autos	1.4%
HEL	1.3%
Leases	0.8%
Credit Cards	0.3%
Equipment	0.0%
Floor Plans	0.0%
Small Business Loans	0.0%
Student Loans	0.0%
Other Receivables	0.0%
Other ABS	1.0%
All ABS	2.7%

Source: Hu, Cantor, Silver, Phillip, and Snailer [2003].

II. S&P'S FIVE-YEAR TRANSITION TO D

In three reports issued in January and February 2003, S&P published five-year transitions to D rates, or the historic rate at which structured finance tranches have been downgraded to D. We take the D rates as a close proxy for default.

We show in Exhibit 2 S&P's results for ABS (Ertuk, Coyne, and Elengical [2003]); CMBS (Hu and Chun [2003]); and RMBS (Hu, Pollsen, and Elengical [2003]). We also show S&P's five-year corporate credit default rate from Brady, Vazza, and Bos [2003]). Boxed in the exhibit

is the entry for BBB Resi B&C tranches.

Keep in mind that S&P's RMBS category includes transactions backed by prime and subprime first and second residential liens, including home equity lines of credit, home improvement loans, reverse mortgages, and tax liens, so the numbers in the exhibit merely suggest the actual downgrade rate of any specific type of RMBS. The same point holds for the different types of securitizations in the ABS and CMBS categories.

Exhibit 2 contradicts two beliefs widely held by structured finance market participants. The first, as we noted at the outset, is that default rates for structured finance transactions are lower than for corporate debt. The second is that CMBS and RMBS have lower default rates than ABS.

We see that many of the investment-grade structured finance transitions to D rates are higher than the corporate default rates for credits of the same rating. At the extreme, the AA CMBS rate is seven times the corporate AA rate. And the BBB RMBS, is 4.0% versus the corporate 3.2% rate. We also see that for many rating categories, ABS transition rates are lower than those for CMBS and RMBS.

We believe that both of these effects are a result of S&P's transition study methodology rather than a reflection of true credit experience.

S&P's Transition to D Methodology

S&P calculates five-year transition to D rates in a way that excludes recent rating experience. This can sometimes lead to strange results, such as when the transition to D rate is higher over a shorter time interval than it is over a longer time interval. For example, almost all ABS transitions to D rates over *three* years are higher than ABS transition rates over *five* years.

S&P's transition methodology requires that, to enter the five-year transition matrix, the rating must be five years old. So the last *rating cohort* (group of credits with the same rating at a particular time) that can enter the five-year transition calculation is the one running from January 1, 1998, to January 1, 2003. This means that any structured finance securitization rated after January 1, 1998, is not part of the five-year rating transition calculation.

S&P's methodology greatly reduces the number of structured finance transactions incorporated in the five-year transition calculation. For example, there are 282 BBB RMBS with five or more years of rating history *included* in the five-year transition rates, but there are 530 BBB RMBS with four or fewer years of rating history that are *excluded* from the five-year transition rates. Furthermore, it appears that a disproportionate number of pre-1998 RMBS transitioned to D.

We demonstrate the fact of declining transition rates by comparing the 1978-2002 RMBS average one-year transition matrix with the earliest available RMBS transition matrix S&P published, the 1978-2000 average one-year transition matrix. In Exhibit 3 we show the 1978-2000 transition matrix *minus* the 1978-2002 transition matrix. The positive numbers for BBB transitions to BB, B, CCC,

EXHIBIT 2

S&P Five-Year Transition to D Rates

	ABS[a]	CMBS[b]	RMBS[c]	Corporate Default Rate[d]
AAA	0.00%	0.00%	0.00%	0.10%
AA	0.20%	1.93%	0.80%	0.27%
A	1.47%	1.97%	2.40%	0.62%
BBB	1.23%	0.93%	4.00%	3.20%
BB	4.62%	5.55%	9.90%	12.34%
B	0.00%	13.68%	13.70%	26.59%

