2003-2015 Credit Risk Loss Experience Study: Private Placement Bonds

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Caveat and Disclaimer

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Executive Summary

This report covers credit risk loss experience during the period 2003 through 2015 on non-Rule 144A private placement securities (and, with limited exceptions, some specific types of Rule 144A bonds) held by participating companies of the life insurance industry. The Society of Actuaries' Private Placement Experience Committee (**the Committee**) initiated the report as part of its mission to conduct research with support from the participating companies (**the Contributors**). The study seeks to perform analyses and develop insights into the behavior of private placement credit risk, to compare incidence and severity measures to public corporate bond experience, and to stimulate further research into credit risk. This report, also referred to as the Study, extends the 2003-2012 review of private placement experience, which was published in 2016, to include experience from 2013-2015. For the purposes of this report, unless specified otherwise, results that combine years of experience are based on 2003-2015. This report is completely self-contained. There is no need to refer to the 2003-2012 report. An earlier report published in 2006 covered experience from 1986 through 2002. Due to data availability and asset experience studied, prior study results do not link directly to the current study.

There were 20 contributors of experience data to the study during 2003-2015. Sixteen contributors participated in 2013-2015 who collectively held about 23%[1] of life insurance industry general account invested private placements at year-end 2015. The data was reviewed extensively for consistency and accuracy within and between contributors. The contributors provided balance sheet data as of the end of each study year and information on assets experiencing credit losses. The magnitude of losses was determined by comparing cashflows, before and after credit events, using the data supplied by the contributors. The study experience was based on 14,412 CUSIPs that had 100,767 exposure years by number and $1.73 billion exposure years weighted by amount.

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[1] Percentage estimate based on total life insurance industry private placements reported by ACLI's 2016 Life Insurance Fact Book. The percentage of study to industry private placement holdings may be understated by an unknown amount because the source includes private placement 144As that the study is designed to exclude. The study includes credit tenant leases and project finance issued as 144As, but excludes corporate 144As.

The study analyzes credit risk loss with respect to three measures:

- Incidence (the frequency of loss),

- Loss severity (the magnitude of a loss), and

- Economic loss (the product of incidence and loss severity).

The study uses the term "credit risk event" (CRE) for these losses. A CRE is more expansive than the definition of default generally used by rating agencies. The CRE definition is designed to capture situations where active management opportunities unique to private placements avoided losses that eventually would have resulted in default. This is intended to avoid understatement of credit losses. CRE experience is analyzed relative to several asset characteristics, e.g., current quality rating, loss type, and time since funding. The analysis of private placement experience by itself is supplemented with a comparison to corporate public bond default and recovery experience during the same experience period.

<u>Main Findings</u>

Overall Results: The average annual incidence for the study period was 0.44% by number and 0.36% by amount. Loss severity was 32% and the annual economic loss was 0.11%. This was a decrease from 2003-2012 for incidence by amount and economic loss of 0.50% and 0.15%, respectively. Loss severity and economic loss are generally conveyed only by amount in the report. Lower incidence by amount than by number of CUSIPs implies the contributors in aggregate benefited from their decisions to allocate different amounts to the CUSIPs they held.

Incidence: The pattern of annual incidence is consistent with quality ratings supplied by the contributors (internal ratings) and National Association of Insurance Commissioners (NAIC) ratings. Average incidence increases with decreasing credit quality. As would be expected in a general default study, incidence is more closely linked to current rating as opposed to earliest rating, and it is higher during economically stressed periods. The highest aggregate incidence by amount was 1.74% in 2009. The highest incidence by number, 2.17%, occurred in 2003. Because each CUISP held by a contributor is counted when measuring incidence by number, many small CREs, held in different CUSIPs from a common issuer, inflated CRE counts for 2003. This effect recurs in other areas of the analysis and is noted where appropriate. The next highest incidence by number, 1.52%, occurred in 2009. The lowest incidence by number, 0.04%, and by amount, 0.05%, both occurred in 2015. In comparison to 2003-2012, the extended analysis period of 2013-2015 had very low incidence, with 13 CREs versus 428 CREs during 2003-2012. Incidence by number and by amount for 2013-2015 was 0.05% and 0.06%, respectively. The highest and lowest levels of incidence can be said to generally align with stressed and benign economic conditions.

Loss Severity: Average loss severity increased to 32% in 2003-2015 from 29% in 2003-2012. Average loss severity based on thirteen CREs during 2013-2015 was 63%. Because there were few CREs during the extended period of 2013-2015, losses, as noted in the prior report, continue to be highly dispersed. When loss given default was grouped in 10% ranges, only one of those ranges held more than 10% of CRE principal amounts. Loss severity varied by structure of the security. Senior securities had lower losses,

28%, than subordinated ones, 57%. But security did not reduce losses for senior instruments. Senior secured losses were 39% versus 25% for senior unsecured positions. This unexpected result is due mostly to very low senior unsecured loss severity, 19%, when the same CUSIP is owned by more than one contributor. Loss severity of CUSIPs owned by only one contributor also showed the same anomaly but to a lesser degree. CUSIPs owned by one contributor had senior secured losses and senior unsecured loss severity of 39% and 38%, respectively. There were a large proportion of CREs that had negative loss severity (amount recovered greater than the amount exposed to loss). Measured by the amount held at the CRE, 32% of the CREs had negative losses with an average 12% gain. There were no discernable effects on loss severity from quality rating or between stressed and benign economic conditions.

Economic Loss: The economic loss rate is the percentage of the amount invested that is lost to CREs each year. Economic loss results exhibit similar, though not identical, behaviors as incidence when quality ratings or economic conditions vary. This is because incidence is closely related to those factors, but loss severity is not. Loss severity has little correlation with quality rating or economic conditions (the major drivers of incidence), which means that economic losses are less strongly correlated with these factors. Economic loss decreased from 0.15% in 2003-2012 to 0.11% in 2003-2015. The average, high, and low economic losses during 2003-2015 were 0.11%, 0.46%, and 0.02%, respectively. Like incidence economic loss was very low, 0.04%, during 2013-2015. The high and low years from 2003-2015 were 2003 and 2014, respectively. The highest and lowest years of incidence by amount, 2009 and 2015, respectively, did not match the high and low economic loss years because of varying associated loss severities. The highest incidence year, 2009, had relatively low loss severity, 17%, which precluded it from being the highest economic loss rate year.

Public to Private Placement Comparison: Private placements showed a 0.10% annual advantage relative to public bonds based on economic loss by current rating assuming a senior unsecured instrument. The decrease from 0.15% in the prior study was caused primarily by lower incidence of default in this study. Because private placements in the study have higher average quality than rated public bonds, the advantage was estimated by controlling for the quality differences. The advantage assuming a private quality mix was 0.06%, and was 0.15% for a public quality mix. The basis of the study measures used for all other portions of this report was converted to have consistent comparisons of private placement to public bond experience.

The amount of the assumed advantage for senior unsecured bonds is dependent on the asset mix assumed because the advantage varies by quality rating. The private placement mix aligns with the contributors' average holdings, whereas the public bond mix reflects the distribution of publicly-rated bonds. The different distributions of investment grade versus speculative grade bonds between private and public bonds was substantial. The trend through 2003-2015 was for private placement contributors to reduce their speculative grade holdings, while the proportion of speculative grade publicly-rated bonds increased (see Section 2.5, Figures 20 and 21). In 2015, speculative grade private and public holdings were 6% and 49%, respectively, versus 16% and 36%, respectively, in 2003. Private placement incidence was higher for all qualities Baa and lower. Public and private investment grade default rates were 0.12% and 0.15%, respectively, and corresponding speculative default rates were 3.03% and 3.56%, respectively. Default rates on rated bonds for privates, 0.51%, were lower than public bonds, 1.50%, because the private portfolio quality was higher. When aggregate incidence is based on a re-weighting by private placement or public bond quality mix, private placement aggregate incidence is higher.

Generally, issuer basis senior unsecured private placement loss severity has the strongest and most statistically reliable advantage compared to public bonds, 38% versus 52%[2]. The other seniority statuses do not show a clear advantage. While there is a similar difference for subordinated bonds, the low number of their CREs does not support credible results and the difference for senior secured bonds is not significant. The lower senior unsecured loss severity of private placements offsets the higher incidence, in aggregate, for either a private placement or public bond quality mix. A similar advantage may apply for subordinated bonds, but not for senior secured bonds.

Loss Type: The triggering event of CREs was dominated, in descending order of occurrence, by distressed exchange, missed payment, and bankruptcy. These three loss types comprised over 80% of CREs. An important trend that is masked by the average for 2003-2015 is increased usage of distressed exchange in recent years. By amount, private placement distressed exchange occurred 53% of the time since 2009 versus 28% of the time before that. The importance of that trend is amplified by the generally lower loss severity experienced by distressed exchange CREs. The increased occurrence of distressed exchanges has also been seen for public bonds during the same time. The sale of a bond at 70 (which implies 70% of par value of a bond bought at par) or less was the fourth most frequent type of CRE. Because these CREs had the highest average loss severity of 52%, their economic loss of 0.02% nearly equaled the 0.03% economic loss for each of the three most frequently occurring types of loss (distressed exchanges, missed payments, and bankruptcies).

Rating Consistency: The main quality rating used in the study, the internal rating supplied by the contributors for each CUSIP for all years, was found to be consistent across two dimensions. Based on comparisons of commonly held CUSIPs, ratings were very consistent between contributors. They were also reasonably consistent in comparison to NAIC ratings. The NAIC ratings are determined by the NAIC's Securities Valuations Office (SVO) for otherwise non-rated CUSIPs, or a rating agency if the CUSIPs are rated and treated as filing exempt with the NAIC. Consistency relative to NAIC ratings supports the internal ratings as being aligned with ratings determined by an external entity. Differences of internal and NAIC ratings on CREs were analyzed to test for reliability of one versus the other. In those instances, the internal ratings tended to have more predictive power than the NAIC ratings, but there were also some CREs where both ratings understated the likelihood of loss. It is possible that, in those situations, both ratings lagged deteriorating credit conditions. A caveat to these conclusions is that ratings were not supplied on all assets. If assets with no reported rating are more volatile on average, overall results could be affected. Ratings were not reported more often for internal ratings versus NAIC ratings.

Rating Transitions: Generally, investment grade bonds had the most stable ratings, with a likelihood of the same rating one year later ranging from 92% to 95%. Generally speculative grade ratings had increasing instability with decreasing rating, but bonds rated less than CCC were an exception with a likelihood of the same rating one year later of 83% versus 72% for CCC-rated bonds on an internal ratings basis. When expressed on a comparable basis, there were some differences between migration rates on an internal-

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[2] The public bond loss severity for senior unsecured bonds is sensitive to the range of experience. Loss severity based on Moody's published ultimate recovery experience for 1987-2017 was 52%. The estimated comparable loss severity for the 2003-2015 experience period of the study, 2003-2015, was 59%, which was used to derive the stated 0.10% private to public loss rate advantage.

rating versus NAIC-rating basis. The likelihood of a rating change was higher for the NAIC than internal ratings for BB, B, and CCC-rated bonds (NAIC ratings 3, 4, and 5, respectively). Although NAIC ratings changed more frequently, there did not appear to be a bias, except for CCC-rated bonds. The downgrade to upgrade ratio was greater or less than 100% (and similar in magnitude) for each rating except CCC. Notably, the downgrade to upgrade ratios for bonds rated CCC internally and by the NAIC were 182% and 55%, respectively.

<u>Limitations</u>

Concentration: The data is highly concentrated. Five contributors provided 68% of the data and the contributors had significant experience in the private placement market. Actual experience for any one company, whether new or an experienced market participant, may or may not be in line with the experience results presented in this study. Further, there is a different mix of contributors in 2003-2012 versus 2013-2015. Relative to 2003-2012, 11 contributors continued participation in 2013-2015 and four left the study. Five new contributors joined the study in 2013-2015.

Data: Although the Private Placement Experience Committee devoted extensive and meticulous attention to the "scrubbing" of the data to ensure they were as clean and reliable as possible, ultimately the quality of the data depended on the contributors and was beyond the control of the Committee. The Committee performed no audits or independent verification of the information supplied. To the extent there were any material errors in the information provided, the results of the analysis would be affected as well.

Credibility: The credibility of the results is related to the incidence of unique CREs. There are 441 company-CUSIP CREs, and 297 of those are unique CUSIPs. There are 154 unique issuers that experienced a CRE. The relatively small number of CREs limits analysis by some characteristics.

CRE Loss Measurement: The study used the CRE experience of one contributor for all contributors holding the same CUSIP to minimize data submission requirements for CREs in 2003-2012. Actual results by the non-submitting contributors on commonly held assets may have been different. Each contributor submitted its own CRE experience for 2013-2015. The study includes all cashflows that resulted from a CRE workout. Cashflows are both actual and estimated future amounts. These cashflows may include non-debt securities, i.e., equity, but the study did not attempt to analyze the unrealized gains or losses from non-debt securities before they were sold. The study also did not attempt to analyze gains or losses that resulted directly from calls or prepayments (e.g., prepayment penalties).

Section 1: Introduction

1.1 BACKGROUND

This is a report on the study of credit risk experience of private placement bonds from 2003-2015. It is a self-contained report that appends 2013-2015 experience to the prior 2003-2012 report. It does not require referencing to that report or the earlier one covering experience from 1986-2002 but, where appropriate, references to experience in those reports are highlighted in this report.

The report consists of four main parts: this Introduction; the Analysis and Commentary, which deals with the significant findings of the study including a comparison of the Private Placement credit risk experience developed by the study to the experience under Public Corporate Bonds; the Data Summaries, which present the detailed results of the study in aggregate and in relation to various selected parameters or characteristics; and a set of Appendices setting out the technical aspects of the study methodology and validation of the data.

This report adds to the body of credit risk event (CRE) loss experience on non-public debt instruments that has been gathered since 1986. At the inception of that work, both private placement bond and commercial mortgage experience were covered. The first study was initiated by the Committee in cooperation with the American Council of Life Insurers (ACLI), representing a joint effort of actuaries and investment professionals. It was followed by four similar studies, focusing on private placements, through 2002. Those five studies were combined into one report that covered 1986-2002. This report is an extension of the prior 2003-2012 report that combines 2013-2015 experience to produce a standalone 2003-2015 report. This report was initiated by the Committee with support from investment professionals outside of its membership. It continued the gathering and analysis of private placement experience in the same manner used for the 2003-2012 report, which was substantially like the prior studies but, due to software issues, the Committee was unable to combine the data from the study periods prior to 2003. Therefore, while the combined studies can be viewed as comprising 30 years of experience, this study in isolation only covers 2003-2015.

Private placement bonds represent a significant portion of fixed-income securities owned by life insurance companies. According to the ACLI's 2015 Life Insurance Fact Book, such assets represented 23% of life insurance companies' general account-invested assets as of December 31, 2015, the last year of the current study, but this percentage may be understated by an unknown amount. The ACLI data includes private placement types not included in this study (primarily Rule 144A issues that were not credit tenant loans or project finance). Despite substantial holdings, there is no published, industry-wide, direct data from which default loss experience or, more importantly, economic loss from credit risk events related to private placement securities can be assessed. Consequently, a disciplined study of insurance company private placement bonds is important. An ongoing study is essential to:

- provide information of value in the portfolio management process,

- provide the basis for making informed choices about the setting of assumptions as to future credit risk losses for liability valuations and asset acquisition strategies,

- build a credible longitudinal database that allows the study of the behavior of these asset classes and the correlation of credit risk to environmental and asset-specific variables, and

- provide reasonable assumptions for issue-specific rating adjustments for use by the NAIC's Securities Valuation Office (SVO) and rating agencies to support their global ratings process.

The definition of private placement bonds may vary by company and analysis source. For this study, contributors were given specific criteria used to determine whether assets were private placements. All credit tenant leases, project finance, military housing deals, and capital leases were to be included.

Certain assets were specifically omitted. These include asset-backed securities (ABS), collateralized debt obligations (CDOs), corporate 144A bonds, and CAPCOs or other similar securities sponsored by states for economic development that provide payments using premium tax offsets or "equity" returns such as payments dependent on pooled-company performance. It is important to note the definition of private placement utilized for this current analysis may be different than prior versions of the study before 2003. The current definition was reached through numerous discussions with investment professionals, and extreme care was utilized to confirm the data contributions were consistent with this definition.

The suggestion has been made that, since private placements are sufficiently like publicly-traded bonds, the value added by studying the former is limited. Evidence suggests there are differences in the experience of private placements versus public-corporate bonds (see Section 2.5, Comparison with Public Bond Experience).

1.1.1 ECONOMIC CONDITIONS DURING THE OBSERVATION PERIOD

The insurance business continually evolves with respect to the types of products sold and the types of investments made. The economic environment during the current study period varied significantly between expansion and severe recession conditions that posed substantial investment challenges. The period included most of the last trough-to-trough cycle, November 2001 to June 2009. While the study period does not span a complete economic cycle, the variety of economic conditions inclusive of the Financial Crisis provide a wide range of conditions to measure private placement experience on a standalone basis, and in comparison to public corporate bonds. To better understand the credit risk events of 2003-2015, the reader may find it helpful to review the economic conditions and their impact on asset defaults. See Economic Conditions below in Section 1.9 for an expanded discussion on the economy during the study period.

1.1.2 ASSESSMENT OF CREDIT RISK

Credit risk is a key risk facing life insurance companies with respect to the vast liabilities created transparently by investment-oriented products and indirectly by other products, most or all of which assume an investment return. Moreover, insurance companies are not the only entities subject to credit risk events. Banks, pension funds, and other lenders encounter many of the same issues. With companies ever more sophisticated in searching out the lowest possible cost of funds and the continued movement towards more efficient utilization of capital, the margins of all lending institutions are under pressure. In this environment, the enhanced understanding and accurate assessment of credit risk becomes valuable knowledge for investment professionals and actuaries alike. The Committee believes the maintenance of

a unique database of the kind the present study represents allows both of those groups to enhance their understanding of credit risk behavior in ways unavailable otherwise.

While economic cycles are generally not easily identifiable, one independent source, the National Bureau of Economic Research (NBER), indicates there have been three trough-to-trough cycles during the period of November 1982 to June 2009. Before June 2009, the prior trough occurred in November 2001. According to this source, the Private Placement Study, since its inception in 1986, has spanned two full economic cycles, with this current report encompassing most of the last cycle. Although some relationships have become evident as more experience has been added, the Committee anticipates the ongoing study, providing results over an even longer period, will be better able to identify or clarify such implications and provide information of significant value for this asset class.

1.2 GOALS OF THE 2003-2015 STUDY

Though there was a significant lag between the 1986-2002 and 2003-2012 reports, the Committee continues to support its prior conclusion that it is desirable to produce updates to the study as an ongoing experience study. Investment professionals and contributors endorsed this view and again lent their support by providing data and input to the study to extend it through 2015. The goals of the ongoing study on Private Placements are to:

- compile a reliable, accurate database of credit risk events and associated exposures on a "cash to cash" basis;
- continue to develop and refine the design of the study and the definition of the data to be collected;
- provide information about the incidence and severity of credit risk events and the economic loss resulting from them;
- provide insights of comparable incidence and severity measures to public corporate bond experience;
- perform analyses and develop insights into the behavior of private placement credit risk in relation to various parameters and environmental variables; and
- stimulate further thinking and research into credit risk behavior.

1.3 DATA CONTRIBUTORS

Since the initial period of the study in 1986, several companies have contributed to it. The participating companies have varied over time as some joined and others withdrew. While the contributing companies are not the same across the full length of the study, 1986-2015, the continuity of study methods and consistent definitions of CREs support some limited comparisons of experience across the two study periods, 2003-2015 and 1986-2002. Table 1 shows the contributing companies to this study. The Committee thanks all companies for their admirable efforts in supporting the private placement bond study.

Table 1

CONTRIBUTING COMPANIES

Company	2003-2012	2013-2015	Company	2003-2012	2013-2015
AFLAC		√	Nationwide	√	√
AIG	√	√	Ohio National	√	
Aviva	√		Pacific Life		√
AXA Equitable/MONY	√	√	Principal	√	√
CMFG	√		Resolution Life		√
Hartford Life	√	√	State Farm	√	√
John Hancock	√	√	Thrivent		√
Lincoln Financial	√		TIAA-CREF	√	√
MetLife	√	√	Unum	√	√
Mutual of Omaha	√	√	Voya (ING)		√

In all, 20 companies contributed to this study. Fifteen contributed in 2003-2012 and 16 contributed in 2013-2015. Seven companies contributed data to all years of this report. Table 2 maps the 20 companies' years of participation. The average unweighted and amount weighted years of participation in 2003-2012 were 8.93 and 9.59 years, respectively. The corresponding participation for 2013-2015 was 2.81 and 2.97 years, respectively.

Table 2

CONTRIBUTOR (COMPANY NAMES WITHHELD) PARTICIPATION

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
√	√	√	√	√	√	√	√	√	√	√	√	√
√	√	√	√	√	√	√	√	√	√	√	√	√
√	√	√	√	√	√	√	√	√	√	√	√	√
√	√	√	√	√	√	√	√	√	√	√	√	√
√	√	√	√	√	√	√	√	√	√	√	√	√
√	√	√	√	√	√	√	√	√	√	√	√	√
√	√	√	√	√	√	√	√	√	√	√	√	√
	√	√	√	√	√	√	√	√	√	√	√	√
	√	√	√	√	√	√	√	√	√	√	√	√
√	√	√	√	√	√	√	√	√	√			
√	√	√	√	√	√	√	√	√	√			
	√	√	√	√	√	√	√	√	√			
	√	√	√	√	√	√	√	√	√			
					√	√	√	√	√	√	√	√
							√	√	√	√	√	√
										√	√	√
										√	√	√
										√	√	√
											√	√
												√

The total outstanding principal at each year-end in the current study is summarized in Table 3. By way of comparison, the table also shows the aggregate amount of Private Placements in life insurers' general accounts. Finally, the table shows the number of Credit Risk Events by year in the study along with the exposure associated with them.

Table 3

STUDY VS. INDUSTRY PRIVATE PLACEMENT HOLDINGS AND STUDY CRE OVERVIEW 2003-2015

Year	TOTAL OUTSTANDING PRIVATE PLACEMENT PRINCIPAL AT YEAR END (BILLIONS)			PRIVATE PLACEMENT CRE DURING YEAR	
	Private Placements Study	Life Insurance Industry General Accounts*	%	Number	Outstanding Principal at time of CRE (Millions)
2003	$87.9	$445.6	15%	114	$857.4
2004	$95.1	$486.6	20%	38	$489.6
2005	$105.1	$492.1	20%	22	$246.9
2006	$112.6	$501.3	21%	14	$143.2
2007	$127.2	$527.0	22%	13	$266.0
2008	$127.2	$567.6	24%	58	$834.4
2009	$131.2	$616.7	22%	121	$2,211.2
2010	$137.1	$654.4	21%	20	$285.8
2011	$149.0	$689.8	21%	10	$186.6
2012	$160.4	$740.7	22%	18	$288.4
2013	$188.3	$744.1	25%	5	$158.0
2014	$191.3	$799.0	24%	5	$104.5
2015	$197.8	$844.7	23%	3	$106.8
2003 - 2015				441	$6,178.8

*Source: ACLI Life Insurers Fact Book, General Account Bond Distribution. The percentage of study to industry private placement holdings may be understated by an unknown amount because the source includes private placement 144As that the study is designed to exclude. The study includes credit tenant leases and project finance issued as 144As, but excludes corporate 144As.

The reader may notice the outstanding principal amounts shown in Table 3 do not agree with the aggregate exposures for the corresponding years in the accompanying online Excel database pivot tables. The exposures in the report are computed in accordance with the formulae in Appendix I and represent average amounts exposed to credit risk during the calendar year, while the stated outstanding principal amounts are year-end statistics.

1.4 BASIC MODEL

The model used for the study was the so-called incidence and severity model. The study is, therefore, more like a morbidity study than a mortality study. The underlying concepts are defined in Appendix I. In general, incidence[3] refers to the number of times an event occurs over a given period out of all possible occurrences (that is, the probability of occurrence of the event - in the present case a CRE), while severity describes the loss sustained given that the CRE has occurred. Severity is often also referred to as a loss given default (LGD). If expressed as a percentage, LGD is the same as one minus the recovery rate. Multiplying incidence by severity gives the economic loss per unit exposed. Economic loss is conveniently thought of as the loss in basis points of a contractually promised investment return because of CREs.

It is important to note that private placement bonds are individually negotiated with borrowers. Therefore, if a CRE occurs, the company will typically approach the borrower to work out an alternative agreement. In some cases, the LGD would likely provide more than a make-whole, i.e., the LGD is negative since recovery is greater than 100%. This report shows both the true LGD, as well as calculations limiting the LGD to 0%. Care should be taken if utilizing this report for experience review or assumption setting to account for this. For example, utilizing a negative LGD would likely be viewed as an aggressive assumption since not all workouts would result in an outcome "better than" a make-whole.

The definition of a CRE parallels the rating agency definition of default except for two additional types of CREs.

1. The sale of a private placement bond at a price less than or equal to 70 cents on the dollar.
2. Any other credit event a contributor substantiated as a default-like credit deterioration, but due to the nuances of the private placement market, does not fit the definitions above.[4] The purpose of including these types of events as CREs is to avoid understatement of the incidence of CREs for situations that, in similar circumstances in public bonds, would have most likely resulted in a default.

A complete definition of all CRE triggers is given in Appendix 1.A, Definition of Credit Risk Event.

For readers familiar with insurance models, the conceptual framework for this study was that of disability insurance. There is a parallel between the life cycle of a disability policy and the life cycle of a bond. Just as a disability policy is underwritten at issue, a bond is underwritten at origination. A policyholder may or may not become disabled while the policy is in force. Likewise, a bond may or may not experience credit deterioration. Once disabled, a person may remain disabled long enough to receive disability benefits, fully recover before any benefit becomes payable, or die after a period of disablement. Similarly, once a

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[3] Incidence may be measured two ways: by number of bonds and by dollar amount of bonds exposed. Both are computed in the present study.

[4] All CREs submitted by the contributors were reviewed for consistency of classification as a CRE. Where contributors had initial opposing views of the CRE status of a CUSIP, they were asked to substantiate their opinion. Some contributors revised their views in that process, which reduced the number of conflicting opinions. The remaining unresolved conflicting opinions were reviewed by a panel of investment professionals from the contributing companies who determined whether those CUSIPS experienced a CRE.

bond's credit deteriorates, a bond may recover or may remain "ill." If its credit condition does not recover, it may eventually be unable to make its required payments and trigger a default. If a bond defaults, its creditors may receive a cash liquidation, or the bond may be revived with new payment terms.

For disability insurance, various risk factors are used to calculate a premium that is deemed to be commensurate with the risk assumed. For a bond, various risk factors are also considered in determining a basis point spread over treasuries at which the bond rate is set. Just as experience studies on disabilities can help calibrate the associated risk factors, experience studies on credit risk can serve the same purpose.

By collecting a sufficient amount of experience, the study attempts to calculate incidence rates, loss severity rates, and economic loss rates to analyze their relationship to observable risk factors. The intent of the study is to follow the outflow of cash in the form of a loan until repayment is completed, "cash to cash" or "cradle to grave." Various characteristics can be investigated to determine their relationships to problem investments and to quantify their impacts on credit losses over the life cycle of the investments.

1.5 APPENDIX – TECHNICAL DESCRIPTION OF METHODOLOGY

Appendix I of this report gives the definition of a credit risk event, the definitions of date of credit risk event and date of loss calculation and a summary of the calculation methodology used in the study. The summary of the calculation methodology gives details about the discounting methodology and the calculation of economic loss, exposure, and the loss statistics.

Appendix I also contains a description of the data validation procedures used to ensure, to the best of the Committee's ability, that the final "scrubbed" data used to compile the results of the study were of the best quality that could be achieved. Ultimately, however, the Committee must rely on the contributors for the accuracy of the data.

1.6 REVISIONS TO PRIOR STUDIES

There have been no changes to the methodology and assets covered in extending the study from 2012 to 2015. The changes to assets covered and accompanying methodology supporting the analysis in the 2003-2015 report relative to the 1986-2002 report are described below.

The current study uses a discounting methodology like the 1986-2002 study. The methodology is described in Appendix 1.C, Actuarial Methodology. The spreads applied to the original and revised cashflows are distinct by calendar quarter. Previously, those spreads were applied to broader timeframes.

The current study revises the assets studied. Asset Backed Securities (ABS), which were in the studies prior to 2003, have been excluded. They were excluded because, as securitized investments of small individual risks, the underlying credits were not deemed similar enough to institutional credit risk for inclusion in the study. During data scrubbing, two other asset types were identified and examined. Because of this review, and the lack of an investment professional consensus to exclude or retain them, state lottery annuities were left in the study, but because less than five companies supplied lottery deals, it was decided to exclude the indicator from the final database to protect contributor confidentiality. The

other asset type, CAPCOs, were excluded from the study. A Capital Company (CAPCO) deal produces return that provides state investment tax credits that offset premium tax and potential distributions from a venture capital-like pool. Because the return does not fit the profile of a fixed income investment with stated coupon rates, fixed payment dates, and maturity, these deals were excluded from the study.

The severity rate is produced on two different bases for this study. The prior basis utilizing principal has been supplemented with a basis that uses par value. The purpose of the par-based severity calculation is to have a measure that is more comparable to rating agency severity calculations. The principal and par methods are closely related, but serve different purposes. Section 2.13, Loss Severity Method Considerations - Study Method Versus Approximate Rating Agency Method, describes these measures.

1.7 KEY LIMITATIONS OF THE 2003-2015 STUDY

Although the Private Placement Experience Committee believes the 2003-2015 study makes a significant contribution to a better understanding of the economic loss resulting from credit risk events, the study has limitations that should be noted to minimize possible misinterpretation and misuse of the results. This report must be read in its entirety to be understood. Any distribution of this report must be in its entirety. The Committee does not intend to benefit from this study and assumes no liability to parties who receive this report. A company's actual experience with private placements and CREs may differ from the results of this study.

More detailed limitations are listed in Section 1.10. The three key limitations the Private Placement Experience Committee wishes to draw attention to are as follows:

1. Although the Committee devoted extensive and meticulous attention to the "scrubbing" of the data to ensure it was as clean and reliable as possible, ultimately the quality of the data depends on the contributors and is beyond the control of the Committee. The Committee performed no audits or independent verification of the information supplied. To the extent there are any material errors in the information provided, the results of the analysis will be affected as well.
2. The data field that caused the most concern was the original quality rating. In too many cases, the information was missing and had to be inferred through a backtracking method that gives rise to the 'earliest' quality rating. The backtracking method is reasonable and carefully undertaken, but can result in differences since an estimate is being used. For that reason, the Committee does not recommend blindly equating the earliest quality rating to the original quality rating at issue. Although the Committee believes the earliest quality rating is a reasonable proxy for rating at issue, it is certainly a noisy proxy.
3. The data is highly concentrated. Five contributors provided 68% of the data and these contributors have significant experience in the private placement market. Actual experience for any one company, whether a new or experienced market participant, may or may not be in line with the experience results presented in this study.

Notwithstanding the limitations of the study, the Private Placement Experience Committee believes the results are reliable overall and constitute a meaningful addition to the understanding of the behavior of credit risk with respect to Private Placements.

1.8 USE OF THE RESULTS

The data and data processing limitations identified in Section 1.10 suggest the results of this study need to be interpreted and used with great care. Overreliance on the absolute magnitude of these results should be avoided. They inevitably reflect market and economic conditions of the period in question. Even though these studies, since their inception in 1986, now encompass roughly three full economic cycles, much of the value of the 2003-2015 study lies in assessing the relative significance of identifiable risk factors. The approach of the study is an empirical one through the pooling of intercompany data using consistent definitions.

While not directly displayed in the interest of confidentiality, the variability of results by company suggests that material differences may exist in company risk tolerance standards and, perhaps, risk assessments. The large variability of results by year for the same company is not surprising for a low-incidence, potentially high-severity occurrence.

For those involved in product pricing, reserving, and setting investment risk margins, the trends and patterns of the results can provide a basis for comparison with assumptions currently being used, keeping in mind, of course, the variability of results. Ultimately, it is anticipated that detailed results by asset type and asset characteristic will be useful in models in a manner similar to how companies often use intercompany mortality and morbidity data.

For those involved in developing and managing investment portfolios, the trends and patterns can assist in providing a better understanding of how various asset characteristics impact risk and, ultimately, how to set risk premiums.

As noted above, an important caution to users of the study is that, generally, contributors to the study possess substantial private placement portfolios and expertise in underwriting of new offerings, monitoring their portfolios, and working out troubled assets. Companies not possessing such expertise may or may not have similar results as the experience of the contributors to this study.

1.9 ECONOMIC CONDITIONS DURING THE STUDY

Public bond default studies have shown that defaults, or the timing of when defaults occur, are highly correlated with the economic cycle. The same applies to private placement defaults. This section is included to provide the reader with some basic insight on economic cycles and conditions for the studied period of this report. This section represents the Committee's observations only and is useful when viewing the cyclical nature of the data. This is a general high-level summary of the US economy and is not meant to be a substitute for economic research reported by professional economists.

1.9.1 INTRODUCTION

During the 13-year (2003-15) Private Placement research study period, the US economy experienced portions of two economic cycles, as defined by the economic research performed by the National Bureau of Economic Research (NBER). The peak and trough dates are determined through the use of various economic indicators such as Real Gross Domestic Production (GDP), Real Gross Domestic Income (GDI), Real Manufacturing and Trade Sales, Index of Industrial Production, Real Personal Income Less Transfers, Payroll Survey Employment, Household Survey Employment, and Aggregate Weekly Hours Index in Total Private Industries. Note the graph below is for illustration purposes only. The true expansion and contraction of the economy are not strictly monotonically increasing or decreasing in terms of economic activities. In both recessions and expansions, momentary reversals in economic activity may occur. For example, a recession may include a short period of expansion followed by further decline. Similarly, an expansion may include a short period of contraction resumed by further growth.

Figure 1
ECONOMIC CYCLES
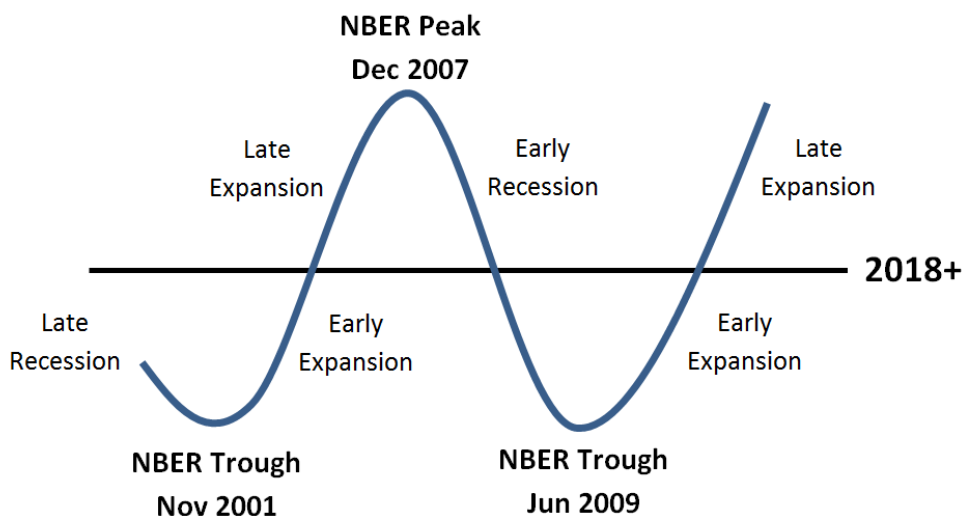
Source: *National Bureau of Economic Research*

The following subsection discusses the economy in the three sub-periods shown above and discusses the implications each economic cycle has on the wider financial markets, particularly the rising and falling cyclical stresses impacting interest rates and credit risk:

- Expansion Period: 2002 to Late 2007
- Financial Crisis: Late 2007 to Mid-2009
- Historically Low Interest Rate Environment: Mid-2009 and Beyond

1.9.2 EXPANSION PERIOD: 2002 TO LATE 2007

The NBER determined that a peak in economic activity occurred in the US economy in December 2007. The peak marked the end of the expansion that lasted 73 months, and the beginning of a recession triggered by the Financial Crisis. This period is the last part of the Great Moderation period, which was defined by economists starting in the mid-1930s where volatility of business cycle fluctuations had decreased compared to other economic periods. This reduction in volatility is believed to be due to greater independence of the central banks from political and financial influences, information technology advancements, and improved and stabilized economic structure. Shifting away from manufacturing and adopting better inventory management practices and sales forecasts, along with more fluid communications, has increased corporations' stability. Limited governmental interference was perceived as the best way to provide growth in the banking industry and the world's economy during this period of time. More relaxed regulation is also seen through the "Financial Services Modernization Act of 1999," which partially deregulated the financial services industry by permitting commercial banks to integrate with investment banks as a means to foster growth. Despite the bursting of the Tech Bubble in 2001, with over a decade of relatively low inflation and stable growth, the Great Moderation cultivated complacency and risk-taking in the market that ultimately led to the Financial Crisis in 2007.

