

Defaults and Losses Given Default of Structured Finance Securities

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Default of corporate bonds and recovery rates have been the subject of voluminous research. There is little such research so far on structured finance securities in general, even though the performance of structured securities has become increasingly important in bank regulation and risk management as well as in valuing market transactions.

The structured finance market has grown rapidly in recent years. In 2003, the total issuance of U.S. asset-backed securities (ABS) including collateralized debt obligations (CDOs) and private-label mortgage-backed securities (MBS) topped \$1,106 billion, far exceeding the issuance of corporate debt at \$813 billion.

Structured securities are issued by special-purpose-entities (SPEs) whose activities are limited to selling securities, buying assets, and distributing the assets' cash flows to securityholders. An SPE is limited in its purpose and structured to be bankruptcy-remote. The performance of its securities is determined almost entirely by the performance of the underlying collateral pool and by the covenanted direction of cash flows to each security.¹

Despite bankruptcy remoteness, the securities issued by an SPE can default. These securities, like other debt, typically have an explicit principal balance, a promise to pay periodic interest, and a promise to pay principal back to investors on or before an explicit final maturity date. Any tranche that has not paid its promised interest and principal in

entirety by its final maturity date is unambiguously in default.²

Defining payment default prior to the final maturity date, however, can be complicated. Each prospectus generally provides a technical definition of default. Some prospectuses, however, anticipate that interest and principal due in a given period can under certain circumstances be deferred to later periods. Sometimes payment shortfalls are capitalized, so one-time shortfalls can be made up to investors gradually over the remaining life of the transaction. Sometimes one-time shortfalls are due in full at the beginning of the next payment period. Sometimes payment deferrals require interest on interest, and sometimes they do not.

Additionally, the definition of timeliness of payment varies not only from sector to sector and at time from transaction but also for transactions within sectors, depending on the language of the prospectus.

We investigate defaults and losses given default, using a data sample of 13,419 structured finance instruments rated by Moody's during 1993–2002. Moody's structured ratings primarily address a security's lifetime expected loss rate, which is the product of the probabilities of default and expected loss severity in the event of default. As a result, ratings performance may not be inferred as well from defaults—which may or may not be cured before the final maturity date—as from material impairments, or accumulated permanent interest or principal losses on a security's final maturity date.

We adopt a single definition of payment default to apply to all securities. It is based on payment shortfall information as recorded in the periodic servicer reports that are commonly available to investors. In some cases, our definition does not conform to the definition of timely payment specifically addressed by Moody's rating or to the concept of default explicitly defined in the underlying documentation of certain transactions.

Even when securitizations allow for the deferral of promised interest and principal, investors typically expect timely payment of interest. We define default as the first payment period (typically first month) when investors receive less than they would be entitled to if the assets underlying the transaction had performed well from a credit perspective. If shortfalls continue for many months, the security will clearly suffer payment shortfalls, and default at its final maturity date.

We define a structured security as in payment default if it has suffered:

- An interest shortfall (excluding prepayment interest shortfalls), or ³
- A principal write-down.⁴

Payment default rates, however, may be poor proxies for expected loss rates, both because many payment defaults will eventually be cured and will not impose permanent losses and because securitizations often experience sufficiently poor collateral performance that losses at final maturity are certain, even though no payment shortfalls have yet materialized.

In the former case, Moody's may maintain a high rating on a security in default during the security's cure period. In the latter case, Moody's will generally assign a low rating, despite the absence of a current default. For example, securities rated in the two lowest rating categories, Ca and C, are virtually certain to sustain substantial losses at maturity even if they are not yet in default.

For these reasons, we define a security to be materially impaired (MI) if it has:

- Sustained a payment default that has not been cured,
- Been rated Ca or C, and hence is expected to suffer a significant level of payment losses in the future.

Of the total 13,419 structured securities, 390 or 2.91% sustained payment defaults. By July 2003, 94 of these defaults had been cured, leaving 296 uncured defaults. Of the universe of 168 Ca- or C-rated securities, 30 had

not yet defaulted. Therefore, a total of 326 securities or 2.43% were materially impaired during the sample period.

Our research shows that highly rated structured securities have sustained low payment default rates and low material impairment rates. In addition, in the event of default, securities that carried high initial ratings have generally suffered low loss rates, while those that carried low initial ratings often suffered substantial rates of loss. The average loss severity rate on 84 "matured" defaulted securities was 42% as a percentage of their original balance.

I. DATA SAMPLE AND DISTRIBUTION OF RATINGS

We adopt six criteria to select rating observations for this study:

1. Our sample covers a ten-year period from 1993 through 2002. To be part of the sample, a security must have been assigned its initial rating by Moody's or had its first payment sometime after the start of 1993 and before the end of 2002. Defaults are measured between 1993 and 2002, and the cure status of default is updated through July 2003.
2. The sample is drawn from the ABS, CMBS, and RMBS sectors. Asset-backed commercial paper (ABCP), collateralized debt obligations (CDO), credit derivatives, structured notes, and securities wrapped by financial guaranty insurers or guaranteed by federal agencies or government sponsored enterprises (GSEs) are excluded.⁵
3. Single-tranche deals whose ratings are effectively a pass-through of the credit risk of single corporate or sovereign issuers are excluded.
4. Tranches carrying the same rating in the same deal are collapsed into a single tranche. In such cases, the longest outstanding tranche is selected.⁶
5. IO (interest-only) and residual tranches are excluded.
6. Only U.S. structured securities are included.⁷

The sample consists of 13,419 structured securities from 4,288 transactions. Of these securities, 6,522 are ABS, 2,614 are CMBS, and 4,283 are RMBS. Home equity loan (HEL) transactions are defined to be part of the ABS sector.⁸

The number of outstanding securities at the beginning of each year is shown in Exhibit 1 by broad rating category and in Exhibit 2 by sector. Because we include

EXHIBIT 1

Percentages of Outstanding Securities at the Beginning of Each Year by Rating

	1994	1995	1996	1997	1998	1999	2000	2001	2002
Total Outstanding	752	1620	2573	3283	4232	5243	6190	7136	8875
Aaa	41.1%	36.4%	33.2%	34.0%	34.0%	34.0%	33.6%	32.9%	31.9%
Aa	27.5%	24.3%	22.0%	18.8%	18.0%	15.9%	15.5%	15.3%	15.2%
A	12.8%	15.2%	18.0%	20.2%	20.6%	21.0%	21.5%	21.9%	21.7%
Baa	11.8%	15.6%	16.6%	16.2%	17.3%	16.7%	17.5%	17.0%	18.3%
Ba	3.7%	5.1%	6.8%	7.2%	6.6%	7.7%	6.3%	7.1%	7.2%
B	2.9%	3.3%	3.4%	3.1%	3.3%	3.8%	4.0%	4.2%	4.3%
Caa	0.1%	0.1%	0.0%	0.2%	0.1%	0.3%	0.8%	0.7%	0.7%
Ca/C	0.0%	0.1%	0.0%	0.2%	0.1%	0.6%	0.8%	0.8%	0.8%
Investment Grade (%)	93.2%	91.5%	89.7%	89.2%	89.8%	87.6%	88.1%	87.1%	87.1%
Speculative Grade (%)	6.8%	8.5%	10.3%	10.8%	10.2%	12.4%	11.9%	12.9%	12.9%

EXHIBIT 2

Percentages of Outstanding Securities at the Beginning of Each Year by Sector

	1994	1995	1996	1997	1998	1999	2000	2001	2002
TOTAL	752	1620	2573	3283	4232	5243	6190	7136	8875
ABS	21.4%	26.5%	31.3%	37.2%	41.9%	46.2%	48.2%	50.3%	48.5%
CMBS	7.8%	6.9%	5.4%	5.8%	8.4%	12.1%	16.1%	18.4%	20.8%
RMBS	70.7%	66.5%	63.3%	57.1%	49.6%	41.7%	35.7%	31.3%	30.7%

only ratings assigned after January 1, 1993, Exhibits 1 and 2 do not show a 1993 column.

Exhibit 1 shows that investment-grade securities in U.S. structured finance have outnumbered speculative-grade securities by a large margin. The ratio of investment-grade securities to speculative-grade securities has been above 7-to-1 in recent years. In the meantime, Aa has become a relatively small rating category, even though during the late 1980s and early 1990s it was the most common category. Its share in the investment-grade rating universe was surpassed by A in 1996 and by Baa in 1998.

Exhibit 2 demonstrates there has been strong rating growth in all three structured finance sectors. The CMBS sector has recorded high rating growth rates in recent years, with a growth rate of about 60% in 1999, about 30% in 2000, and about 40% in 2001. The growth of the rated ABS sector has been consistently above 20% since 1999, led primarily by the growth of HEL securities, whose rating growth rates have been about 36% in 1999, 38% in 2000, and 42% in 2001. The RMBS sector also recorded a strong rating growth rate of 22% in 2001.

II. DISTRIBUTION OF DEFAULTS

We describe distributions of defaults by a number of characteristics.

Distribution by Sector

We have identified 390 securities from 218 deals that sustained payment defaults through the end of 2002 on securities that were first rated on or after January 1, 1993. Exhibit 3 presents the number and percentage of defaults across broad sectors.

Defaults sometimes affect multiple securities issued by the same SPE. The 167 ABS defaults arise from 99 deals. The 80 CMBS defaults arise from 29 deals, and the 143 RMBS defaults arise from 90 deals.