[a] *Ertuk, Coyne, and Elengical [2003].*

[b] *Hu and Chun [2003].*

[c] *Hu, Pollsen, and Elengical [2003].*

[d] *Brady, Vazza, and Bos [2003].*

EXHIBIT 3

S&P Average 1978-2000 RMBS Transition Matrix Minus 1978-2002 Transition Matrix

Rating at Beginning of Year	Rating at End of One Year									
	AAA	AA	A	BBB	BB	B	CCC	CC	C	D
AAA	-0.04%	0.03%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
AA	-2.84%	2.48%	0.21%	0.04%	-0.01%	-0.03%	0.05%	0.00%	0.00%	0.00%
A	-0.82%	-2.73%	3.07%	0.25%	0.01%	0.03%	0.04%	0.00%	0.00%	0.03%
BBB	-0.08%	-1.59%	-0.84%	1.33%	0.35%	0.62%	0.10%	0.00%	0.00%	0.01%
BB	0.00%	0.00%	-1.13%	-4.13%	4.36%	0.21%	0.40%	0.13%	0.00%	0.06%
B	0.00%	0.00%	0.00%	0.04%	-2.30%	3.86%	-1.81%	0.23%	0.00%	-0.12%

and D mean that there were more BBB downgrades in 1978-2000 than in 1978-2002. In other words, BBB downgrades declined in 2001 and 2002.

This is consistent with our hypothesis that the small number of BBB credits before 1998 experienced more downgrades than later BBB RMBS, and bias the five-year transition to D statistic upward. The same result, declining transition rates in recent years, holds true for the other RMBS rating categories too.

Another aspect of S&P's methodology that affects its five-year results is the treatment of *withdrawn* ratings. In calculating five-year rating transitions, S&P excludes structured finance credits whose ratings were withdrawn sometime over the five-year period (unless the credit was rated D before its rating was withdrawn). An example shows the implication of this approach.

Suppose there are 100 BBB ratings at the beginning of a five-year period, and 50 of the ratings are withdrawn sometime over the period. Further, suppose that one BBB credit was downgraded to D. The five-year transition to D rate would be 1 divided by 50, or 2%, because the 50 withdrawn ratings are excluded from the calculation of transition rates. The alternative treatment would be to treat withdrawn ratings as stable ratings and calculate the transition to D rate as 1 over 100 or 1%.

There are arguments for both approaches. Treating a withdrawn rating as a stable rating makes sense in that a withdrawal is usually not a negative credit event. In fact, it is an unambiguously good thing that a credit pays off its debt and has its rating withdrawn. On the other hand, if a credit is not outstanding, it does not have an opportunity to default. Why keep congratulating a one-year bond for not defaulting four years after its maturity?

One thing is certain. Compared to including withdrawn tranches in its calculations, S&P's exclusion of withdrawn ratings *increases* the percentage of credits deemed downgraded to D. And eventually, over a long enough period, all credits in a cohort will either mature, thereby having their ratings withdrawn (and be excluded from the cohort), or default. When this happens, the transition to D rates must be 100%. As we noted earlier, withdrawn ratings are a bigger problem in studies of structured finance defaults where the short maturities of specific issues, rather than the ongoing existence of a corporate entity, are the object of study.

But the S&P methodology used in the three studies published in 2003 is not the only way to calculate transition statistics, and is probably not the best way. It is also not the way S&P and Moody's calculate their *default* statistics.[1]

Multiplying Transition Matrices

We attempt to sidestep the methodological issues raised here by *multiplying transition matrices* (which admittedly stirs up its own methodological issues). Our preferred way to calculate the five-year transition to D rates from S&P data is to "multiply" transition matrices. By this we mean, for example, to look at a six-month average transition matrix and see where BBB RMBS transition to after six months. Most ratings will remain the same, but some percentage of them will be upgraded or downgraded. Then, we put the vector of ratings and percentages back into the transition matrix to see where the originally rated BBB RMBS migrate in one year. We continue this process until we have transitioned BBB RMBS ten times to arrive at cumulative five-year transitions.