Figure 2
US REAL GDP GROWTH
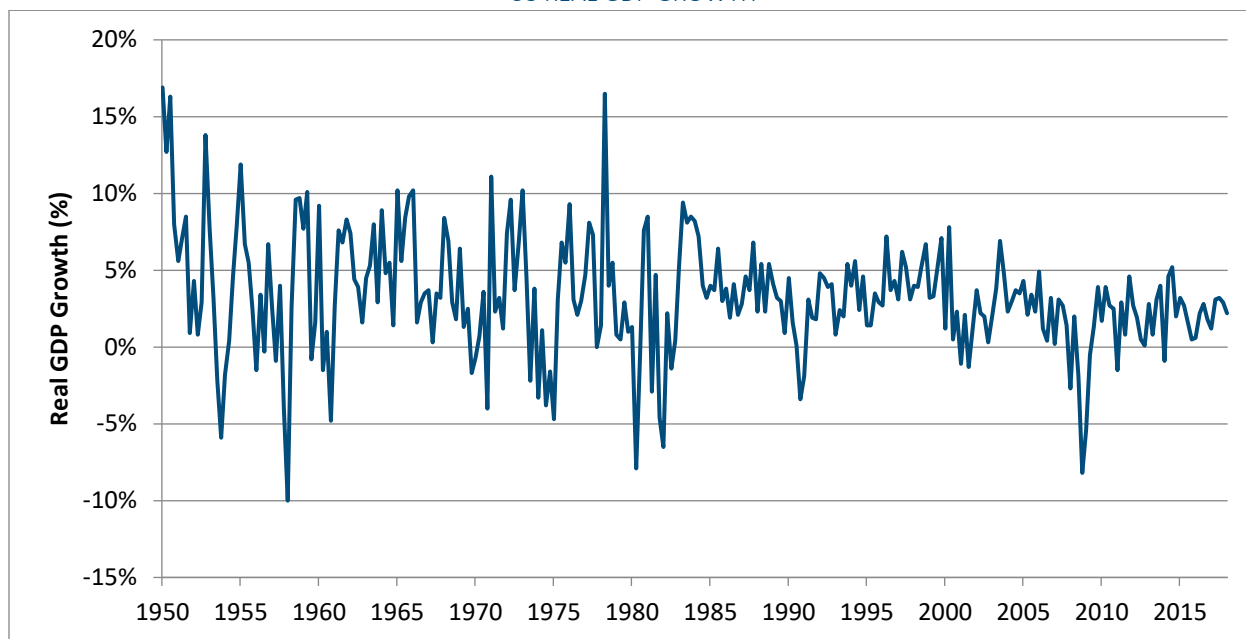
Source: Federal Reserve Economic Data

1.9.3 FINANCIAL CRISIS: LATE 2007 TO MID-2009

2007-2009 was a period where economic activity was in widespread decline across the US economy, as indicated by figures such as real income, real GDP, unemployment ratios, industrial production, and wholesale-retail sales. The recession lasted approximately 18 months, which is the longest since World War II. The Federal Reserve reduced interest rates to historic lows and purchased approximately four trillion dollars of US debt to stop the recession and help the economy recover to its current state. The actions the Federal Reserve took during this period of time were widely known as Quantitative Easing.

Multiple causes led to the Financial Crisis of 2008, also known as the Global Financial Crisis. Due to the interconnectedness of financial markets and the US being a dominant world economy, the bursting of the US housing bubble caused the prices of structured products, such as mortgage-backed securities (MBS), to plummet, severely damaging financial institutions worldwide – some of which required significant bailouts by national governments to prevent a total collapse like that of Lehman Brothers in 2008. The partial collapse of the US economy during the Financial Crisis was triggered by an intricate interplay of lending practices, risky and complex financial products such as subprime mortgages, as well as the monitoring and evaluation of the risk levels at financial institutions. Financial engineers pooled together mortgages, which they, in turn, labeled as less risky due to the diversification of risk through pooling. However, in reality, the pooling of these mortgages did not lower the inherent risks because property markets in different US cities were more positively correlated during a decline than expected. For example, if risks were positively correlated, defaults in one region might be related to defaults in other regions but, if negatively correlated, defaults in one region might be more localized or exhibit other characteristics such as different severity, different incidence of loss, or length of recovery period, not similar to other regions. After the housing bubble peaked in 2006, the US suffered a nationwide house-price decline, with a surge in foreclosures. As shown in the graph below, there was also an increase in the total amount of domestic private debt securities issued in domestic markets as a share of the GDP, which included data on long-term bonds and notes, commercial paper, and other short-term notes.

Figure 3
TOTAL CREDIT TO PRIVATE NON-FINANCIAL SECTOR TO GDP FOR UNITED STATES
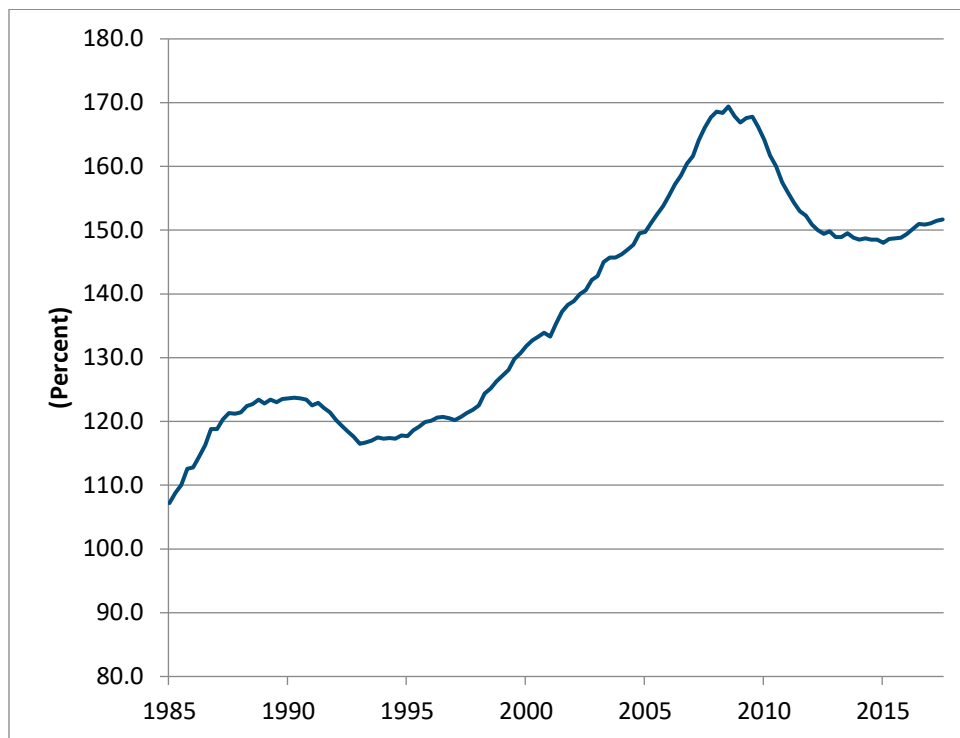
Source: Federal Reserve Economic Data

During the same period, Asia's excessive savings further lowered global interest rates, driving investors to accept riskier investments in their search for returns. European banks borrowed excessively in American money markets with their low interest rate before the crisis, and then used the funds to buy risky investments as well. All of these factors contributed to the magnitude and pervasiveness of the Global Financial Crisis.

The Treasury-Eurodollar (TED) spread, the difference between interest rates on interbank loans (e.g., LIBOR) and short-term US government debt (e.g., T-Bills), spiked in 2008, breaking historic records set during the crash of 1987. The TED spread is an indicator of counterparty risk in financial markets since T-bills are considered risk-free, while LIBOR reflects the counterparty risk associated with lending to large commercial banks. An increase in the TED spread is a signal of increasing default risk between interbank lenders or the absence of a liquid lending market. These two phenomena were both observed during the Financial Crisis.

Figure 4
TED SPREAD
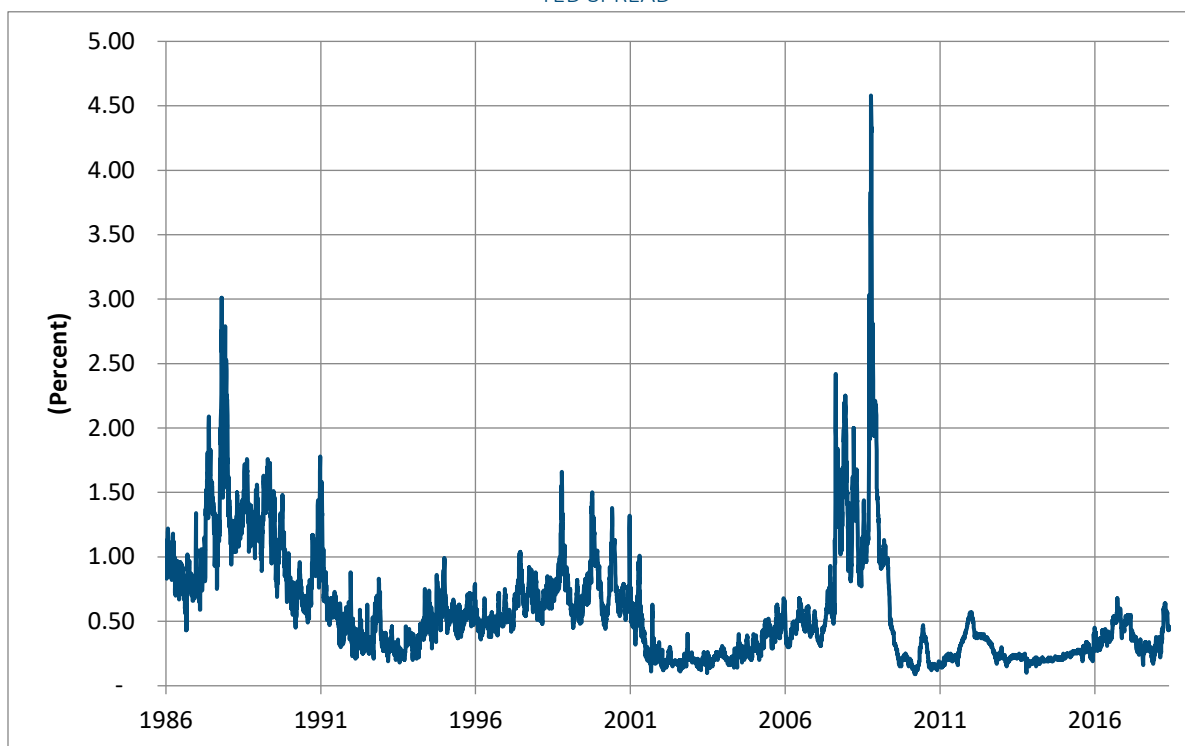
Source: *Federal Reserve Economic Data*

1.9.4 HISTORICALLY LOW INTEREST RATE ENVIRONMENT: MID-2009 AND BEYOND

In September 2010, the Business Cycle Dating Committee of the NBER marked June 2009 as the trough of the economic cycle, which defined the end of the recession that began in December 2007. Despite the fact that the recession had ended, economic recovery was slow and gradual. The 2007 Financial Crisis was the most intense global financial downturn since the Great Depression. The Federal Reserve took extraordinary measures to help stabilize the US financial market and wider economy. One of the most prominent actions taken by the Federal Reserve was the reduction of short-term interest rates to a near-zero level. In addition, the Federal Reserve purchased large quantities of long-term Treasury securities and securities issued by government-sponsored agencies, such as Fannie Mae and Freddie Mac, to lower long-term interest rates and help stabilize asset prices. As shown by the Treasury Constant Maturity Rates below, the one-year CMT rate has been near zero. Rates for other maturities are also at historic lows.

Figure 5
TREASURY CONSTANT MATURITY RATES
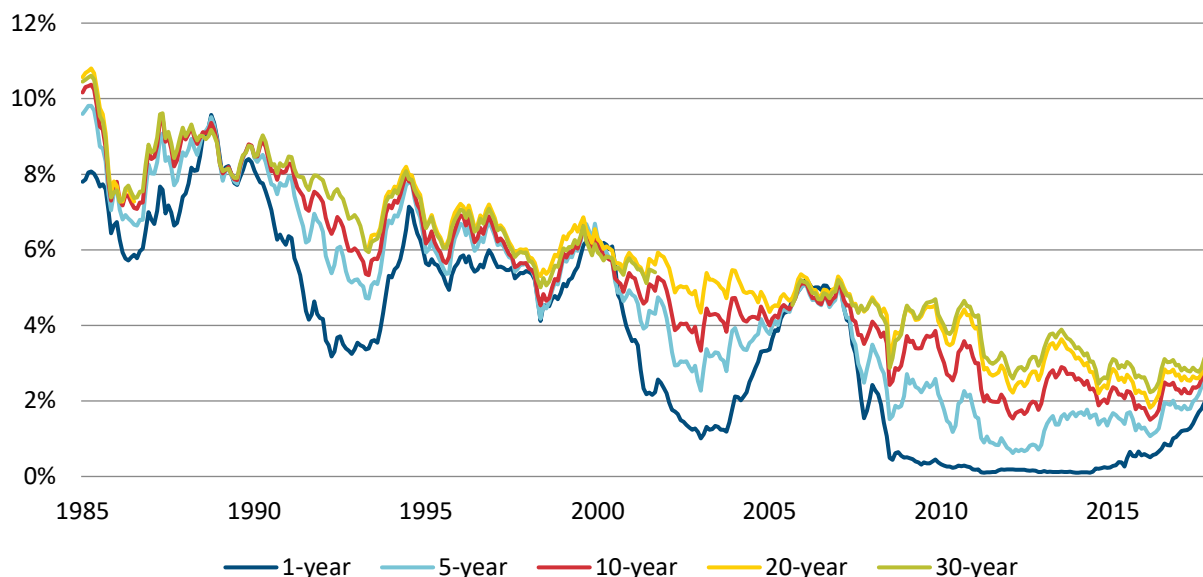
Source: Federal Reserve Economic Data

The main role of the Federal Reserve is to manage monetary policy to both generate full employment and keep inflation at a low, stable level. Following the trough of 2009, the US economy has experienced a period of continued modest expansion. This culminated in recent unemployment figures, which in May of 2018, reached the lowest levels since 2000. This expansion is not exclusive to the US, with most developed nations experiencing synchronized growth for the first time since the Financial Crisis.

1.10   LIMITATIONS OF THE REPORT

There are generally two types of limitations found in this study: those related to the quality and completeness of the data collected and used, and those concerning the sufficiency of the data for purposes of drawing valid conclusions about credit risk.

Limitations include:

- Company participation varied over the period. Four companies did not continue into the 2013-2015 period and five new companies were added. Seven of the 20 participating companies contributed data to all years of the study. On an unweighted basis, the average participation of 15 companies in the 2003-2012 period was 8.9 years and the average participation of 16 companies in the 2013-2015 period was 2.8 years.

- The proportion of private placements in the study versus those held in life insurance company general accounts ranges from a low in 2003 of 15% to a high of 25% in 2013. However, this percentage may be understated to an unknown degree because the source data includes corporate Rule 144A private placements, which this study excludes. While the sample size is substantial in amount, it is highly concentrated. The top five contributors provided 68% of the exposures.

- The nature of private placements and the definition of a CRE introduce an active investment management element to the study. Private placement investors may, in many instances, have greater control if credit deteriorates than they would have with a similar public bond. Their active investment management in those situations can affect results, whereas the same opportunity to control the outcome with public bonds is less certain given the larger groups of investors with diverse ownership interests. Also related to active investment management, a sale at or less than 70 cents on the dollar is defined as a CRE. The sale decision and its timing affect study experience. Companies with less experience in underwriting these bonds may or may not replicate the experience presented in the study.

- Study results are not directly comparable to public corporate bond studies. The definition of a CRE is broader to accommodate the nuances of the private placement market as discussed in Section 1.1, Background. The loss severity calculation is slightly different, too, as discussed in Section 2.13, Loss Severity Method Considerations - Study Method Versus Approximate Rating Agency Method. The number or count basis treats each CUSIP, i.e., each issue, held by each contributor as a distinct entity, whereas public corporate bond studies typically report experience on an issuer basis. Results by amount are not affected by this treatment.

- With respect to the 2003-2012 period, the CRE cashflow for each CUSIP held by more than one company is based on the cashflow experience of one submitting company that represents the experience of all companies holding the CUSIP. This was done to minimize the data submission requirements. Results of active management, if any depending on circumstances, may lead to differences with other companies that hold the same CUSIP. All companies submitted their own CRE cashflow data for the 2013-2015 CREs.

- Credibility is related to the incidence of unique CREs. There are 441 company-CUSIP CREs and 297 of those are unique. There are 154 unique issuers that experienced a CRE. The relatively small number of CREs makes it difficult to analyze results by some characteristics.

- A long "tail" exists before the final outcomes of many credit risk events are known with certainty. In some instances, the CRE cashflow is estimated past the submission date of the data.

- Although significant efforts were made to ensure the reasonableness and completeness of the contributed data, the results of the study are ultimately dependent on the nature and scope of the data submitted. See Appendix 1.D, Data Validation, for a detailed discussion of the procedures used to review and process the data.

- The study does not link experience between 2003-2015 and the study period 1986-2002. Great care was taken in the determination of CRE dates, which are in some cases subject to interpretation of the specific circumstances. We believe CREs occurring near the beginning of this study have been included or excluded correctly. However, we were unable to audit the CRE CUSIPs in the 1986-2002 study for crossover into the 2003-2012 study period to determine if there was any unintended double counting or omission of a CUSIP with both study periods combined. CREs submitted for the 2013-2015 period were checked against the 2003-2012 records to preclude omission or double counting.

- This study does not attempt to measure the risk-reward tradeoff of any investment.

- The study includes all cashflows that resulted from a CRE workout. These cashflows may include traditional debt instruments and non-debt securities, i.e., equity, however the study includes, but does not attempt to analyze, the unrealized gains or losses from non-debt securities before they are sold, even though private placement bonds, particularly those associated with leveraged buyouts, often include equity components which, on a portfolio basis, can provide substantial gains to offset losses. The study also does not attempt to analyze gains or losses that resulted directly from calls or prepayments (including the impact of prepayment penalties).

While not a limitation of the study per se, the attention of the reader is drawn to the fact that the bulk of the experience has been contributed by companies that were and are continuous and substantial participants in the private placement market. They have developed considerable expertise in the origination, acquisition, and tracking of private placements, and the management of the workout of distressed or defaulted assets. A new entrant to the market, lacking the expertise and resources of more experienced market participants, may or may not achieve similar or better credit loss results.

Section 2: Analysis and Commentary

2.1 INTRODUCTION (WITH GRAPH NOTES)

This section presents and discusses the major results of the study and compares the credit risk experience of private placements to that of publicly-issued corporate bonds. There is some (but not complete) overlap between the results presented in this section and those appearing in Section 3. Section 3 features limited text, but detailed tables and graphs giving breakdowns of experience by year and other variables of interest (for example, experience by NAIC rating and year). Results appearing only in Section 3 include credit risk experience by years since funding and years to maturity. Where there is overlap, the most detailed tables usually appear in Section 3.

The main statistics reported in this study, the definitions of which are summarized in Table 4, differ somewhat from the default and recovery rate statistics that are familiar from studies of default and loss on publicly-issued corporate bonds. Such studies typically compute default rates by issuer as the number of bond issuers in a given cell that default over some period, divided by the total number in the cell. For example, a cell might include all A-rated bond issuers outstanding at the beginning of 2010. This study treats each issue held by a contributor as one count. Incidence by amount is not affected by this treatment. Incidence on either measure also uses a slightly different and broader definition than rating-agency-defined default.

Loss severity rate (loss-given-default) calculations also differ from traditional rating agency approaches, which use either 30-day post default trading prices or a discounted future value (ultimate recovery) as a comparison to par value to determine a recovery percentage. In this study, the main reported measure of individual bond loss severity is the difference between the net present value of the remaining original and revised post-CRE contract cashflows, divided by the present value of the remaining original post-CRE contract cashflows. This measure was designed for actuarial use to capture the economic effect of the present value of future current coupon rates versus the coupon rate of the original cashflows at the time of the CRE. Section 2.5, Comparison with Public Bond Experience, uses an alternative loss severity measure that is closely related to the rating agency loss severity definition. Section 2.13 provides a detailed explanation of the comparison between the two loss severity methods. Severities are available for every CRE, making it possible to compute consistent economic loss rates for any subsample, and to partition the loss into incidence and loss severity components.

Table 4
DEFINITION OF PRIMARY STATISTICS (SEE APPENDIX 1.C FOR DETAILS)

Statistic	Definition	Comments
Incidence By Number	Number of assets experiencing CREs in a given year divided by number exposed (roughly, the latter is the sum of the number in the cell[5] at the start of each year; see Appendix 1.C.4, Loss Statistics Calculations, for handling of maturities and originations within the year).	Like an average of one-year default rates, but CREs include distress sales and default like credit deterioration unique to private placements in addition to traditional rating-agency-defined defaults.
Incidence By Amount	Outstanding principal[6] of assets, at the time of their CREs, experiencing CREs in a given year, divided by total outstanding principal exposed (roughly, the latter is the sum of the outstanding principal for the cell; see Appendix 1.C.4, Loss Statistics Calculations, for handling of maturities and originations within the year).	Like incidence by number, but based on dollar amounts.
Loss Severity	The sum of dollar economic losses attributable to assets experiencing a CRE in a given year, divided by the sum of outstanding principal at the time of the CRE. Economic loss for each CRE is measured as the difference in net present value of the remaining original and revised asset cashflows, multiplied by the ratio of outstanding principal to the present value of the remaining original cashflows. The latter ratio is applied to place economic loss on a book-value basis. With respect to a single CRE, the loss severity formula is equivalent to the difference in the net present value of the remaining original and revised cashflows, divided by the present value of the remaining original cashflows.	Sometimes called the loss-given-default rate. Same as (1- recovery rate).
Economic Loss Rate	The product of loss severity and incidence rate by amount for a cell. Equivalently, the sum of dollar economic losses for a cell, divided by total outstanding principal exposed in the cell.	The average annual percentage loss resulting from CREs in the cell being analyzed.

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[5] Cell is a generic reference to any defined subset of the data, e.g., "A"-rated assets or the aggregate of the data.
[6] Outstanding principal (OP) is equivalent to amortized cost. It is carried in the exposure file for each year-end that a contributor holds a given asset. OP is based on the original amortization schedule as modified by any cashflow deviations from the original schedule. In the event of prior write downs before the CRE, OP is increased to negate the effect of the write down(s) on measurements associated with the CRE. This is done to avert understatement of the CRE incidence rate and economic loss by amount.

2.2 AGGREGATE PRIVATE PLACEMENT EXPERIENCE OVER TIME

Figure 6 shows economic loss rates for each calendar year of the current study. The economic loss rate is the percentage of the amount invested that is lost to CREs each year. The graph shows a loss pattern that reflects economic conditions during the study period. The study period covers most of a full economic cycle. The study period starts in 2003, two years after the 2001 trough, and extends six years past the 2009 trough to the end of 2015. Economic losses during the study were highest in 2003-2004, and during the Financial Crisis, 2008-2009. Other years reflect the significant swings of CRE losses as between unfavorable and benign economic conditions. Years with favorable economic conditions, 2005-2007 and 2010-2015, have much lower losses.

The data shows an aggregate loss from CREs for the full study period of 0.11%, or $0.11 per $100 invested. For the last decade, 2006-2015, the aggregate loss from the CREs was 0.09%, or $0.09 per $1,000 invested.

Figure 6
ECONOMIC LOSS BY AMOUNT
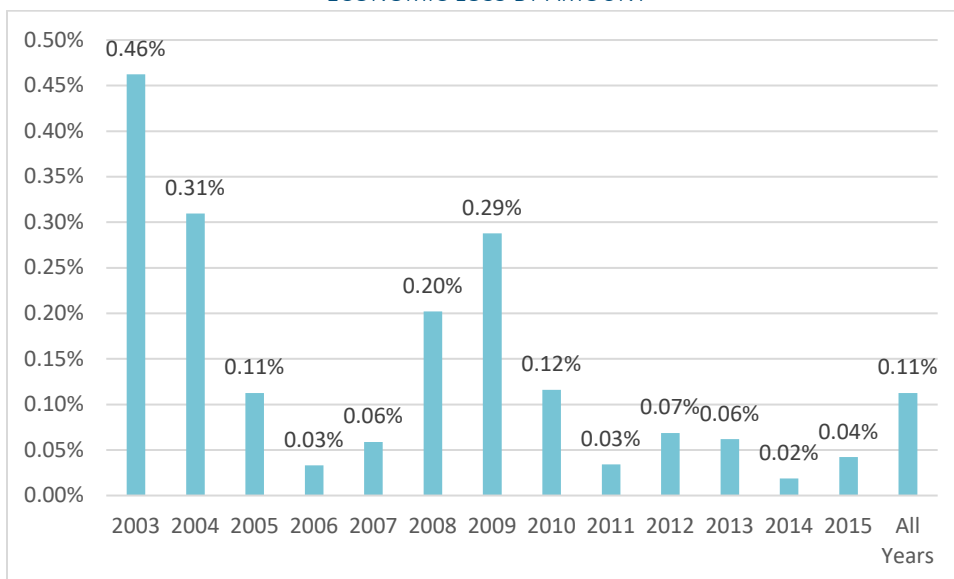
Figure 8 shows incidence during the study by number (count of CUSIPs owned by each contributor), and Figure 7 by amount. Overall, incidence was higher by number, 0.44%, than by amount, 0.36%, indicating that a higher proportion of lower than average amount positions had CREs. The highest one-year incidence rate by number, 2.17% in 2003, was caused in part by CREs involving a unique series of trust assets that had different CUSIPs, but were from the same issuer. Because these CREs were relatively small individually, the corresponding incidence by amount of 1.38% was much lower. Except for 2003, incidence by number and amount were close to each other, with generally small variations and no apparent pattern as to when one measure was higher or lower than the other. Because the economic loss in Figure 7 is shown by amount, it is more instructive to review the pattern of incidence by amount as well. The variation of incidence by amount and by year drives the corresponding variation in economic loss rates. With the exception of years 2010, 2013, and 2015, which had relatively high loss severity rates, all other years of incidence and economic loss rates matched each other in pattern and

relative level of comparisons between incidence and economic loss. Incidence rates generally had the same relative pattern as observed for economic loss across the study years and as compared to similar public bond experience.

Figure 7

CRE INCIDENCE RATES BY AMOUNT
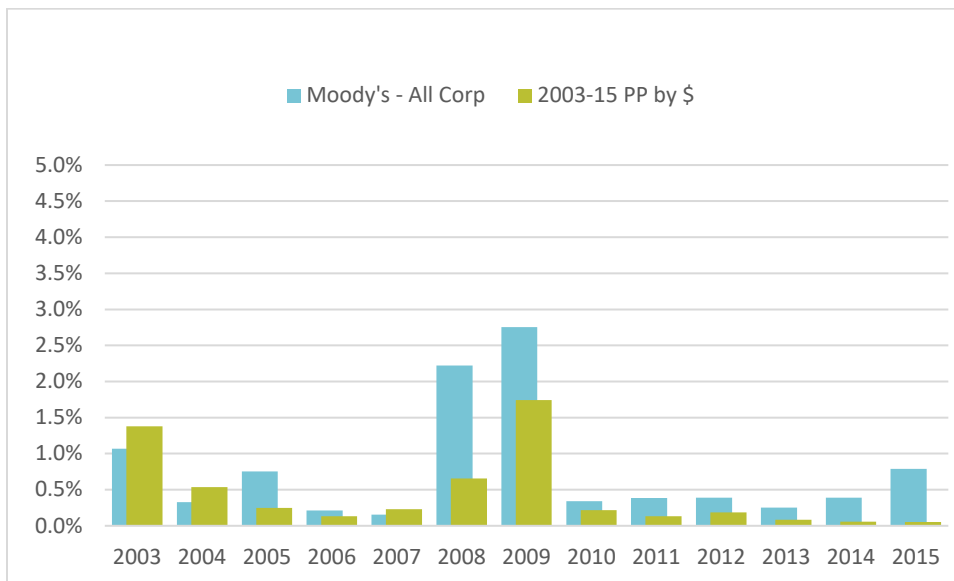
Source for Moody's All Corp: Moody's 2017 Public Corporate Bond Default Study (1970-2017), Exhibit 39

Figure 8

CRE INCIDENCE RATES BY NUMBER
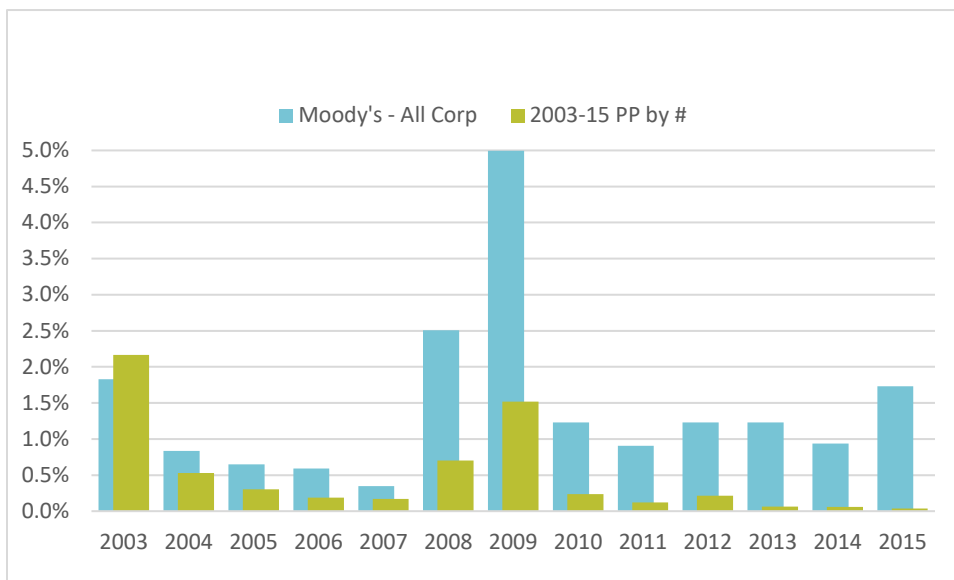
Source for Moody's All Corp: Moody's 2017 Public Corporate Bond Default Study (1970-2017), Exhibit 30

Figure 9 shows the average loss severity by amount across study years. Because loss severity varies less proportionally, as compared to incidence, loss severity variation by year is less of a factor in economic loss variation by study year. Overall, the loss severity rate was 32% by amount (see Section 2.5, Comparison with Public Bonds, for details of how this loss severity should be compared to public bond experience). Loss severity varied significantly by year, but without an apparent pattern. Generally, recovery studies observe that loss severity varies by economic conditions at the time of loss[7]. If economic conditions are worse at the time of loss, higher severity (lower recovery) often occurs. The study data does not reflect this general observation for private placements. A possible reason for this is there may be an insufficient number of CREs to produce statistically reliable results. Note the second half of the study period has a significantly smaller number of CREs. While it appears that loss severity was peaking one year after the highest incidence (not consistent with public experience), those peak loss percentages in 2004, 2010, 2013, and 2015 were produced by a small number of CREs, which raises the possibility of statistically unreliable results from a small number of CREs in those years.

Figure 9

LOSS SEVERITY BY AMOUNT

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	All Years
Gains	34%	58%	45%	25%	26%	31%	17%	54%	26%	37%	74%	34%	77%	32%
# of CREs	114	38	22	14	13	58	121	20	10	18	5	5	3	441

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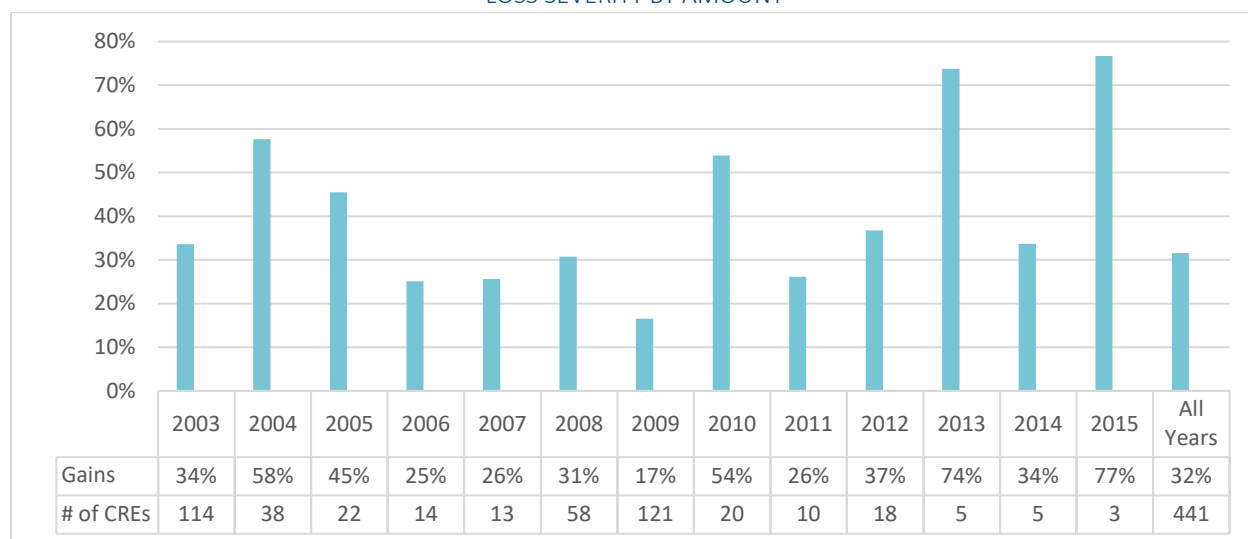
[7] *Default, Transition and Recovery: Recovery Study (US): Are Second Liens and Senior Unsecured Bonds Losing Ground As Recoveries Climb?,* D. Vazza and E. Gunter Standard and Poor's Ratings Direct, December 16, 2013.

Figure 10 shows the distribution of loss severity by amount. While it is traditional to show loss severity histograms by issuer or number, we used amount in this view to have the distribution shown align with the stated 32% overall loss severity in the graph above. The graph below shows that loss severities were widely distributed, with the exception of a nearly 20% concentration in the loss severity range of [-10,0). By amount, gains resulting from CREs occurred 31.5% of the time, with an average gain of 16.5%; and by number of company-CUSIP pairs, the corresponding results were 20.2% occurrence, with an average gain of 17.4%. The lower proportion of gains by number of company-CUSIP pairs aligns with the overall higher 35% loss severity by number. Because results were better by amount than number, we can conclude that larger deals produced lower than average loss severities. While gains from a CRE may seem counterintuitive, we believe these results are valid (see Appendix 1.D, Data Validation). CRE workouts can involve renegotiation of debt terms (coupon, collateral, and the inclusion of equity or warrants), which can produce a more favorable result than the original terms.