Distribution by Initial Default Event

Among 390 payment defaults, 216 securities (about 55%) initially defaulted solely because of interest shortfalls, 166 (about 43%) initially defaulted solely because of loss of principal, and eight securities (about 2%) defaulted initially because of both interest shortfalls and principal losses.

Exhibit 4 shows the distribution of defaults by these initial default events in each sector. In the CMBS sector, interest shortfalls have accounted for all the initial payment default events to date, while in the RMBS sector, initial defaults have mainly been attributable to a loss of principal.

Under the typical interest-principal-interest-prin-

EXHIBIT 3

Number and Percentage of Payment Defaults by Sector—1993-2002

	ABS	CMBS	RMBS	TOTAL
Number of Payment Defaults	167	80	143	390
Total Number of Rated Securities in the Sample	6522	2614	4283	13419
Percentage of Payment Defaults in Each Sector	2.56%	3.06%	3.34%	2.91%

EXHIBIT 4

Number of Payment Defaults by Initial Default Event

	Interest Shortfall	Principal Loss	Interest Shortfall and Principal Loss	Total
ABS	109	52	6	167
CMBS	80	0	0	80
RMBS	27	114	2	143
Total	216	166	8	390

principal (IPIP) and sequential-pay structure, interest is paid to subordinated tranches only after both interest and principal due to senior tranches are paid, and typically junior tranches do not receive principal until all principal payments are made to senior investors.

In many of the defaulted deals in CMBS and some ABS, workouts on the underlying defaulted loans can take a long time, up to three years. If the servicer did not advance on the problem loan and the loan were not written down, interest shortfalls would occur due to the payment priority schedule. The delinquent loan would not generate cash, so the subordinate bonds would be short of cash for interest payments before realizing any loss of principal.

If delinquent loans subsequently are liquidated and losses materialize, interest shortfalls and principal losses become permanent. Otherwise, if they are later cured or are expected later to be cured, interest shortfall would be repaid and defaults cured. This partially explains why there are more interest defaulters than principal defaulters in our CMBS and ABS samples.

Distribution by Cure Status

Among the 390 payment defaults, 94 (about 24%) were fully cured with no remaining interest shortfalls or principal losses outstanding as of July 2003.⁹ Correspondingly, 296 payment defaults still have losses outstanding and remain uncured.

In determining the cure status of a payment default and the number of payment periods for a default to be cured (the defaulters in our sample all make payments on a monthly frequency), we look only at the beginning of

a payment default event and the cumulative losses as of July 2003, or as of the final date when the security had cash flow information.

If there were losses outstanding, the payment default is considered uncured even though the first payment default may have been cured and the final loss is the result of new payment default events. Similarly, the number of months from default to the time the security is cured is measured from the initial payment default date to the first date when losses are no longer observed.¹⁰

The vast majority of cured defaults (88 of the 94 cured defaults) are payment defaults triggered by interest shortfalls. Short-term interest shortfalls can be the result of either a technical breakdown of deal structure or the recovery of servicer advances depending on their assessment of problem loans.

Of the 88 cured interest defaulters, 46 (more than 50%) were cured after just one month, and 59 (or 67%) were cured within three months after the initial payment default. Only 7 (or 8%) were cured after more than one year in payment default.

A distribution of months to cure from initial payment default for cured defaults is shown in Exhibit 5. By asset class, defaults in CMBS were most likely to be cured (63%), while ABS had the lowest cure rate at 10%. RMBS had a 15% cure rate.

Payment defaults involving principal losses were almost never cured. In fact, whether the initial payment default event was a loss of principal or an interest shortfall, as long as a security suffered a loss of principal the default was almost never cured.

Specifically, of the 187 defaults that have suffered loss of principal, 174 of these went into payment default initially as principal defaults, and 13 had principal losses after they first missed interest payments. 181 of the 187 remained uncured as of July 2003.

A security with cured payment defaults could of course experience losses again as long as the security has not been paid down. Therefore, the final cure status of a payment default can be evaluated only when payments cease—when the security is paid down or written down.

EXHIBIT 5

Number of Months from Initial Payment Default to Cure

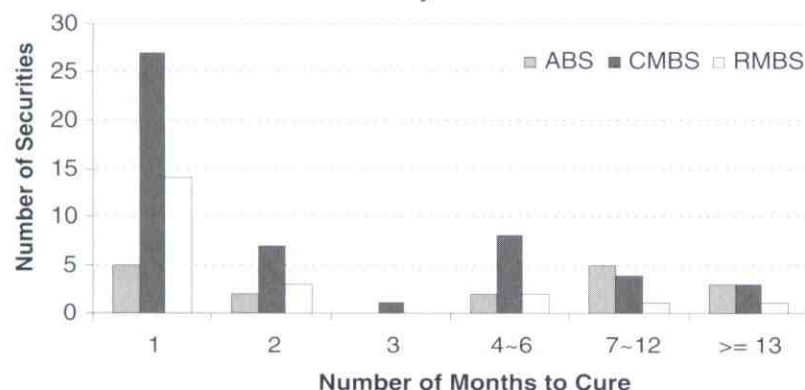


EXHIBIT 6

Number and Percentage of Securities Rated Ca or C by Sector—1993-2002

	ABS	CMBS	RMBS	TOTAL
Number of Ca or C Rated Securities	99	5	64	168
Total Number of Rated Securities in the Sample	6522	2614	4283	13419
Percentage of Ca or C rating in Each Sector	1.52%	0.19%	1.49%	1.25%

In our sample, there were 84 such securities: 20 ABS, 60 RMBS, and 4 CMBS. Of these 84 securities, 11 defaulted due to interest shortfalls, and 73 defaulted due to principal losses. Of the 11 interest defaults, 6 were cured and 5 were never cured. The 73 principal defaults were not cured before the end of the sample period.

Distribution of Ca/C-Rated Securities

Payment defaults generally result from deterioration in collateral performance, but the worsening of overall collateral performance that led to shortfalls of cash payments do not always lead to downgrades or assignment of Ca or C ratings. By the same token, a Ca or C rating does not imply that a security is already in default. In our entire sample, 168 securities were at some point or other downgraded to Ca or C.

Exhibit 6 shows the number and percentage of Ca- or C-rated securities by sector. There are only five (or 0.2%) Ca- or C-rated securities in the CMBS sector. This is in sharp contrast to the large number of payment defaults seen in Exhibit 3 (80, or 3%). The percentages of ABS and RMBS securities rated Ca or C are also lower than the percentages of defaulted securities (only about half of those in Exhibit 3).

Because payment defaults can be cured, or even if

they are uncured, their losses can be small, ratings on these securities—which are based on expected loss—do not necessarily fall to Ca or C simply because a payment default has occurred. Moody's assigns a Ca or C rating to indicate that losses are expected to be substantial over the lifetime of the security.

Relationships Among Payment Default, Ca/C Rating, and Material Impairment

Not all securities experiencing payment defaults are rated Ca or C, and not all Ca- or C-rated securities are experiencing payment defaults, but there is a strong correlation between the two events. Of the 168 Ca- or C-rated securities, historical payment records are complete for only 154. Of the 154 Ca- or C-rated securities for which we have complete data: 2 securities were paid down without losses, 16 are anticipated to suffer losses in the future, and the remaining 136 all had losses at some point during the sample period.

Exhibit 7 categorizes defaults by sector and cure status for payment defaults, Ca- or C-rated securities, and materially impaired securities.

III. ONE-YEAR PAYMENT DEFAULT AND MATERIAL IMPAIRMENT RATES

We evaluate one-year results also by a number of characteristics.

Historical One-Year Default and Impairment Rates

We compute one-year payment default rates of structured securities by cohort rating as follows. At the beginning of each year and for each rating category, we construct a cohort that consists of all outstanding securities with a given rating. The one-year payment default rate of a rating category is the total number of securities defaulted in a cohort year divided by the total number of outstanding securities minus one-half of all securities withdrawn during the year.¹¹

The material impairment rate is computed in a sim-

EXHIBIT 7

Distribution of Payment Defaults and Ca- or C-rated Securities—1993-2002

	ABS	CMBS	RMBS	TOTAL
Total Number of Rated Securities in the Sample	6,522	2,614	4,283	13,419
All Securities Experiencing Payment Defaults	167	80	143	390
<i>Cured</i>	22	50	22	94
<i>Uncured</i>	145	30	121	296
All Ca or C rated Securities	99	5	64	168
<i>Cured Payment Defaults</i>	2	0	0	2
<i>Uncured Payment Defaults</i>	66	4	64	134
<i>No Payment Default As of December 2002 but Default Anticipated in Future</i>	16	0	0	16
<i>No Payment Default and fully paid down by December 2002</i>	2	0	0	2
<i>Incomplete Payment Records</i>	13	1	0	14
Material Impairments	174	31	121	326
<i>Uncured Payment Defaults</i>	145	30	121	296
<i>Not in Payment Default but Ca or C Rated</i>	29	1	0	30

ilar fashion. In addition, the time of material impairment is the time of the first Ca or C rating action or the time of first payment default event, whichever happened first.

Historically, investment-grade one-year default rates have consistently been low. The highest investment-grade payment default rate was seen in 1999, but that was only at 0.67% of the outstanding securities. The speculative-grade one-year default rate had two peaks—one in 1997 (at 9.9%) and the other in 2002 (at 9.1%). Since the year 2000, the speculative-grade default rate has been on a remarkable upswing.