The advantage of this approach is that we use all available data because the six-month transition matrix incorporates data from recent periods, even January 1, 2003, to July 1, 2003. It also prevents average transition to D rates from being higher over shorter periods than they are over longer periods.

Another advantage of this approach is that it uses S&P's latest structured finance rating transition study (Ertuk, Elengical, and Gillis [2003]). This study makes some improvements in S&P's rating database and methodology in creating average six-month rating transition matrices. First, structured finance credits are more carefully categorized by type of asset and domicile. Second, for ratings that are withdrawn at the end of the six-month period, but that transitioned to some intermediate rating during the six-month period, the last rating before withdrawn is taken as the ending rating. Thus, if a credit started the six-month period as a BBB, transitioned to BB over the six months, but was withdrawn by the end of six months, this would be taken as a transition to BB in S&P's study.[2]

Results of Multiplying Transition Matrices

In Exhibit 4, we show the results of multiplying the average six-month matrices and compare those results to S&P's previous calculated five-year transitions and to five-year corporate defaults.

Note that for RMBS and CMBS, multiplying the six-month matrix ten times almost always gives much lower five-year transition to D rates than S&P's five-year transition matrix number. For example, the multiplying method yields a BBB RMBS transition rate of 1.62%

EXHIBIT 4
S&P Five-Year Transition to D Rates

	ABS		CMBS		RMBS		Corporate Default Rate
	Multiply	5-Year	Multiply	5-Year	Multiply	5-Year	
AAA	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.10%
AA	1.16%	0.20%	0.00%	1.93%	0.02%	0.80%	0.27%
A	2.09%	1.47%	0.08%	1.97%	0.47%	2.40%	0.62%
BBB	13.80%	1.23%	0.65%	0.93%	1.62%	4.00%	3.20%
BB	42.56%	4.62%	4.36%	5.55%	4.50%	9.90%	12.34%
B	82.53%	0.00%	12.28%	13.68%	14.14%	13.70%	26.59%

EXHIBIT 5
S&P ABS Defaults

	1998	1999	2000	2001	2002	Total
Auto	1	-	-	-	1	2
Credit Card	-	-	-	2	2	4
Franchise Loan	-	-	-	9	22	31
Manufactured Housing	-	-	-	1	32	33
Other	-	9	-	-	1	10
Total	1	9	0	12	58	80

Source: Ertuk, Coyne, and Elengical [2003].

while S&P's five-year matrix shows 4.00%. This, incidentally, is consistent with the SF CDO structurer assumptions of a 1.8% default rate over five years for BBB Resi B&C. We also see that CMBS gain what we think is their rightful place at the top of structured finance credit quality with the lowest transition rates.

Yet for ABS, the effect is the opposite, as transition rates calculated by the multiplying method are higher than the five-year rate. This is because ABS credit performance since 1998 has been much poorer than prior to 1998. This recent poorer credit performance is captured only by the multiplying method. As we mentioned before, the poor performance of ABS in recent years has mainly come from new and untested asset classes.

Exhibit 5 shows S&P's classification of recent ABS defaults.

Five-Year Transitions of International Structured Finance and CDOs

S&P has also carefully calculated six-month transition rates for CDOs and structured finance transactions backed by assets originated outside the United States. Exhibit 6 shows transition to D rates for the geographies and structured finance categories that could be calculated.

European ABS and emerging market structured finance transition rates are similar, but usually a little lower than for the U.S. ABS. It would seem that S&P faced more surprises from strange U.S. ABS asset categories than from international ABS asset categories. On average, U.S. CDO transitions are worse than U.S. CMBS and RMBS, but not as bad as U.S. ABS. European CDO transitions win the booby prize, being worse than U.S. ABS.

Also interesting are the international categories we could not calculate transition to D rates for: European CMBS, European RMBS, Asian structured finance, and Australia/New Zealand structured finance. These categories have never had a transition to D. Of course, there are not as many tranches making up their statistics, particularly low-rated tranches, as in the U.S. structured finance categories.