Figure 10

LOSS SEVERITY FREQUENCY DISTRIBUTION

2.3 CHARACTERISTICS OF THE AGGREGATE PRIVATE PLACEMENT PORTFOLIO

This subsection provides some descriptive statistics that may be useful as background for interpreting results. All pie charts in this subsection combine 2003-2015 data to state portfolio characteristics. All the percentages in this subsection refer to dollar amounts of exposed assets (not counts or numbers of CUSIPS). Unless otherwise noted, percentages are for reported values only (observations with unreported values, labeled Not Reported (NR), of the given variable are omitted from calculations). The predominant asset in contributors' portfolios continues to be a traditional private placement: dollar-denominated, non-Rule 144A, investment-grade debt, which comprises 86% of study portfolios. Other asset types that comprise 14% of portfolios in the study are project finance, credit tenant leases, and equipment trusts/lease obligations. Although analyzed in prior studies, Asset-Backed Securities were excluded from this study, so are not included in this asset distribution. The graph below shows the shares of the asset types in the study.

Figure 11
EXPOSURE BY ASSET TYPE
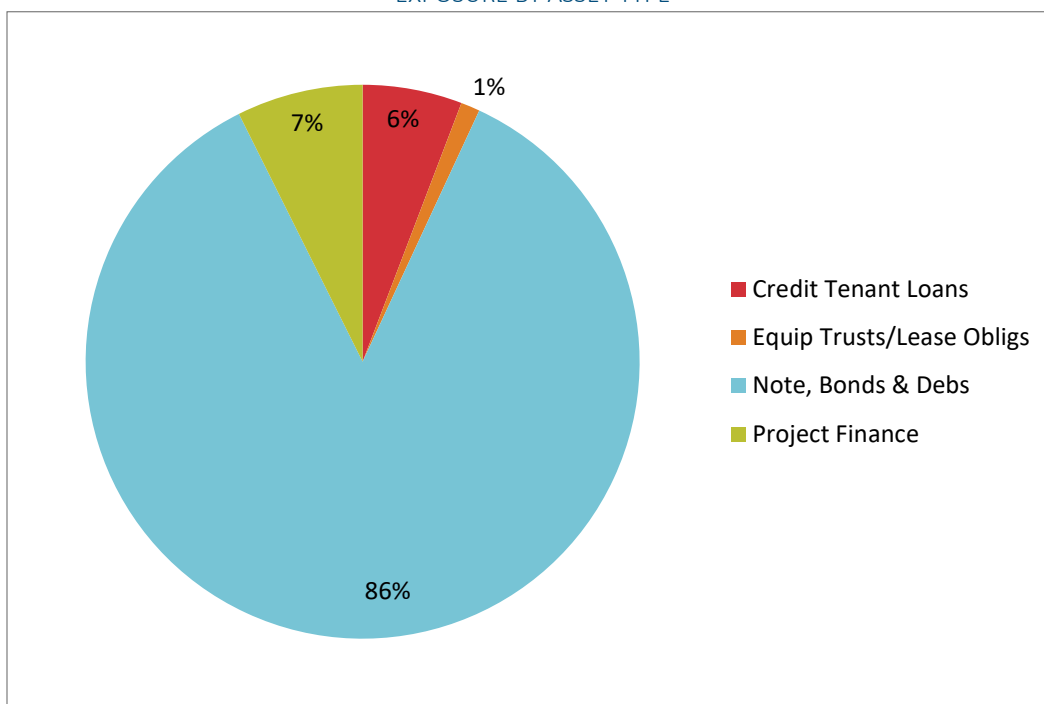
The majority of contributors' private placement portfolios are held in senior-secured and senior-unsecured instruments. As reported in the graph below, the concentration of these instruments is 85% of all assets, but may be higher because 14.5% of asset seniority status was Not Reported. For the purpose of this exhibit, convertible debt (0.1%) was combined with the subordinated category. The bulk of the combined category is comprised of subordinated assets. Because the loss severity in the Not Reported category is sandwiched by the senior and subordinated assets, it is likely that the Not Reported assets contain a mix of all asset types, but with a higher subordinated percentage than the reported 0.83%.

Figure 12
SENIORITY STATUS

Legend:
- All Other
- Sr_Secured
- Sr_Unsecured
- Subord

0.83%
14.51%
26.19%
58.47%
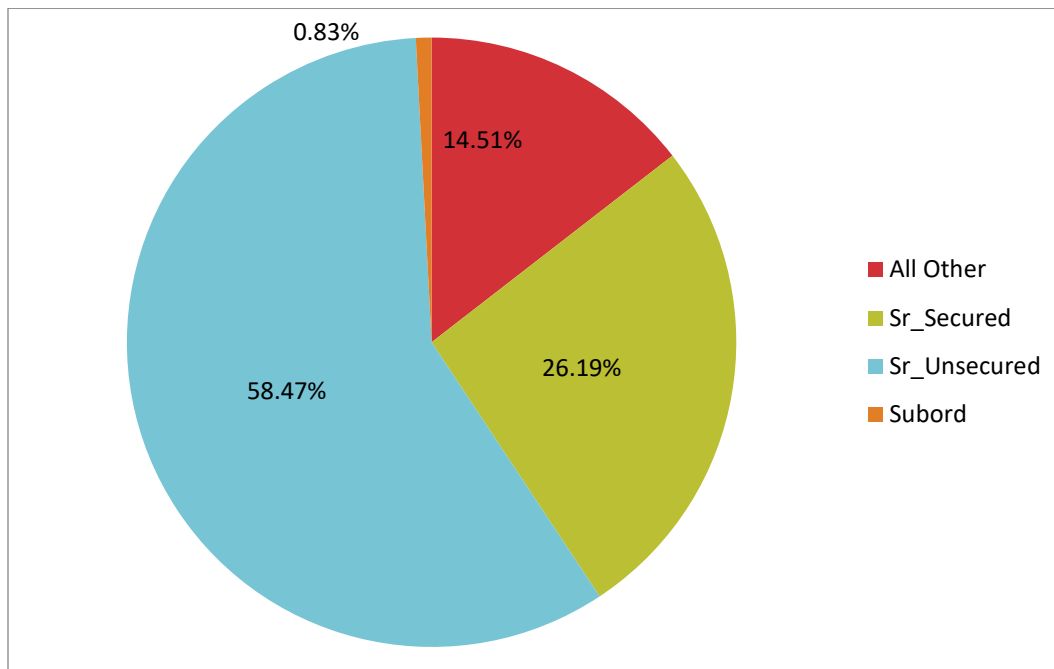
Most investors secure private placements at the time of issue (rather than in the secondary market). Ninety-one percent of the private placement assets studied are denominated in dollars and 57% are from US issuers. This is a decrease from 60% in the last report that reflected increasing private placements by European and Australian issuers. Issuer Domicile concentrations by region are shown in the graph below.

Figure 13
ISSUER DOMICILE
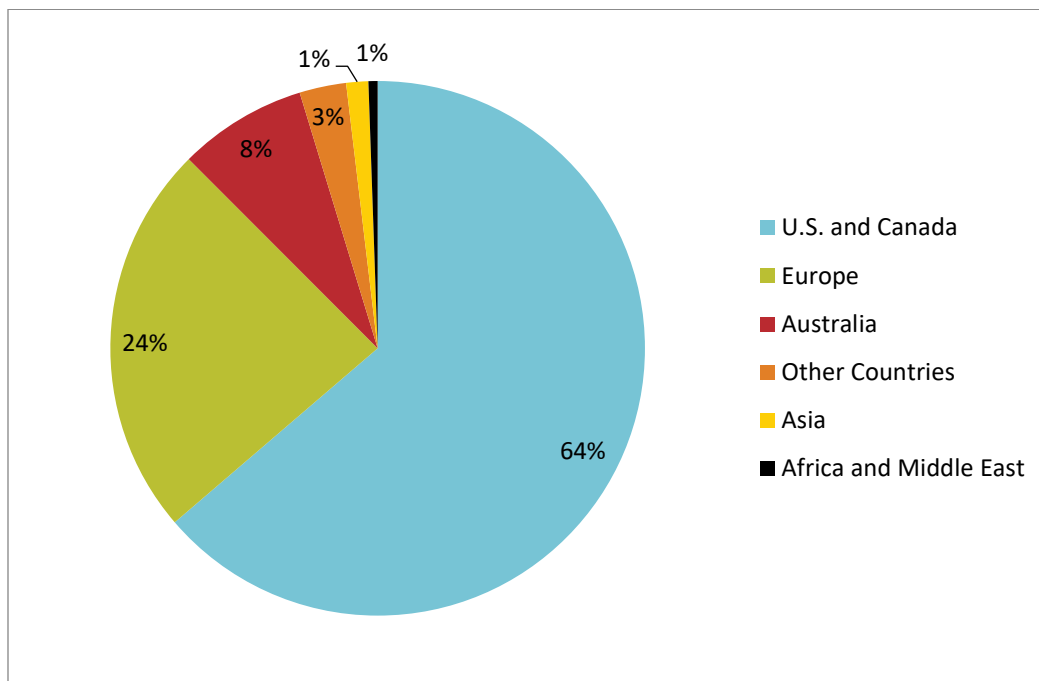
Private placements continue to be predominantly long-term, fixed-rate investments. The mean original years to maturity is 14.6, and 35% of the bonds have an amortization or paydown feature that reduces the average life relative to the original time to maturity. Ninety-four percent carried fixed interest rates and 6% carried variable rates, with a small portion of zero-coupon instruments.

Assets are classified in five industry sectors, with the greatest concentration in industrials, utilities, and finance. The graph below shows the sector distribution.

Figure 14
INDUSTRY SECTOR ALLOCATION
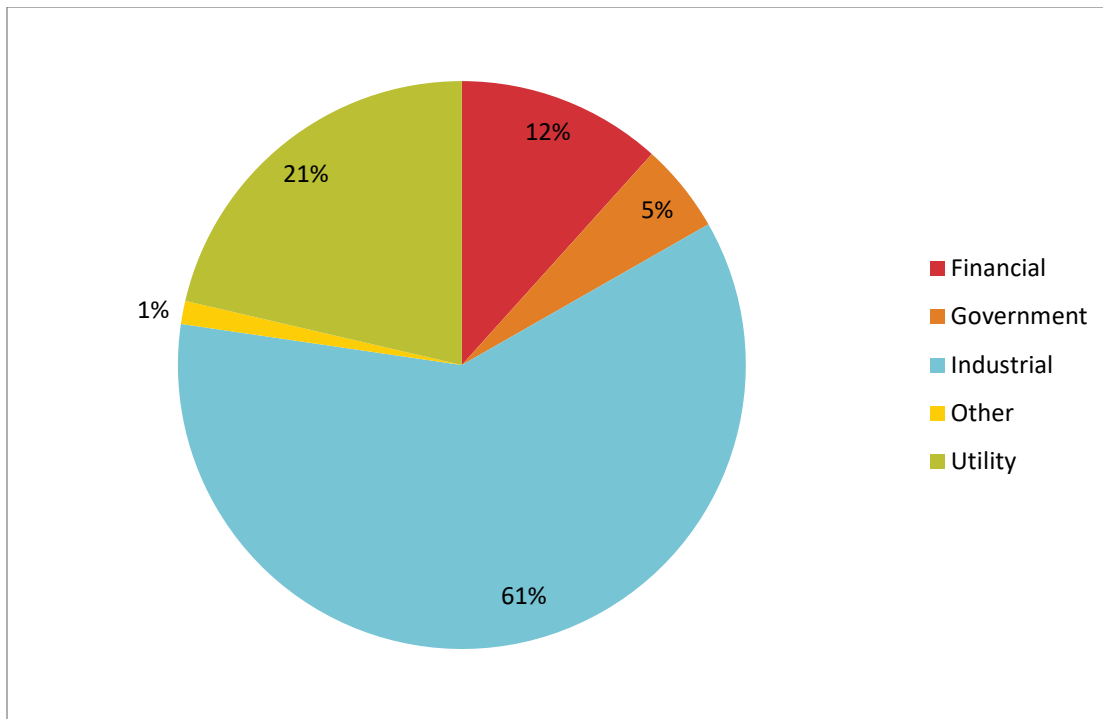
During the study period, Financials had the highest average incidence, which was caused by much higher incidence during the financial crisis years 2008-2009. During that time, Financials recorded incidence rates of 1.67% in '08 and 5.01% in '09, far exceeding the longer-term average of 0.54% for the 2003-2015 period. The graph below compares incidence for the main sectors (Other and Government are excluded) across high and low incidence time periods.

Figure 15
INCIDENCE BY AMOUNT BY SELECT INDUSTRY SECTOR

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Utility	2.37%	0.22%	0.00%	0.03%	0.04%	0.00%	0.22%	0.00%	0.00%	0.49%	0.20%	0.14%	0.03%	0.16%
Industrial	1.27%	0.74%	0.39%	0.20%	0.13%	0.75%	2.01%	0.27%	0.11%	0.12%	0.15%	0.30%	0.10%	0.42%
Financial	0.42%	0.10%	0.00%	0.00%	0.74%	1.67%	5.01%	0.47%	0.00%	0.00%	0.00%	0.00%	0.00%	0.54%
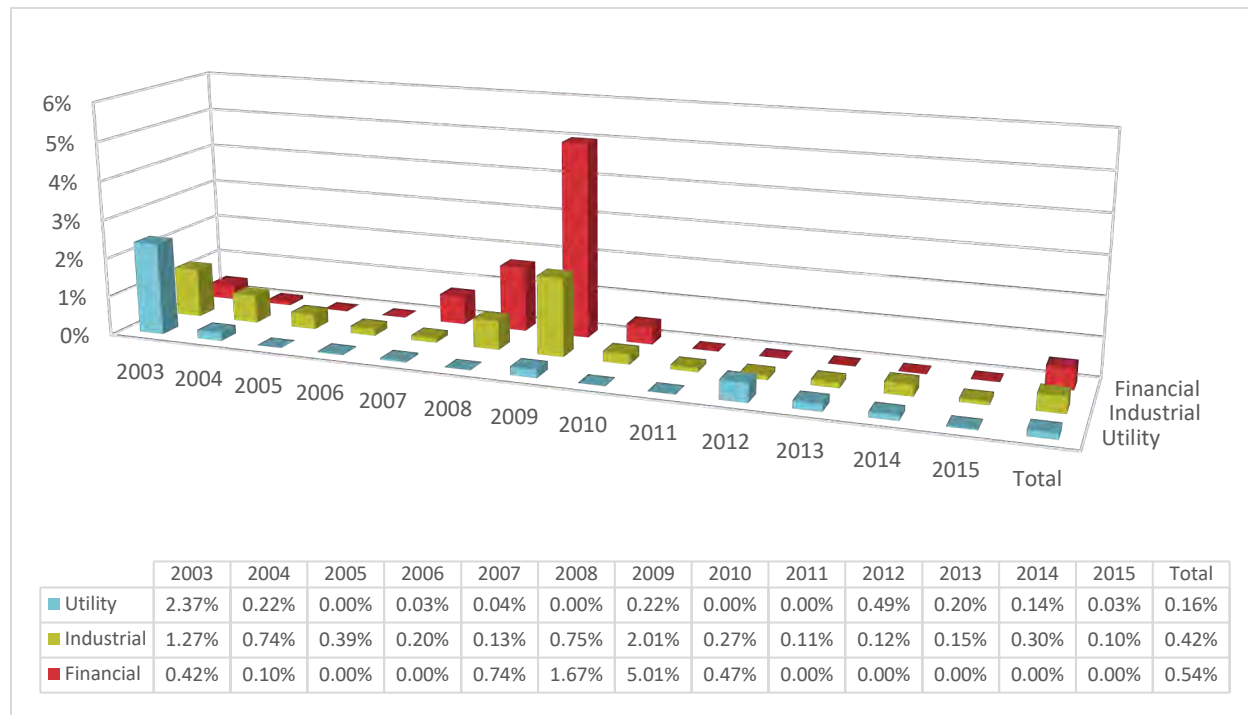
Based on contributors' most recent internal ratings, their private placement portfolios are predominantly investment-grade, as shown in the graph below, for all year-ends 2003-2015. Omitting amounts in the NR (Not Reported) category, 86% of exposures by number and 93% by amount are rated BBB or higher.

Figure 16

PRIVATE PLACEMENT CONTRIBUTORS' INTERNAL RATINGS DISTRIBUTION 2003-2015
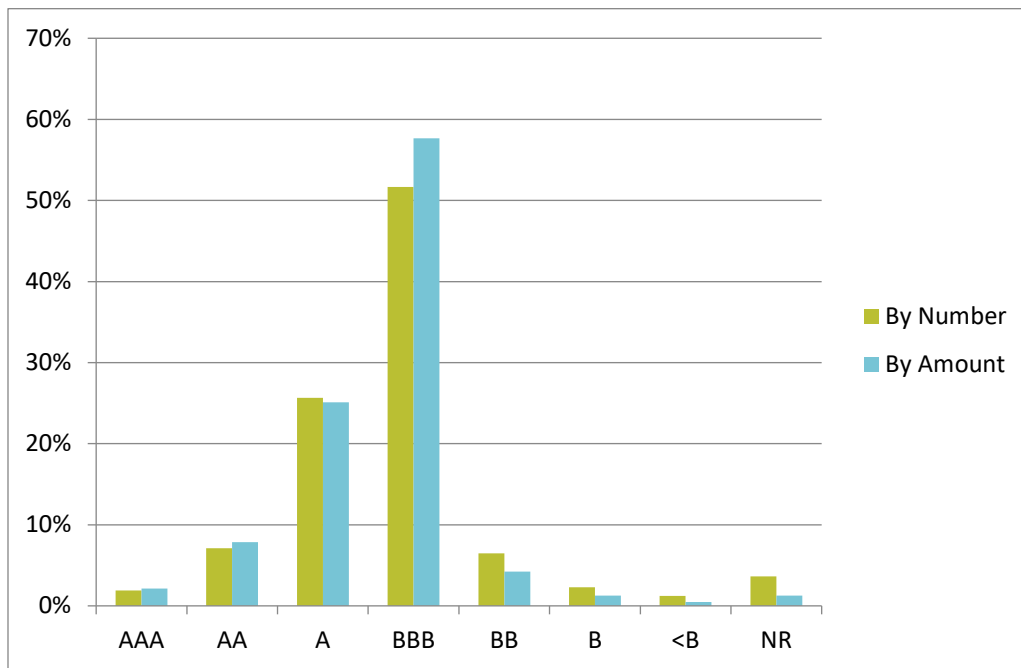
2.4 EXPERIENCE BY THE INVESTOR'S MOST RECENT INTERNAL CREDIT RISK RATING

Figure 17 below summarizes the investors' private placement experience by the most recent internal rating. Because private placement assets are not rated as frequently as public bonds, most insurance companies participating in this study routinely produce internal ratings of private placements in their portfolio. These ratings were reported for this study on a scale comparable to S&P or Moody's.

No CREs during any year of the study were reported on assets rated AAA in the beginning of that year. Average incidence and economic loss rates were low for other assets, with the equivalent of investment-grade ratings (AA, A, and BBB) during the period of the study, but rose steeply in the speculative grades. Although there was an apparent tendency for below-investment-grade assets to experience larger loss severities in studies prior to 2003, this effect looks less pronounced at and after 2003. Although A-rated assets exhibited an unusually high loss severity, it is important to note that only seven CREs occurred in the A-rated bond population during the study period, corresponding to over 25,000 A-rated exposures, so the credibility of the loss severity for A-rated bonds is likely quite low.

Figure 17
LOSS EXPERIENCE BY MOST RECENT INTERNAL RATING 2003-2015

	AAA	AA	A	BBB	BB	B	<B	NR	All
■ Incid by Number		0.01%	0.03%	0.22%	1.63%	5.13%	8.89%	0.59%	0.44%
■ Incid by Amount		0.01%	0.04%	0.18%	1.51%	6.20%	15.17%	1.00%	0.36%
▬ Economic Loss		0.00%	0.03%	0.04%	0.18%	2.38%	7.36%	0.34%	0.11%
● Loss Severity		-9.9%	74.4%	22.5%	12.0%	38.4%	48.5%	34.3%	31.6%
# of CREs	0	1	7	116	103	103	92	19	441
Exposure by #	1.8%	7.5%	25.5%	52.7%	6.3%	2.0%	1.0%	3.2%	100.0%
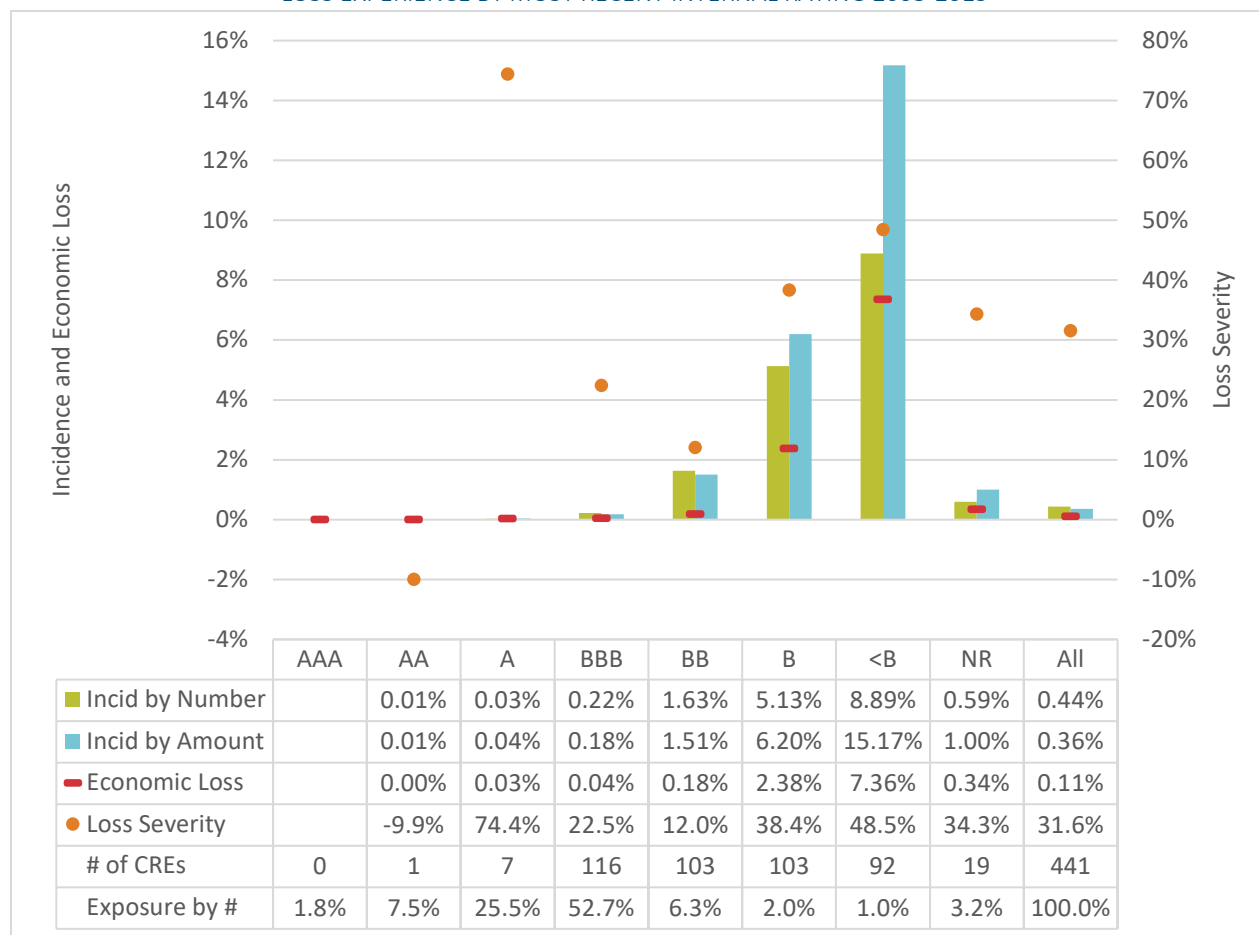
2.5 COMPARISON WITH PUBLIC BOND EXPERIENCE

This study's comparison of private placement experience with that of publicly-issued corporate bonds has four motivations:

1. Studies on public bond experience influence people's sense about corporate debt credit risk. In that regard, public bond experience provides a benchmark for comparison to private placement debt.

2. Although private placements are similar to public bonds in many respects, privates are widely viewed as offering additional protection and value to investors. This analysis aims to quantify and explain observed differences on a consistent basis. However, it does not provide a complete analysis of all potential sources of incremental value between public and private debt.

3. Regulatory and rating agency treatment of private placements (such as risk-based capital requirements) has been based largely on public bond default experience. To the extent that private placement experience differs, a comparison may provide useful input.

4. The analysis supports an assessment of the credibility of internal ratings of private placements. Since privates are a different market than public bonds, differences in rating may be attributable to market agents and their varying underwriting rather than expectations of experience.

2.5.1 DIFFERENCE IN DISTRIBUTION OF MOST RECENT RATING

Figure 18

PRIVATE VS. PUBLIC DISTRIBUTION BY MOST RECENT RATING 2003-2015
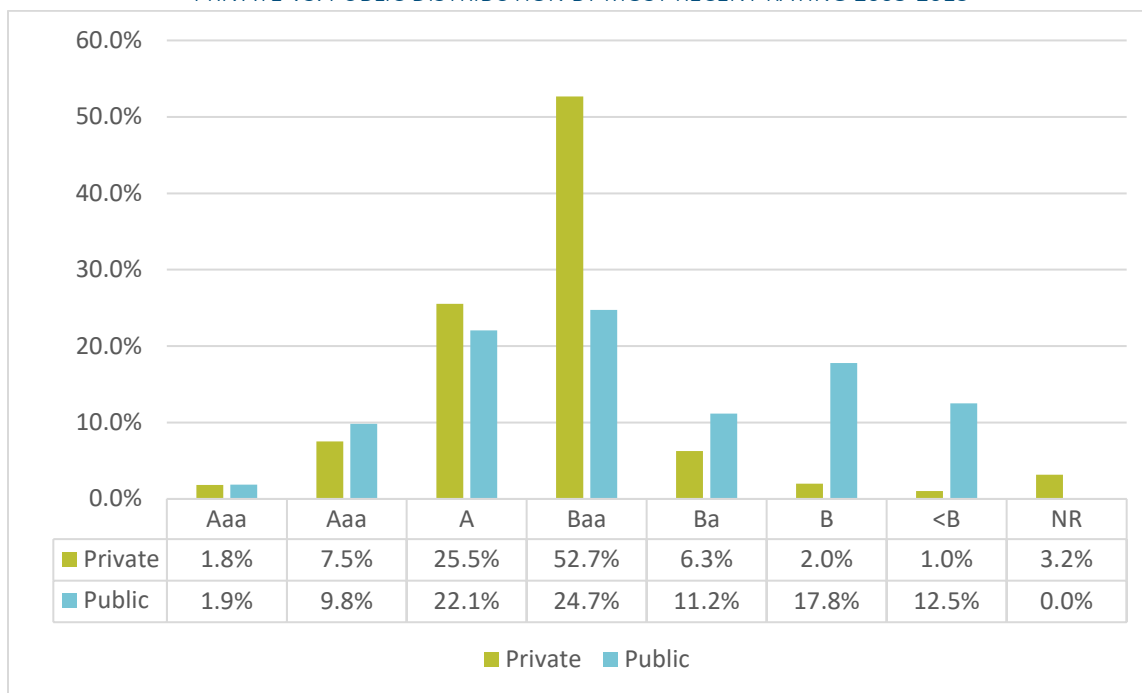
	Aaa	Aaa	A	Baa	Ba	B	<B	NR
Private	1.8%	7.5%	25.5%	52.7%	6.3%	2.0%	1.0%	3.2%
Public	1.9%	9.8%	22.1%	24.7%	11.2%	17.8%	12.5%	0.0%

Source for Public Bonds: *Moody's 2017 Public Corporate Bond Default Study (1970-2017), Exhibit 41, arithmetic average of cohorts*

The graph above compares the Study's exposure of private placement bonds at participating insurance companies with the universe of public bonds (at large, not confined to insurance companies) captured by Moody's 2017 public corporate bond default study.

Private placements at insurance companies clustered at the BBB, based on the most recent internal rating provided to the Study. In fact, 87.5% of privates were recorded as investment grade. In contrast, Moody's data suggests (through their yearly cohorts) that public bonds were far more widely distributed across the credit risk spectrum.

When we narrow the focus to only insurance companies' balance sheets through the use of ACLI data, the ratings composition of publics is much closer to that of privates in our study. The graph below removes government and agency securities from the public debt figures in an attempt to make a corporate-to-corporate comparison between public and private market insurance holdings expressed on an NAIC ratings basis (NAIC ratings equivalency, 1 = Aaa, Aa or A; 2 = Baa; 3 = Ba; 4 = B; 5 = Caa; 6 = Lower than Caa).

Figure 19

ESTIMATED 2016 GENERAL ACCOUNT BOND DISTRIBUTION – PRIVATE VS. PUBLIC CORPORATE

NAIC Rating	1	2	3	4	5	6
2016 Private	49.5%	40.4%	6.1%	2.6%	1.1%	0.3%
2016 Public Corporate	53.0%	40.7%	4.2%	1.7%	0.3%	0.1%
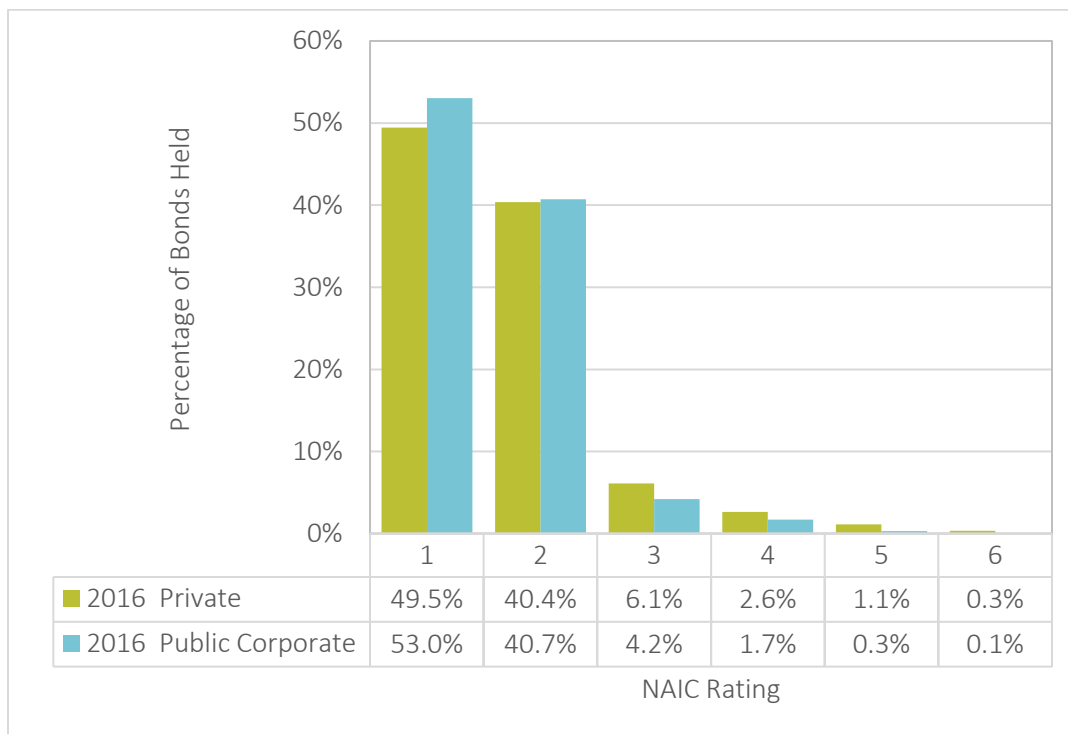
Source: 2017 ACLI Fact Book, Tables 2.3 and 2.6. Both private and public bond exposures are sourced from the ACLI to keep the basis for comparison as close as possible.

The graphs below illustrate how credit quality has shifted in both the private and public markets. The change in private placement ratings has been slight in recent years, with a minimal reduction in non-investment grade holdings. The more remarkable shift, according to Moody's, is in public bonds, which have shifted towards riskier issuances. Most notably, the proportion of Caa-C holdings (navy blue) have increased significantly, while the proportion of investment-grade holdings has been trending downward. What implications this holds for the end of the current cycle is left to the reader.

Figure 20
NUMBER OF PUBLIC-CORP ISSUERS BY RATING BY MOODY'S ANNUAL COHORT
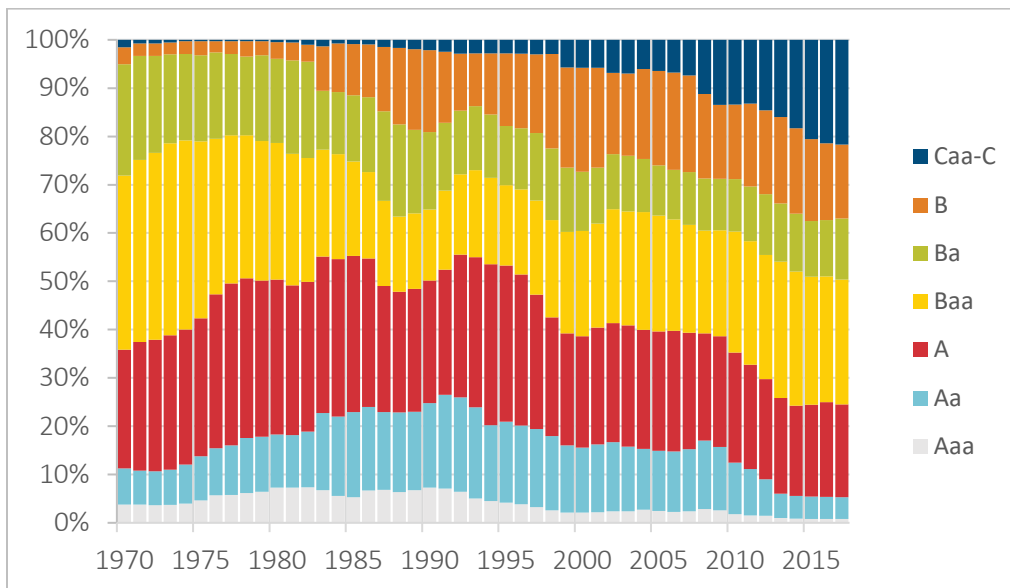
Figure 21
PRIVATE-PLACEMENT EXPOSURE COUNT BY MOST RECENT RATING
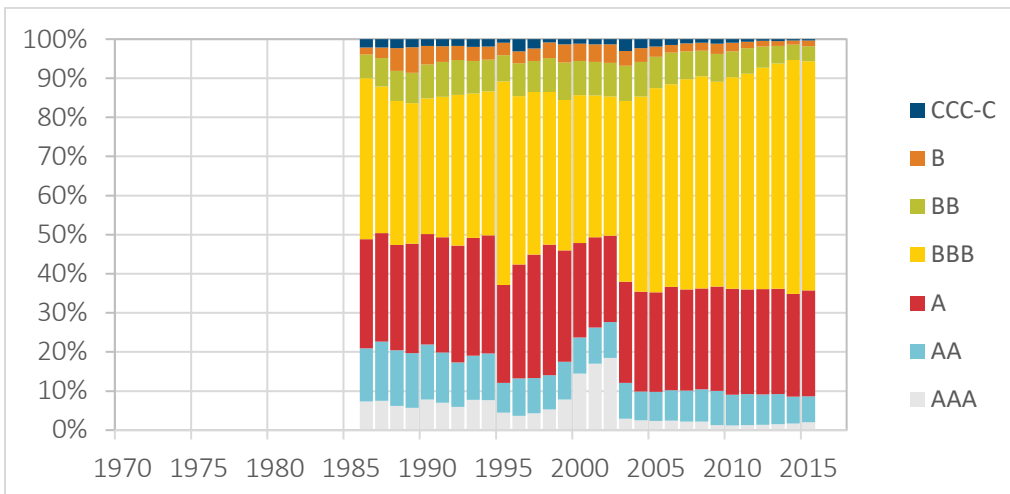
Source for Public Bonds: Moody's 2017 Public Corporate Bond Default Study (1970-2017), Exhibit 41
Note: The discontinuity in the 2002-2003 private data was due to the Study moving to exclude ABS.