Exhibit 8 illustrates these differences in default rates and the dynamic trends from 1994 through 2002 (there is no 1993 rating cohort because cohorts are formed at the beginning of each year). While the difference between investment-grade and speculative-grade has been significant, there was virtually no difference between payment default rates and material impairment rates of speculative-grade securities before 2001. (The 1999 material impairment rate was slightly higher due to a somewhat higher number of Ca or C rating actions.)

Since the year 2001, the payment default rate has started to rise above the material impairment rate for speculative-grade ratings. This is mainly the result of a large number of CMBS interest shortfalls that were subsequently cured. Meanwhile, because the sample includes only deals originated since 1993, and defaults generally do not occur in newly originated transactions, the low default rates observed in the earlier years could be the result of our sample construction method.

The noticeable spike in 1997 was the result of default

of a large number of RMBS tranches. A high percentage of these 1997 defaults came from securities backed by collateral originating from a single lender, Quality Mortgage. In addition, since 2000 a weakening economy has caused poor performance in parts of the manufactured housing loan sector and franchise loan sector. Some deals backed by subprime mortgage loans also showed signs of distress, although the overall collateral performance in the HEL sector is still good.

The softening of the commercial real estate market and fallout after the terrorist attack on September 11, 2001, also impacted a number of CMBS deals, resulting in a surge of interest shortfalls. Exhibit 9 depicts these trends and differences by sector by deconstructing the all speculative-grade material impairment (MI) rate by sector.

According to data in Exhibit 9, the material impair-

EXHIBIT 8

One-Year Payment Default and MI Rates by Grade

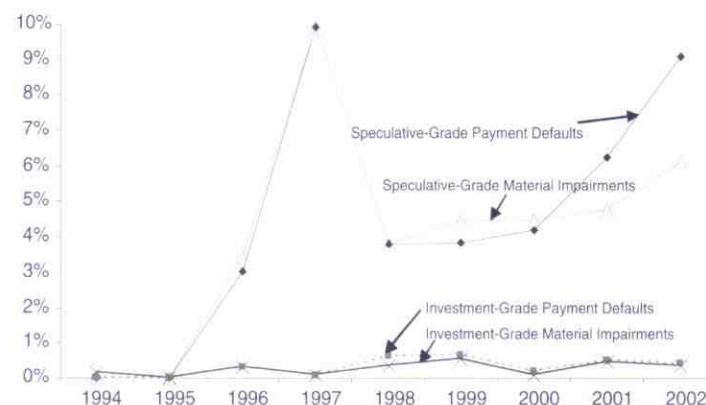
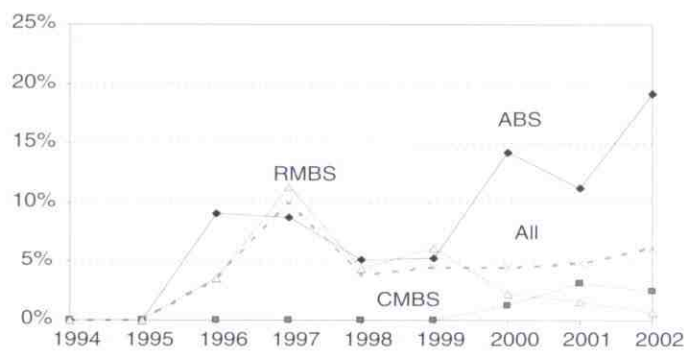


EXHIBIT 9

One-Year Speculative-Grade MI Rates by Sector



ments in the RMBS sector occurred earlier in the sample period, while ABS and CMBS material impairments are generally more recent. In particular, RMBS had a peak speculative-grade MI rate of 11.3% in 1997, but recorded a 6.2% speculative-grade MI rate in 1999, before dropping to only 1.5% in 2001 and 0.7% in 2002.

The ABS sector's speculative-grade MI rate had a big jump in 2000 from 5.3% in 1999 to 14.3%, and farther up to 19% in 2002. CMBS deals had no material impairment before 2000 and have stayed low since then.

One-Year Default and Impairment Rates by Rating

Exhibit 10 provides weighted-average one-year payment default rates and material impairment rates by cohort ratings, where the weights are the number of securities outstanding in each cohort year as percentages of all outstanding securities from all cohort years (all default rates are weighted-average default rates unless otherwise noted). Our approach puts more weight on default rate experiences in the years when there were more outstanding securities, which corresponds to the most recent years in the sample.

The bars in Exhibit 10 demonstrate a strong inverse correlation between cohort ratings and average one-year payment default rates and material impairment rates. That is, the lower the ratings, the higher the one-year payment default rates and material impairment rates.

Default Rates for Different Types of Default

There are strong correlations with ratings not only for one-year payment default rates and for material impair-

ment rates, but also in transition rates to Ca/C ratings and subcategories of payment defaults, such as cured and uncured payment defaults. We summarize these findings in Exhibit 11.

Exhibit 11 presents default rates for seven categories of defaults and impairments. For each cohort rating group, the first column provides one-year default rates for payment defaults cured within three months.

The second column is for those cured after three months, and the third column is for uncured payment defaults. The fourth column lists default rates based on anticipated defaults (i.e., Ca- or C-rated but not yet in payment default).

The fifth column is the sum of columns (3) and (4) and shows the material impairment rate. The sixth column includes all payment defaults, both cured and uncured. The last column provides rating transition rates into the Ca/C rating category based on all securities rated Ca or C, whether they are in payment default or not.

Exhibit 11 demonstrates that, regardless of the default classifications, the one-year default rate has generally aligned well with cohort ratings. The lower the rating, the higher the one-year default rate—and there are several notable additional observations to be made.

First, a comparison of columns (5) and (6) shows the Aaa payment default rate is much higher than the Aaa material impairment rate, implying that Aaa payment defaults are almost all cured defaults. Furthermore, comparison of columns (1) and (2) shows that cured Aaa payment defaults were all cured within three months. Correspondingly, Aaa material impairment rates have been extremely low.

Second, within the investment-grade universe, Baa payment default rates and material impairment rates are markedly higher than those of Aaa, Aa, and A. Aa and A default rates and impairment rates are very similar. Additionally, investment-grade (except for Aa) securities have had higher payment default rates than material impairment rates.

Third, within the speculative-grade rating universe, sharp differences in payment default, material impairment, and Ca/C transition rates are evident across the Ba, B, and Caa rating categories. This means that the default classification used has a particularly significant impact on speculative-grade default rates.

Fourth, even for cured defaults in columns (1) and (2) there is some inverse correlation between default rate and cohort ratings.

Finally, for all rated securities, both one-year mate-

EXHIBIT 10

One-Year Payment Default and MI Rates by Rating—1994-2002

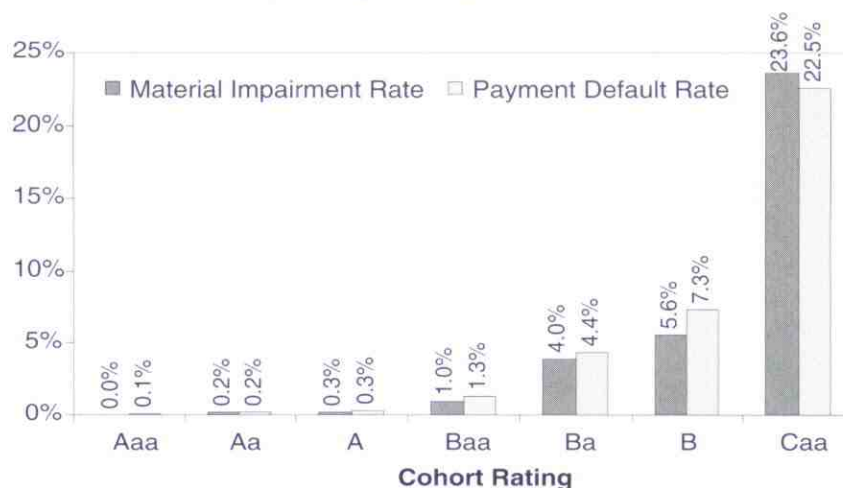


EXHIBIT 11

One-Year Default Rates by Cohort Rating and Type of Default—1994-2002

	Payment Default Cured in 3 months (1)	Payment Default Cured after 3 months (2)	Uncured Payment Default (3)	Ca or C rated but not in payment default (4)	Material Impairment (MI) (3)+(4) = (5)	All Payment Default (1)+(2)+(3) = (6)	Ca/C Transition Rates (7)
Aaa	0.05%	0.00%	0.01%	0.00%	0.01%	0.06%	0.00%
Aa	0.05%	0.06%	0.12%	0.12%	0.24%	0.23%	0.12%
A	0.02%	0.05%	0.25%	0.02%	0.27%	0.32%	0.07%
Baa	0.22%	0.16%	0.90%	0.09%	0.99%	1.28%	0.30%
Ba	0.41%	0.08%	3.88%	0.08%	3.95%	4.36%	2.06%
B	1.19%	1.13%	5.02%	0.56%	5.58%	7.34%	3.04%
Caa	0.54%	4.53%	17.47%	6.11%	23.58%	22.54%	13.30%

rial impairment rates and payment default rates have on average been much higher than one-year Ca/C transition rates. In fact, the Ca/C transition rate is only about half of the material impairment rates for most of the rating categories.