S&P Study Conclusion

We think our method of multiplying six-month transition matrices from S&P's report by Ertuk, Elengical, and Gillis [2003] is better at assessing the long-term credit quality of structured finance tranches than the five-year transition matrices in S&P's three studies published in January and February 2003. The multiplication method includes data from all years in arriving at long-term results and eliminates the problem that short-term transition rates

may be higher than long-term transition rates. It also makes use of S&P's improved database and methods.

S&P's five-year RMBS transition rates are high because S&P did not rate very many RMBS below AA until the last five years, and older RMBS have performed more poorly than more recently issued RMBS. The multiplication methodology leads to lower transition results for RMBS and CMBS that are in line with our understanding of these products. It also calculates higher ABS transition rates by weighing in the recent poor performance of those tranches.

III. MOODY'S RATING TRANSITION STUDY

Moody's structured finance transition study calculates average one-year transition matrices by *modified* rating categories, adding the 1s, 2s, and 3s to the letter rating designation (see Hu and Cantor [2003]). Moody's does not calculate rating transitions over multiple years.

We follow the same multiplying technique we used on the S&P average transition matrices to create Exhibit 7. It shows the rate at which Moody's structured finance ratings have migrated to Ca and C over five years. Bear in mind that Moody's does not have a D rating category, and Ca and C ratings usually indicate default. Boxed in Exhibit 7 are the Moody's categories that include Baa Resi B&C tranches.

The fineness of the modified rating categories leads to the unexpected result that in some cases higher ratings have transitioned to Ca and C more often than lower ratings have. But if one regroups ratings into letter rating categories, we can compare them with the S&P multiplied five-year transition to D matrices. CMBS and RMBS rating transitions, especially in the investment grades, are roughly similar. For CDOs, Moody's transitions are a lot more frequent, which we attribute to the significantly greater CDO market share Moody's had over S&P for much of the study period, especially of CDO tranches rated below Aa.

For ABS, especially tranches rated below Aa, Moody's transitions are much less frequent than S&P's multiplied transition results in Exhibit 4. We think this is partly because of a different mix of transactions designated as ABS by the two rating agencies. For example, Moody's classifies Resi B&C and other home equities as ABS, while S&P classifies them as RMBS. Unfortunately, this does not provide much clarity as we try to figure out the historical default rate of Resi B&C.

As we show in the first two rows of Exhibit 8, Moody's five-year Baa ABS transition rates range from 5.47% to 9.65% and average 7.21%. This is four times the 1.62% rate we calculated for S&P's BBB RMBS transitions.

But as we saw in Exhibit 1, Moody's reports that home equity loan defaults (including Resi B&C and other home equities) are a little less than half of those of ABS in total. Using this percentage (arbitrarily, because we don't really know how to apply it to specific ratings), we arrive at average five-year Baa Resi B&C transition rates ranging from 2.63% to 4.65% and averaging 3.47%. We show these calculations in the last three rows of Exhibit 8. These Moody's Resi B&C transition rates are twice as high as the 1.62% S&P BBB RMBS transition rate, but lower and we feel much more accurate than Moody's all-ABS Baa transition rates.

EXHIBIT 6

S&P Other Five-Year Transition to D Rates

	Euro ABS Multiply	EM SF Multiply	US CDO Multiply	Euro CDO Multiply	Corporate Default Rate
AAA	0.00%	0.00%	0.07%	0.54%	0.10%
AA	0.20%	0.00%	0.33%	1.32%	0.27%
A	1.30%	1.26%	1.56%	4.02%	0.62%
BBB	7.22%	12.02%	2.20%	16.04%	3.20%
BB	39.35%	55.88%	4.41%	41.18%	12.34%
B	80.69%	80.03%	9.26%	90.24%	26.59%

Calculated from Ertuk, Elengical, and Gillis [2003].