2.5.2 LOSS DISTRIBUTION

Private bonds generally experienced lower loss rates than public bonds. Speculative-grade privates had significantly better experience than their public counterparts. While this may speak to the efficacy of private placement underwriting teams and the power of covenants, relatively few private placement bonds are issued in speculative-grade ratings, rendering this a niche market.

Note that, when comparing the total loss rates of publics versus privates, one must take into account the rating skew that we saw in the previous section: Public bonds in Moody's study had far more low-credit quality exposure than private placements in insurance companies' holdings in the Study, so it is appropriate that the public corporate experience below had higher aggregate loss rates. When looking at a rating-by-rating comparison, loss rates are more comparable over the 2003-2015 study period. Additionally, given the relatively low exposure to below-investment grade in the Study, one should consider the credibility of rating-by-rating comparisons.

Please note that private loss rates in this display will not balance to other exhibits in the study due to restricting recoveries to those of senior-unsecured securities. This adjustment is made to provide comparability with the issuer basis of Moody's exhibits. In Figure 22 and Table 5 below, we have adjusted the Study's loss rates to be more comparable with the Moody's exhibits. The estimated ultimate recovery rate for public bonds in this section is 41.2%. When we discuss recovery rates more in depth in Section 2.5.4, the same figure will be 47.9%. The difference is due to the experience period covered (2003-2015 in this section, vs. 1987-2017 in Section 2.5.4). We have also restricted the private recovery rates in this section to those of senior-unsecured bonds, again for comparability purposes with Moody's.

Figure 22

PRIVATE VS. PUBLIC LOSS RATES 2003-2015
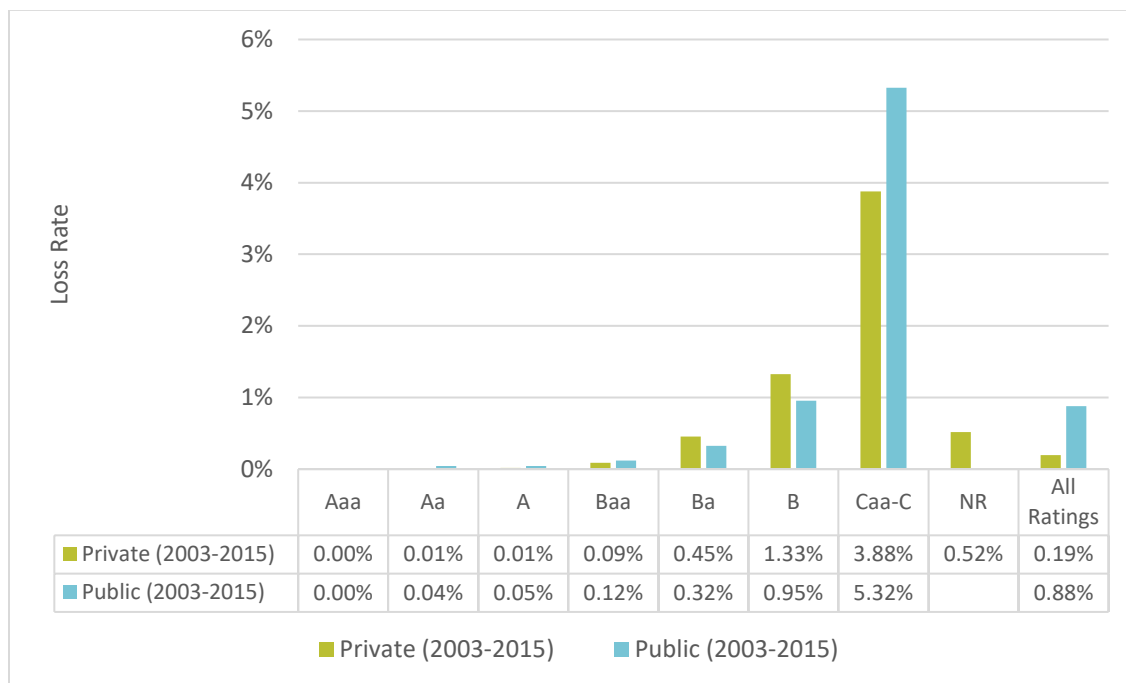
	Aaa	Aa	A	Baa	Ba	B	Caa-C	NR	All Ratings
Private (2003-2015)	0.00%	0.01%	0.01%	0.09%	0.45%	1.33%	3.88%	0.52%	0.19%
Public (2003-2015)	0.00%	0.04%	0.05%	0.12%	0.32%	0.95%	5.32%		0.88%

Source for Public Bonds: Moody's 2017 Public Corporate Bond Default Study (1970-2017), Exhibit 23 with Exhibits 16, 30, and 41 used to develop weightings to combine annual experience.
Private bond figures calculated using issuer default and senior unsecured recovery rates, which is an attempt at reproducing the basis of Moody's Exhibit 23).

Another approach to measuring loss rates is to adjust for the varying quality mix by weighting public and private loss experience by the counterpart's quality mix. This is a metric that was created and described in the previous report[8]. What follows are loss rates for private placements converted to an issuer basis.

Row (1): Economic loss rates with incidence measured on an issuer basis, and with senior-unsecured recovery rates

Row (2): Economic loss rates from (1), with publics weighted by the credit quality mix of privates

Row (3): Economic loss rates from (1), with privates weighted by the credit quality mix of publics

Table 5

PUBLIC VS. PRIVATE LOSS RATES WITH ADJUSTMENTS FOR COUNTERPART QUALITY MIX 2003-2015

Basis	Loss Rates (bps)		
	Public	Private	Difference
Unadjusted	88	19	69
Public estimated based on private quality mix	25	19	6
Private estimated based on public bond quality mix	88	74	15

Both bases indicate a private advantage over public bond loss rates. Row (3) shows a larger advantage of privates due to the more favorable loss rates on sub-B debt.

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[8] Society of Actuaries 2003-12 Credit Risk Loss Experience Study: Private Placement Bonds, January 2016

2.5.3 DEFAULT INCIDENCE

Default events are extremely rare for investment-grade bonds, both public and private. Privates and publics had similar issuer default incidence rates of 0.15% and 0.12%, respectively, and privates had higher issuer incidence for all ratings Baa and lower. Because the public quality mix was lower than for privates, the overall incidence rate for rated bonds was lower for privates, 0.51%, than for publics, 1.50%. The quality mix difference between private versus public bonds also explains why privates had lower overall speculative grade defaults, even though their defaults were higher for each speculative grade rating. The quality mix within each speculative grade was lower for public than private placement bonds.

Figure 23

PUBLIC VS. PRIVATE ISSUER DEFAULT RATES 2003-2015
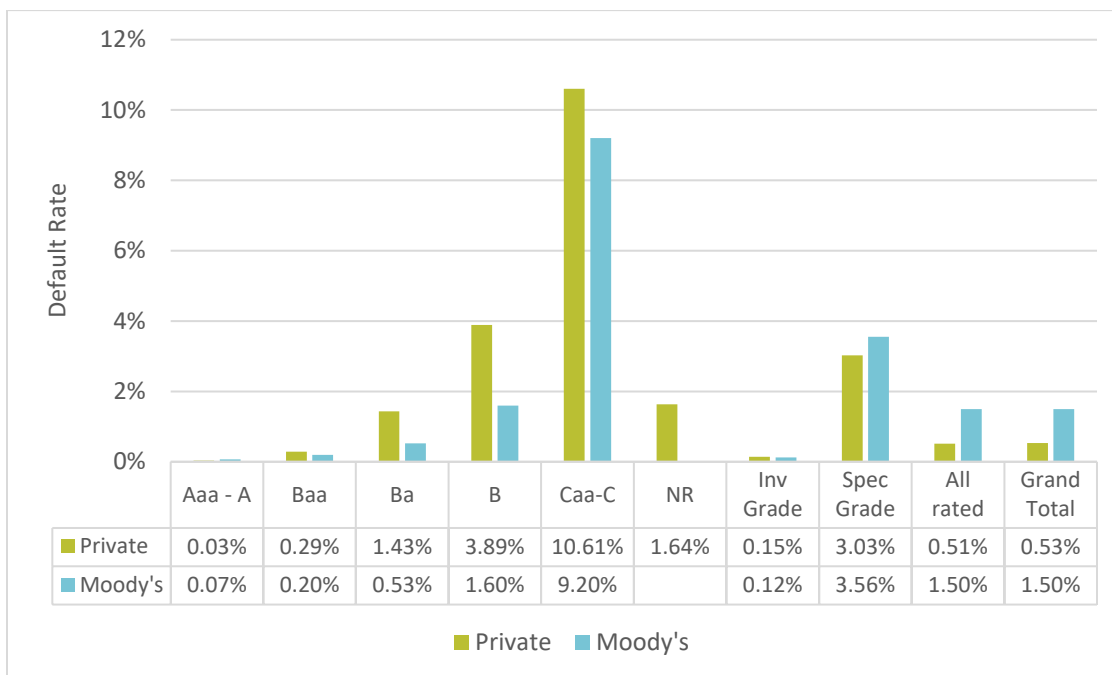
	Aaa - A	Baa	Ba	B	Caa-C	NR	Inv Grade	Spec Grade	All rated	Grand Total
Private	0.03%	0.29%	1.43%	3.89%	10.61%	1.64%	0.15%	3.03%	0.51%	0.53%
Moody's	0.07%	0.20%	0.53%	1.60%	9.20%		0.12%	3.56%	1.50%	1.50%

Source for Public Bonds: Moody's 2017 Public Corporate Bond Default Study (1970-2017), Exhibits 16, 30, and 41 are used to develop weightings to combine annual experience.

Focusing on lower-rated securities in the graphs below, publics and privates also experienced business cycles in a similar manner with respect to default rates by year.

Figure 24

MOODY'S PUBLIC ISSUER DEFAULT RATES 2003-2015
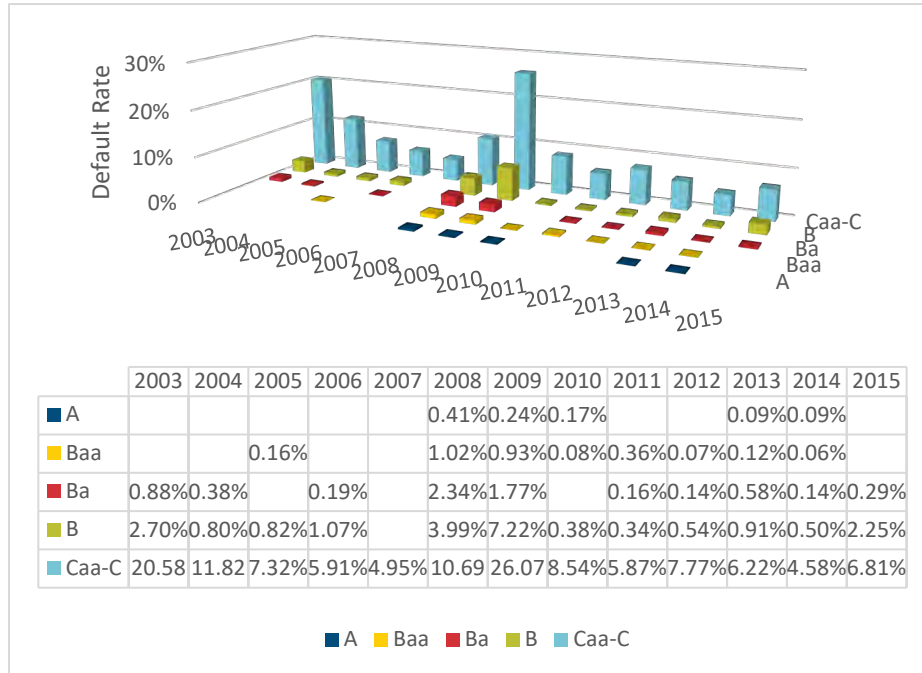
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
■ A							0.41%	0.24%	0.17%		0.09%	0.09%	
■ Baa			0.16%				1.02%	0.93%	0.08%	0.36%	0.07%	0.12%	0.06%
■ Ba	0.88%	0.38%		0.19%			2.34%	1.77%		0.16%	0.14%	0.58%	0.14%	0.29%
■ B	2.70%	0.80%	0.82%	1.07%			3.99%	7.22%	0.38%	0.34%	0.54%	0.91%	0.50%	2.25%
■ Caa-C	20.58	11.82	7.32%	5.91%	4.95%	10.69	26.07	8.54%	5.87%	7.77%	6.22%	4.58%	6.81%

■ A ■ Baa ■ Ba ■ B ■ Caa-C

Source for Public Bonds: Moody's 2017 Public Corporate Bond Default Study (1970-2017), Exhibit 30

Figure 25

PRIVATE PLACEMENT CRE INCIDENCE BY AMOUNT 2003-2015

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
■ A	0.23%					0.17%	0.16%						
■ BBB	0.70%	0.19%	0.19%	0.10%	0.20%	0.59%	0.63%	0.09%	0.10%	0.19%	0.11%	0.08%	0.09%
■ BB	2.21%	2.02%		0.76%	1.52%	3.22%	2.21%			2.32%			
■ B	1.31%	1.64%	7.25%	1.46%	1.96%	2.00%	13.40		4.89%	3.82%	2.18%	1.49%	1.43%
■ <B	12.96	11.85	7.33%	4.22%		5.19%	19.06	16.95	4.85%	23.17	9.88%	6.78%	5.56%

■ A ■ BBB ■ BB ■ B ■ <B
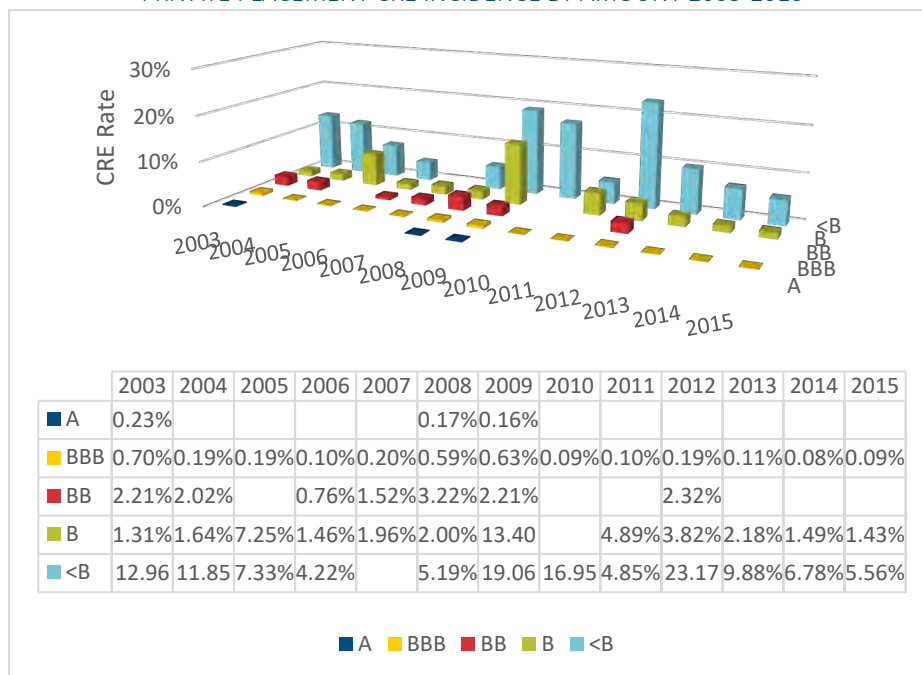
2.5.4 LOSS SEVERITY

According to study data, private placements hold an advantage in recovery in lower seniority exposure. While recovery rates are nearly at parity in senior-secured issues, privates have a 14.3% absolute advantage (62.2% - 47.9%) in ultimate recovery rate for senior-unsecured debt, and a 15.5% absolute advantage (43.5% - 28.0%) in subordinated debt.

Although these public and private recovery rates are based on different experience periods, we show this comparison on that basis because it is not possible to estimate the average public senior-secured and subordinated recovery rates for 2003-2015.

Table 6
PRIVATE VS. PUBLIC RECOVERY BY SENIORITY

	Sr. Secured	Sr. Unsecured	Subordinated
Public	62.3%	47.9%	28.0%
Private	61.8%	62.2%	43.5%
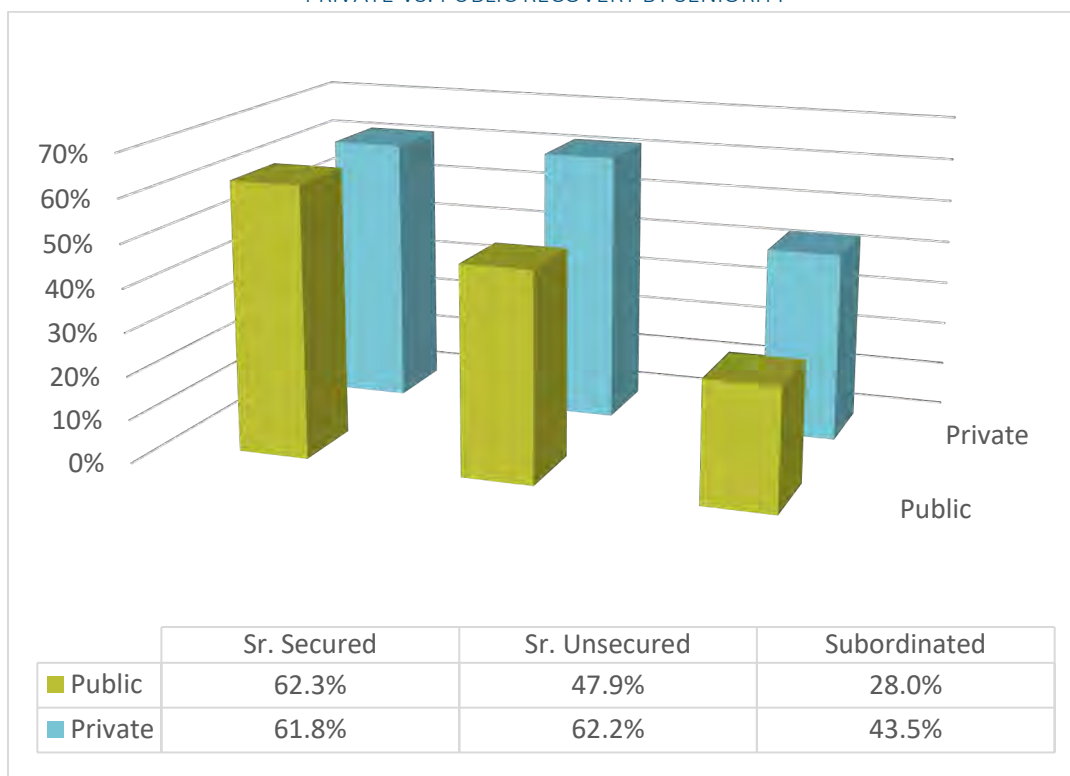
Source for Public Bonds: *Moody's 2017 Public Corporate Bond Default Study (1987-2017), Exhibit 8 (Ultimate Recovery Rates).*
Private Placement based on 2003-2015 experience.

2.6 LOSS ON TRADITIONAL PRIVATES RELATIVE TO OTHER ASSET TYPES

Figure 26 shows that traditional notes, bonds, and debentures comprised the majority of the study exposure, with the majority of the remainder being in project finance, credit tenant loans (CTLs), and the catch-all other category (unclassifiable or not reported).

Figure 26
EXPOSURE (BY AMOUNT) BY ASSET TYPE 2003-2015
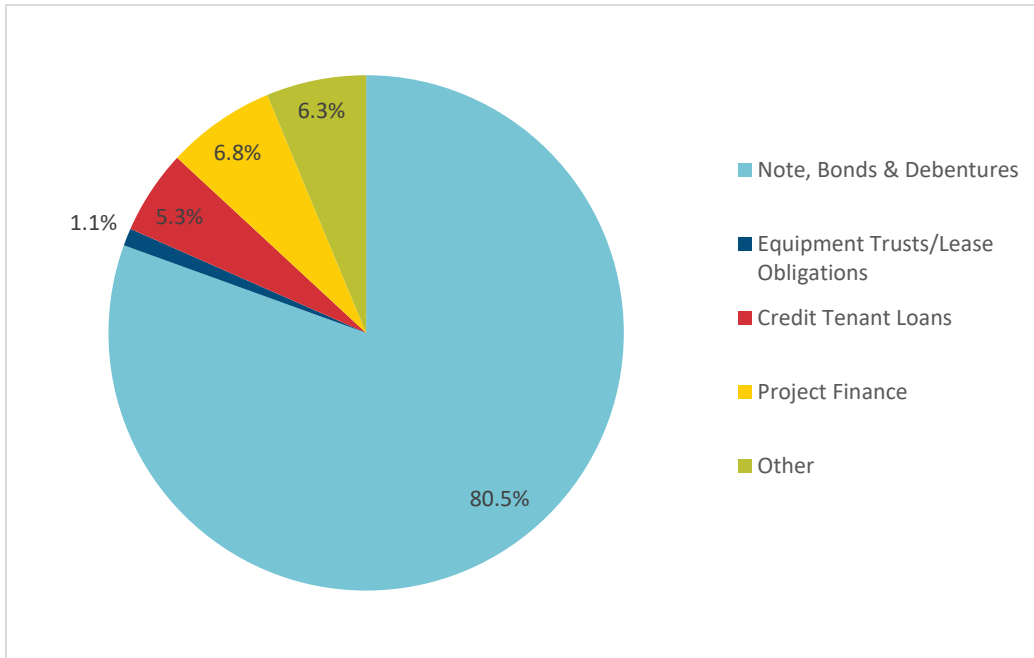
Table 7 shows that incidence and, to a lesser degree, loss severity varied widely between asset types. This produced economic loss ranging from 0.02% for CTLs to 0.22% for equipment trusts/lease obligations, but readers should bear in mind the low credibility of the non-traditional categories based on the smaller number of CREs for equipment trust/lease obligations, CTLs, and project finance.

Table 7
LOSS EXPERIENCE BY ASSET TYPE 2003-2015

Asset Type	Exposure (by amount)	Number of CREs	Incidence (by amount)	Loss Severity	Economic Loss
Note, Bonds, & Debentures	80.5%	301	0.36%	31.5%	0.11%
Equipment Trusts/Lease Obligations	1.1%	19	0.52%	43.3%	0.22%
Credit Tenant Loans	5.3%	17	0.05%	44.9%	0.02%
Project Finance	6.8%	32	0.58%	31.3%	0.18%
Other	6.3%	72	0.31%	30.0%	0.09%

Tables 8, 9, and 10 show exposure amount, economic loss, and number of CREs, respectively, by asset type and internal rating. The higher economic loss for equipment trust/lease obligations and project finance is explained by their higher, relative to all asset types, combined B and <B exposure where higher than average economic losses occurred. The combined exposure of B and <B for all asset types was 1.8% versus 4.3% and 6.3% for equipment trust/lease obligations and project finance, respectively. Each of those two asset types had their highest losses in those ratings. With respect to B and <B ratings, the economic losses of equipment trust/lease obligations were 5.24% and 3.65%, respectively, and the corresponding project finance losses were 0.87% and 9.09%, respectively. Even though BB project finance had the largest speculative grade exposure, 11.4%, that was not a primary cause of the higher than average project finance, 0.18%, economic loss because the economic loss of that ratings cell was 0.10%, but, as noted above, readers should consider the low number of CREs in these asset type and rating cells when evaluating this experience.

Table 8
PERCENTAGE OF EXPOSURE (BY AMOUNT) BY ASSET TYPE AND INTERNAL RATING 2003-2015

	Note, Bonds, & Debentures	Equipment Trusts/Lease Obligations	Credit Tenant Loans	Project Finance	Other	All Asset Types
AAA	1.7%	5.0%	4.4%	2.9%	3.8%	2.1%
AA	7.4%	22.7%	22.9%	1.4%	8.0%	8.0%
A	24.8%	42.2%	32.8%	15.0%	27.0%	24.9%
BBB	59.5%	22.0%	35.2%	60.7%	53.1%	57.5%
BB	4.1%	2.9%	2.6%	11.4%	5.5%	4.6%
B	1.0%	1.5%	1.4%	4.8%	1.3%	1.3%
<B	0.4%	2.8%	0.4%	1.5%	0.3%	0.5%
NR	1.2%	0.9%	0.4%	2.3%	1.0%	1.2%

Table 9
ECONOMIC LOSS BY ASSET TYPE AND INTERNAL RATING 2003-2015

	Note, Bonds, & Debentures	Equipment Trusts/Lease Obligations	Credit Tenant Loans	Project Finance	Other	All Asset Types
AAA	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%
A	0.03%	0.00%	0.00%	0.00%	0.15%	0.03%
BBB	0.05%	0.12%	0.00%	0.00%	0.01%	0.04%
BB	0.21%	0.64%	0.18%	0.10%	0.04%	0.18%
B	3.05%	5.24%	1.20%	0.87%	2.40%	2.38%
<B	7.75%	3.65%	0.70%	9.09%	3.95%	7.36%
NR	0.48%	0.00%	0.00%	-0.27%	0.00%	0.34%
All Categories	0.11%	0.22%	0.02%	0.18%	0.09%	0.11%

Table 10
NUMBER OF CREs BY ASSET TYPE AND INTERNAL RATING 2003-2015

	Note, Bonds, & Debentures	Equipment Trusts/Lease Obligations	Credit Tenant Loans	Project Finance	Other	All Asset Types
AAA						
AA	1					1
A	4				3	7
BBB	87	2	1		26	116
BB	58	8	3	2	32	103
B	75	7	1	12	8	103
<B	58	2	12	17	3	92
NR	18			1		19
All Categories	301	19	17	32	72	441

2.7 EXPERIENCE BY EARLIEST INTERNAL RATING

The graph below integrates the data for the earliest internal rating, including the incidence rate by number, the incidence rate by amount, the loss severity, the economic loss, the number of Credit-Risk Events (CRE), and the exposure by number.

'Earliest rating' is a proxy for the rating at private placement issuance, but is not a precise measure of it. Participating companies were asked to report their 'internal rating at acquisition' for each asset, but for those unable to report an 'internal rating at acquisition,' the 'most recent internal rating' as of the earliest reported year-end was used. For example, if data for an asset were reported for years 2003-2006 with a 'most recent internal rating' for year-ends 2004 and after, but no 'internal rating at acquisition' was submitted, the 'earliest rating' was set equal to the year-end 2004's 'most recent internal rating.' About one-third of the earliest rating values were inferred in this manner, with the remainder being the reported rating at acquisition.

Earliest ratings of private placements in the study by number were almost 90% in BBB or above, over 50% in BBB alone, 28% in A alone, and about 10% below investment grade.

The distribution of the earliest rating was very similar to that of the most recent rating although, as expected, the most recent ratings showed a slightly lower proportion of investment-grade bonds and a correspondingly higher proportion of lower-rated bonds due to the rating migration between acquisition and the study end date. Because very few private placements had a rating below B at origination, results for those grades may mainly reflect the experience of privates for which the date of our earliest rating information was at least a year or two after origination. Thus, earliest-rating results for the less risky grades might somewhat understate losses relative to rates that would be revealed if at-origination ratings were universally available.

The graph below shows incidence rates and economic loss rates by earliest rating. These are average one-year rates, but the default for an individual bond that occurs during a span of years after acquisition is associated with its rating at acquisition, not just with the most recent rating at the start of each year. Private placements with a below B rating had the highest incidence rate, which was close to 5% by number and close to 7% by amount, as well as the highest economic loss rate, which was close to 2.7%. AA-rated placements had a lower incidence rate than AAA-rated placements, and this could be due to the scarcity of incidence data for these higher-rated placements.

Loss rates for investment-grade bonds at acquisition were higher than loss rates for investment-grade bonds at the most recent rating because a newly acquired bond does not typically default within a year or two of being rated investment grade. Instead, they transition through the lower grades, raising the loss rates by most recent rating of those grades on the way through.

Figure 27
LOSS EXPERIENCE BY EARLIEST INTERNAL RATING 2003-2015

	AAA	AA	A	BBB	BB	B	<B	NR	All
Incid by Number	0.04%	0.02%	0.17%	0.51%	1.24%	1.94%	4.88%	0.40%	0.44%
Incid by Amount	0.01%	0.02%	0.15%	0.43%	1.20%	2.66%	7.05%	0.14%	0.36%
Economic Loss	0.00%	0.01%	0.10%	0.10%	0.31%	1.81%	2.51%	0.02%	0.11%
Loss Severity	-8.7%	41.7%	63.8%	23.9%	25.4%	68.3%	35.5%	18.1%	31.6%
# of CREs	1	2	46	260	49	27	37	19	441
Exposure by #	2.4%	8.1%	27.6%	51.1%	3.9%	1.4%	0.8%	4.7%	100.0%
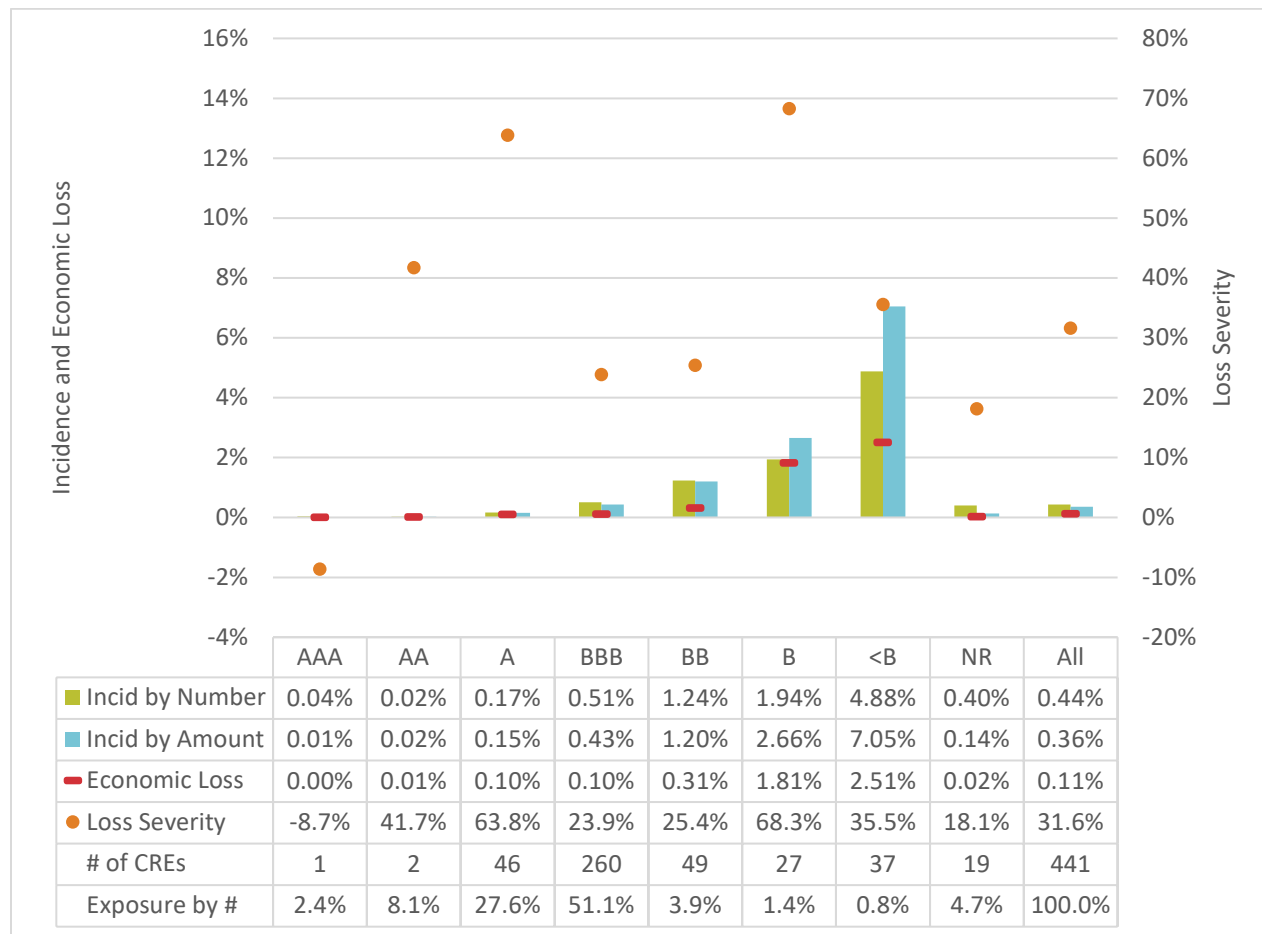
2.8 EXPERIENCE BY NAIC RATING

NAIC ratings are specific alphanumeric symbols used by the NAIC SVO to denote the credit quality of the financial instrument. NAIC 1 is assigned to debt instruments with the lowest credit risk, whereas NAIC 6 is assigned to instruments that are in or near default. The NAIC rating scale has not been changed since 1990. NAIC SVO ratings are available for most of the private placements throughout the study's sample period. Table 11 below shows the equivalents of NAIC ratings to the other two most common rating schemes: Moody's and Standard and Poor's.

Table 11
NAIC RATING EQUIVALENTS TO MOODY'S AND STANDARD AND POOR'S

NAIC SVO	Moody's	Standard and Poor's
1	Aaa, Aa1, AA2, AA3, A1, A2, A3	AAA, AA+, AA, AA-, A+, A, A-
2	Baa1, Baa2, Baa3	BBB+, BBB, BBB-
3	Ba1, Ba2, Ba3	BB+, BB, BB-
4	B1, B2, B3	B+, B, B-
5	Caa1, Caa2, Caa3	CCC+, CCC, CCC-
6	Ca, C	CC, C, D

The graph below illustrates the economic loss by most recent NAIC Rating over the study period from 2003-2015. As expected, the economic loss had a clear trend of worsening as the NAIC rating worsens.