IV. MULTIYEAR MATERIAL IMPAIRMENT RATES

Materially impaired securities consist of uncured payment defaults and Ca- or C-rated securities that are not yet in payment default. Our sample includes a total of 326 material impairments: 174 ABS, 31 CMBS, and 121 RMBS. Henceforth we focus exclusively on material impairment rates.

By Cohort Rating

The cumulative material impairment (MI) rates by cohort rating are computed using the marginal method. That is, we first compute marginal material impairment rates each year, given a rating cohort. The marginal MI rate is the number of securities that become materially impaired during a given year following the formation of a cohort as a percentage of the total securities that were unimpaired and still outstanding at the beginning of the year.

Each year's marginal MI rate is an MI rate adjusted for ratings withdrawn by reducing the number of securities in the beginning of the year by half the number of securities whose ratings were withdrawn, implicitly assuming that withdrawals are evenly spaced throughout the year. Marginal MI rates are then averaged (weighted

EXHIBIT 12

Multiyear Cumulative MI Rates by Cohort Rating—1994-2002

Cohort Rating	Years after Cohort Formed				
	1	2	3	4	5
Aaa	0.01%	0.08%	0.23%	0.42%	0.56%
Aa	0.24%	0.47%	0.80%	1.13%	1.23%
A	0.27%	0.79%	1.20%	1.42%	1.48%
Baa	0.99%	2.53%	5.01%	6.49%	8.36%
Ba	3.95%	9.05%	12.37%	16.48%	17.95%
B	5.58%	11.78%	16.87%	19.18%	20.35%
Caa	23.58%	26.33%	28.79%	28.79%	28.79%

by the number of securities in the cohort year) across cohorts.

Cumulative MI rates are calculated iteratively. The first year's cumulative MI rate is the same as its marginal MI rate. Thereafter, the cumulative MI rate for horizon T is equal to the cumulative MI rate of horizon T - 1 plus the marginal MI rate for T, times the survivors (one minus the cumulative MI rate at time T - 1).

Exhibit 12 presents cumulative MI rates over a five-year horizon and for each cohort rating category. While cumulative MI rates for Aa and A ratings are fairly similar, the difference between Aaa and Aa/A is quite great, as it is between Aa/A and Baa. That is, within the investment-grade sector, rating categories provide fairly sharp differentiation for material impairments over multiple time horizons.

Exhibit 12 also indicates that while cumulative MI rates for Ba and B ratings are fairly similar, the difference between Caa and Ba/B is quite great, as is the difference between Baa and Ba/B. Therefore, within the speculative-grade sector, the rating categories also provide fairly sharp differentiation with respect to material impairments over multiple time horizons.

By Original Rating

The original ratings on structured securities are the assessments of these securities' credit risk at the time a transaction is originated and first sold into the market. These ratings attempt to differentiate securities by their relative expected loss rates as of the origination date. Our examination of material impairment rates by original ratings is intended to recognize that loss rates, and not material impairment rates alone, are the primary determinants of structured finance ratings.

To study material impairment rates by original ratings, we form cohorts by original rating and origination year (also called vintages). We then use the same method for a cohort rating-based default rate to calculate cumulative material impairment rates for each rating vintage. That is, we first calculate marginal material impairment rates in each year for a given rating vintage; then calculate marginal unimpaired rates and cumulative unimpaired rates; and finally calculate cumulative material impairment rates. As for material impairment rates by one-year cohorts, we also adjust material impairment rates by original rating to reflect withdrawn ratings.

Exhibit 13 displays these cumulative material impairment rates by original rating and years since origination. The cumulative MI rates by original rating in Exhibit 13 are markedly lower than (on average less than half of) those by cohort rating in Exhibit 12, with the exception of the Aa rating category. There is also a strong correlation between original rating and material impairment rate, which becomes stronger over longer time horizons. Notice that the Caa rating category is particularly small.¹²

The performance of three sets of securitizations accounts for the non-intuitive rank ordering of Aa and single-A original rating default rates. Two sets of these deals, BankAmerica and UCFC Funding, were in the manufactured housing sector and did not have A-rated tranches. When those deals sustained large interest shortfalls, losses went up the waterfall to the Aa tranche. In addition, all NPF (National Premier Financial) healthcare receivables securitizations sponsored by National Century Financial Enterprises, Inc. (NCFE), were structured into just two tranches—one Aaa and one Aa—and subsequently all Aa tranches were downgraded to Ca or C.

EXHIBIT 13

Multiyear Cumulative MI Rates by Original Rating—1993-2002

Cohort Rating	Years after Cohort Formed				
	1	2	3	4	5
Aaa	0.01%	0.08%	0.23%	0.42%	0.56%
Aa	0.24%	0.47%	0.80%	1.13%	1.23%
A	0.27%	0.79%	1.20%	1.42%	1.48%
Baa	0.99%	2.53%	5.01%	6.49%	8.36%
Ba	3.95%	9.05%	12.37%	16.48%	17.95%
B	5.58%	11.78%	16.87%	19.18%	20.35%
Caa	23.58%	26.33%	28.79%	28.79%	28.79%

Seasoning Pattern in Marginal Material Impairment Rate

A notable phenomenon in both Exhibits 12 and 13 is that MI rates of all rating categories appear to increase faster in earlier years than in later years. To further examine this pattern, we group all ratings together and follow their aggregate marginal material impairment rates as they season (i.e., as ratings age, measured in years since origination).

Exhibit 14 shows there are substantial increases in material impairments in the first three years after origination, and then a significant drop in the fifth year followed by continued declines. In fact, this seasoning pattern of marginal material impairment rates can also be observed within most of the individual rating categories, even though the timing of the peak is not the same across ratings. This suggests there is a seasoning pattern in the marginal material impairment rate that is not related to specific ratings, but is more pertinent to the collateral's performance.¹³

The seasoning pattern helps to explain why default rates by original rating tend to be lower than those by cohort rating on the same time horizon. A vintage rating cohort consists of all new ratings assigned in that vintage year, while a standard rating cohort mixes ratings of different ages.

Exhibit 14 shows that defaults appear to exhibit a seasoning pattern regardless of rating. That is, there is a greater likelihood of default for moderately seasoned securities than for newly issued securities or for well-seasoned securities. Therefore, for any given time and given horizon in our sample (which consists of a mixture of new and moderately seasoned securities), default rates of a mixed cohort will generally be higher than those of a cohort of new issues.

Material Impairment Rate by Vintage

Finally, we show material impairment counts and material impairment rates by vintage. According to Exhibit

15, the 1997 and 1998 vintages had the most material impairments, while the 1996 vintage had the highest material impairment rate. Overall material impairment rates were quite similar between 1994 and 1998, and more recent vintages since 1999 had lower MI rates, but will likely experience more material impairments as they season.

V. MATERIAL IMPAIRMENT RATES BY SECTOR

We have found so far that material impairment rates in ABS, CMBS, and RMBS, on average, have been strongly correlated with ratings over both short- and long-term horizons. We now analyze material impairment rates by individual sector.

In Exhibit 16, we first compare average one-year material impairment rates across sectors. Weighted-average one-year material impairment rates are correlated with cohort ratings for each sector; the higher the rating, the lower the material impairment rate. The Aa rating category is the only exception, due to the small sample size.

There are typically few outstanding speculative-grade securities, particularly B- and Caa-rated securities, in each sector. Hence their material impairment rates can be unstable, and are subject to small-sample biases.

For instance, the B rating category in the ABS sector had 42 rating observations outstanding in 2001 (for the B category, 2001 is the largest of all cohorts). There were 10 material impairments in 2001 in this rating category, resulting in a 25% material impairment rate for this year.

Similarly, there were ten ABS Caa-rated securities in 2002, and five of them became materially impaired. This results in a 50% impairment rate for the Caa rating category in 2002. A small change in the number of materially impaired securities can dramatically change the material impairment rate for these small rating categories.

EXHIBIT 14

Marginal MI Rates by Years since Origination—1993-2002

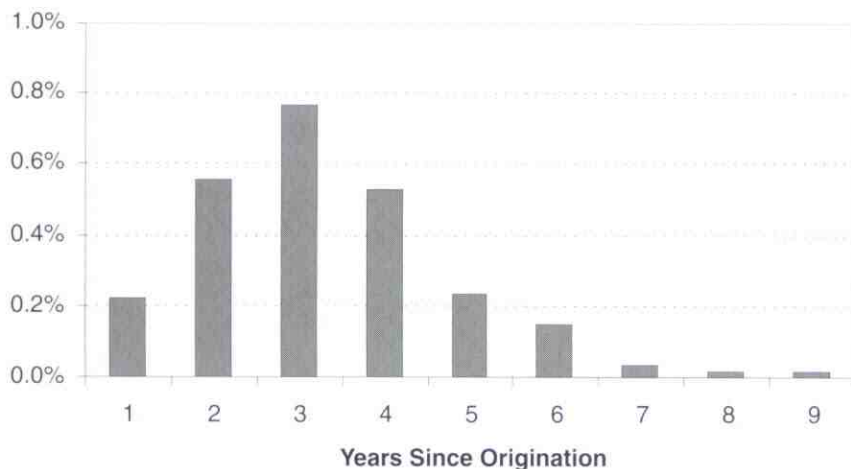
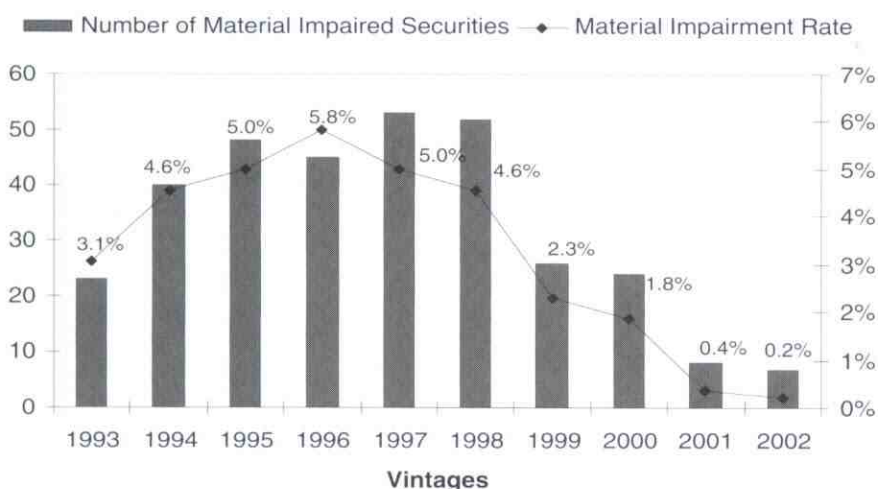