EXHIBIT 7

Moody's Five-Year Transition to Ca and C

	ABS	CMBS	RMBS	CDOs	Corporate Default Rate
Aaa	0.01%	0.00%	0.00%	0.30%	0.17%
Aa1	0.27%	0.00%	0.01%	1.87%	0.17%
Aa2	0.49%	0.09%	0.03%	1.92%	0.33%
Aa3	2.75%	0.01%	0.09%	4.99%	0.29%
A1	0.80%	0.02%	0.49%	6.00%	0.47%
A2	0.40%	0.01%	0.12%	2.95%	0.68%
A3	1.88%	0.01%	1.12%	7.89%	0.62%
Baa1	6.51%	0.56%	2.41%	9.20%	1.80%
Baa2	5.47%	0.77%	1.31%	19.70%	2.24%
Baa3	9.65%	0.07%	3.47%	22.09%	4.23%
Ba1	24.74%	0.62%	4.95%	40.27%	7.61%
Ba2	28.60%	0.06%	4.57%	47.49%	9.42%
Ba3	47.58%	0.60%	10.46%	38.24%	20.70%
B1	53.28%	0.83%	4.85%	83.87%	27.56%
B2	47.22%	1.07%	11.57%	56.19%	34.49%
B3	83.90%	3.23%	22.56%	82.09%	44.40%

Calculated from Hu and Cantor [2003].

EXHIBIT 8

Moody's Baa Resi B&C Five-Year Transitions to D

	Baa1	Baa2	Baa3
ABS Transitions	6.51%	5.47%	9.65%
Average ABS Transition		7.21%	
Relative Default Frequency of Resi B&C versus All ABS		48.15%	
Resi B&C Transitions	3.13%	2.63%	4.65%
Average Resi B&C		3.47%	

Calculated from data in Exhibits 1 and 7.

EXHIBIT 9

Moody's Five-Year Transition to Ca and C Eliminating Withdrawn Ratings

	ABS	CMBS	RMBS	CDOs	Corporate Default Rate
Aaa	0.02%	0.00%	0.00%	0.35%	0.17%
Aa1	0.32%	0.00%	0.01%	2.14%	0.17%
Aa2	0.53%	0.12%	0.03%	2.14%	0.33%
Aa3	2.93%	0.01%	0.09%	5.38%	0.29%
A1	0.93%	0.02%	0.52%	7.01%	0.47%
A2	0.47%	0.01%	0.13%	3.45%	0.68%
A3	2.19%	0.02%	1.16%	8.48%	0.62%
Baa1	7.15%	0.75%	2.47%	10.58%	1.80%
Baa2	5.92%	0.79%	1.36%	20.95%	2.24%
Baa3	10.83%	0.08%	3.59%	23.38%	4.23%
Ba1	26.02%	0.78%	5.14%	41.67%	7.61%
Ba2	30.51%	0.08%	4.72%	48.78%	9.42%
Ba3	52.90%	0.72%	10.80%	39.76%	20.70%
B1	57.60%	1.06%	5.04%	85.25%	27.56%
B2	49.66%	1.39%	12.14%	58.00%	34.49%
B3	86.32%	3.57%	23.54%	84.37%	44.40%

Calculated from Hu and Cantor [2003].

Effect of Withdrawn Ratings

The Moody's data also allow us to explore the methodological question involving the treatment of *withdrawn* ratings. In arriving at the downgrade rates in Exhibit 7, we multiplied Moody's one-year transition matrix with withdrawn ratings treated as *stable* ratings. In Exhibit 9, we show the result of removing withdrawn ratings.

As we expected, eliminating withdrawn ratings raises the transition rates, particularly for ABS and CDOs ratings and particularly for speculative-grade ratings, but the difference is not great. We think the multiplying method eliminates a lot of the difference between the two withdrawn rating methodologies, because over six months or one year there are not very many withdrawn ratings. We expect that the treatment of withdrawn ratings makes a bigger difference in the cumulative rating transitions like those of S&P shown in Exhibit 2. This is because over time, as cumulative cohorts age, withdrawn ratings make up an increasingly greater proportion.