Figure 28
LOSS EXPERIENCE BY MOST RECENT NAIC RATING 2003-2015

	1	2	3	4	5	6	NR	All
Incid by Number	0.04%	0.22%	1.82%	3.35%	5.09%	6.05%	2.58%	0.44%
Incid by Amount	0.04%	0.22%	1.09%	3.75%	8.16%	15.73%	1.74%	0.36%
Economic Loss	0.03%	0.05%	0.12%	1.20%	5.00%	6.98%	-0.09%	0.11%
Loss Severity	61.7%	23.0%	11.0%	32.0%	61.3%	44.4%	-5.3%	31.6%
# of CREs	15	118	136	69	52	46	5	441
Exposure by #	36.4%	52.2%	7.4%	2.0%	1.0%	0.8%	0.2%	100.0%
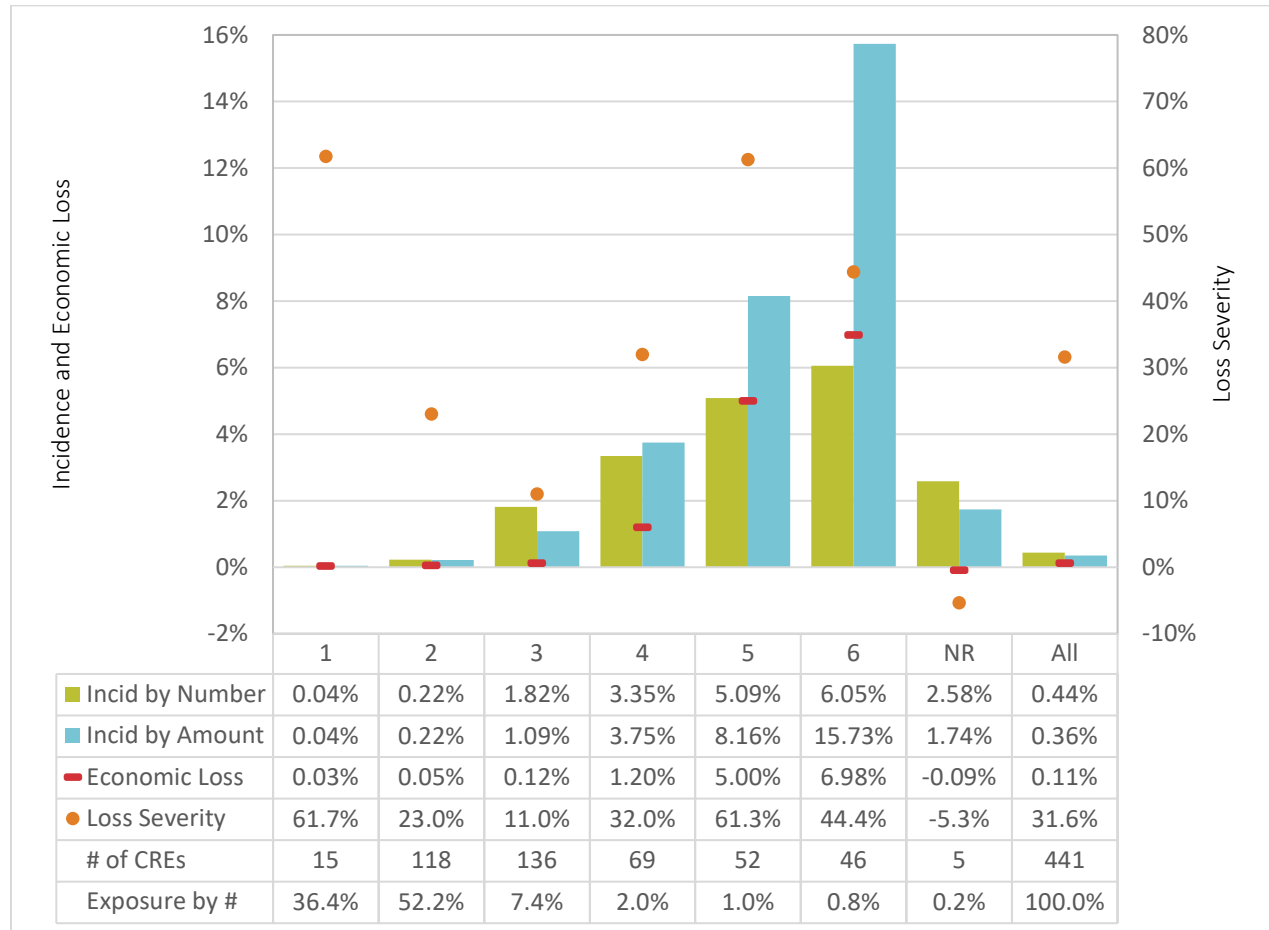
The table above shows the distribution of CREs and loss rates over the combined experience years from 2003-2015. The incidence rate by number and by amount corresponded well to the decreasing NAIC quality ratings. At NAIC ratings 5 and 6, we saw an increase in incidence rate, as well as the amount involved. The reader will obviously note the negative values shown in this and other tables. In some cases, contract provisions are renegotiated following a CRE, which can produce more than 100% recovery. More description of this is included in Sections 2.12 and 2.13.

For high quality NAIC 1 assets, of those that experienced a CRE, the severity was notably high (62%). As expected of high quality assets, the incidence rate for this category of asset was very low. However, of those that experienced credit risk events, 90% of those NAIC 1 assets belonged to the financial sector. Those CREs were observed during the period from 2007-2011, as expected from the 2007 Financial Crisis and the aftermath of economic turndown.

The incidence rate for all NAIC ratings between 2003-2015 declined slightly when compared to the 2003-2012 study. Not surprisingly, CREs were less common during the benign credit environment experienced between 2013-2015. Similar to the 2003-2012 study, while the incidence rate was low for high quality NAIC assets, of those that experienced a CRE with a NAIC 2 internal rating, the severity was notable (67%). The high loss severity rate was driven primarily by: i) a highly distressed European engineering and construction company that failed to overcome its cashflow challenges due to fraudulent activity; and ii) a lack of drilling activity in the oil sector due to the severe decline in oil prices experienced in late 2014 and 2015.

2.9 EXPERIENCE BY LOSS TYPE

Each CRE was classified according to its triggering event with the definitions described in Appendix 1.A. Generally, the CRE type is the first to occur of a missed payment, bankruptcy, distressed exchange (restructure), imposition by a sovereign of adverse terms, or a sale at 70 (implies 70% of par value of a bond bought at par) or less. The study also makes provisions for the submission of a CRE under "Other" circumstances, which a contributor deems to be a CRE, but does not fit the five definitions stated above. In some instances, a CRE submitted as an "Other" classification was reclassified due to the nature of its occurrence, e.g., if a sale at greater than 70 was submitted as "Other," it was reclassified to "Sale."[9]

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[9] CRE type was gathered for the 2003-2015 report, but was not gathered previously for the 2003-2012 report. Some CREs in 2003-2012 were submitted as "Other" or with no CRE type indicated. The associated CRE cashflows and their notes were used to reclassify some CREs submitted as "Other" and to infer the type of CRE where it was not reported. CREs were cross-checked by issuer to increase consistency of the determined CRE type between reported and not reported CREs.

Figure 29 shows the mix of CRE types in aggregate for 2003-2015. When viewed by number, distressed exchange was the most frequently occurring CRE type. The 43.1% rate of occurrence of it was more than 75% greater than missed payments as the next most frequent type, which comprised 24.3% of the CREs. When viewed by amount, distressed exchanges also occurred with the highest frequency, 37.5%, but that was a smaller proportion, 33%, than by number over missed payments, which had a 28.3% rate of occurrence. The other CRE types occurred in similar magnitudes when compared by number and amount. The three largest of those in descending order were bankruptcy, sale, and other. CREs related to a sovereign imposition were a very small proportion of all CREs.

Figure 29
CRE TYPE DISTRIBUTION 2003-2015
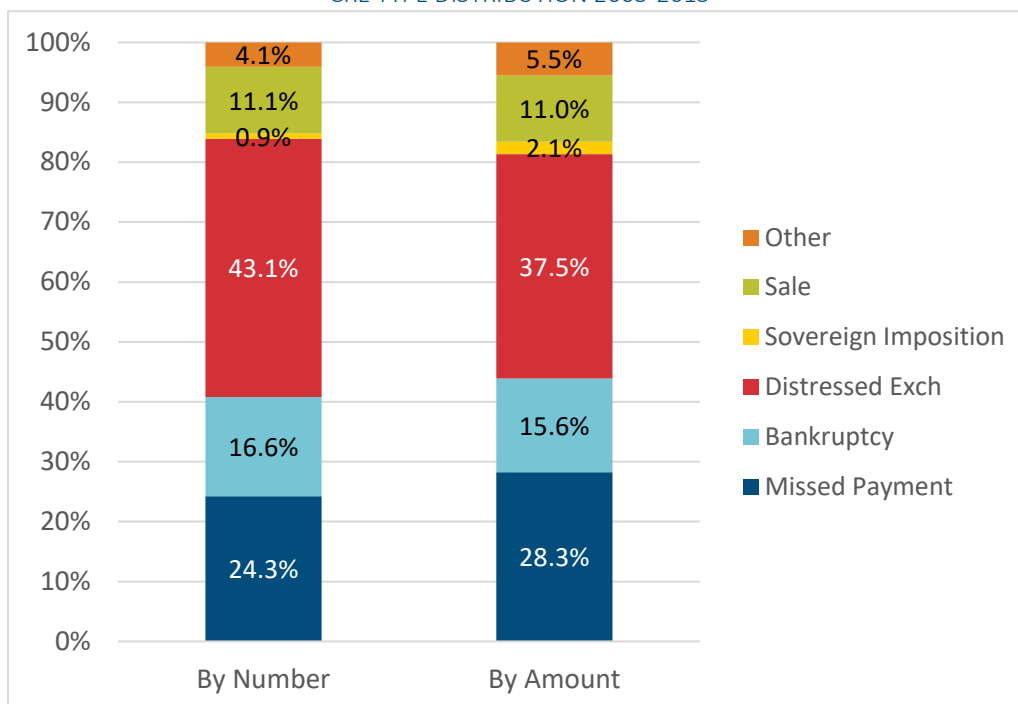
The average CRE type distribution for 2003-2015 may mask an important change in the mix of CRE types across years. Figure 30 shows the annual percentage mix by year of CRE type by number and amount. Except for 2003 by number and 2004 by amount, the percentage of distressed exchange CREs have generally increased since 2009.

Figure 30
CRE TYPE DISTRIBUTION BY YEAR
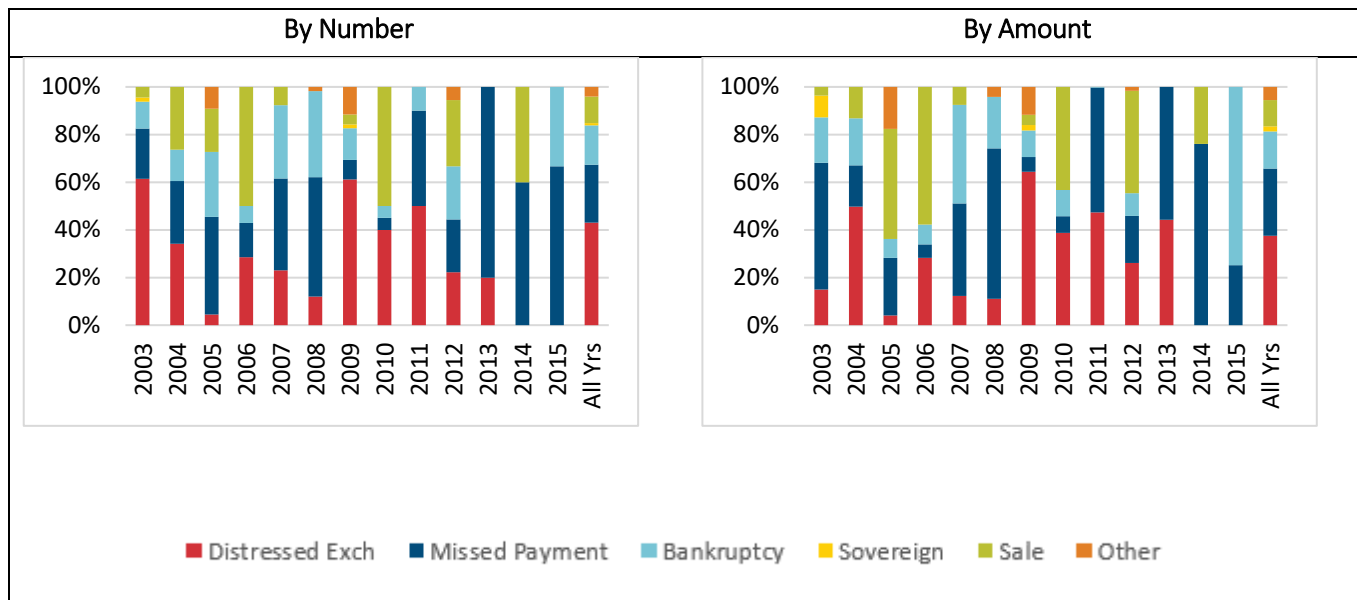
Figure 31 expands the periods covered to include private placement experience starting in 1986. Because the CRE types are not completely matched between the two study periods, 1986-2002 and 2003-2015, we limit the analysis to distressed-change CREs. The two left panels of Figure 31 show the annual percentage of distressed-exchange CREs and their average over two periods, 1986-2002 and 2009-2015. The two right panels of the same figure show cumulative CREs (by number and amount) since 1986 for each calendar year contrasted with the distressed-exchange percentage for each year. Years with distressed CREs of at least 50% of all CREs are labeled to give perspective to the chart. The left and right panels, taken together, show the increased frequency of distressed exchanges since 2009. The right panel shows the relative weight associated with the corresponding annual value in the left panel. Although some years, e.g., 1996 and 1998, had high percentages, their weight was low. The few relatively higher years before 2009 are outweighed by other lower years. This produced a distressed-exchange frequency (by either number or amount) of just under 30% from 1986-2008 and just over 50% from 2009-2015.

Figure 31
DISTRESSED EXCHANGE/RESTRUCTURE PERCENTAGE OF CREs 1986-2015
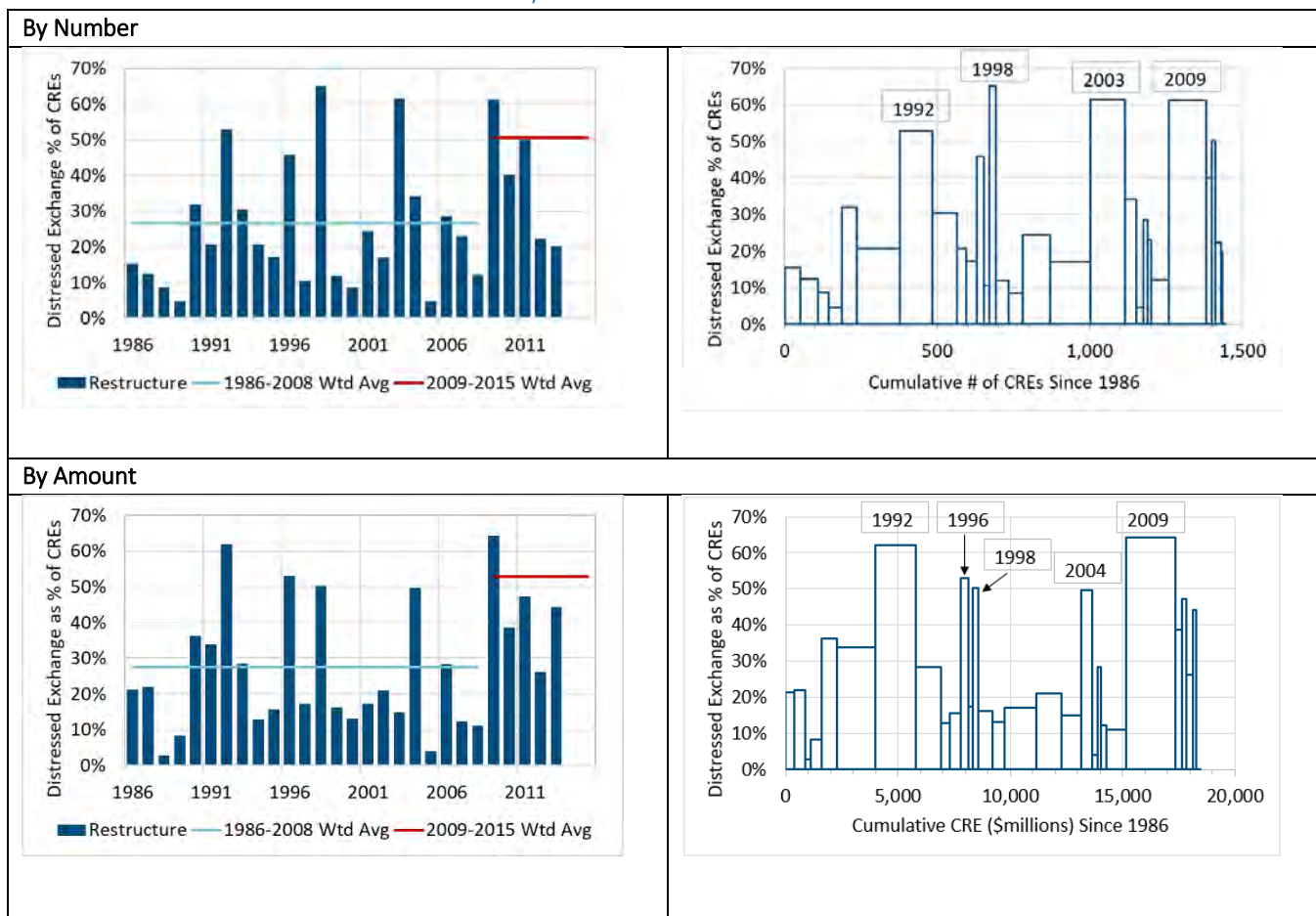
Figure 32 shows Moody's historical experience of default types for public bonds (due to data availability, this exhibit is limited to an issuer basis). While the percentage of distressed exchanges has varied up and down across years before 2008, since then it has increased and become more consistent from 2008-2017. Moody's has commented on this shift in recent reports[10].

Figure 32
PUBLIC BOND BY ISSUER DEFAULT TYPE DISTRIBUTION
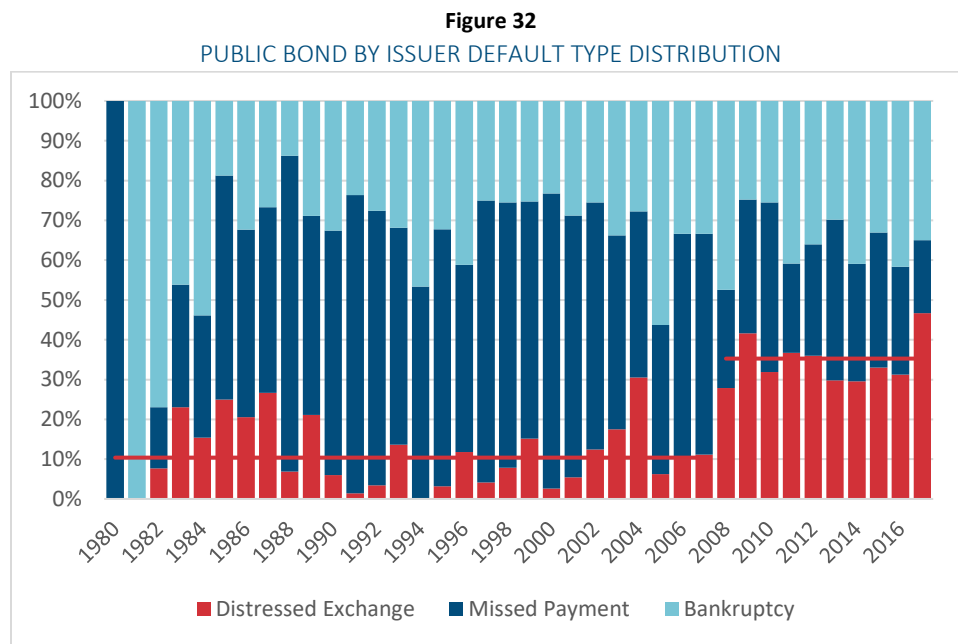
Source: **1980-2005** Moody's Default and Recovery Rates of Corporate Bond Issuers 1920-2005 Exhibit 39; **2006-2007** Estimated based on total defaulted issuers Moody's Default and Recovery Rates of Corporate Bond Issuers 1920-2006 and 1920-2007 Exhibit 19; **2008-2017** Moody's annual Default and Recovery Rates of Corporate Bond Issuers 1920-2008 through 1920-2017 Exhibits 25, 20, and 19 for 2008, 2009-2010, and 2011-2017, respectively.

The emphasis on credit analysis, covenant protection, monitoring, and negotiation are plausible reasons for private placements to favor distressed exchanges. Private placement and public (Moody's) experience each showed increased usage of distressed exchanges in more recent years. Per Figure 31, privates saw average usage of just under 30% from 1986-2008 and just over 50% from 2009-2015. By comparison, public bonds saw 11% from 1983-2007 and, since then, about 40.2%. Because public bond data is signaling increased distressed-exchange activity, it reinforces the validity of its occurrence for private placements.

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[10] **"Distressed exchanges remained popular**
Since 2008, distressed exchanges have been a common restructuring strategy and this trend continued in 2012. Among the 58 initial default events in the last year, 25 (or 43%) were distressed exchanges. The share of distressed exchanges is up slightly from 2011's 41%, and substantially higher than the historical average of 11% between 1983-2007. We expect distressed exchanges to persist because the wide use of leveraged loans will persuade junior bondholders to agree to exchanges rather than risk lower recovery in a bankruptcy. In addition, private equity firms, which are prevalent among lower-rated companies, favor distressed exchanges because they often produce higher recoveries, preserve ownership and buy time to restore value to the equity capital. **Source:** "Moody's Annual Default Study: Corporate Default and Recovery Rates 1920-2012" (page 3).

The importance of this for private placements (and public bonds) is that distressed exchanges / restructures have generally produced lower loss severity (except 2003-2008 private placement) than the other main CRE types, missed payment and bankruptcy. A sustained increased of the percentage of distressed-exchange default settlements could produce lower future average loss severity for all defaults combined. Table 12 shows private placement and public bond (Moody's) loss severity by missed payment, bankruptcy, and distressed exchange. Private placement values are derived from study data and Moody's values are estimated to provide a public-bond comparison. Private placement study loss severities are based on CRE cashflows, whereas Moody's values are based on trading prices 30 days after default.

Table 12
PRIVATE PLACEMENT VS. PUBLIC BOND LOSS SEVERITY BY CRE TYPE

	Period	Weighting	Missed Payment	Bankruptcy	Distressed Exchange
Priv Placement	2003-2008	Amount	26%	54%	45%
	2009-2015	Amount	50%	48%	16%
	2003-2015	Amount	33%	52%	23%
Public	1982-2003	Amount	70%	68%	57%
	1982-2003	Issuer	65%	68%	47%
	2008-2017	Issuer	66%	75%	45%

Public Source: **1982-2003** Moody's Default and Recovery Rates of Corporate Bond Issuers 1920-2003 Figure 5; **2008-2017** Estimated from Moody's annual Default and Recovery Rates of Corporate Bond Issuers 1920-2008 through 1920-2017, Exhibits 25, 20, and 19 for 2008, 2009-2010, and 2011-2017, respectively. Loss severity is 100% minus reported Moody's recovery rates.

Table 13 shows combined 2003-2015 private placement experience by CRE type. "Incid by #" and "Incid by Amt" are the rates that underlie the distributions shown in Figure 32. Loss severity varies by CRE type. The highest loss severity by type is shared by bankruptcy and sale. Bankruptcy reflects the generally larger losses taken in that event. Sale loss severity is driven by the condition (except for originally reported "other" CREs of sales greater than 70 (implies 70% of par value of a bond bought at par) that were re-classified as sale CREs) that the minimum loss severity is 30% because a CRE sale is defined as sale at 70 or less. The result is an average loss severity equivalent to bankruptcy. The lowest loss severity of -10.7% is for "other" CREs. These are CREs that did not fit the definitions of the first four CRE types (left to right) shown in the table below, but which the contributors considered to be CREs. Generally, these were bonds that had accelerated payments that, in some instances, included make-whole provisions. While the incidence and loss severity varied for all CRE types, their combined effect produced the same level of economic loss, 0.03%, for each of missed payment, bankruptcy, and distressed exchange. The economic loss for sale was 0.02% and was negligible for sovereign imposition and CREs classified as other.

Table 13
LOSS PROFILE BY CRE TYPE 2003-2015

	Missed Payment	Bankruptcy	Distressed Exchange	Sovereign Imposition	Sale	Other	All
Incid by #	0.11%	0.07%	0.19%	0.00%	0.05%	0.02%	0.44%
Incid by Amt	0.10%	0.06%	0.13%	0.01%	0.04%	0.02%	0.36%
Loss Severity	33.1%	51.6%	22.9%	23.6%	51.5%	-10.7%	31.6%
Econ Loss	0.03%	0.03%	0.03%	0.00%	0.02%	0.00%	0.11%
# of CREs	107	73	190	4	49	18	441
CRE Amt ($M)	1,747	966	2,315	129	681	341	6,179

Note: *All following charts with data tables show a blank cell if there was no CRE for that combination. Cells with values of 0.00% or -0.00% (economic loss only) indicate that a CRE occurred, but the absolute value of the cell is less than 0.005%.*

Figure 33 shows the CRE-type distribution of annual incidence by number. Incidence is notably higher in 2003-2004 and 2008-2009 than the other years. Regarding those two pairs of years, distressed exchange occurred more often than any other CRE type, except in 2008 when it was exceeded by missed payment and bankruptcy. Although the CRE-type distribution by year varied, in descending rank order for 2003-2015, the top three CRE types were distressed exchange, missed payment, and bankruptcy. CREs classified as other were concentrated in 2009 with 78% of other CREs occurring in that year. The incidence of other exceeded all CRE types, except distressed exchange and bankruptcy in that year.

Figure 33
INCIDENCE BY NUMBER BY CRE TYPE 2003-2015

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	All Yrs
Other			0.03%			0.01%	0.18%			0.01%				0.02%
Sale	0.10%	0.14%	0.06%	0.09%	0.01%		0.06%	0.12%		0.06%		0.02%		0.05%
Sovereign	0.04%						0.03%							0.00%
Distressed Exch	1.33%	0.18%	0.01%	0.05%	0.04%	0.08%	0.93%	0.09%	0.06%	0.05%	0.01%			0.19%
Bankruptcy	0.25%	0.07%	0.08%	0.01%	0.05%	0.25%	0.20%	0.01%	0.01%	0.05%			0.01%	0.07%
Missed Payment	0.46%	0.14%	0.12%	0.03%	0.07%	0.35%	0.13%	0.01%	0.05%	0.05%	0.05%	0.04%	0.02%	0.11%
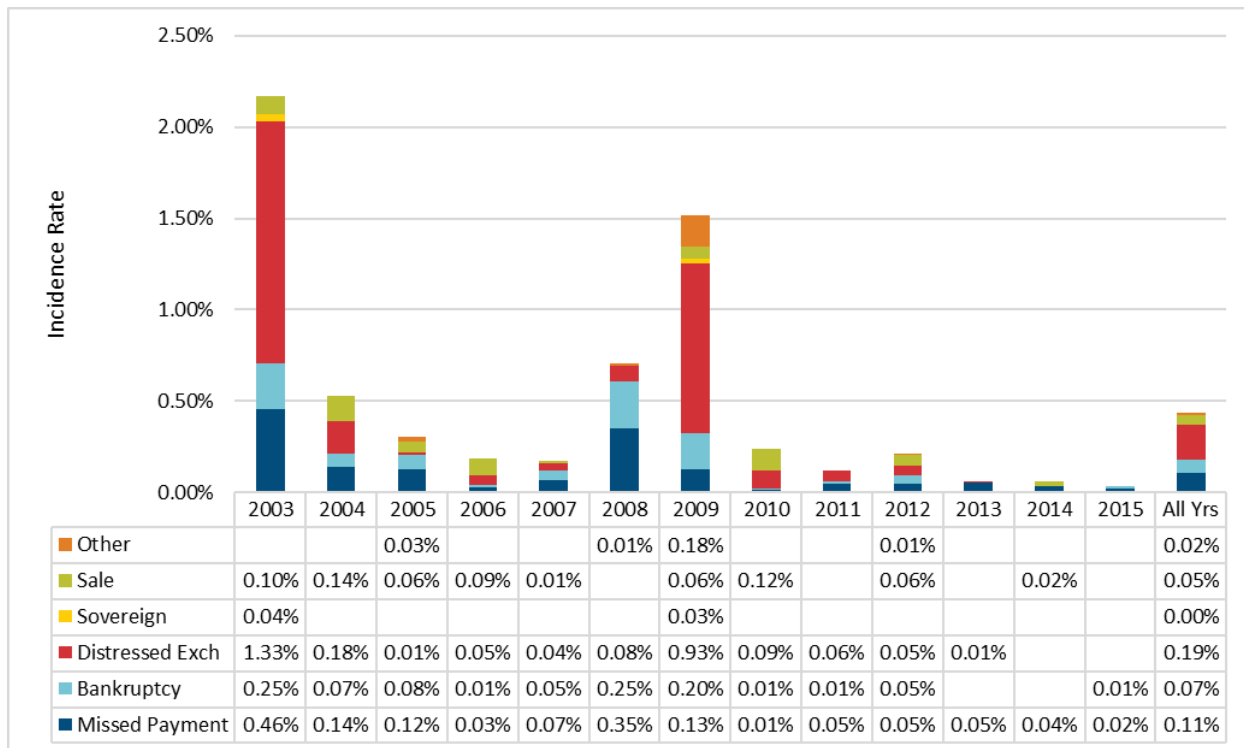
Figure 34 shows the CRE-type distribution of annual incidence by amount. The pattern is like incidence by number in Figure 33, except for a large difference in 2003 for distressed exchange. That difference is caused by several small CREs that inflate results by number compared to by amount. As with results by number, incidence is notably higher in 2003-2004 and 2008-2009 than the other years, but regarding those two pairs of years, the pattern was different than by number due to the reduced degree of distressed exchange in 2003 when viewed by amount. Missed payments occur more often than distressed exchange in the first year (2003 and 2008) and the order for those two types reverses in the second year (2004 and 2009). Overall for the aggregate experience of 2003-2004, missed payment outnumbered distressed exchange and vice-versa for 2008-2009. CREs classified as other, like results by number, were concentrated in 2009, which had 76% of CREs classified as other.

Figure 34
INCIDENCE BY AMOUNT BY CRE TYPE 2003-2015

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	All Yrs
Other		0.04%				0.03%	0.20%			0.00%				0.02%
Sale	0.05%	0.07%	0.11%	0.08%	0.02%		0.08%	0.09%		0.08%		0.01%		0.04%
Sovereign	0.13%						0.04%							0.01%
Distressed Exch	0.21%	0.27%	0.01%	0.04%	0.03%	0.07%	1.12%	0.08%	0.06%	0.05%	0.04%			0.13%
Bankruptcy	0.26%	0.11%	0.02%	0.01%	0.09%	0.14%	0.19%	0.02%	0.00%	0.02%			0.04%	0.06%
Missed Payment	0.73%	0.09%	0.06%	0.01%	0.09%	0.41%	0.11%	0.02%	0.07%	0.04%	0.05%	0.04%	0.01%	0.10%
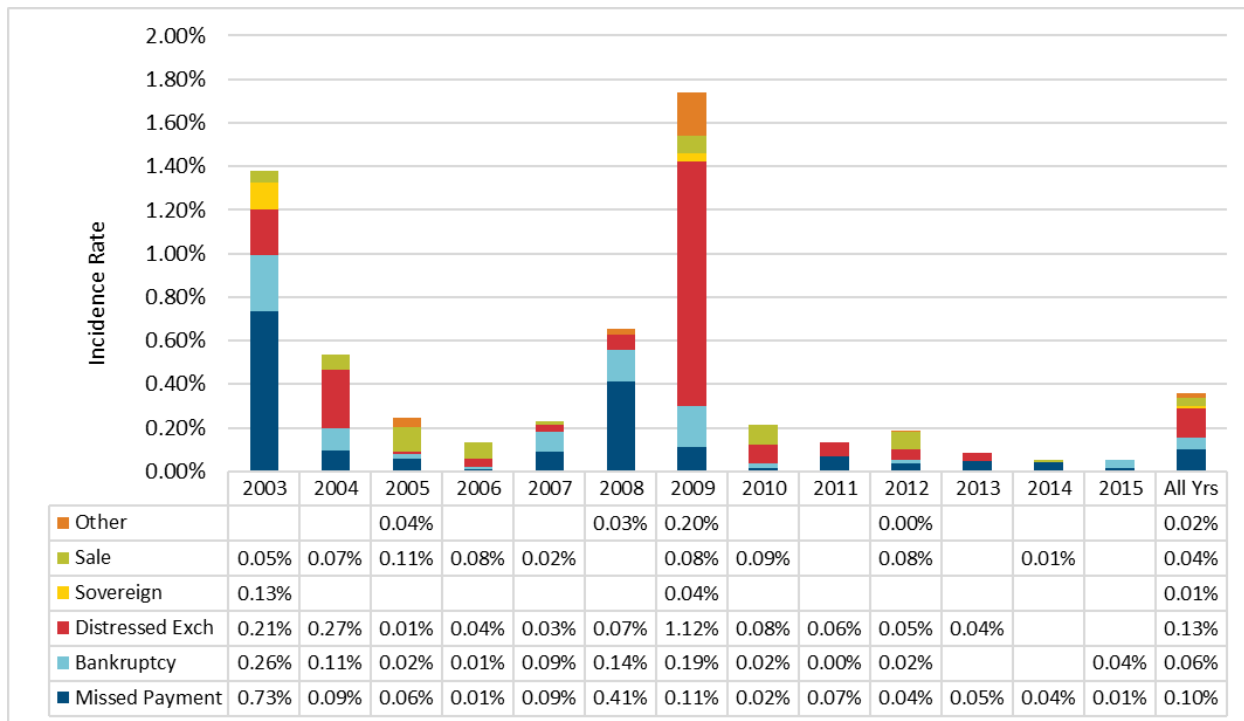
Figure 35 shows loss-severity experience by CRE type, except for sovereign imposition, which had little impact on overall experience for each year in 2003-2015. Generally, there is no apparent pattern with respect to year or type of CRE. Missed payment, bankruptcy, and distressed exchange each varied notably relative to their average for all years. CREs classified as sale had less annual variation and other CREs only occurred sporadically. The -68% bankruptcy loss severity in 2011 was due to one CRE with a settlement that included equity. The relatively low 9% distressed-exchange loss severity in 2009 was 61% of the total distressed-exchange CRE amount for 2003-2015. Even though distressed exchange had higher loss severity than other CRE types in some years other than 2009, its concentration of CRE amount in 2009, combined with a low loss severity that year, helped to produce the lowest loss severity, except for CREs classified as other by CRE type, 23%, for 2003-2015.

Figure 35
LOSS SEVERITY BY CRE TYPE 2003-2015

	2003	2004	2005	2006	2007	2008	2009	2011	2012	2013	2014	2015	All Yrs
Other			-3%			-3%	-13%		10%				-11%
Distressed Exch	25%	54%	97%	39%	90%	28%	9%	37%	35%	61%			23%
Missed Payment	31%	59%	50%	42%	-3%	20%	62%	17%	23%	84%	31%	70%	33%
Bankruptcy	56%	59%	63%	14%	20%	71%	40%	-68%	41%			79%	52%
Sale	86%	67%	54%	18%	100%		49%		44%		42%		52%
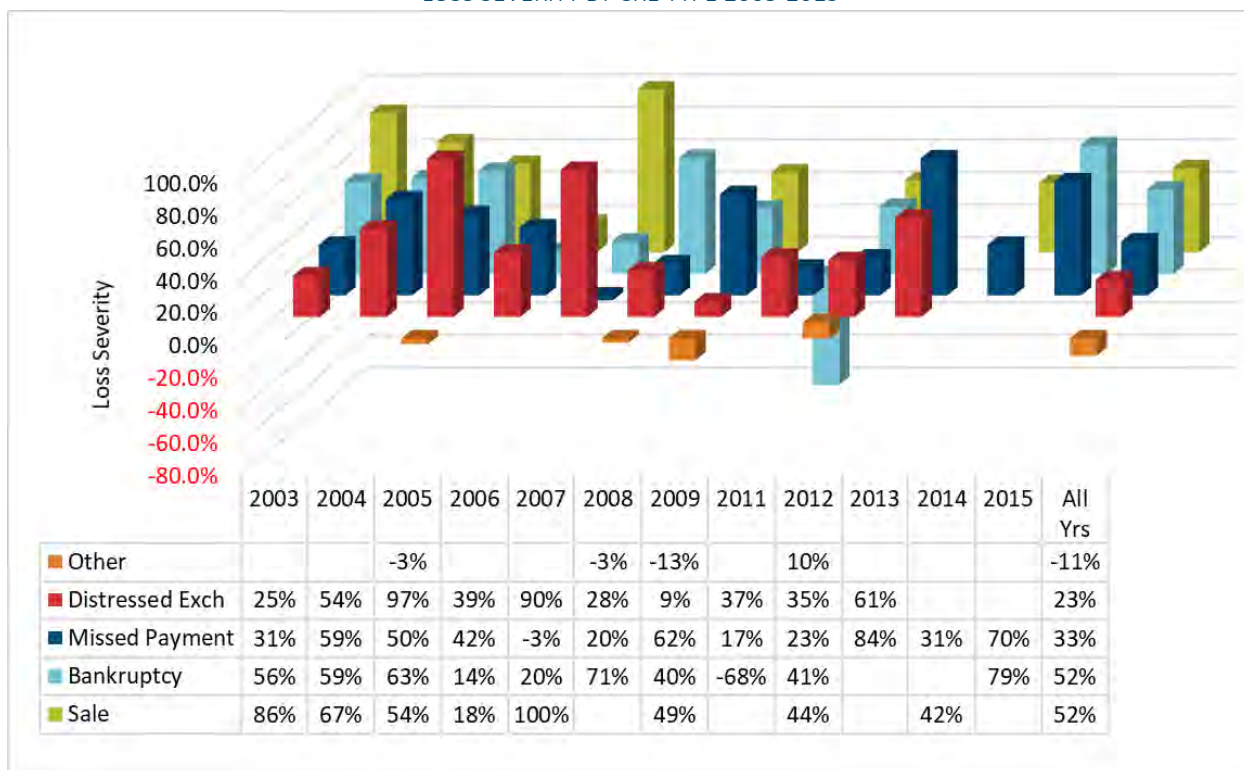
Figure 36 breaks out economic loss as per the associated figures for incidence. Generally, the pattern of economic loss is similar, as would be expected, to incidence by amount. The notable difference is the impact of the -13% loss severity in 2009 for other CREs that, combined with its incidence of 0.20%, produced a -0.03% economic loss. The three greatest contributors to economic loss for 2003-2015 were distressed exchange, missed payment, and bankruptcy. The rank order of incidence by amount is distressed exchange, missed payment, and bankruptcy, but that rank order is reversed for loss severity, which resulted in the same economic loss of 0.03% for those CRE types.