EXHIBIT 15

Cumulative MI Rates to Date by Vintage—1993-2002



Also notable in Exhibit 16 is the difference in material impairment rates across sectors. CMBS had the lowest material impairment rate, while ABS had the highest. In fact, material impairment rates for CMBS are substantially lower across all rating categories except Aaa. Between ABS and RMBS, the difference is more pronounced for speculative-grade ratings than for investment-grade ratings (Aa is an exception). These differences are partly the result of the failures of a small number of originators or issuers like Green Tree/Conseco and Quality Mortgage.

The differences are also partly the result of diverse cyclical characteristics of each sector. For example, our sample period has not encompassed more than a full credit cycle in the residential or commercial real estate market.

Therefore, these large differences in realized material impairment rates across these sectors may not persist into the future.

Material Impairment Rates in ABS

Among materially impaired ABS, most have been backed by manufactured housing loans (80, or 46% of all ABS material impairments); franchise loans (31, or 18% of ABS material impairments); and HEL (31, or 18% of ABS material impairments). These three asset types account for 82% of all ABS material impairments.

Among the asset subcategories, health care securitizations had the highest material impairment rate. This is followed by franchise loan-backed securities and manufactured housing loan securitizations. While not yet in payment default, 12 health care receivables securities were rated Ca due to the failure of their sponsor—National Century Financial Enterprises, Inc. (NCFE)—and expectations they would suffer material losses in the near future. This resulted in a 40% material impairment rate for this small asset type. Other receivables securitizations such as trade receivables, timeshare receivables, and future receivables had no defaults during the same period.

Because there are quite a few rated HEL securities, 31 HEL material impairments (24 of these backed by subprime mortgage loans) are only a small fraction (1.3%) of all rated HEL securities, suggesting that HEL is still a relatively less impaired asset type (comparable to autos) within the ABS sector.

Exhibit 17 compares the material impairment rates across asset types in ABS. It shows that while health care receivables and franchise loan securitizations suffered significantly during the sample period, many other ABS asset types have performed very well, either sustaining low material impairment rates or no material impairment at all. This is particularly evident for securities backed by student loans, small business loans, autos, home equity

EXHIBIT 16

One-Year MI Rates by Cohort Rating and Sector—1994-2002

Cohort Rating	Aaa	Aa	A	Baa	Ba	B	Caa
ABS	0.00%	0.67%	0.30%	1.14%	9.44%	15.97%	70.83%*
CMBS	0.00%	0.00%	0.10%	0.42%	0.94%	2.86%	1.85%
RMBS	0.02%	0.03%	0.28%	1.14%	2.64%	5.56%	24.66%
TOTAL	0.01%	0.24%	0.27%	0.99%	3.95%	5.58%	23.58%

*Sample size is small.

EXHIBIT 17

Number and Percentage of ABS Material Impairments—1993-2002

ABS Collateral Type	Total Number of Rated Securities in the Sample	Number of Material Impairments	Percentage
Healthcare Receivables	30	12	40.0%
Franchise Loans	136	31	22.8%
Manufactured Housing	661	80	12.1%
Autos	623	9	1.4%
HEL	2320	31	1.3%
Leases	368	3	0.8%
Credit Cards	1272	4	0.3%
Equipment	70	0	0.0%
Floor-plans	105	0	0.0%
Small Business Loans	108	0	0.0%
Student Loans	343	0	0.0%
Other Receivables	68	0	0.0%
Other ABS	418	4	1.0%
ABS All	6522	174	2.7%

loans, and credit card receivables transactions.

Loan origination in the manufactured housing and franchise loan sectors, the two most impaired sectors in ABS, was competitive in the late 1990s. Manufactured housing loans are made to low-income consumers, and franchise loans are typically made to owners of small businesses like fast food, video rentals, and quick-lube franchises. These two types of securitizations both primarily serve small and low-income borrowers whose economic circumstances are sensitive to cyclical changes and therefore were sharply affected during the recent economic downturn.

Also significant in the ABS sector were the troubles of Conseco Finance (formerly Green Tree Finance). In fact, 30 of the 80 (37.5%) material impairments in manufactured housing loan securities were associated with Green Tree/Conseco securities either because of poor collateral performance or because of the weakening of a corporate guaranty provided by Green Tree/Conseco.

Most (a total of 25) of these securities were originally rated Baa1 or Baa3 due to Green Tree's guaranty.

The default of these securities has impacted the Baa material impairment rate in the ABS sector. The overall effect on default rates of Green Tree/Conseco is found to be small, once all Green Tree deals are excluded. This is because there are a large number of Green Tree/Conseco related securities in the sample.

In addition, there were four material impairments from two Heilig-Meyers deals in the ABS sector that were the result of corporate failure. Overall, the failures of Conseco, NCFE, and Heilig-Meyers contributed 46 material impairments, or 26% of the 174 total material impairments in the ABS sector.

Exhibit 18 shows the weighted-average cumulative material impairment rates for the ABS sector. Within the ABS sector, we rank-order material impairment (MI) rates of all horizons by rating. Material impairment rates are generally higher for lower rating categories (Aa is the only

EXHIBIT 18

Cumulative MI Rates in ABS by Cohort Rating—1994-2002

Cohort Rating	Years after Cohort Formed				
	1	2	3	4	5
Aaa	0.00%	0.02%	0.06%	0.06%	0.06%
Aa	0.67%	1.25%	2.03%	2.83%	3.13%
A	0.30%	0.85%	1.32%	1.61%	1.61%
Baa	1.14%	2.88%	6.74%	8.85%	13.44%
Ba	9.44%	23.47%	31.66%	47.50%	53.08%
B	15.97%	36.00%	44.44%	49.38%	49.38%
Caa	70.83%	70.83%	70.83%	NA	NA

**Italics indicate small sample sizes.*

EXHIBIT 19

Cumulative MI Rates in CMBS by Cohort Rating—1994-2002

Cohort Rating	Years after Cohort Formed				
	1	2	3	4	5
Aaa	0.00%	0.00%	0.00%	0.00%	0.00%
Aa	0.00%	0.00%	0.00%	0.00%	0.00%
A	0.10%	0.26%	0.53%	1.03%	1.03%
Baa	0.42%	0.99%	1.55%	2.23%	2.23%
Ba	0.94%	2.20%	4.33%	5.17%	5.17%
B	2.86%	7.07%	12.92%	15.68%	19.43%
Caa	1.85%	4.70%	9.85%	9.85%	9.85%

**Italics indicate small sample sizes.*

exception due to a small sample), especially for speculative-grade securities. For the Caa rating category, MI rates for the four- and five-year horizons cannot be calculated because there was no security outstanding in the fourth year after the cohort was formed.

Material Impairment Rates in CMBS

The CMBS sector has seen a large number of securities experience interest shortfalls since 2001. CMBS payment defaults to date have been caused entirely by interest shortfalls. The reasons for interest shortfalls include appraisal reduction (known as ASER—Appraisal Subordinate Entitlement Reduction), loan modifications, unanticipated terrorism insurance expenses, special servicing fees, and unanticipated legal expenses. Among these, appraisal reductions and special servicing fees are the two leading reasons.

Interest shortfalls in CMBS have sometimes affected senior CMBS tranches owing to the current servicer advancing and recovery mechanism. This mechanism allows servicers to recover advances in one rather than

multiple payment periods. Many of these interest shortfalls were cured within a short period of time.

Of a total of 80 payment defaults, 49 were cured and 31 were not cured (and hence materially impaired) by July 2003.¹⁴ There were five securities rated Ca or C before the end of 2002, four of them from a single deal, Morgan Stanley Capital I 1998-CF1. Of the 31 materially impaired CMBS securities, 20 were backed by large multiborrower loan pools, 10 were backed by small multiborrower loan pools, and one by a single asset.

Exhibit 19 shows cumulative MI rates by cohort rating in the CMBS sector. There are three notable observations to be made on the evidence in Exhibit 19.

First, cumulative MI rates of Baa-, Ba-, and B-rated CMBS securities are strongly differentiated across all horizons shown, and the MI rates for B-rated securities are much higher than those for Baa and Ba.

Second, cumulative MI rates of Aaa- and Aa-rated securities are zero, indicating particularly strong performance in these two CMBS rating categories.