Moody's Material Impairment and Downgrade Study

Hu, Cantor, Silver, Phillip, and Snailer [2003] examine "material impairments" of structured finance securities. Moody's defines a material impairment as a *payment default that has gone uncured or a downgrading* to the Ca or C rating categories. A rating of Ca or C in the absence of a payment default may indicate that the structured finance tranche is still paying its coupon, but the condition of the underlying collateral augurs an almost-certain eventual default on interest or principal. Alternatively, the presence of an uncured payment default in the absence of a Ca or C rating may indicate that the payment default is slight or expected to be cured.

About half of all material impairments so defined are payment defaults of tranches rated above Ca or C. Moody's has not taken a public stand that the payment default is severe or is going to continue. In fact, a high percentage of structured finance payment defaults later become cured, maybe about 20% to 30%. Thus, we view Moody's material impairment category as an *expansive* definition of default.

Another step in Moody's methodology is to deduct half of all withdrawn ratings in the calculation of default rates. So, if two ratings in a cohort of 100 ratings were withdrawn over the year, those defaulting over the year would be compared to a denominator of 99 rather than 100 or 98. But if next year two more ratings are withdrawn, defaults are compared to a denominator of 97. This splits the difference between counting withdrawn ratings as non-defaults and eliminating them completely from the default statistics and thereby biasing the default statistics. But again, one has to expect that many structured finance tranches mature every year and have withdrawn ratings. To the extent this is so, this treatment will exaggerate the calculated structured finance defaults, and the effect is compounded as tranches season.

Exhibit 10 shows Moody's material impairment rates for structured finance tranches along with the agency's calculation of five-year corporate default rates. Moody's BBB Resi B&C are categorized as ABS (the boxed number).

We see in Exhibit 10 that CMBS impairments are about in line with corporates, but that ABS and RMBS are higher than corporates. Moody's structured finance results are generally a lot higher than those we achieved from multiplying S&P's six-month transition matrix. Part of the relatively high structured finance default rate is attributable to the expansive definition of material impairments versus default and the elimination of withdrawn ratings.

Rolling Cohort versus Original Issue Cohorts

Moody's also provides a second set of five-year impairment rates, calculated in a slightly different manner, that sheds further light on these default rates. Instead of the rolling cohort methodology, where a BBB Resi B&C tranche issued on January 1, 2000, its part of the 2000, 2001, and 2002 cohorts, Moody's alternative original issue cohort methodology forms cohorts only from *newly issued* tranches. The tranche issued on January 1, 2000 would be part of only that one single cohort, and would count only as a three-year default at its original issue rating.

Structured finance defaults calculated by both methodologies differ greatly, as shown in Exhibit 11. With the same exact data, default rates for structured finance tranches are about twice as high under the rolling cohort method as under the original issue method.

Moody's points out that the reason for the different results is that marginal defaults among structured finance tranches tend to increase over time after issuance. Exhibit 12 illustrates the pattern of marginal defaults year-by-year after initial issuance.

It shows that marginal defaults increase until three years after original issuance and then decline. This pattern of defaults insures that the rolling cohort method will produce higher default rates than the original issue cohort method. This is because under the rolling cohort method, defaults in later years in the life of a tranche are weighted into the default rate of earlier years. Under these circumstances, we feel the original cohort method provides a better estimate of future structured finance default rates.[3]

In Exhibit 13, we show Moody's material impairment rates for structured finance tranches, using the original cohort methodology, along with the rating agency's

EXHIBIT 10

Moody's Five-Year Material Impairment Rates—Rolling Cohorts

	ABS	CMBS	RMBS	Corporate Default Rate
Aaa	0.06%	0.00%	0.97%	0.12%
Aa	3.13%	0.00%	0.61%	0.26%
A	1.61%	1.03%	1.42%	0.51%
Baa	13.44%	2.23%	7.25%	2.25%
Ba	53.08%	5.17%	9.65%	11.36%
B	49.38%	19.43%	17.17%	32.31%

Source: Hu, Cantor, Silver, Phillip, and Snailer [2003].