Figure 36
ECONOMIC LOSS BY CRE TYPE 2003-2015

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	All Yrs
Other			0.00%			0.00%	-0.03%			0.00%				0.00%
Sale	0.04%	0.05%	0.06%	0.01%	0.02%		0.04%	0.05%		0.04%		0.01%		0.02%
Sovereign	-0.01%						0.03%							0.00%
Distressed Exch	0.05%	0.14%	0.01%	0.01%	0.03%	0.02%	0.11%	0.04%	0.02%	0.02%	0.02%			0.03%
Bankruptcy	0.15%	0.06%	0.01%	0.00%	0.02%	0.10%	0.08%	0.01%	0.00%	0.01%			0.03%	0.03%
Missed Payment	0.23%	0.06%	0.03%	0.00%	0.00%	0.08%	0.07%	0.01%	0.01%	0.01%	0.04%	0.01%	0.01%	0.03%
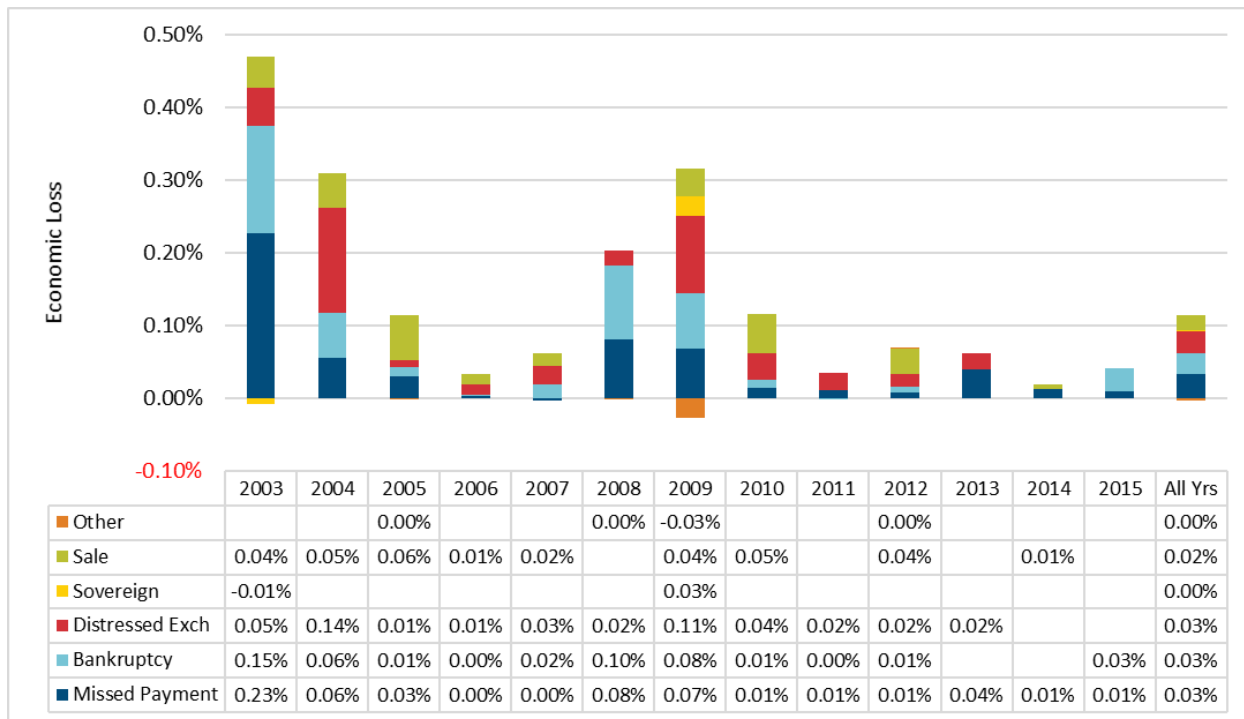
Figures 37-40 show incidence by amount, incidence by number, loss severity, and economic loss, respectively, by most recent internal rating and CRE type. Generally, there is no apparent pattern by ratings. Incidence and economic loss increased by lower quality ratings, paralleling aggregate results, but the CRE-type mix varied across quality ratings. Loss severity for bankruptcy, sale, and other was, with exceptions, more consistent than distressed exchange, missed payment, and sovereign imposition across quality ratings. Except for that relationship, there was no consistent pattern by CRE type across quality ratings or by rating across CRE types.

Figure 37
INCIDENCE BY NUMBER BY MOST RECENT INTERNAL RATING AND CRE TYPE 2003-2015

	AAA	AA	A	BBB	BB	B	<B	NR	All
Other			0.00%	0.03%	0.03%			0.04%	0.02%
Sale			0.03%	0.06%	0.13%		0.92%	0.02%	0.05%
Sovereign			0.01%				0.26%		0.00%
Distressed Exch	0.04%		0.07%	0.24%	0.50%	1.08%	1.06%	0.08%	0.19%
Bankruptcy			0.05%	0.06%	0.25%	0.29%	1.06%	0.08%	0.07%
Missed Payment		0.02%	0.01%	0.12%	0.33%	0.57%	1.58%	0.17%	0.11%
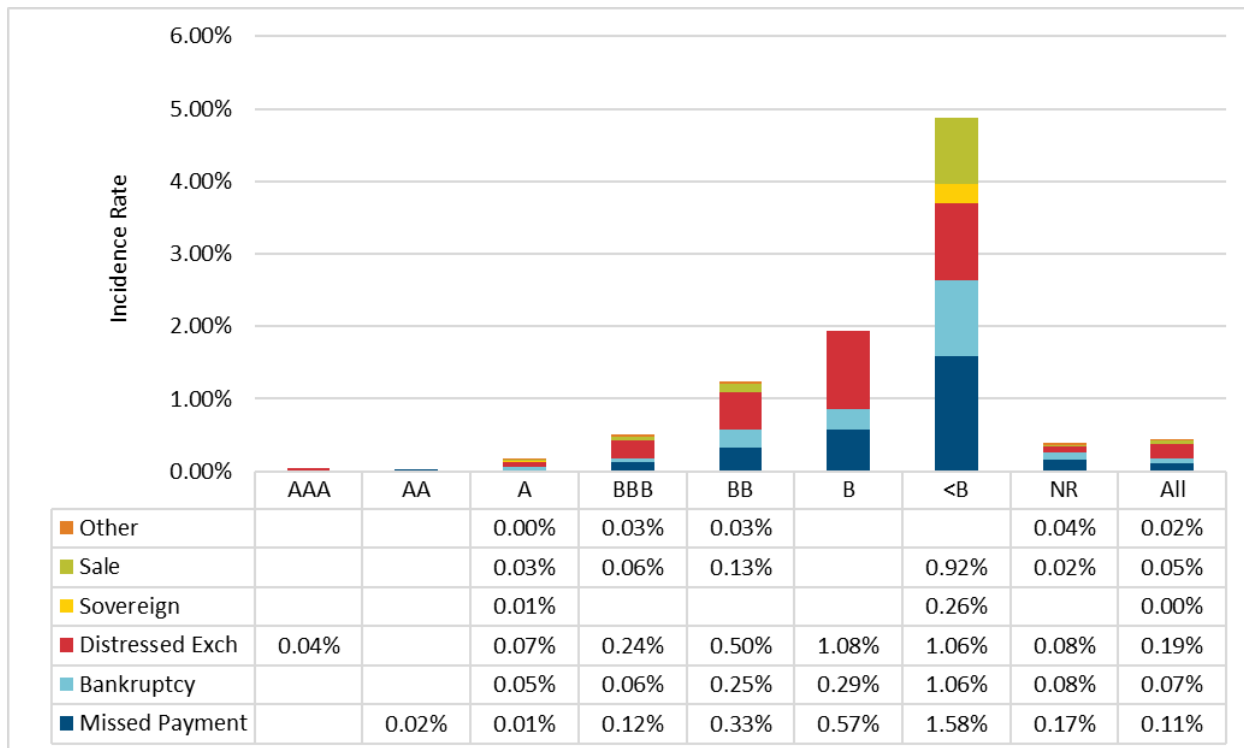
Figure 38
INCIDENCE BY AMOUNT BY MOST RECENT INTERNAL RATING AND CRE TYPE 2003-2015

Incidence Rate	AAA	AA	A	BBB	BB	B	<B	NR	All
Other			0.00%	0.03%	0.01%			0.01%	0.02%
Sale			0.04%	0.05%	0.11%		0.42%	0.00%	0.04%
Sovereign			0.01%				1.40%		0.01%
Distressed Exch	0.01%		0.05%	0.18%	0.28%	1.69%	0.74%	0.02%	0.13%
Bankruptcy			0.03%	0.05%	0.62%	0.13%	1.64%	0.02%	0.06%
Missed Payment		0.02%	0.02%	0.12%	0.19%	0.85%	2.85%	0.08%	0.10%
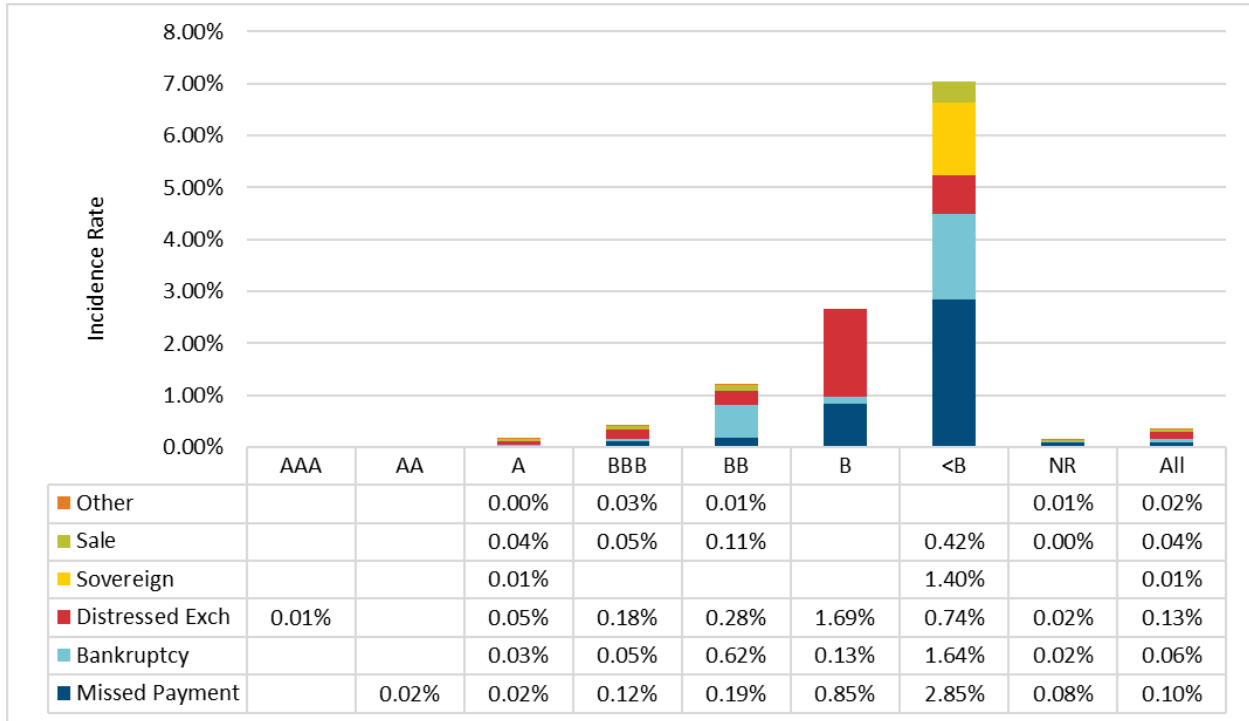
Figure 39
LOSS SEVERITY BY MOST RECENT INTERNAL RATING AND CRE TYPE

Loss Severity	AAA	AA	A	BBB	BB	B	<B	NR	All
Other			-24%	-10%	10%			-18%	-11%
Distressed Exch	-9%		53%	12%	44%	66%	21%	9%	23%
Missed Payment		42%	72%	26%	50%	75%	31%	11%	33%
Bankruptcy			69%	69%	5%	56%	76%	63%	52%
Sale			76%	42%	56%		72%	28%	52%
Sovereign			69%				-5%		24%
All Types	-9%	42%	64%	24%	25%	68%	36%	18%	32%
# CREs	1	2	46	260	49	27	37	19	441

Figure 40
ECONOMIC LOSS BY MOST RECENT INTERNAL RATING AND CRE TYPE

	AAA	AA	A	BBB	BB	B	<B	NR	All
Other			0.00%	0.00%	0.00%			0.00%	0.00%
Sale			0.03%	0.02%	0.06%		0.30%	0.00%	0.02%
Sovereign			0.01%				-0.08%		0.00%
Distressed Exch	0.00%		0.03%	0.02%	0.12%	1.11%	0.16%	0.00%	0.03%
Bankruptcy			0.02%	0.03%	0.03%	0.07%	1.25%	0.02%	0.03%
Missed Payment		0.01%	0.02%	0.03%	0.09%	0.63%	0.87%	0.01%	0.03%
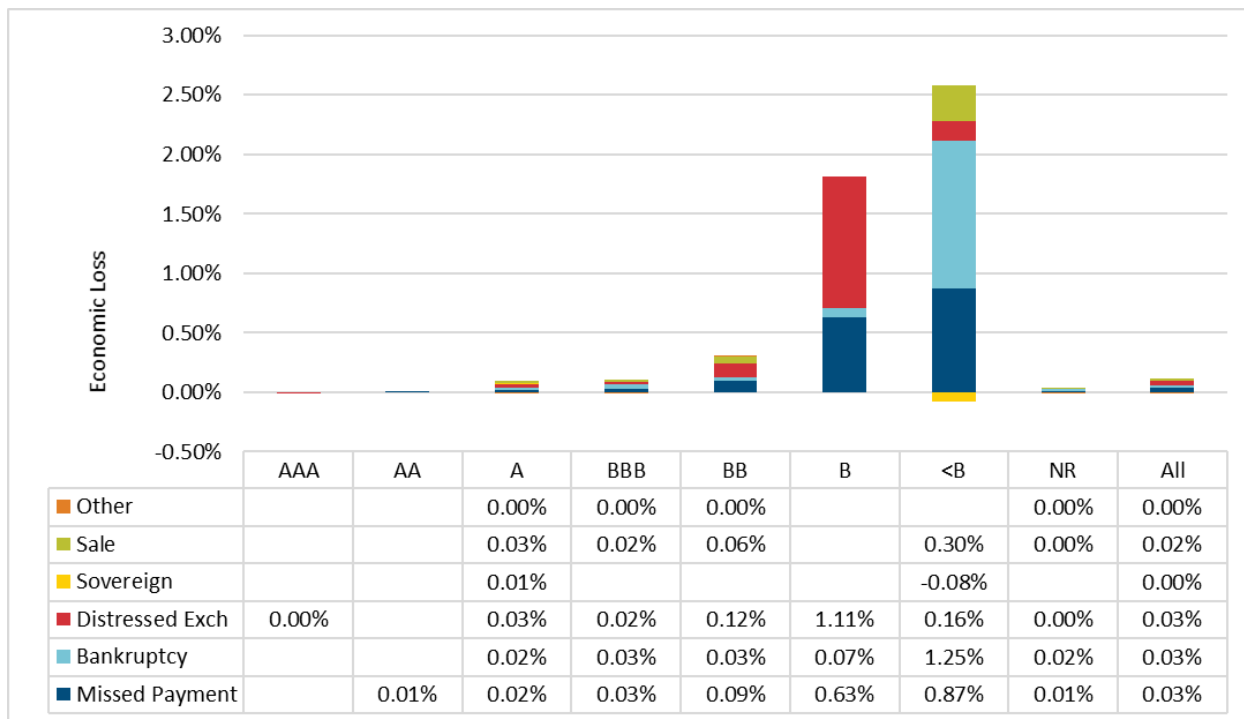
2.10 RATING DISAGREEMENTS AND RELATIVE PREDICTIVE POWER

Credit ratings are opinions about credit quality. Differences of opinion are to be expected. The frequency of differences of opinion is of some interest, as is the relative predictive power of different kinds of ratings for credit events and losses.

Results in this subsection should be interpreted with caution because of imperfect data quality despite this study's best efforts. One influencing data issue can be associated with miscoded or unreported most recent internal ratings and NAIC ratings. If there is any correlation between miscoded or unreported ratings and assets with volatile or very uncertain credit quality, that may bias the results of this subsection in unknown ways.

Most assets in this study carry two ratings at each year-end, a most recent year-end internal rating and a most recent year-end NAIC rating. The two types of ratings can be compared using the NAIC scale from 1 to 6 as the common measure of rating quality.

Table 14

FREQUENCY OF MOST RECENT INTERNAL VS. NAIC RATING DISAGREEMENTS

Grades Different	Frequency	Cumulative Frequency
0	86.6%	86.6%
1	12.2%	98.8%
2	0.8%	99.6%
3	0.3%	99.9%
4	0.1%	99.9%
5	0.1%	100.0%

The table above displays the frequency of differences between most recent internal and most recent NAIC ratings of each magnitude. The extent of agreement is remarkable, with full agreement for 86.6% of the number of assets and a difference of opinion of one grade or less for over 98.8% of the number of assets. Such agreement is perhaps unsurprising given that 86.7% of exposed assets were investment grade, falling into the NAIC 1 or 2 categories.

Table 15

FREQUENCY OF MOST RECENT INTERNAL RATING DISTRIBUTION ACROSS INSURANCE COMPANIES

Grades Different	Frequency	Cumulative Frequency
0	83.7%	83.7%
1	15.5%	99.2%
2	0.7%	99.9%
3	0.1%	100.0%
4	0.0%	100.0%
5	0.0%	100.0%
6	0.0%	100.0%
7	0.0%	100.0%

The table above reports frequencies of disagreement across insurance companies on most recent internal ratings of the same asset. Assets were matched across companies by a combination of CUSIP and observation year where at least two companies owned the same CUSIP in the same year, yielding about 18,400 comparable pairs of ratings. While disagreements appear to be slightly more common than in the prior table, it is important to note that the rating scale used in the table above is more granular, with eight rating categories instead of the six used in the prior table. The rating scale used to develop the table above was based on the internal rating equivalents to rating agency letter modifier ratings converted to a numerical letter-only rating basis, i.e., AAA = 1, AA = 2, A = 3, BBB = 4, BB = 5, B = 6, CCC = 7, D = 8.

Disagreements about most recent internal ratings are somewhat more frequent for both very safe and very risky assets, for example, 83.7% of the cases where a pair of contributors hold the same asset. The table below displays the frequency distribution of assets across all permutations of pairs of ratings by different companies of the same asset at the same time.

Table 16
RATING DISAGREEMENTS BY QUALITY: DISTRIBUTION OF RATINGS OF THE SAME ASSET
BY DIFFERENT COMPANIES FOR ALL PERMUTATIONS OF COMPANY PAIRS FOR ALL COMMON ASSETS

Rating at One Company	Rating at Other Company							
	1	2	3	4	5	6	7	8
1	0.36%	X	X	X	X	X	X	X
2	0.32%	2.20%	X	X	X	X	X	X
3	0.05%	3.34%	20.21%	X	X	X	X	X
4	0.04%	0.20%	7.97%	57.33%	X	X	X	X
5	0.00%	0.01%	0.10%	3.32%	3.07%	X	X	X
6	0.00%	0.00%	0.02%	0.20%	0.44%	0.44%	X	X
7	0.00%	0.00%	0.00%	0.02%	0.09%	0.10%	0.04%	X
8	0.00%	0.00%	0.00%	0.02%	0.02%	0.02%	0.02%	0.04%

Some disagreements may arise, not because of any substantive disagreement, but because the schedules on which ratings are reviewed and updated are not synchronized across insurance companies or between insurance companies and the NAIC. For example, one company might update a rating just before year-end and another after year-end.

Table 17
MEAN INTERNAL RATING DISAGREEMENT BY COMPANY
(NUMBER OF GRADES DIFFERENT THAN PEERS)

Company	Scale	
	20 Point	8 Point
1	0.31	0.07
2	0.07	0.00
3	0.09	-0.01
4	0.09	0.01
5	0.06	0.05
6	-0.18	-0.04
7	0.19	0.03
8	-0.03	-0.01
9	0.15	0.06
10	-0.28	-0.10
11	-0.13	-0.02
12	-0.05	-0.01
13	-0.24	-0.06
14	0.00	0.00
15	-0.17	-0.03
16	-0.26	-0.07
17	-0.14	-0.01

Note the 20-point system follows the following mapping: Aaa – 1, Aa1 – 2, Aa2 – 3, Aa3 – 4, A1 – 5, A2 – 6, A3 – 7, Baa1 – 8, Baa2 – 9, Baa3 – 10, Ba1 – 11, Ba2 – 12, Ba3 – 13, B1 – 14, B2 – 15, B3 – 16, Caa1 – 17, Caa2 – 18, Caa3 – 19, Ca – 20

Although disagreements about most recent internal ratings are fairly common among companies, contributing companies generally agree about the average credit quality of assets. The table above displays mean disagreements about most recent internal ratings for each insurance company for assets that are common with any other company. Companies more optimistic than their peers have negative means in the table, and vice versa.

The relative predictive power of internal and NAIC ratings is of some interest. The two kinds of ratings are produced differently and are intended for different purposes. Results described earlier make clear that both are predictive of loss, but when there is disagreement, is one kind of rating more informative than the other?

The table below displays results from a logistic regression in which the dependent variable has a value of 1 if a CRE occurred in the experience year for the observation, and a value of zero otherwise. The explanatory variables are a series of indicator variables for the combination of most recent ratings assigned by the NAIC and insurance company using the NAIC 1-6 scale similar to the one used in generating the table at the start of this subsection titled "Frequency of Most Recent Internal Versus NAIC Rating Disagreements," with one modification where assets rated NAIC 5 or 6 were pooled together under the NAIC 5 rating. In essence, the regression splits the data into cells corresponding to each possible combination of most recent internal rating and most recent NAIC rating and measures the likelihood of a CRE for each cell.

Incidence rates by number are shown in the third column of the table below. The focus of this analysis is on cases of disagreement. For example, if at the prior year-end, an asset is rated 1 by the NAIC, but 3 by the insurance company, are incidence and loss rates over the following year similar to those of assets rated 1 by both the NAIC and the company?

As an example, consider the 12th row of the table below, which summarizes the findings for assets rated 3 by the NAIC, but rated 2 internally (hereafter referred to as 'assets rated 3/2'). There were quite a few of these assets in the study: the time-weighted number of exposures is 2,458 as shown in column 9 of the table below, and this group experienced 40 CREs during the time of the study. Is this more in line with the population that was rated 3 both internally and by the NAIC ('assets rated 3/3'), or is it more consistent with the experience of the population with quality rating 2 ('assets rated 2/2')?

Column 3 of the table below shows the incidence rate for assets rated 3/2 was 1.63%. The same table reveals that, for assets rated 3/3, the incidence rate is close (1.52%), and for assets rated 2/2, it is much lower (0.15%). So, at first glance, it seems the NAIC rating is a better predictor of CREs than the internal rating. Indeed, column 4 of the table shows an odds ratio (NAIC) equal to 1, meaning this population is just as likely to experience a default as a population rated 3/3. The next column confirms the difference between the population rated 3/2 and the one rated 3/3 is not statistically significant. Conversely, column 6 of the table shows that assets rated 3/2 are 10.9 times more likely to experience a CRE than assets rated 2/2, and the difference between the 3/2 and 2/2 populations is statistically significant.

Note that the following numbered NAIC ratings correspond to these lettered ratings: AAA-A=1, BBB=2, BB=3, B=4, <B=5&6.

Table 18
PREDICTIVE ABILITY OF DIFFERENT KINDS OF RATINGS

NAIC Rating	Internal Rating	Incidence by Number	Odds Ratio, NAIC	Significance, NAIC	Odds Ratio, Internal	Significance, Internal	Economic Loss Rate	Number Exposed	Number of CREs
5&6	1	1.68%	0.2	N	72.7	Y	2.37%	60	1
5&6	2	3.08%	0.4	N	17.2	Y	4.24%	98	3
5&6	3	2.04%	0.3	Y	1.2	N	0.55%	197	4
5&6	4	4.40%	0.5	Y	0.9	N	4.32%	546	24
5&6	5	7.83%	1.0		1.0		8.42%	805	63
4	1	0.00%	n/c*	n/c	n/c	n/c	0.00%	24	0
4	2	0.00%	n/c	n/c	n/c	n/c	0.00%	152	0
4	3	1.23%	0.3	Y	0.8	N	0.05%	650	8
4	4	4.37%	1.0		1.0		1.89%	1,052	46
4	5	13.10%	3.3	Y	2.0	Y	2.68%	115	15
3	1	0.00%	n/c	n/c	n/c	n/c	0.00%	102	0
3	2	1.63%	1.1	N	10.9	Y	0.08%	2,458	40
3	3	1.52%	1.0		1.0		0.06%	4,409	67
3	4	6.53%	4.3	Y	1.7	N	0.99%	245	16
3	5	29.33%	18.3	Y	4.3	Y	10.23%	38	11
2	1	0.00%	n/c	n/c	n/c	n/c	0.00%	3,047	0
2	2	0.15%	1.0		1.0		0.04%	46,502	69
2	3	2.26%	15.2	Y	1.5	N	0.75%	972	22
2	4	12.96%	98.7	Y	3.9	Y	3.26%	108	14
2	5	2.22%	14.8	Y	0.4	N	0.34%	45	1
1	1	0.02%	1.0		1.0		0.02%	31,892	7
1	2	0.11%	5.6	Y	0.7	N	0.00%	3,760	4
1	3	0.00%	n/c	n/c	n/c	n/c	0.00%	55	0
1	4	3.28%	145.3	Y	0.8	N	0.11%	31	1
1	5	3.45%	156.5	Y	0.5	N	8.39%	29	1

*N/C (No CREs) appears in some rows because the number of observations associated with the specified most recent internal and NAIC ratings was small and the number of CREs zero.

In making the assertion that the Internal Rating (when available) may have better predictive power than the NAIC, it may be fair to point out that, nonetheless, the Internal Rating is NR (Not Reported) three times as often as the NAIC by exposure amount (bottom of first graph below), and almost four times as often by the CRE count (second graph below).

Table 19
EXPOSURE IN $MILLIONS BY NAIC VS. INTERNAL RATINGS

	1	2	3	4	5&6	NR	All
Internal	605,379	996,352	79,569	22,437	8,840	20,855	1,733,434
NAIC	623,177	961,370	103,129	23,238	16,027	6,494	1,733,434
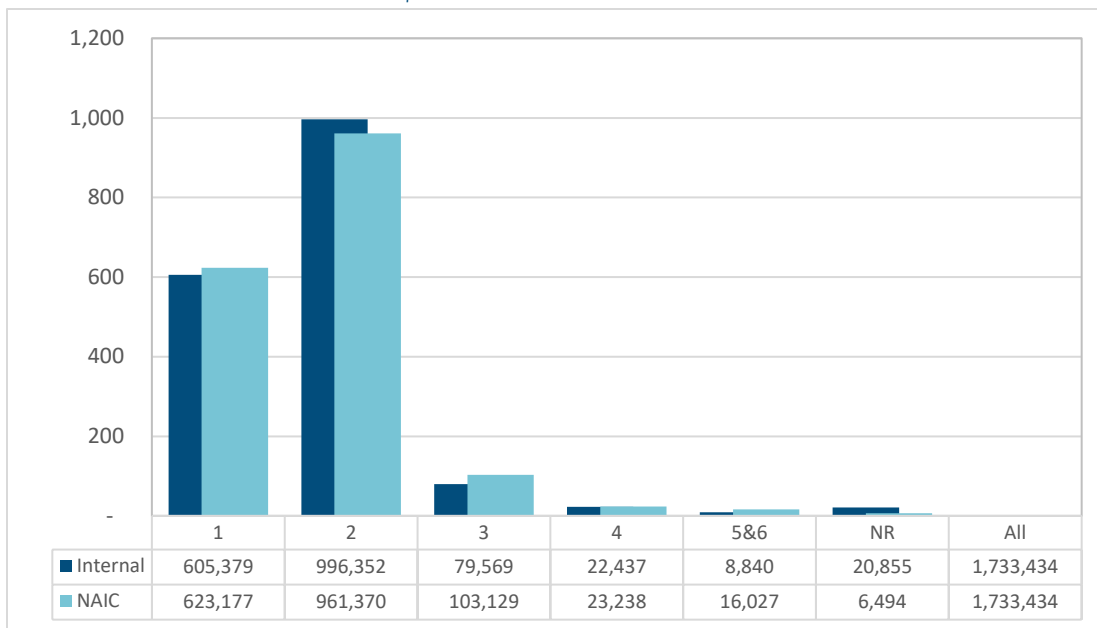
Table 20
NUMBER OF CREs BY NAIC VS. INTERNAL RATINGS

	1	2	3	4	5&6	NR	All
Internal	8	116	103	103	92	19	441
NAIC	15	118	136	69	98	5	441
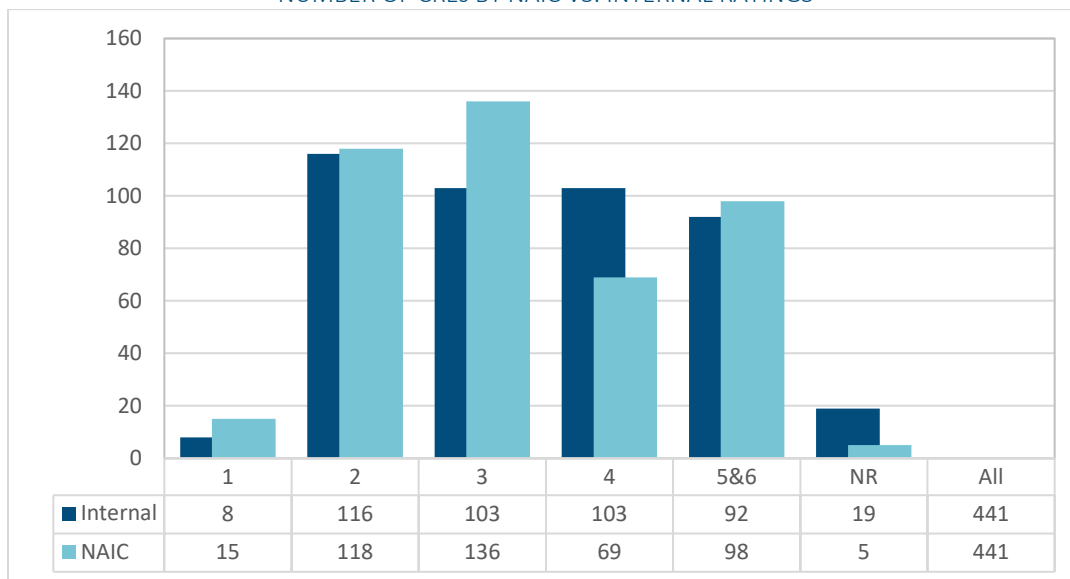
2.11   RATING TRANSITIONS

Portfolio credit risk models and debt-pricing models use rating transition matrices as key inputs. The credit ratings that are used for private placements are often the investor's internal rating of the asset or borrower, such as the "most recent rating" variable in this study. Insurance company internal databases may not readily support measuring how such ratings migrate over time, so many companies use the rating migration (or "transition") matrices published by Moody's or S&P for modeling purposes. However, an open question is the similarity of internal rating migrations to agency rating migration patterns. The tables[11] in this section, based on individual asset holdings of the contributors, provide data that may be useful as a supplement to ratings transition data produced by rating agencies for public bonds.

However, results should be interpreted with caution because data problems may bias the results in unknown ways. For example, as described further below, private placements exit the exposure database at a rate much higher than implied by the percentage maturing in each year. Such exits may represent sales, prepayments, or calls, but they may also occur because of changes in the asset ID numbers from one year to the next. This most often occurs when an asset is assigned a temporary record at acquisition by a contributor before a CUSIP number is assigned. If an ID change occurs as a rating changes, the true migration rates will differ from the results presented here. Moreover, there may be instances of miscoded ratings for individual assets in individual years, which would cause spurious migrations. The Committee has reviewed the data to detect systematic miscoding, but some errors may remain.

Table 21 displays average most-recent-internal-rating migration patterns over one-year horizons. For example, the second row of the table gives the percentage of all assets rated the internal equivalent of AA at the previous year-end that retain the same rating, 88.75%, improve to AAA, 0.73%, or fall to A, 5.29%, at the end of the year. One AA asset had a CRE within a year of holding that rating. A notable portion of assets are denoted as WR. These principally include assets that have matured, been sold, or called. This classification also includes a very small proportion of assets that migrated from a letter rating to no rating submitted by the contributor in the following year. Assets migrating to a WR status are shown as a valid transition state in this table to provide information on the degree of its occurrence. Because the time weighting of assets in the year of disposal is 0.5, the proportion of assets denoted WR is approximately double the rate shown. Table 22 treats migration rates with letter ratings that migrated to WR rating as a null event. They are nullified by allocating their occurrence proportionally to the letter rating migrations in Table 21. Eliminating the effect of WR migration occurrences gives a more consistent view of the actual migration rates, assuming an asset does not withdraw within a year, than Table 21. Tables 23 and 24, which are based on NAIC ratings, are constructed similarly to Tables 21 and 22. Table 25 consolidates the AAA-A internal ratings into a combined rating so that the migration rates are directly comparable to the NAIC migration rates in Table 24.

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[11] Migration percentages are determined using the time-weighted exposure by number of assets held by each contributor to determine the proportion of assets in a rating (including WR or CRE status) at the end of the year relative to their rating at the start of the year. Assets acquired or disposed of have 0.5 exposure in the year of that occurrence.