Third, the Caa rating category appears to have lower average MI rates than the B category, but there are few

EXHIBIT 20

Cumulative MI Rates in RMBS by Cohort Rating—1994-2002

Cohort Rating	Years after Cohort Formed				
	1	2	3	4	5
Aaa	0.02%	0.15%	0.42%	0.76%	0.97%
Aa	0.03%	0.13%	0.32%	0.55%	0.61%
A	0.28%	0.86%	1.21%	1.30%	1.42%
Baa	1.14%	2.90%	5.00%	6.30%	7.25%
Ba	2.64%	5.31%	7.31%	8.61%	9.65%
B	5.56%	10.29%	14.52%	16.42%	17.17%
Caa	24.66%	28.52%	28.52%	28.52%	28.52%

**Italics indicate small sample sizes.*

observations in this rating category. Any small changes in the cure status of a payment default in this rating category can cause wide swings in its material impairment rates. In fact, the Caa MI rate changed significantly when two Caa-rated securities were cured in 2003 after they first sustained a payment default before the end of 2002.

We note that the CMBS sector typically lags the performance of the corporate sector, as tenants reduce their use of space before loans on property default. The cutoff of our study period at year-end 2002 misses what is likely to be a pickup in loan delinquencies and bond defaults.

Material Impairment Rates in RMBS

There were a total of 121 RMBS material impairments. All of them had payment defaults and loss of principal. Sixty of them were rated Ca or C before the end of 2002. Of the 121 materially impaired securities, 113 defaulted solely due to principal write-down.

A large number of defaulted RMBS securities were backed by loans originated from a single mortgage lender, Quality Mortgage. Of the 121 securities, 75 (62%) involving 40 deals, were from this lender. Of the 75 securities that defaulted, 60 defaulted during 1997, 1998, and 1999. These securities are the major contributors to high RMBS material impairment rates in those three years. In fact, Moody's downgraded 101 securities from 43 Quality Mortgage deals in 1998 and further downgraded 94 securities from 38 deals in 1999.

The mortgage loan pools underlying these deals performed poorly, and included high percentages of investor properties, two- to four-family properties, and loans originated with inadequate documentation. High losses were the result of poor origination and underwriting practices,

including weak appraisals and loans made to risky borrowers. These problems were further exacerbated by high geographic concentration in the affected pools.

Exhibit 20 illustrates the relationship between RMBS cohort ratings and their cumulative MI rates. As we can see, RMBS cohort ratings have generally had the correct rank-ordering and distinguishable cumulative MI rates over each horizon shown. Cumulative MI rates of Baa ratings have been closer to those of Ba ratings in RMBS than in ABS and CMBS. Also, cumulative MI rates of Ba- and B-rated RMBS securities have been much lower than those of similarly rated ABS and CMBS securities. Also, after two years, Aaa-rated RMBS had sustained slightly higher cumulative MI rates than Aa-rated RMBS.

VI. MI RATES OF STRUCTURED AND CORPORATE RATINGS

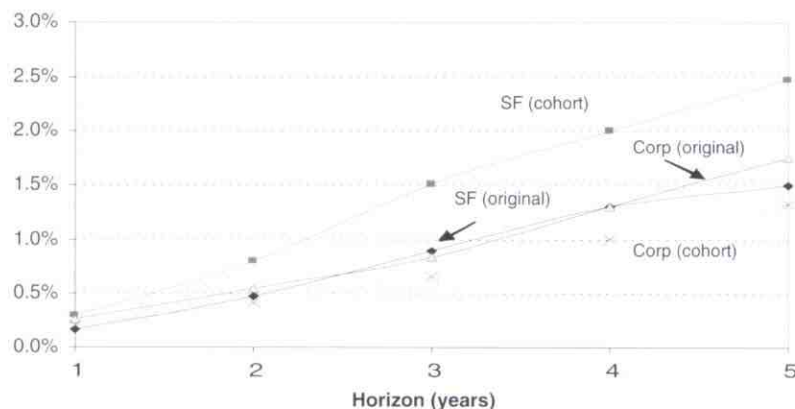
While Moody's corporate and structured ratings reflect both the likelihood of default and financial loss suffered in the event of default, structured ratings rely more heavily on estimates of expected loss rates than do the corporate ratings. Default risk plays a much more significant role in corporate rating assignments than in structured rating assignments. The performance of structured ratings should not be measured on frequencies of default alone.

Because we incorporate data only back to 1993, or only one economic cycle, one should interpret the results with caution both on an absolute basis and in comparison to default study statistics for the corporate or other sectors. Much of the recent issuance occurred during one of the longest economic expansions in U.S. history, which then was followed by one of the shortest recessions. Also, interest rates were falling during most of the study period.

EXHIBIT 21

MI Rates for Structured (SF) and Corporate Sectors (Corp) by Cohort and Original Rating—1993-2002

Panel A: All Investment-Grade Securities



Panel B: All Speculative-Grade Securities

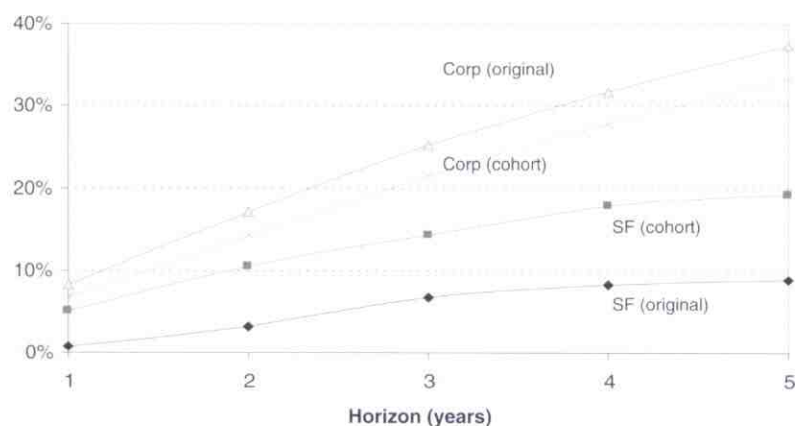


Exhibit 21 compares cumulative material impairment rates on structured and corporate ratings over the same sample period 1993-2002, both by cohort rating and original rating, grouped into investment-grade and speculative-grade. We use the same definition for material impairment in the corporate sector by combining defaults and Ca- or C-rated issuers, whichever occurred first. We also use only corporate ratings initially assigned during the same period from 1993 through 2002. All MI rates are adjusted for withdrawn ratings.

Note that there are significant differences in rating distributions across the two sectors. For instance, the percentage of Aaa ratings among investment-grade securities is much higher in the structured sector than in the corporate sector, while the percentage of Caa ratings among speculative-grade securities is much lower. The

first potentially biases downward the investment-grade material impairment rates of structured securities relative to corporate securities, and the second biases downward speculative-grade material impairment rates of structured securities.

Acknowledging these differences between the two sectors, let us note a few key observations in Exhibit 21. First, by cohort rating, investment-grade MI rates on average are higher in the structured securities than in the corporate issuers, and more so over longer horizons. By original rating, investment-grade MI rates are similar between the structured and corporate sectors. These points are illustrated in Panel A of Exhibit 21.

Second, Panel B of Exhibit 21 shows that speculative-grade MI rates are generally much lower in structured than in corporate securities, both by original rating and cohort rating (the cohort rating-based Ba MI rate is the only exception). Note the much lower percentage of speculative-grade securities, particularly B- and Caa-rated securities, in structured finance than in corporate finance.

Third, unlike structured securities whose original rating-based MI rates are generally lower than their cohort rating-based MI rates, investment-grade corporate MI rates are similar for original rating-based and cohort-based MI rates.

For speculative-grade corporate issuers, original rating-based MI rates are higher than cohort-based MI rates. This suggests that seasoning patterns may be different across the structured and corporate sectors.

Exhibit 22 offers more detail on the comparisons of the corporate sector and the structured sector by rating category.

Finally, we should note that structured finance is a much younger sector than corporate finance. What has been realized in the past ten years may not necessarily represent what is going to happen in the future. It usually takes a few credit cycles to obtain a full assessment of default risk on rated securities. As sample periods extend into the future, and more default and loss data become available, estimates of material impairment rates in aggregate or by rating category are expected to become more reliable.