EXHIBIT 11

All Structured Finance Cumulative Impairment Rates

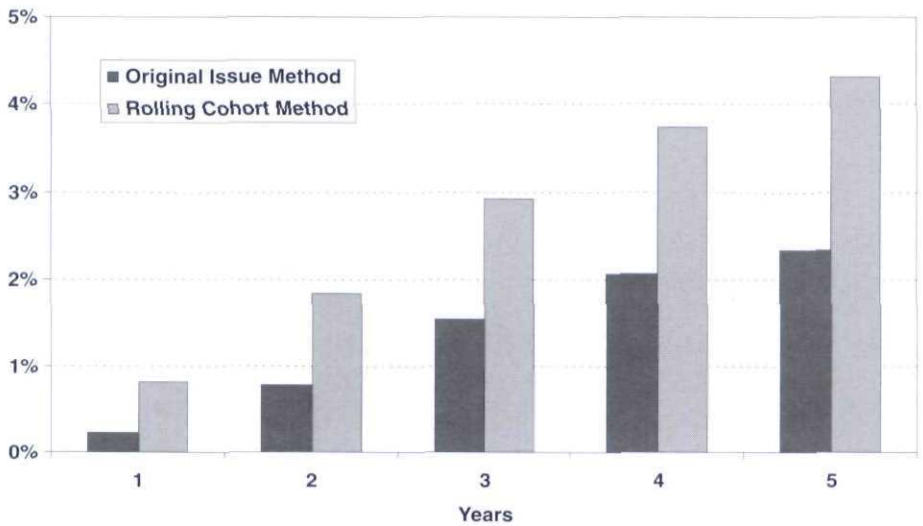

EXHIBIT 12

Marginal Material Impairments

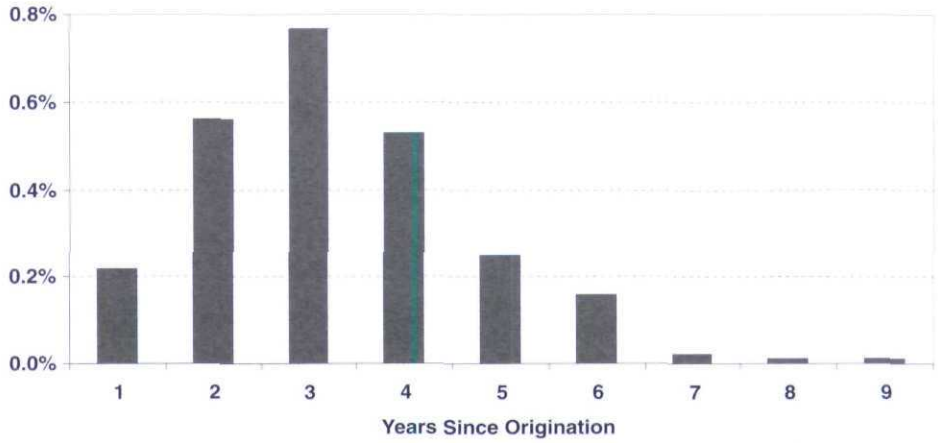

EXHIBIT 13

Moody's Five-Year Material Impairment Rates—Original Issue Cohorts

	ABS	CMBS	RMBS	Corporate Default Rate
Aaa	0.05%	0.00%	0.58%	0.12%
Aa	2.83%	0.00%	1.01%	0.26%
A	1.10%	0.23%	0.63%	0.51%
Baa	4.38%	0.83%	6.00%	2.25%
Ba	19.70%	1.77%	4.98%	11.36%
B	39.53%	5.66%	13.66%	32.31%

Source: Hu, Cantor, Silver, Phillip, and Snailer [2003].

EXHIBIT 14

Moody's Baa Resi B&C Five-Year Material Impairments

	Baa
All ABS Material Impairments	4.38%
Relative Frequency of Resi B&C and All ABS Material Impairments	48.15%
Resi B&C Transitions	2.11%

Calculated from Exhibits 1 and 13.

calculation of five-year corporate default rates. Boxed in the exhibit is the Moody's category that includes BBB Resi B&C. The original cohort methodology produces lower material impairment rates than the rolling cohort methodology, especially for ABS and especially for the Baa category including Resi B&C. CMBS defaults are now lower than corporate defaults, but ABS and RMBS defaults are still higher than corporates.