Table 21

MOST RECENT INTERNAL RATINGS ONE-YEAR MIGRATION RATES

From \ To	AAA	AA	A	BBB	BB	B	CCC	<CCC	CRE	WR
AAA	**83.65%**	4.57%	1.10%	1.53%	0.05%	0.03%	0.00%	0.00%	0.00%	9.06%
AA	0.73%	**88.75%**	5.29%	0.55%	0.07%	0.01%	0.01%	0.01%	0.01%	4.56%
A	0.03%	1.03%	**87.77%**	5.86%	0.12%	0.03%	0.04%	0.00%	0.03%	5.10%
BBB	0.02%	0.03%	1.68%	**88.97%**	2.05%	0.25%	0.02%	0.03%	0.22%	6.74%
BB	0.03%	0.03%	0.41%	6.50%	**75.23%**	3.15%	0.79%	0.36%	1.63%	11.86%
B	0.00%	0.00%	0.15%	0.80%	6.15%	**66.48%**	2.84%	1.89%	5.13%	16.56%
CCC	0.00%	0.00%	0.00%	0.60%	1.20%	6.08%	**56.97%**	5.98%	10.56%	18.63%
<CCC	0.00%	0.00%	0.00%	0.94%	1.31%	4.50%	0.94%	**65.29%**	7.32%	19.70%

Table 22

MOST RECENT INTERNAL RATINGS ONE-YEAR MIGRATION RATES, WR EXCLUDED

From \ To	AAA	AA	A	BBB	BB	B	CCC	<CCC	CRE
AAA	**91.99%**	5.03%	1.20%	1.69%	0.06%	0.03%	0.00%	0.00%	0.00%
AA	0.77%	**92.99%**	5.55%	0.57%	0.07%	0.01%	0.01%	0.01%	0.01%
A	0.03%	1.09%	**92.48%**	6.17%	0.12%	0.03%	0.04%	0.00%	0.03%
BBB	0.02%	0.03%	1.80%	**95.41%**	2.20%	0.27%	0.02%	0.03%	0.22%
BB	0.04%	0.04%	0.47%	7.39%	**85.54%**	3.58%	0.89%	0.41%	1.63%
B	0.00%	0.00%	0.18%	0.97%	7.45%	**80.54%**	3.44%	2.29%	5.13%
CCC	0.00%	0.00%	0.00%	0.75%	1.51%	7.67%	**71.96%**	7.55%	10.56%
<CCC	0.00%	0.00%	0.00%	1.19%	1.67%	5.72%	1.19%	**82.91%**	7.32%

Table 23

MOST RECENT NAIC RATINGS ONE-YEAR MIGRATION RATES

From \ To	1	2	3	4	5	6	CRE	WR
1	**89.70%**	4.98%	0.10%	0.02%	0.04%	0.04%	0.04%	5.08%
2	2.50%	**87.54%**	2.71%	0.30%	0.07%	0.06%	0.22%	6.60%
3	0.91%	9.55%	**71.09%**	4.96%	0.80%	0.30%	1.82%	10.57%
4	0.41%	1.31%	8.22%	**59.03%**	9.82%	1.75%	3.35%	16.12%
5	1.47%	2.15%	3.52%	10.61%	**51.78%**	5.67%	5.09%	19.71%
6	0.86%	0.13%	1.51%	1.71%	3.42%	**65.53%**	6.05%	20.79%

Table 24

MOST RECENT NAIC RATINGS ONE-YEAR MIGRATION RATES, WR EXCLUDED

	To						
From	**1**	**2**	**3**	**4**	**5**	**6**	**CRE**
1	**94.50%**	5.25%	0.11%	0.02%	0.05%	0.04%	0.04%
2	2.68%	**93.74%**	2.90%	0.32%	0.07%	0.07%	0.22%
3	1.02%	10.71%	**79.67%**	5.55%	0.90%	0.34%	1.82%
4	0.49%	1.57%	9.86%	**70.85%**	11.78%	2.09%	3.35%
5	1.85%	2.72%	4.44%	13.39%	**65.35%**	7.16%	5.09%
6	1.10%	0.17%	1.94%	2.20%	4.39%	**84.15%**	6.05%

Table 25

MOST RECENT INTERNAL RATINGS ONE-YEAR MIGRATION RATES (AAA-A COMBINED), WR EXCLUDED

	To						
From	**AAA - A**	**BBB**	**BB**	**B**	**CCC**	**<CCC**	**CRE**
AAA - A	**95.07%**	4.73%	0.11%	0.03%	0.03%	0.01%	0.02%
BBB	1.85%	**95.41%**	2.20%	0.27%	0.02%	0.03%	0.22%
BB	0.54%	7.39%	**85.54%**	3.58%	0.89%	0.41%	1.63%
B	0.18%	0.97%	7.45%	**80.54%**	3.44%	2.29%	5.13%
CCC	0.00%	0.75%	1.51%	7.67%	**71.96%**	7.55%	10.56%
<CCC	0.00%	1.19%	1.67%	5.72%	1.19%	**82.91%**	7.32%

There are notable differences in the ratings migration rates between the internal and NAIC ratings bases when they are viewed on a comparable basis[12] in Tables 24 and 25. Figure 41 compares the likelihood of no change in the rating between the internal and NAIC ratings bases, and Figure 42 compares the likelihood of an upgrade or downgrade for each of the internal and NAIC ratings bases.

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[12] The NAIC equivalence to the internal ratings is 1 - AAA, AA, and A; 2 − BBB; 3 − BB; 4 − B; 5 − CCC; 6 − less than CCC. The AAA, AA, and A internal ratings migrations are weighted to produce a combined AAA - A set of migration rates that are compared directly to NAIC 1 ratings. Any reference in this section to an NAIC letter rating equivalent imply the associated NAIC numerical rating.

Figure 41

AVERAGE ONE-YEAR PROBABILITY OF NO CHANGE IN RATING

	AAA - A 1	BBB 2	BB 3	B 4	CCC 5	<CCC 6
■ Internal	95.1%	95.4%	85.5%	80.5%	72.0%	82.9%
■ NAIC	94.5%	93.7%	79.7%	70.8%	65.4%	84.1%

■ Internal ■ NAIC
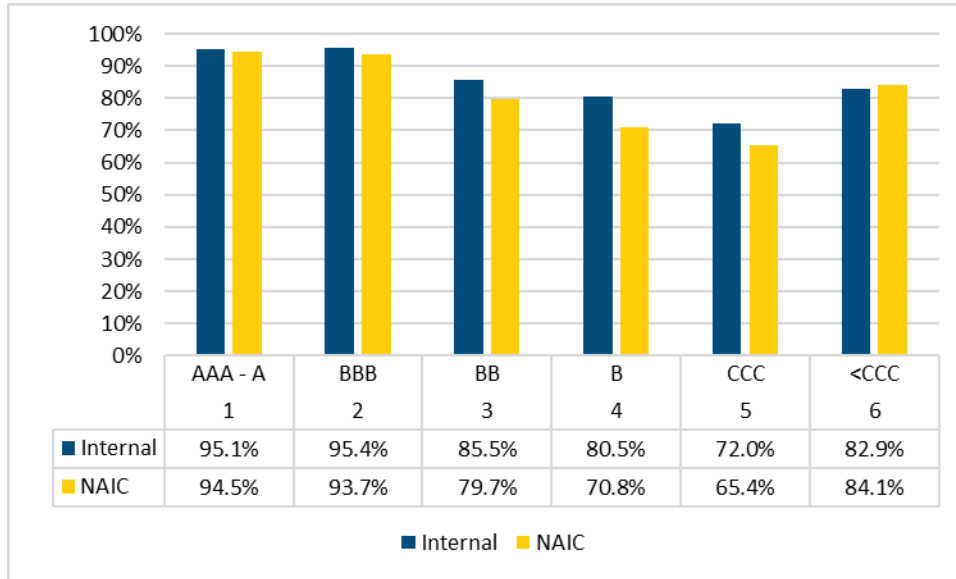
Figure 42

AVERAGE ONE-YEAR PROBABILITY OF RATING UPGRADES/DOWNGRADES

	AAA - A 1	BBB 2	BB 3	B 4	CCC 5	<CCC 6
■ Up Internal		1.85%	7.94%	8.60%	9.94%	9.77%
■ Up NAIC		2.68%	11.72%	11.93%	22.40%	9.80%
■ Down Internal	4.93%	2.73%	6.52%	10.86%	18.11%	
■ Down NAIC	5.50%	3.59%	8.61%	17.22%	12.24%	

■ Up Internal ■ Up NAIC ■ Down Internal ■ Down NAIC
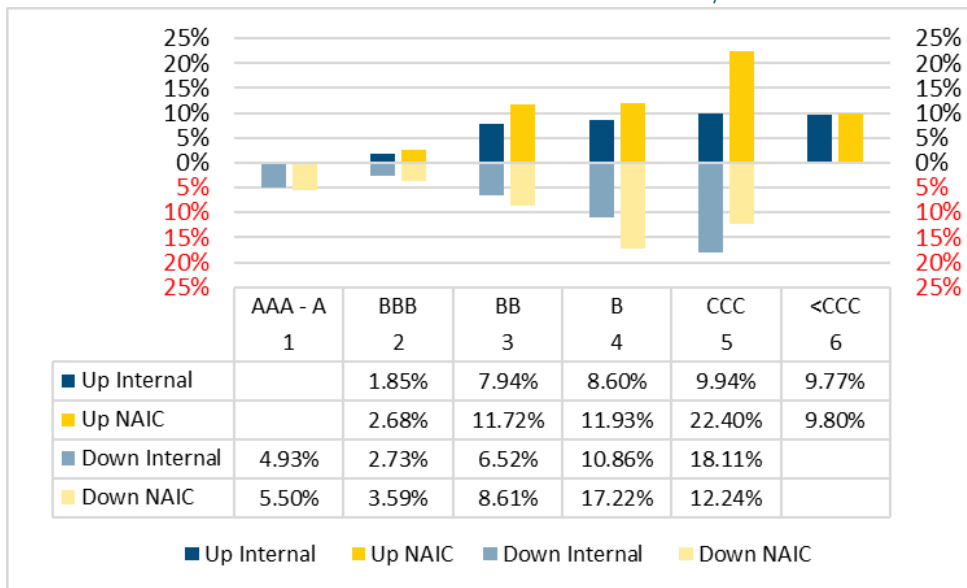
Table 26 uses the data in Figures 41 and 42 to derive comparisons of no change in ratings and the ratio of rating downgrades to upgrades for BBB - CCC ratings. The likelihood of no rating change over one year is similar between the two ratings bases for investment grade and <CCC-rated assets, but is higher for internal than NAIC ratings where assets are rated BB - CCC. Although BB - CCC internal ratings are adjusted less frequently than the NAIC, there does not appear to be a migration bias, upgrade, or downgrade between the two rating bases. Except for CCC-rated bonds, the ratios of downgrades to upgrades are greater or less than 100% and similar in magnitude by rating for each basis. Assets rated CCC have a notably different downgrade to upgrade ratio for internal versus NAIC ratings. Internally-rated CCC assets are more likely to be downgraded (ratio of 182.2%) and NAIC-rated CCC assets are more likely to be upgraded (ratio of 54.7%).

Table 26
MOST RECENT INTERNAL VS. NAIC RATINGS ACTION COMPARISON

Rating	No Change in Rating			Downgrade to Upgrade Ratio	
	Internal	NAIC	Difference	Internal	NAIC
AAA - A	95.1%	94.5%	0.6%	Not Applicable	Not Applicable
BBB	95.4%	93.7%	1.7%	147.3%	134.0%
BB	85.5%	79.7%	5.9%	82.2%	73.4%
B	80.5%	70.8%	9.7%	126.3%	144.4%
CCC	72.0%	65.4%	6.6%	182.2%	54.7%
<CCC	82.9%	84.1%	-1.2%	Not Applicable	Not Applicable

2.12   LOSS SEVERITY – GAINS VERSUS NO GAINS

This section compares study results both with and without CRE gains. A CRE gain is a recovery of more than 100% after a CRE. Gains can be derived from individual CRE workouts resulting in warrants, equity, collateral, or revised terms to the original financing. Users of this report should consider whether it is appropriate to include gains in their own analysis.

As shown in Section 3.3 and the table below, a significant number of reported CREs resulted in gains.

Table 27
LOSS SEVERITY SUMMARY OF CRES WITH LOSSES VERSUS GAINS

	Percentage of CREs		Average Loss Severity	
	By Number	By Amount	By Number	By Amount
All CREs	100.0%	100.0%	35.0%	31.6%
CREs with Losses	79.6%	68.4%	47.4%	51.5%
CREs with Gains	20.4%	31.6%	-13.2%	-11.5%

The effect of suppressing gains on the loss-severity distribution can be shown by shifting all the gains to a 0% loss in the histograms shown in Section 3.3. A sample is shown for loss severity by amount in the chart below where 90 CREs with gains, in light blue, are shifted into the darker blue bar, which is added to the 0-10% loss range.

Figure 43
CRE GAINS SUMMARY – LOSS SEVERITY DISTRIBUTION WITH SUPPRESSED GAINS
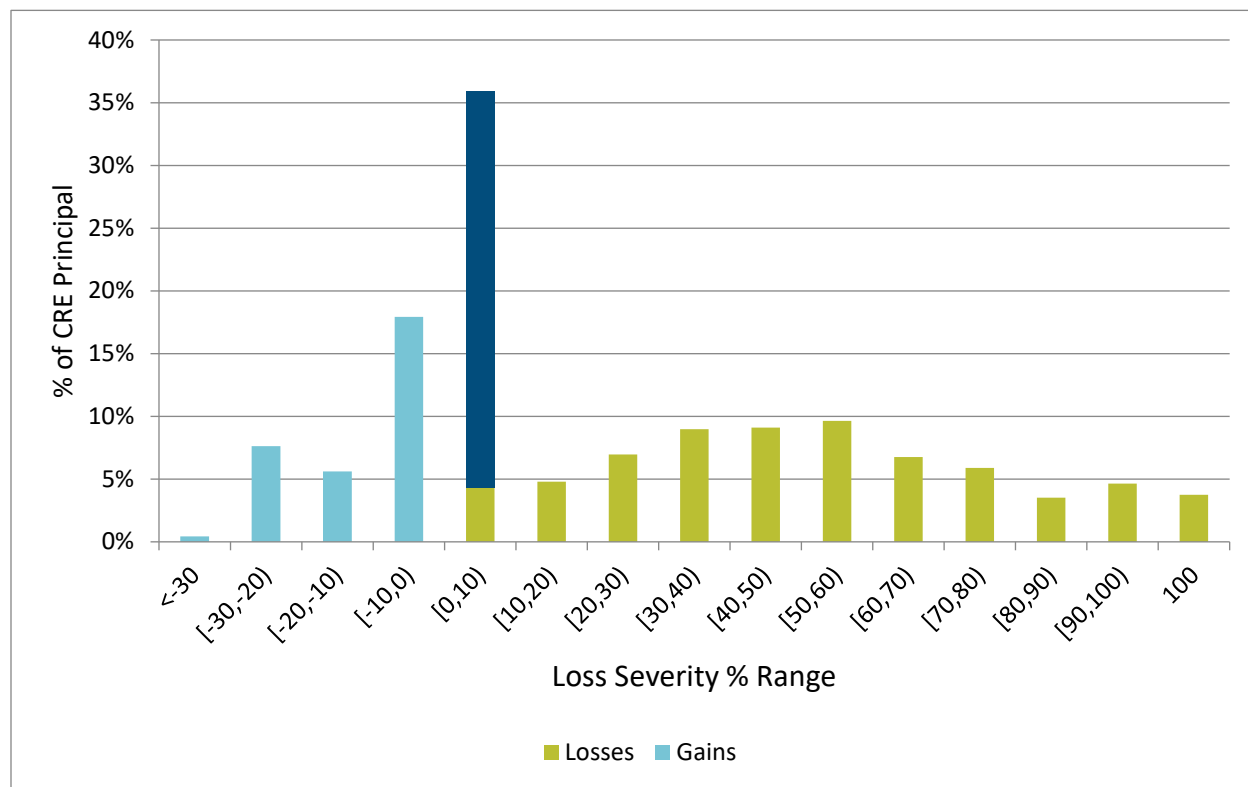
The effect of suppressing gains on key measures is shown in the table below. With gains suppressed, loss severity increased about four percentage points by amount, and about three percentage points by number. The economic loss rate increased by 0.02%.

Table 28
LOSS SEVERITY GAINS EFFECT ON KEY MEASURES 2003-2015

Gains Treatment	Average Loss Severity		Economic Loss Rate
	by Amount	by Number	
Included	31.6%	35.0%	0.11%
Suppressed to Zero	35.2%	37.7%	0.13%

CRE gains and losses by dollar amount are notably concentrated:
- Over 50% of the total dollar losses occurred in the largest 44 of 351 CREs with losses.
- Over 50% of the total dollar gains occurred in the largest 13 of 90 CREs with gains.

The tables below show loss severity differences (loss severity with no gains minus loss severity with gains) across variables that are analyzed in the Data Summaries. Because incidence is the same whether or not there is a loss severity gain, the tables focus on the effect of gain versus no gain on loss severity differences to demonstrate whether there were any meaningful differences by variable for the two measures.

A loss severity difference of 3.6%, the difference between average loss severity by amount without gains and with gains (35.2% minus 31.6%), was used as a baseline to measure significant differences by each category within a variable. For statistically significant cells with 40 or more CREs, the tables flag differences of loss severities greater than a 50% deviation from the 3.6% baseline; i.e., greater than 5.4% and less than 1.8%. If the loss severity difference was less than 3.6%, it implies there were fewer gains than the average in that cell and vice versa. Orange-shaded cells had significant differences above the average. Red-shaded cells had significant differences below the average.

The difference in loss severity by year of CRE in the final table shows the most significant results. CREs with gains in 2007, 2008, and 2009 were far higher than other years in an unmistakable, nonrandom way. They corresponded tightly with the timing of the financial crisis and onset of the subsequent global recession.

Further examination of gains by year shows that:
- More than half of the CREs with gains over the 13-year study period (50 out of 90) occurred in 2009.
- While 38% of the CREs in 2007-2009 resulted in gains, only 7% of the CREs did so in the other years of the study: 2003-2006 and 2010-2015.

Clearly, the financial crisis of 2007-2008 precipitated many CREs. However, the subsequent economic rebound may have more than recouped the losses in several cases, resulting in a significantly higher portion of CREs with ultimate gains. Since the study measures loss severity on private placement CREs by taking a longer multi-year view than many public-bond default studies, it is able to "wait out" any transitory overreaction that may be present in market-trading prices shortly after a CRE. The more extreme a recession, the more the market may overreact in the moment, and the more significant subsequent recoveries may be.

Table 29

LOSS SEVERITY WITH NO GAINS MINUS LOSS SEVERITY WITH GAINS

Letter Rating At Acquisition

	AAA	AA	A	BBB	BB	B	<B	NR
Difference in LS	8.7%	5.3%	0.7%	4.3%	4.5%	0.3%	2.6%	5.8%
# of CREs	1	1	46	260	49	27	37	19

Most Recent Internal Rating

	AAA	AA	A	BBB	BB	B	<B	NR
Difference in LS	0.0%	9.9%	0.0%	5.3%	6.8%	1.8%	0.7%	4.5%
# of CREs	0	0	7	116	103	103	92	19

Current Coupon Rate

	0	0.01 - 2.99	3 - 5.99	6 - 8.99	9 - 11.99	12 - 14.99	15 - 17.99	18.00+	NR
Difference in LS	0.0%	12.8%	7.1%	2.4%	2.8%	0.0%	0.0%	0.0%	1.2%
# of CREs	2	3	95	211	95	14	8	0	12

Years Since Funding

	0 - 1.99	2 - 2.99	3 - 3.99	4 - 4.99	5 - 5.99	6 - 7.99	8 - 9.99	10 - 12.99	13+
Difference in LS	0.7%	2.4%	3.1%	7.8%	2.2%	5.5%	3.6%	1.5%	0.3%
# of CREs	46	44	77	60	60	42	27	63	21

Years to Maturity

	0 - 1.99	2 - 2.99	3 - 3.99	4 - 4.99	5 - 5.99	6 - 7.99	8 - 9.99	10 - 12.99	13+
Difference in LS	3.3%	1.7%	2.1%	2.3%	10.9%	3.3%	0.9%	4.1%	2.3%
# of CREs	92	69	58	42	52	68	20	17	22

Year of CRE

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Difference in LS	2.6%	0.3%	0.6%	0.0%	5.1%	6.2%	5.9%	0.0%	1.0%	0.0%	0.0%	1.7%	0.0%
# of CREs	114	38	22	14	13	58	121	20	10	18	5	4	3

2.13 LOSS SEVERITY METHOD CONSIDERATIONS – STUDY METHOD VERSUS APPROXIMATE RATING AGENCY METHOD

Loss severity was calculated using two methods that give different results depending primarily on the relationship between the original coupon rate and the current market rate for the original rating. The primary method used for measurements in this report is the Study Method. The Study Method is the same method used in prior studies. Another method, meant to approximate loss severity as measured by rating agencies, was introduced in the 2003-2012 study for limited use in developing comparisons of private placement experience to public bond experience. The Approximate Rating Agency Method is labeled as the ARA Method below. This section compares and contrasts these methods and their results.

The Study Method and ARA Method are very similar, with the main difference being the Study Method captures the opportunity gain/loss of the difference between the original coupon rate and the corresponding current market rate at the original quality. This calculation is performed for the remaining term of the original expected cashflows at the time of the CRE. The ARA Method does not include that opportunity gain/loss as part of measured loss severity. Because of this difference, the two methods produce different results depending on the difference of current interest rates and the original coupon rate. The table below summarizes the key components of the Study Method and ARA Method. The derivation of the approximation to the rating agency method is described in the following table.

Table 30

KEY COMPONENTS OF THE STUDY METHOD AND ARA METHOD

Element	Study Method	ARA Method[13]	Evaluation
Economic Loss	$(\text{Principal}/PV_{OCF})*(PV_{OCF} - PV_{RCF})$ $= \text{Principal}*(1 - PV_{RCF}/PV_{OCF})$ Where: OCF = Original Cashflows RCF = Revised Cashflows	$\text{Par Value} - PV_{RV}$ $= \text{Par Value}*(1 - PV_{RV}/\text{Par Value})$ Where: PV_{RV} = Present Value of Recovery Value, (RV). RV can be the near term, typically 30 days post default trading price or a future emergence value at the resolution of a default. Emergence Value (EV) is the market value of the prepetition instrument, new instrument or liquidity value of acquired assets in exchange for the prepetition instrument.	1. If bonds are acquired at par value, then par value and principal will be the same. 2. PV_{RCF} and PV_{RV} are closely related. PV_{RCF} discounts all projected cashflow; PV_{RV} discounts the Recovery Value, which is either a near-term post-default market value or the Emergence Value at the end of a workout period. 3. OCF current coupon rate affects the difference of PV_{OCF} to Par Value.
Severity % (LGD%) Recovery % = 1 - LGD %	$(1 - PV_{RCF}/PV_{OCF})$ PV_{RCF}/PV_{OCF}	$(1 - PV_{RV}/\text{Par Value})$ $PV_{RV}/\text{Par Value}$	Assuming PV_{RCF} and PV_{RV} are closely related, the main difference of methods is PV_{OCF} vs. Par Value.
Discount Rate	OCF: Spot rates from the term structure of current Treasury rates plus current credit spread at original quality at the time of the CRE. RCF: Spot rates from the term structure of current Treasury rates plus current credit spread at current quality, (just before the CRE), at the time of the CRE.	Par Value of Defaulted Bond: Implicitly discounted at coupon rate. Recovery Value: Discounted at the prepetition instrument interest rate, i.e., coupon rate in effect prior to default.	Given the similarity of PV_{RCF} and PV_{RV}, the main difference of Study Method to Approximate Rating Agency Method is PV_{OCF} vs. Par Value. Since the par value is implicitly discounted at coupon rate, the differences between the two methods are driven by the difference of coupon rate to OCF discount rate.

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[13] Descriptions are provided by Moody's, see Overview in April 2007 "Moody's Ultimate Recovery Database," and by S&P, see Definitions in December 16, 2013 "Default, Transition, and Recovery: Recovery Study (US): Are Second Liens and Senior Unsecured Bonds Losing Ground As Recoveries Climb?"

Details of the Study Method are discussed more fully in Appendix 1.C, Actuarial Methodology. Generally, as detailed in the above table, rating agencies derive a recovery percentage (equivalent to $1 - \text{Loss Severity } \%$) by comparing the present value of a recovered amount to par value. The recovered amount can be either a trading value 30 days after the default, trading basis, or the present value at the coupon rate of the emergence value at the end of the workout period, ultimate recovery value. Due to the proximity to default, trading values tend to be more volatile as a measure of recovery, but they are immediately available. Conversely, ultimate recovery values are a measure of the actual eventual recovery, but by their nature, take longer to be able to determine. Neither of those values are publicly available for private placements but, if we assume that our actual and projected revised cashflows are a reasonable proxy to either the trading basis or ultimate recovery, then PVRCF serves as a substitute for the rating agency "recovered amount." With this substitution, we create an Approximate Rating Agency (ARA) loss-severity measure that is defined as ($1 - \text{PV}_{\text{RCF}}/\text{Par Value}$).

Actuarial modelers may want to consider the difference between these two methods when performing credit modeling as part of valuation, capital, or pricing modeling. The Study Method captures the opportunity gain/loss of the difference of the original coupon rate and the average OCF discount rate. The latter rate can be thought of as the equivalent to a current coupon for the bond's remaining term at its original quality rating. Conversely, because the ARA measure uses par value as a baseline of expected recovery, it does not include the opportunity gain/loss of the original coupon rate to a current coupon rate.

Although there is a difference between the two loss severity methods, the results on average for the last study period were very similar, even though significant differences occurred within some Company-CUSIP CREs. This extended study period consistently showed the same results as shown in the table below.

Table 31
LOSS SEVERITY METHOD COMPARISON SUMMARY

	Study Method	Approximate Rating Agency Method	Average of Differences	Standard Deviation of Differences
By Number[1]	35.0%	33.4%	1.6%	8.0%
By Amount[2]	31.6%	30.9%	0.7%	9.1%

1. By Number assumes each Company-CUSIP CRE is one count.
2. By Amount values for all measures are weighted by Principal at the CRE.

The formulas in the first table in this section for the Study Method and the defined ARA loss-severity formula can be used to derive the expected difference of the loss severities under the two methods. The difference of the two methods can be expressed as:

Study Method less Approximate Rating Agency Method = $[1 - (PV_{RCF}/PV_{OCF})] - [1 - (PV_{RCF}/Par\ Value)]$

$$= (PV_{RCF}/Par\ Value) - (PV_{RCF}/PV_{OCF})$$

We can see from this that the loss severity for the Study Method will be greater than the ARA Method when the OCF discount rate, at the time of the CRE for the remaining original cashflows, is less than the original coupon rate and vice versa.

Over the extended study period, the two methods still produced almost the same average loss severity for all CREs. It is reasonable considering only 13 extra CREs were added on top of the existing 428 CREs from the last study period. Similarly, given the standard deviation of differences is significant, we can conclude again there were many significant, yet offsetting, differences during the period. This is shown in the graph below where the loss severity difference by CRE is compared to the difference of the original coupon rate and the OCF discount rate at the time of the CRE. For this purpose, we used the US Treasury Constant Maturity Term Rate, plus the average credit spread at the original quality of each CRE, for a 4.5 year term, the average length of the remaining OCFs over all CREs, as a proxy for the average OCF discount rate for each CRE.

Figure 44
COMPARISON OF LOSS SEVERITY METHODS RELATIVE TO
ORIGINAL COUPON RATE VS. AVERAGE OCF DISCOUNT RATE 2003-2015
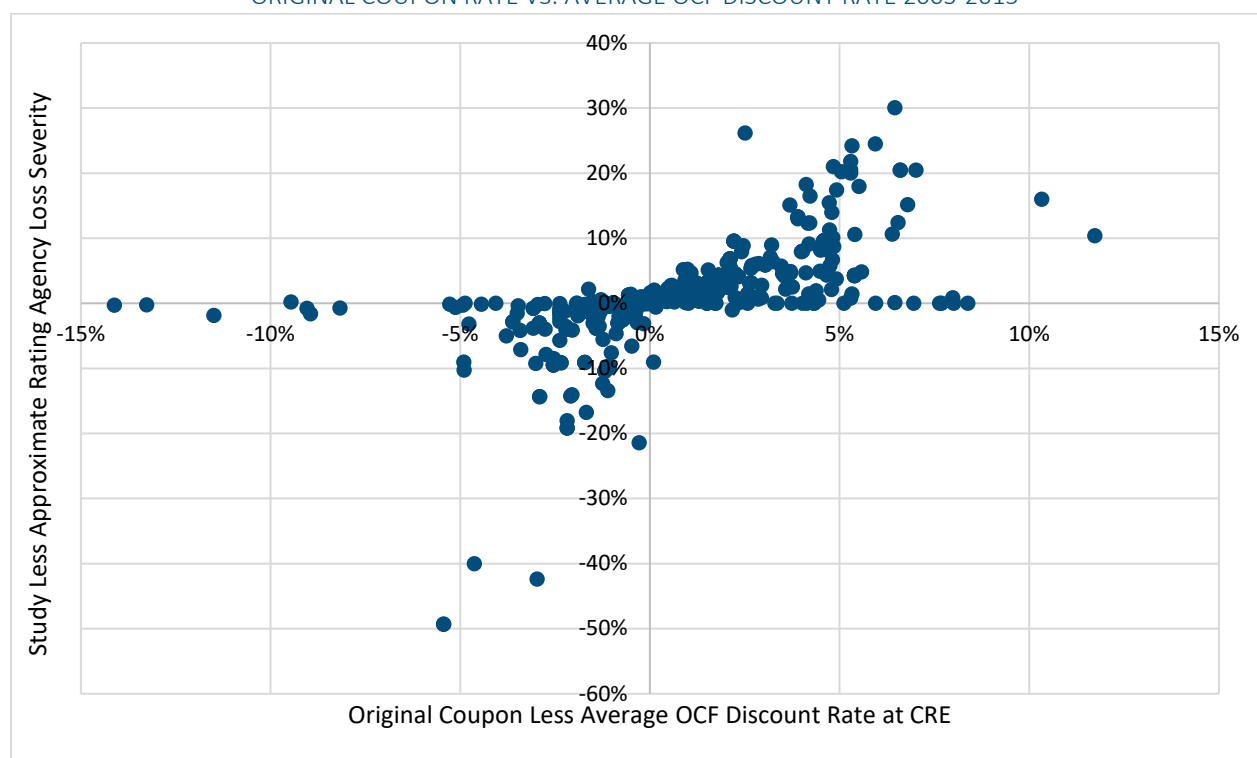
Consistent with the formula for the difference of the method, virtually all of the observations in the above graph were in the southwest or northeast quadrants. Most points were clustered near the origin with some outliers. These were reasonable. For example, the difference of the original coupon rate and average OCF discount rate can be large but, if the duration is short, there will be small to no difference. These observations were clustered on the x-axis. CREs that occurred at or near the original maturity substantiate this. Similarly, if there was a large coupon difference and a long remaining period to original maturity, points would be pushed away from the central point.

It is an interesting observation that almost all new CREs occurring between 2013-2015 landed in the northeast quadrant. Figure 45 shows that, for most CREs in 2013-2015, the coupon rate was higher than the market coupon rate, which caused the loss severity for the Study Method to be greater than the ARA Method for those CREs.

Figure 45

COMPARISON OF LOSS SEVERITY METHODS RELATIVE TO
ORIGINAL COUPON RATE VS. AVERAGE OCF DISCOUNT RATE 2013-2015
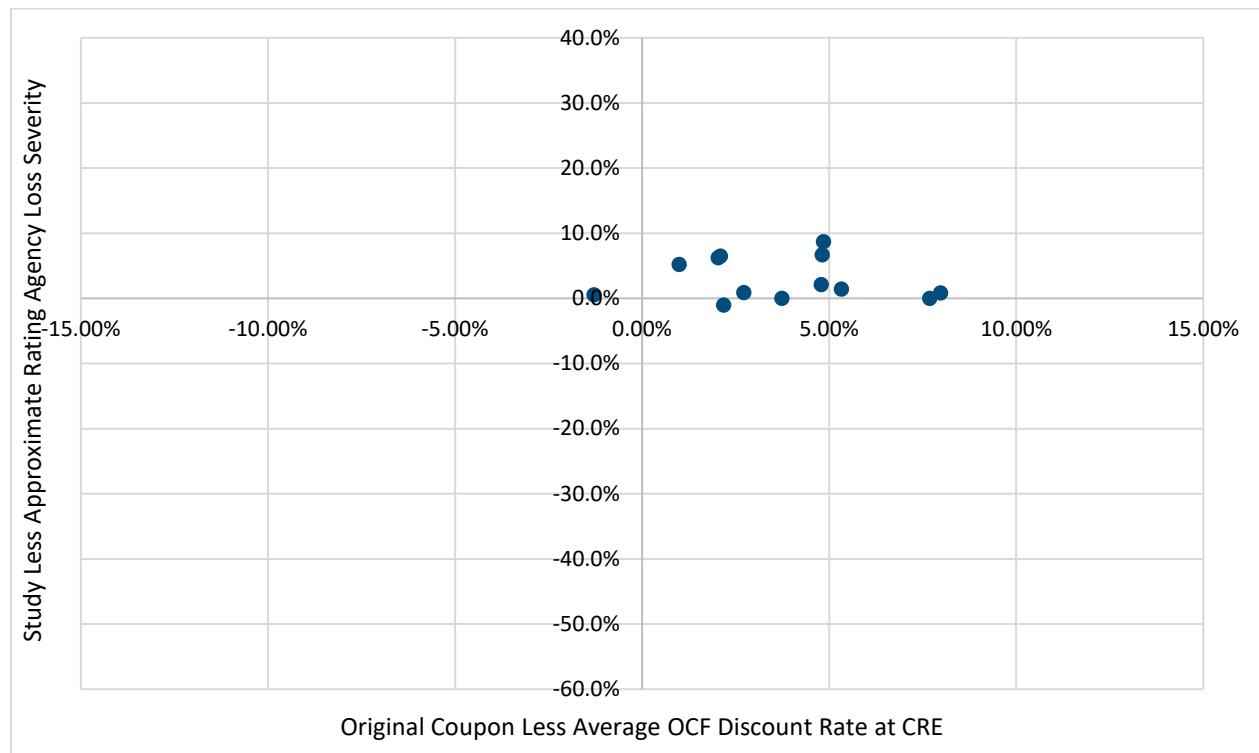
As shown in the graphs below, we can see the two methods had positive-correlated results either by the 13 new CREs or all 441 CREs.