EXHIBIT 22

Cumulative MI Rates by Cohort and Original Rating—1993-2002

<i>Corporate</i>										
	By Cohort Rating					By Original Rating				
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5
Aaa	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Aa	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
A	0.00%	0.00%	0.00%	0.15%	0.15%	0.00%	0.00%	0.00%	0.21%	0.21%
Baa	0.44%	0.95%	1.52%	2.21%	3.06%	0.58%	1.20%	1.86%	2.78%	3.87%
Ba	0.77%	2.91%	6.40%	9.24%	11.96%	4.10%	8.67%	13.38%	16.97%	20.82%
B	6.06%	14.63%	22.61%	30.29%	36.91%	9.28%	19.02%	27.46%	34.59%	40.57%
Caa	22.59%	37.82%	50.85%	62.56%	72.92%	14.51%	31.08%	46.52%	60.22%	71.58%
IG	0.20%	0.42%	0.67%	1.00%	1.33%	0.27%	0.55%	0.84%	1.31%	1.75%
SG	6.73%	14.23%	21.37%	27.76%	33.29%	8.27%	17.15%	25.13%	31.77%	37.46%
All	4.09%	8.65%	12.97%	16.76%	19.88%	5.26%	10.94%	16.05%	20.39%	23.92%
<i>Structured</i>										
	By Cohort Rating					By Original Rating				
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5
Aaa	0.01%	0.08%	0.23%	0.42%	0.56%	0.00%	0.00%	0.03%	0.16%	0.24%
Aa	0.24%	0.47%	0.80%	1.13%	1.23%	0.54%	0.81%	1.14%	1.51%	1.60%
A	0.27%	0.79%	1.20%	1.42%	1.48%	0.03%	0.34%	0.65%	0.83%	0.86%
Baa	0.99%	2.53%	5.01%	6.49%	8.36%	0.26%	1.09%	2.27%	3.33%	3.87%
Ba	3.95%	9.05%	12.37%	16.48%	17.95%	0.43%	2.51%	5.16%	6.60%	7.16%
B	5.58%	11.78%	16.87%	19.18%	20.35%	0.90%	4.16%	9.10%	10.57%	11.30%
Caa	23.58%	26.33%	28.79%	28.79%	28.79%	4.00%	4.00%	8.27%	8.27%	8.27%
IG	0.31%	0.80%	1.51%	2.00%	2.47%	0.17%	0.48%	0.90%	1.30%	1.48%
SG	5.05%	10.46%	14.34%	17.84%	19.19%	0.67%	3.15%	6.67%	8.10%	8.71%
All	0.82%	1.85%	2.92%	3.75%	4.32%	0.22%	0.78%	1.55%	2.08%	2.33%

IG – investment-grade; SG – speculative-grade; All – All rated securities combined.

VII. LOSS SEVERITY RATES OF PAYMENT DEFAULTS

So far we have concentrated on payment defaults and anticipated defaults. Now we look at some simple descriptive statistics summarizing cumulative loss severity rates as of origination date.

We define the cumulative loss severity rate as the sum of present values of periodic losses as of the origination date. It is measured as a percentage of original balance. Periodic losses include both interest shortfalls and principal losses. Implied coupon rates are used as discount rates to compute the present value of losses.

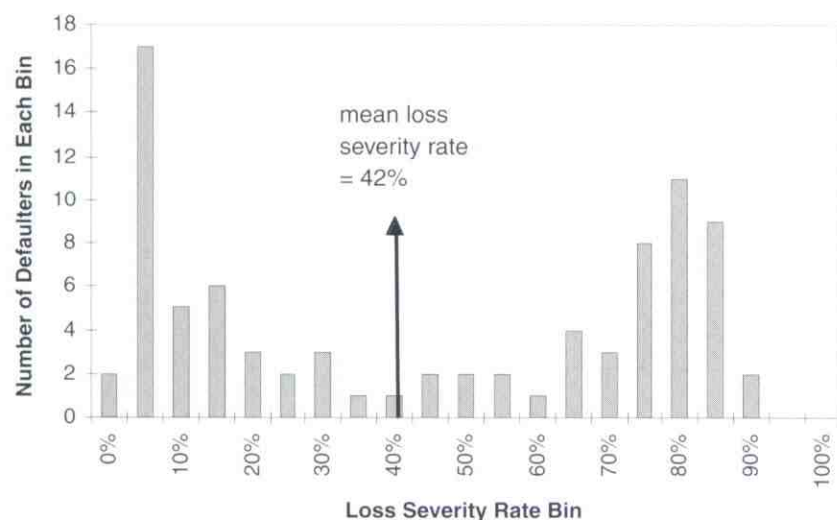
For fixed-rate coupon securities, the implied coupon rate is the fixed coupon rate. For variable-rate coupon securities, implied coupon rates are computed by dividing

the interest payment each period by the outstanding principal balance of the security. In cases of irregular interest payments, discount rates are smoothed using regular discount rates in neighboring payment periods.

Because losses on defaulted structured securities accumulate gradually over time, complete information about lifetime losses on defaulted securities is available only for those few defaulters in our sample that have matured (i.e., paid down or written down defaulters) (84 in total). For the 306 defaulters that have not yet matured, lifetime cumulative loss rates are not available. For these we compute cumulative losses to date as of December 31, 2002.¹⁵

EXHIBIT 23

Lifetime Cumulative Loss Severity Rates of Defaulters that "Matured"—1993-2002



Payment Defaults That Had Matured

Among the 84 defaulters that matured, i.e., had zero outstanding balances, 60 were RMBS, 20 were ABS (including 14 home equity loan-backed, 3 manufactured housing loan-backed, 2 franchise loan-backed, and 1 auto loan-backed), and 4 were from CMBS. Six (two RMBS and four CMBS) of the 84 were cured before their last payment date and hence suffered zero lifetime cumulative losses. More than half (a total of 44) of the 84 were originated in 1994 and 1995.

In other words, this smaller sample of matured defaulters largely represents materially impaired RMBS and ABS securities (the majority of them were HEL securities) and earlier vintages. It does not represent the entire sample of payment defaulters, which spans ten years and includes CMBS defaulters.

Exhibit 23 depicts the distribution of lifetime cumulative loss severity rates based on these 84 defaults. With this limited sample (84 securities represent only 21.5% of all 390 payment defaults), we find that the mean loss severity rate was around 42% of the original balance (or, a recovery rate of 58%). When original tranche balances are used as weights, the weighted-average loss severity rate falls sharply to 26%, an indication of lower loss rates on larger tranches. Infact, high-rated tranches tend to be bigger, and low-rated tranches are typically smaller.

Exhibit 23 also suggests large variations in loss severity rates, with the standard deviation at about 33%. Some defaulters suffered minor losses, and their average

cumulative loss rates were in the range of 5% to 10%. Other defaulters sustained high losses; their average cumulative loss rates went up to somewhere between 80% and 85%. Those with lower loss severity rates typically defaulted late when much of the original principal balance may have already been repaid or else their losses had accumulated more slowly, and those with higher loss severity rates defaulted earlier or else their losses accumulated more quickly in the lives of the transactions. The bimodal phenomenon can also be attributed to the dispersion in tranche sizes and differences in what caused the disruption of payments.

Matured and Non-Matured Payment Defaults Combined

The sample of matured defaulters is a small portion of all payment defaulters. Statistical inferences based on such a small sample may not be very reliable, and comparisons across sectors may not be meaningful. Moreover, most of these matured defaulters were written down in a short period of time. They represent a more risky set of defaulters in the entire defaulter universe.

Defaulters still making payments are likely to suffer lower losses than those of ceased defaulters. Additional information may be gleaned from studying losses to date for all payment defaults, recognizing, though, that losses are still accumulating for many defaults and some defaults have been cured.

Exhibit 24 provides mean loss severity rates and other sample statistics at four distinct seasoning horizons: 24 months, 48 months, 72 months, and 96 months after origination as of year-end 2002. The averages in Exhibit 24 are calculated using all (and only) defaulters outstanding at those seasoning horizons and by matured defaults, non-matured defaults, and the two combined.

According to Exhibit 24, mean loss severity rates of all payment defaults have been similar for ABS and RMBS defaults, while CMBS defaults sustained much lower loss severity rates to date. Loss severities to date from payment defaults that are still making payments are much lower than lifetime loss severity rate based on the smaller sample of 84 securities.

For example, there are 46 payment defaulters already seasoned for 96 months. Their average loss severity rate

EXHIBIT 24

Loss Severity Rates by Sector—1993-2002

		Matured Payment Defaults (84 in total)	Non-Matured Payment Defaults (306 in total)				All Payment Defaults (390 in total)			
			Months after Origination				Months after Origination			
		Lifetime	24	48	72	96	24	48	72	96
ALL	Median	44.12%	0.00%	0.00%	2.33%	4.93%	0.00%	0.25%	9.11%	17.27%
	Mean	42.17%	0.13%	4.68%	11.11%	12.93%	0.55%	12.87%	23.80%	31.77%
	Std dev	33.07%	0.61%	10.06%	14.86%	16.15%	4.65%	23.80%	28.76%	31.46%
	90%ile	81.25%	0.00%	15.94%	33.22%	36.86%	0.01%	54.36%	76.06%	78.31%
	Count	84	300	233	113	46	384	317	197	130
ABS	Median	39.83%	0.00%	0.00%	0.00%	0.02%	0.00%	0.04%	1.82%	23.81%
	Mean	40.57%	0.17%	4.58%	5.69%	0.46%	0.78%	9.61%	18.37%	33.88%
	Std dev	32.99%	0.61%	9.52%	11.32%	0.91%	6.74%	18.88%	27.39%	33.65%
	90%ile	78.66%	0.37%	15.76%	26.03%	1.29%	0.58%	32.89%	65.80%	78.08%
	Count	20	145	110	35	4	165	130	55	24
CMBS	Median	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%
	Mean	0.00%	0.01%	0.77%	0.03%	0.00%	0.01%	0.70%	0.03%	0.00%
	Std dev	0.00%	0.06%	1.59%	0.08%	0.00%	0.06%	1.53%	0.08%	0.00%
	90%ile	0.00%	0.00%	3.85%	0.10%	0.00%	0.00%	3.26%	0.10%	0.00%
	Count	4	72	40	6	4	76	44	6	4
RMBS	Median	53.07%	0.00%	0.00%	5.99%	6.23%	0.00%	5.49%	16.56%	20.08%
	Mean	45.51%	0.15%	6.70%	13.90%	14.12%	0.57%	20.13%	27.04%	32.52%
	Std dev	32.48%	0.83%	12.36%	15.71%	16.42%	2.38%	29.37%	29.21%	31.06%
	90%ile	81.27%	0.00%	20.85%	34.48%	38.90%	0.00%	77.07%	76.83%	78.65%
	Count	60	83	83	76	42	143	143	136	102

to date has been only 12.93%, as compared to a 42.17% severity rate for defaulters that were no longer making payments. Further, the median loss severity rate to date is only 4.93% for these 46 defaulters.