Comparison of these original issue results against those we achieve by multiplying S&P's six-month transition matrix shows Moody's default results are still generally higher. Again, part of the relatively high structured finance default rate is attributable to the expansive definition of material impairment versus default, and part is due to the partial elimination of withdrawn ratings.

Using the ratio of HEL defaults to total ABS defaults from Exhibit 1 (again blindly, since we still don't know how to apply it to specific ratings), we arrive at an average five-year Baa Resi B&C transition rate of 2.11%. We show these calculations in Exhibit 14. This Moody's Resi B&C transition rate is higher than the 1.62% S&P BBB RMBS transition rate, but it is lower, and we feel much more accurate, than Moody's all-ABS Baa default rate.

IV. CONCLUSION

In determining default rates for structured finance tranches, we think the most reliable sources are the S&P multiplied five-year transition to D rates presented in Exhibit 4 and the Moody's original issue material impairment rates presented in Exhibit 13. We thus average the two to produce the five-year default rates shown in Exhibit 15. We also take Moody's ABS rate and multiply it by 0.48 to arrive specifically at Resi B&C default rates.

Obviously, there is a lot of Kentucky windage in our historical default estimates. Yet historical results, whatever their exact number, are pictures of a rear-view mirror. And in this case, they reflect the difficulty of conducting an investigation of structured finance defaults and the almost random effect of corporate credit events on structured finance.

EXHIBIT 15

Estimated Historical Five-Year Default Rates for Structured Finance Tranches and Corporate Bonds

	ABS	CMBS	RMBS	Resi B&C	Corporates
AAA	0.0%	0.0%	0.3%	0.0%	0.1%
AA	2.0%	0.0%	0.5%	0.7%	0.3%
A	1.6%	0.2%	0.6%	0.5%	0.6%
BBB	9.1%	0.7%	3.8%	1.9%	2.7%
BB	31.1%	3.1%	4.7%	7.0%	11.9%
B	61.0%	9.0%	13.9%	16.6%	29.5%

ENDNOTES

This article draws on material to be published in Lucas, Goodman, and Fabozzi, *Collateralized Debt Obligations: Structures and Analysis*, 2nd ed. (Hoboken, NJ: John Wiley & Sons, 2005).

[1]In short, *marginal* default rates (defaults *within* the first year, *within* the second year, and so on) are calculated for each rating cohort. Yearly marginal default rates are then averaged across all rating cohorts with the requisite number of years of history. The one-year cumulative default rate is merely the average of every rating cohort's first-year marginal default rate. But the two-year cumulative default rate is the sum of the one-year cumulative default rate and the average *second*-year marginal default rate. The three-year cumulative default rate is the sum of the two-year cumulative default rate and the average *third*-year marginal default rate. And so it goes, adding average *marginal* default rates to previously calculated *cumulative* default rates.

This approach uses as much of the available data as possible. Last year's rating cohort, with only one year of data, contributes something to the ten-year average cumulative default rate.

The other suboptimal way to calculate a five-year default rate would be to average the cumulative default rates of every cohort with five years of history. (This is what S&P did with structured finance rating transitions in its three studies published in 2003.) In this case, the last four annual cohorts would contribute nothing to the average five-year cumulative default statistic. The marginal method also makes sure that cumulative default rates never decline over time.

[2]S&P and Moody's point out that the multiplication method implicitly assumes that rating downgrades are not serially correlated, i.e., that a tranche that has been downgraded is not more likely to be downgraded *again*, relative to other tranches that have not been downgraded. We know that downgrades of corporate bonds are serially correlated, but we are not sure how serially correlated downgrades of structured finance tranches would affect the overall results of the multiplication method.

[3]The original cohort method still takes advantage of recent default history from tranches issued within the last five years. These defaults go into the calculation of average marginal default in the particular year after issuance.

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