By Original Rating

When payment shortfalls occur, junior tranches are the first to suffer. Losses then gradually climb up the waterfall to impact mezzanine or even senior tranches as losses continue to accumulate. It is therefore natural to expect lower loss severity rates for senior tranches and higher for junior tranches. Also, senior tranches tend to be bigger, so a given dollar loss is less severe per tranche.

Although we have not organized the data set in a way that makes senior/subordinated status explicit, original ratings provide a reasonable approximation because in a multiple-tranche deal, senior tranches are often rated Aaa, mezzanine tranches are rated Aa or A, and junior tranches are rated Baa or below.

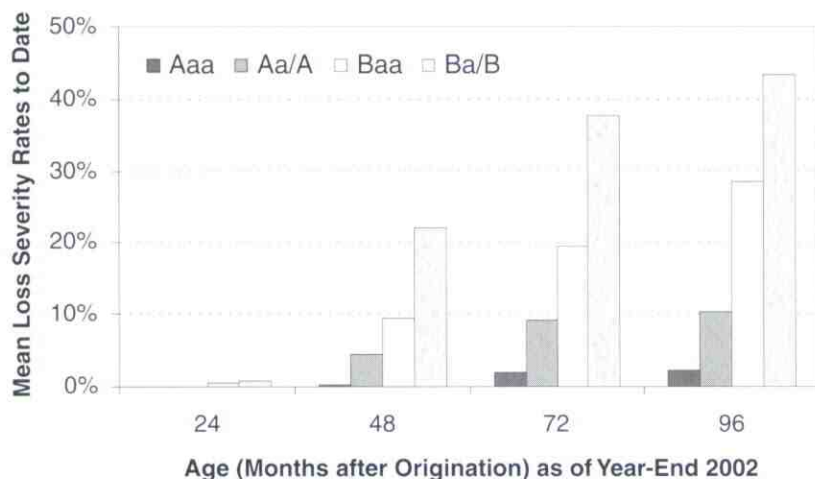
Exhibit 25 provides mean loss severity rates to date at four seasoning horizons for four original rating groups (for ease of comparison, Aa and A ratings are combined in one group, and Ba and B ratings are combined in another group). The four original rating groups correspond to four loss priority levels in a standard structured transaction.

We have chosen to plot up until the eighth year since origination because our sample period is only ten years long, and the number of observations declines quickly as the time horizon extends. For instance, by the 24th month after origination, there were 61 defaulters originally rated Aa/A and 167 defaulters originally rated Ba/B. But by the 96th month after origination, only 20 defaulters were left in the Aa/A original rating bucket, and 59 were left in the Ba/B original rating bucket.

Exhibit 25 shows that loss severity rates are strongly correlated with original ratings. The higher the original rating, the lower the loss severity rate, and at all four seasoning horizons. For instance, average cumulative loss severity rates realized to date from defaulters originated

EXHIBIT 25

Mean Loss Severity Rates to Date of All Payment Defaults—1993-2002



72 months after origination as of year-end 2002, are 37.64% for Ba or B, 19.53% for Baa, 9.12% for Aa or A, and 1.96% for Aaa defaulters. Since differences in original ratings are closely related to seniority in a deal's capital structure, these results also suggest that, as expected, junior tranches have suffered much higher loss severity rates than senior tranches.

VIII. CONCLUDING REMARKS

As far as we know, we are the first to study default rates and loss severity rates given default of structured finance securities. Our examination of defaults and default rates over a ten-year period for the U.S. ABS, CMBS, and RMBS structured securities rated by Moody's reveals a strong inverse correlation between ratings and default rates over one-year and multiyear horizons. We find payment defaults were sometimes cured and did not result in material losses to investors, although the majority of payment defaults were not cured. Material impairments that consist of uncured payment defaults and anticipated future defaults (Ca/C-rated securities) have been strongly inversely correlated with Moody's ratings as well.

Different structured finance sectors have experienced different default rates over the past ten years. Recently default rates have been particularly high in the ABS sector, driven mainly by defaults in the manufactured housing loan and franchise loan sectors. The weak economy in the past two years as well as the current servicer advancing mechanisms have also impacted the CMBS sector, resulting in interest shortfalls to a number of CMBS securities.

Many of these CMBS payment defaults were quickly

cured, and holders suffered no permanent losses. Yet the CMBS sector normally lags the performance of the corporate sector, and more defaults are expected as loan delinquencies and defaults continue to pick up after the end of 2002. Additionally, many asset types in structured finance have sustained only one credit cycle and some even less than one cycle, so the differences we have observed in a short ten-year period may not necessarily persist into the future.

Lifetime cumulative loss severity rates among defaulters that have had zero outstanding balances have averaged around 42%, although their variance has been very great. Because the large majority of these defaulters that were no longer making payments have been written down, their loss experience is likely to turn out to be more severe than the ultimate loss experience of other defaulters that still have positive balances and have not yet reached their final maturity dates.

The estimates of loss severity rates after all defaulters' losses become final may turn out to be considerably lower. In fact, for those defaulters that were not matured yet at the end of our sample period, the average loss severity rate to date as a percentage of original balance has been less than 13%.

ENDNOTES

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¹When external credit enhancement is used in a transaction, the risk of default on the part of the credit enhancer also may have material impact on the overall risk of the transaction. In addition, collateral performance can be affected by the financial condition of the originator or the servicer.

²Our discussion does not extend to the most junior and unrated equity tranche, which is a residual claimant to the securitization's cash flows.

³Prepayment interest shortfalls are losses of interest attributable to prepayments made before the end of a month. When a borrower prepays, interest is paid only until the prepayment date. The remaining interest for the month would be lost. Most servicers pay compensating interest to cover this type of interest shortfall, but only up to a specified percentage of the servicing fee received in the given month. The amount

available to pay interest can also be reduced by application of the Soldiers' and Sailors' Civil Relief Act of 1940, as amended, or comparable state legislation that permits a reduction of the interest on consumer debt for military personnel. These types of shortfall are not reimbursable by the servicer and are allocated pro rata among all certificate holders. In addition, SSCRA of 1940 application is not limited to mortgages. These interest shortfalls are not considered to be payment defaults either.

⁴Once written down, principal balances are almost never written back up. Moreover, when principal balances are written down, the balance against which future interest payments are calculated is typically reduced. Hence, in those instances, principal write-downs lead to permanent losses of interest, even if the write-down itself is later reversed. Not all asset types have write-down provisions. For these asset types, principal shortfalls may occur prior to maturity, but may not be realized. Our definition of payment defaults covers loss events explicitly reported in servicing reports, and those principal shortfalls that are not realized are not considered to be payment defaults.

⁵CDO tranches are not included because it is difficult to obtain detailed tranche-level payment information for all securities in this asset class. Guaranteed securities are excluded because they would skew the default rate statistics. They have all been very highly rated, often as Aaa; no security that has been guaranteed and highly rated by Moody's has ever defaulted; these financial guarantors do not originate or service structured transactions. We do not exclude tranches guaranteed by the originators of the assets, such as those guaranteed by Green Tree/Conseco.

⁶We collapse like-rated tranches in order to avoid placing undue weight on a few securitizations that have many pari-passu tranches in our estimates of default and material impairment rates. By construction, pari-passu tranches have perfectly correlated default and loss experience, and therefore provide no additional information about the likelihood of default or loss.

⁷U.S. structured securities are denominated in U.S. dollars and issued in the U.S. In addition, securities issued in Bermuda, the Cayman Islands, and the Channel Islands, but denominated in U.S. dollars, are categorized as U.S. structured securities.

⁸HELs include subprime mortgage loans, second-lien mortgages, HELOCs (home equity lines of credit), and HILs (home improvement loans).

⁹The last default identified in our list began at the end of 2002. As shown in Exhibit 5, cures after eight or more months of default are rare. Therefore, we have updated cure status through July 2003.

¹⁰If a security went into default, became cured, but later went back into default, we ignore the "temporary cure" and treat the security as defaulted, using the initial default to determine the default date.

¹¹This is an adjustment for withdrawn ratings (WR) in a given calendar year. Such adjustments are made for all default rates in this study. In addition, we assume each security can default only once and that is the first time it sustains a payment default. Once a security goes into default, the security would exit the rating universe and no longer be counted in future rating cohorts. As soon as a security sustains a payment default, we start tracking it and computing its loss severity rate.

¹²There were five defaulters originally rated Caa, all within the CMBS sector. Four of them have remained Caa-rated, and one was downgraded to C.

¹³We note that a majority of payment defaults, and to a lesser extent, material impairments, are in residential mortgage-backed securities and HEL securities whose seasoning pattern is most evident.

¹⁴If interest shortfalls were caused by appraisal reductions or loan modifications, investors will likely receive reduced interest payments for all future payment periods.

¹⁵In the corporate default research, information about lifetime cumulative loss rate is easier to obtain for two reasons. Corporate defaults usually lead to bankruptcy, which is typically resolved within about two years. Second, trading prices for defaulted corporate debt are often widely available, and many studies have shown that trading prices one month after default are good proxies for ultimate recoveries.

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