Figure 46
ECONOMIC LOSS SEVERITY (%) – ARA VS STUDY DEFINITION FOR 13 NEW CRES
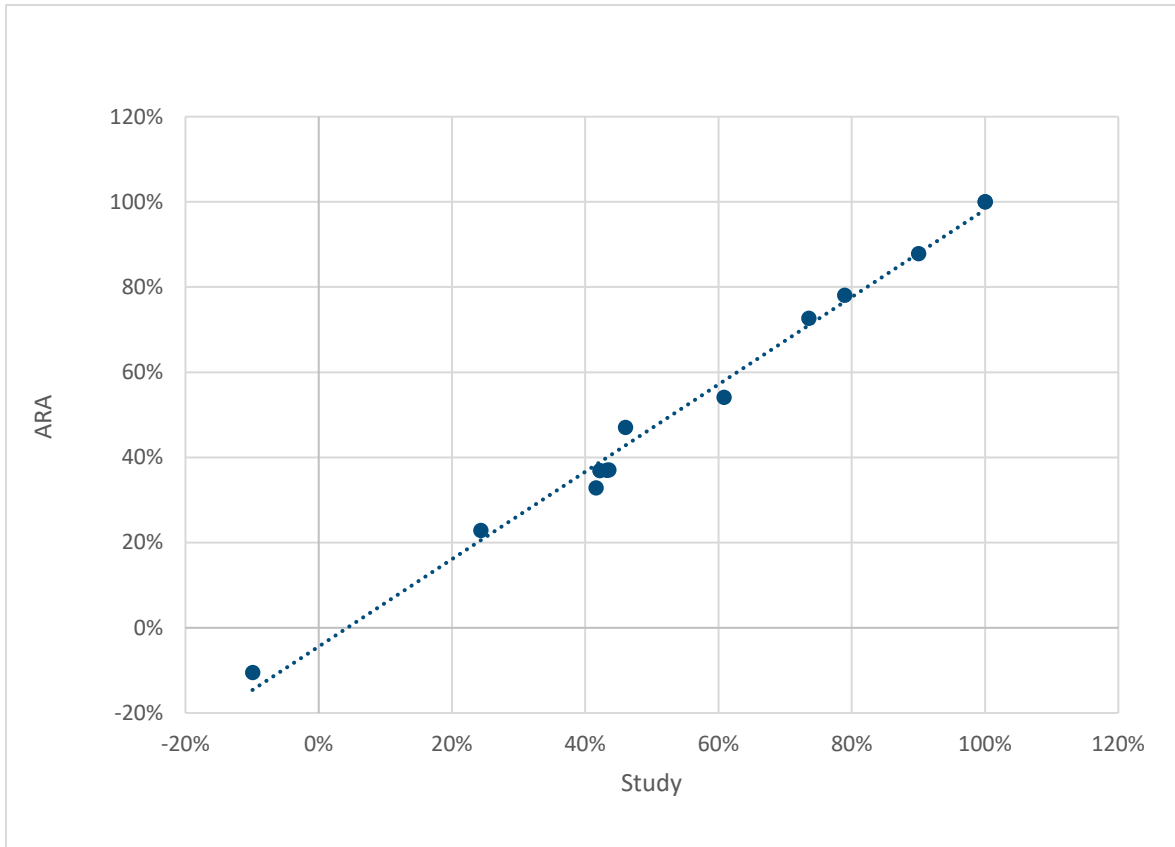
Figure 47
ECONOMIC LOSS SEVERITY (%) – ARA VS. STUDY DEFINITION FOR ALL 441 CRES
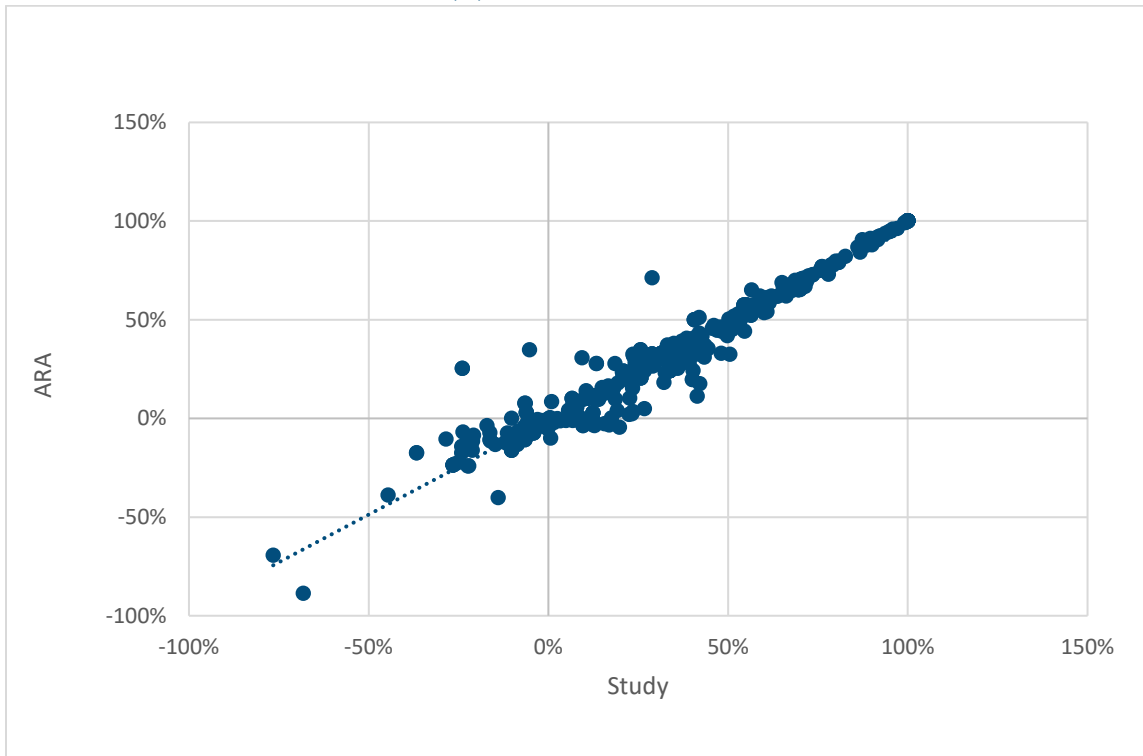
We conclude that it is important to be aware the primary loss severity measure in this study differs from what a practitioner might encounter in reviewing reports of public bond recovery analyses. Each measure serves a purpose. It is important that practitioners understand their differences to apply them appropriately.

Section 3: Data Summaries

3.1 USING THE DATA SUMMARIES

This section of the report presents:

- the aggregate experience by calendar year,

- the loss severity distribution among CREs, and

- the experience by selected characteristics as single-analysis variables:

    1. Most Recent Quality Rating

    2. Earliest Quality Rating

    3. NAIC Rating

    4. Coupon Rate

    5. Funding Year

    6. Years Since Funding

    7. Years to Maturity

For the experience in aggregate, and by each variable, detailed data for the four loss statistics (Incidence Rate by Number, Incidence Rate by Amount, Loss Severity, and Economic Loss Rate) are calculated. In each case, there is a one-page narrative of highlights and data notes, followed by a single graph depicting the four loss statistics. The loss severity distribution is analyzed by Seniority and Calendar Year in a one-page narrative followed by two graphs. To facilitate using the graphs, the underlying data are summarized beneath each graph. Each reader is likely to find different items of interest and alternative interpretations of the data.

3.1.1 FORMATTING NOTES ON GRAPHS FOR THE AGGREGATE EXPERIENCE

- The graph shows the four statistics for each of the 13 years in the 2003-2015 study period.

- The left scale of the graph measures Incidence and Economic Loss Rates, while the right scale measures Loss Severity.

- The Economic Loss Rate is expressed as a percentage of total principal exposed.

- The number of CREs by cell is provided with the data to convey the relative statistical credibility (but is not shown in the graph).

- The percentage of exposure for each year by number and amount is provided (but is not shown in the graph).

3.1.2 FORMATTING NOTES ON GRAPHS FOR THE LOSS SEVERITY DISTRIBUTION

- The first two graphs show loss severity distribution by amount and number, respectively.

- The loss severity distribution is captured in 10% ranges that are left-inclusive rather than right-inclusive, as denoted by [0%, 10%), for example.

- The third and fourth graphs show Loss Severity by Seniority, Calendar Year, and Overall.

- Stacked bars are used to show the frequency distribution in the two graphs that depict Loss Severity by Seniority.

- Plus or minus (+/-) one standard deviation is indicated by the top and bottom point of each stacked bar relative to its middle point.

3.1.3 FORMATTING NOTES ON GRAPHS FOR SINGLE-ANALYSIS VARIABLES

- The format is the same as the Aggregate Experience graph; the left scale of the graph measures Incidence and Economic Loss Rates, while the right scale measures Loss Severity.

- Stacked bars are used for Incidence Rate by Amount, Incidence Rate by Number; horizontal bar markers are used for Economic Loss Rate; and circular markers are used for Loss Severity.

- The Economic Loss Rate is expressed as a percentage of total principal exposed.

- The number of CREs by cell is provided with the data to convey relative statistical credibility (but is not shown in the graph).

- The percentage of exposure for each cell by number and amount is provided (but is not shown in the graph).

3.2 PRIVATE PLACEMENT 2003-2015: AGGREGATE EXPERIENCE

3.2.1 HIGHLIGHTS

- The economic loss rate over all 13 years was 0.11%. The 0.11% is equal to average incidence by amount of 0.36% times the average loss severity of 31.6%.

- The incidence rates by amount and number peaked in 2003 and 2009, shortly after the 2001 recession and the Great Recession from 12/2007 to 6/2009, respectively.

- The economic loss rate remained under 0.5% throughout the study period, even with the jump in incidence in 2003 and 2009.

- The incidence by amount remained close to incidence rate by number (except for 2003), suggesting the size of CREs on average was like the average size of all outstanding private placement bonds.

- Loss severity varied between a low of 16.5% in 2009 and a high of 76.7% in 2015. There were only three CREs in 2015. That low number reduces single-year credibility and their losses may not yet be fully developed. Local maximums occurred in 2004, 2010, 2013, and 2015, with the first two years cited each occurring one year after a peak in incidence rates.

- In 2003, the incidence rate by number was 0.79 percentage points higher than the incidence rate by amount. This was due to several small CREs in 2003 relative to the average CRE amount.

3.2.2 DATA NOTES

- For incidence by number, each occurrence of a default on a bond owned by each contributor was counted as one occurrence of a CRE. If a bond that defaults is owned by three contributors, it would count as three occurrences of a CRE.

- Twenty companies contributed data to the study at some point between 2003-2015. On an unweighted basis during 2003-2012, 15 companies participated with an average of 8.9 years of data, and in 2013-2015, 16 companies participated with an average of 2.8 years of data supplied to the study.

Figure 48
INCIDENCE, LOSS SEVERITY, AND ECONOMIC LOSS 2003-2015

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	All Yrs
Incid by Number	2.17	0.53	0.30	0.19	0.17	0.70	1.52	0.24	0.12	0.21	0.06	0.06	0.04	0.44
Incid by Amount	1.38	0.54	0.25	0.13	0.23	0.66	1.74	0.22	0.13	0.19	0.08	0.06	0.05	0.36
Economic Loss	0.46	0.31	0.11	0.03	0.06	0.20	0.29	0.12	0.03	0.07	0.06	0.02	0.04	0.11
Loss Severity	33.6	57.6	45.5	25.1	25.6	30.8	16.5	53.9	26.2	36.7	73.8	33.7	76.7	31.6
# of CREs	114	38	22	14	13	58	121	20	10	18	5	5	3	441
Exposure by #	5.2	7.1	7.2	7.4	7.6	8.2	7.9	8.4	8.3	8.3	7.8	8.2	8.4	100.0
Exposure by Amt	3.6	5.3	5.8	6.3	6.7	7.3	7.3	7.7	8.2	8.9	10.9	10.9	11.2	100.0

Incidence, Loss Severity, Economic Loss, and Exposure in %

3.3 PRIVATE PLACEMENT 2003-2015: LOSS-SEVERITY DISTRIBUTION

3.3.1 HIGHLIGHTS

- The loss severity among CREs was widely dispersed. When grouped into bands on 10% loss severity percentages, only a few of those bands had more than 10% of the losses when measured by amount or number of CUSIPs.

- Generally, the distribution of losses was similar by amount and by number of company-CUSIPs. The proximity of the mean and median by both amount and number are indicators that loss percentage distributions had minimal skewness.

	Mean	Median	Std Dev
By Amount	31.6%	32.7%	37.1%
By Number	35.0%	35.2%	35.1%

- The distribution by number is influenced by one set of CREs with a loss severity in the 30-40% band. This was due to a unique series of trust assets that had different CUSIPs, but had underlying assets subject to the same CRE cause. Because these CREs were individually relatively small, the corresponding proportion of loss severity in the 30-40% band by amount was smaller than by number, 9.0% versus 16.6%.

- The proportion of CREs with negative loss severity gains was substantial and, whether viewed by amount or number, exceeded the proportion of gains seen in public bond experience[14]. By amount, gains resulting from CREs comprised 31.6% of CRE principal with an average gain of 11.5%; by number of company-CUSIPs, the corresponding values were a 20.4% occurrence with an average gain of 13.2%. The lower proportion of gains by number of company-CUSIPs, combined with the concentration of losses in the 30-40% band mentioned previously, contributed to the overall higher 35.1% loss severity by number.

- Aggregate losses by seniority show an unexpected result where, by amount, senior-unsecured bonds had a lower average loss severity (24.6%) than senior-secured bonds (38.5%). Results showed a similar differential by number. Subordinated bonds had higher losses, 57.3% by amount, than senior bonds.

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[14] S&P's "Default, Transition, and Recovery: Recovery Study (US): "Are Second Liens and Senior Unsecured Bonds Losing Ground as Recoveries Climb?," December 16, 2013. http://www.standardandpoors.com/spf/upload/Ratings_EMEA/2012-12-13_RecoveryStudyUSRecoveriesComeIntoFocus.pdf

- The relationship of loss severity between senior-secured and senior-unsecured bonds was different by the number of companies owning a CUSIP. When one company owned a CUSIP, senior-secured and senior-unsecured loss severity was almost the same, 39.0% versus 38.0%, respectively. When two or more companies owned the same CUSIP, there was a substantial segment of senior-unsecured bonds that had superior loss severity performance. Those much lower loss severities that averaged 19.4% explain the overall better performance of senior-unsecured versus senior-secured bonds, whether measured by amount or number.

Table 32
INCIDENCE, LOSS SEVERITY, AND ECONOMIC LOSS 2003-2015

		Senior Secured	Senior Unsecured	Subordinated	Not Reported	Total
One Owner	Loss Severity	39.0%	38.0%	71.0%	52.8%	43.8%
	# of CREs	73	65	11	44	193
Multiple Owners	Loss Severity	36.9%	19.4%	-6.6%	30.1%	21.2%
	# of CREs	69	158	2	19	248
All CUSIPs	Loss Severity	38.5%	24.6%	57.3%	47.0%	31.6%
	# of CREs	142	223	13	63	441

- A significant proportion of bonds did not have a reported seniority classification. The proportions of CREs and exposure of Not Reported bonds, including those not classifiable, measured by amount were 14.1% and 14.6%, respectively. This similarity of the CRE and exposure proportions of the Not Reported bonds indicates there does not appear to be a bias in their incidence relative to the reported seniority types but, the combined loss severity weighted by CRE amount of the reported types was 29.0% versus 47.0% for the Not Reported. This indicates a bias of higher proportion of subordinated or less secure bonds in the Not Reported category.

- Loss severity, whether reported by amount or number, did not show a discernible relationship to years with incidence greater than 0.50% (a proxy for stressed economic conditions occurring in 2003-2004 and 2008-2009) or benign economic conditions of all other years. Except for 2008-2009, there were similar results by amount and number. By amount, the highest incidence years of 2003-2004 and 2008-2009 produced average loss severities of 42.3% and 20.5%, respectively. The other lower incidence years had a 42.5% loss severity by amount. During 2008-2009, average loss severity by number was 28.2%. Even though this was higher than the 2008-2009 result by amount, it was still than lower loss severity by number (43.4%) for the low incidence years.

3.3.2 DATA NOTES

- See Section 2.12, Loss Severity – Gains Versus No Gains for an expanded discussion on the comparative results of loss severity with and without gains.

- See Section 2.13, Loss Severity Method Considerations – Study Method Versus Approximate Rating Agency Method, which compares the loss severity methods used by the study for private placements and methods rating agencies generally used for recovery studies on public bonds.

- Each CRE's cashflow was individually reviewed for internal consistency and reasonableness. See Appendix 1.D, Data Validation for details of the data review process.

Figure 49
LOSS SEVERITY FREQUENCY DISTRIBUTION BY AMOUNT 2003-2015

	<-30	[-30,-20)	[-20,-10)	[-10,0)	(0,10)	[10,20)	[20,30)	[30,40)	[40,50)	[50,60)	[60,70)	[70,80)	[80,90)	[90,100)	100
% of CRE Principal	0.4%	7.6%	5.6%	17.9%	4.3%	4.8%	7.0%	9.0%	9.1%	9.6%	6.7%	5.9%	3.5%	4.7%	3.8%
Loss Severity %	-39.6%	-23.7%	-13.4%	-5.0%	5.8%	15.2%	25.4%	36.0%	43.9%	54.6%	64.8%	75.5%	86.7%	93.5%	100.0%
# of CREs	5	21	14	50	28	30	39	73	42	33	28	20	18	23	17
% of CREs	1.1%	4.8%	3.2%	11.3%	6.3%	6.8%	8.8%	16.6%	9.5%	7.5%	6.3%	4.5%	4.1%	5.2%	3.9%
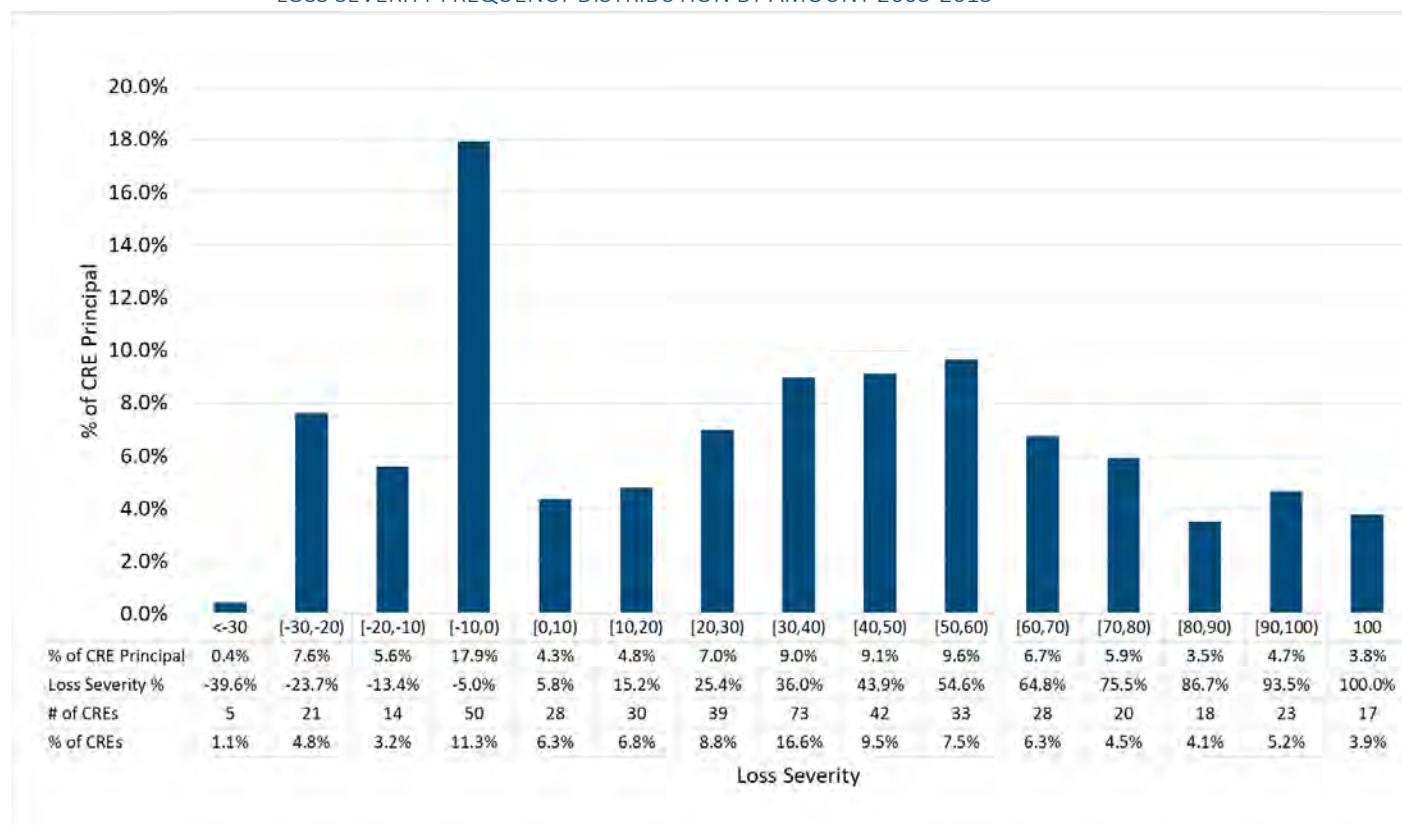
Figure 50
LOSS SEVERITY FREQUENCY DISTRIBUTION BY NUMBER 2003-2015

	<-30	[-30,-20)	[-20,-10)	[-10,0)	[0,10)	[10,20)	[20,30)	[30,40)	[40,50)	[50,60)	[60,70)	[70,80)	[80,90)	[90,100)	100
% of CREs	1.1%	4.8%	3.2%	11.3%	6.3%	6.8%	8.8%	16.6%	9.5%	7.5%	6.3%	4.5%	4.1%	5.2%	3.9%
Loss Severity %	-39.6%	-23.7%	-13.4%	-5.0%	5.8%	15.2%	25.4%	36.0%	43.9%	54.6%	64.8%	75.5%	86.7%	93.5%	100.0%
# of CREs	5	21	14	50	28	30	39	73	42	33	28	20	18	23	17
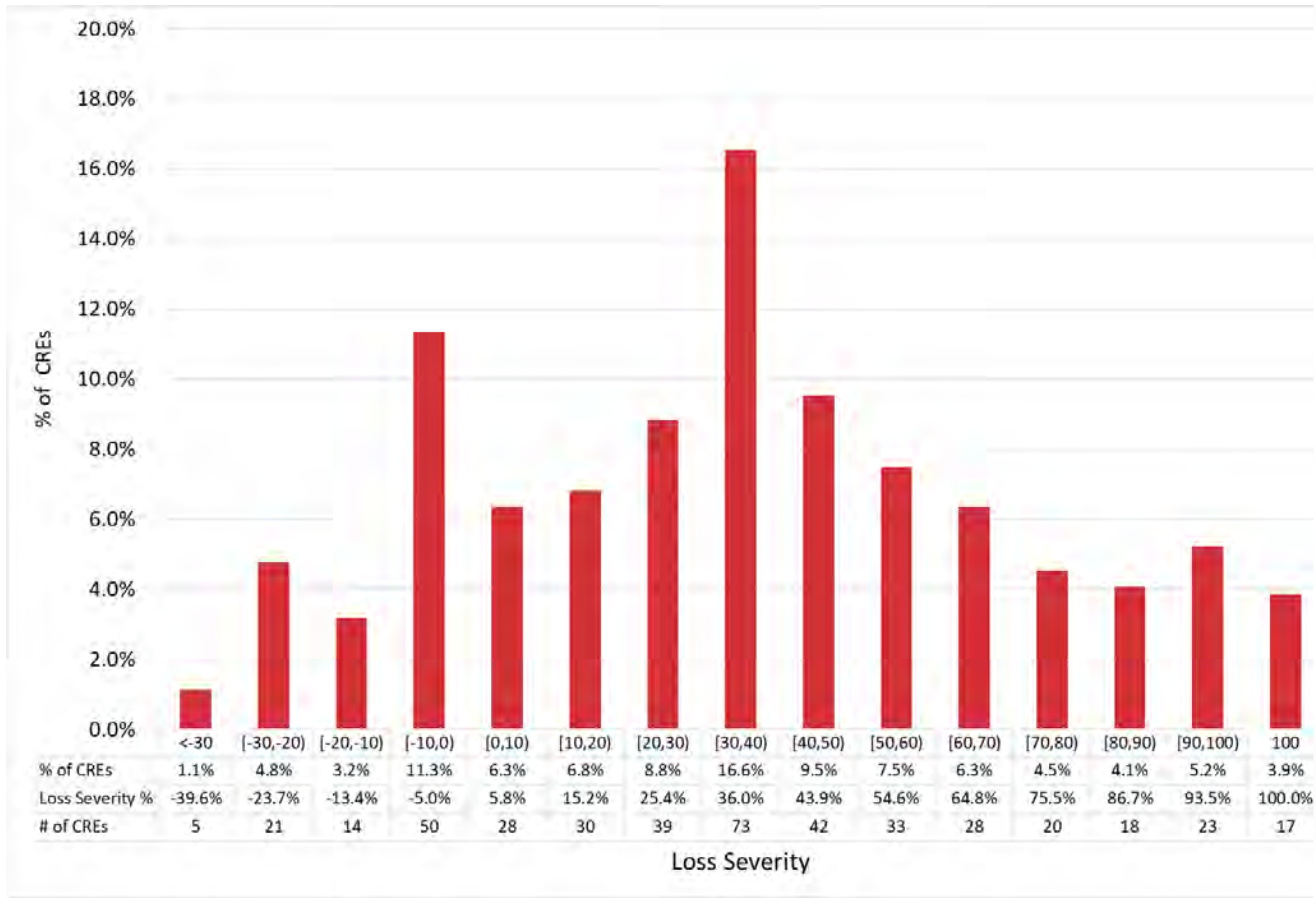
Figure 51

LOSS DISPERSION BY AMOUNT (MEAN +/- STANDARD DEVIATION) BY SENIORITY AND STUDY YEAR GROUPS 2003-2015

	Senior Secured	Senior Unsecured	Subordinated	Not Reported		2003-2004	2008-2009	2005-2007 & 2010-2015		Total
Wtd Mean + SD	69.6%	61.1%	94.4%	85.2%		75.2%	58.2%	75.7%		68.7%
Wtd Mean	38.5%	24.6%	57.3%	47.0%		42.3%	20.5%	42.5%		31.6%
Wtd Mean - SD	7.4%	-11.8%	20.1%	8.9%		9.4%	-17.3%	9.3%		-5.5%

Seniority - Study Period - Total
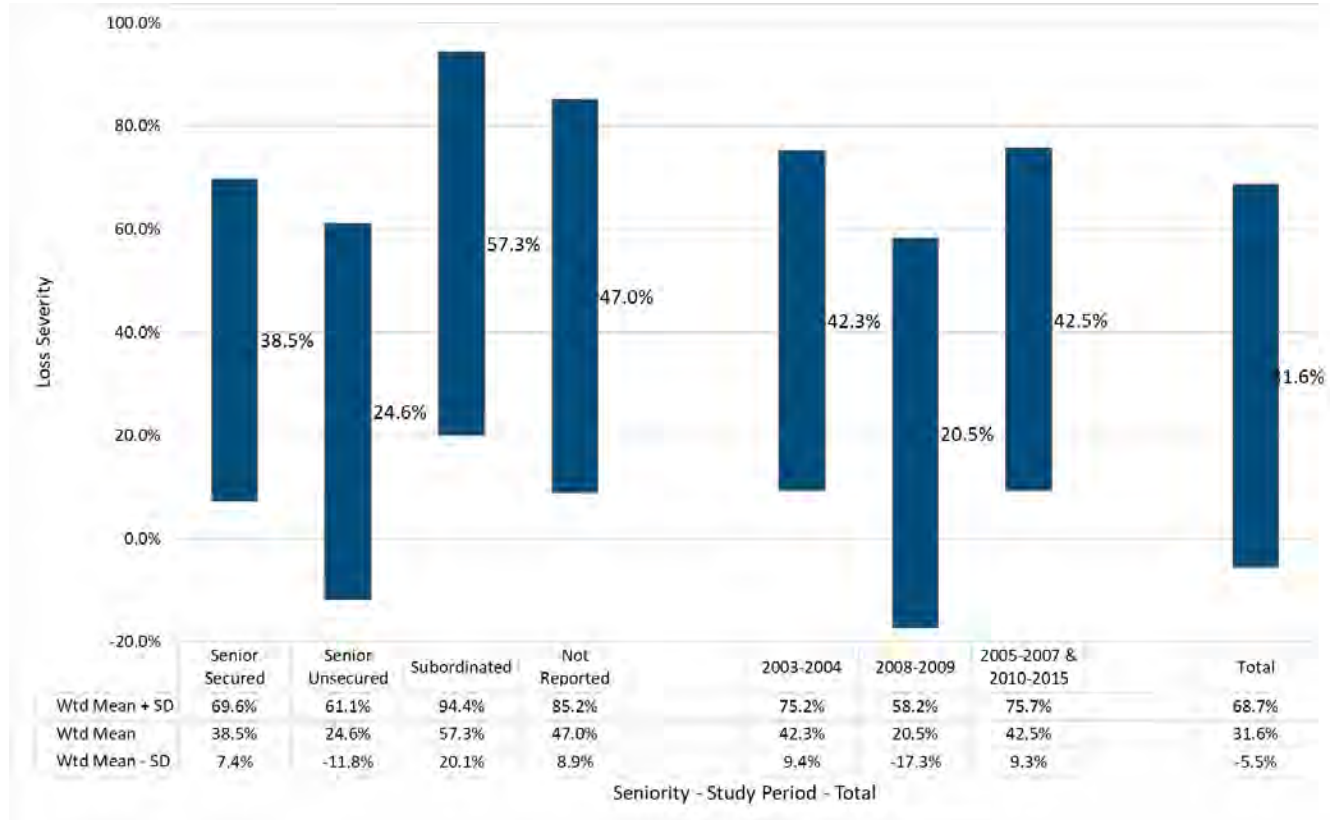
Figure 52

LOSS DISPERSION BY NUMBER (MEAN +/- STANDARD DEVIATION) BY SENIORITY AND STUDY YEAR GROUPS 2003-2015

	Senior Secured	Senior Unsecured	Subordinated	Not Reported		2003-2004	2008-2009	2005-2007 & 2010-2015		Total
UnWtd Mean + SD	62.1%	67.3%	90.4%	85.1%		63.9%	67.9%	78.1%		70.0%
UnWtd Mean	37.5%	29.5%	52.4%	45.2%		36.9%	28.2%	43.4%		35.0%
UnWtd Mean - SD	12.8%	-8.3%	14.4%	5.4%		9.8%	-11.5%	8.8%		-0.1%

Seniority - Study Period - Total

3.4 PRIVATE PLACEMENT 2003-2015: MOST RECENT QUALITY RATING

3.4.1 HIGHLIGHTS

- 'Most Recent Quality Rating' was supplied by participating companies. The internal rating corresponds to a Moody's or other rating scale as determined by the contributors. The submitted ratings were mapped to a simplified study-wide scale patterned after S&P's format.

3.4.2 EXPOSURES AND CREDIBILITY

- The study included 132,714 asset records submitted by the contributors corresponding to 100,767 life-year exposures over 13 years of study. Exposure (by number) wasn't evenly distributed among the quality ratings. The most populous of the most recent quality ratings was investment-grade bonds (equivalent to S&P ratings AAA through BBB), which together accounted for 88,218, or 87.5%, of exposures. Below Investment Grade bonds constituted 9.3% of exposures in the study, as follows:

    o BB: 6.3%

    o B: 2.0%

    o <B: 1.0%

    o The remaining 3.2% of exposures are associated with the bonds missing the most recent quality rating.

3.4.3 INCIDENCE ECONOMIC LOSS RATES

- As expected, incidence rates and economic loss rates increased steeply with lower quality ratings. Both were significantly higher for below investment grade bonds than for higher rated issues.

- Incidence rates were measured by both number and by amount of exposure. Incidence by number was higher, 0.44%, than by amount, 0.36%, even though incidence by number versus amount was higher for only BBB and BB ratings. Overall, higher incidence by number than by amount implies that, on average, smaller bonds had CREs more frequently than larger bonds.

3.4.4 LOSS SEVERITY

- Loss severity was highest in the A-rated segment; however, this number is likely not credible given that only seven CREs were recorded for bonds most recently rated A. All of those defaults occurred between 2006 and 2009. Loss severity associated with these defaults was consistently high, ranging from a 69% loss in 2009 to a 100% loss in 2006.

- Loss severity was relatively low for bonds rated BBB and BB, 22.5% and 12.0%, respectively, while it was higher for bonds rated B and less than B with loss severity of 38.4% and 48.5%, respectively.

Figure 53
INCIDENCE, LOSS SEVERITY, AND ECONOMIC LOSS BY MOST RECENT RATING 2003-2015

	AAA	AA	A	BBB	BB	B	<B	NR	All
Incid by Number	0.00%	0.01%	0.03%	0.22%	1.63%	5.13%	8.89%	0.59%	0.44%
Incid by Amount	0.00%	0.01%	0.04%	0.18%	1.51%	6.20%	15.17%	1.00%	0.36%
Economic Loss	0.00%	0.00%	0.03%	0.04%	0.18%	2.38%	7.36%	0.34%	0.11%
Loss Severity	0.0%	-9.9%	74.4%	22.5%	12.0%	38.4%	48.5%	34.3%	31.6%
# of CREs	0	1	7	116	103	103	92	19	441
Exposure by #	1.8%	7.5%	25.5%	52.7%	6.3%	2.0%	1.0%	3.2%	100.0%
Exposure by Amt	2.1%	8.0%	24.9%	57.5%	4.6%	1.3%	0.5%	1.2%	100.0%
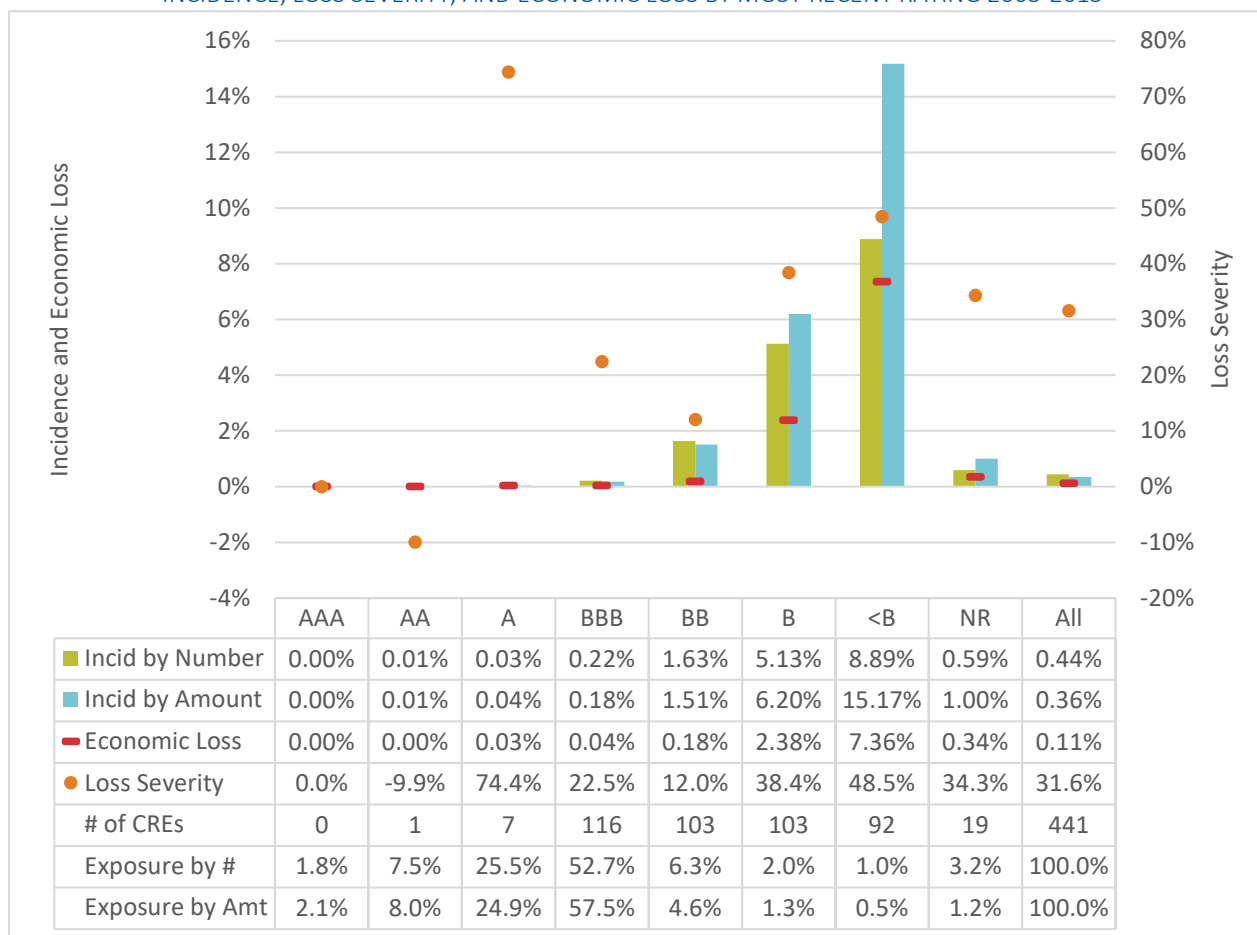
3.5 PRIVATE PLACEMENT 2003-2015: EARLIEST QUALITY RATING

3.5.1 HIGHLIGHTS

'Earliest Quality Rating' is a proxy for rating at private placement issuance, but it is not a precise measure of it. Participating companies were asked to report their 'internal rating at acquisition' for each asset, but for those unable to report an 'internal rating at acquisition,' the 'most recent internal rating' as of the earliest reported year-end was used. In addition, if a private placement was purchased on the secondary market, rating at acquisition would not correspond to rating at issuance.

3.5.2 EXPOSURES AND CREDIBILITY

- The study included 132,714 asset records submitted by the contributors corresponding to 100,767 life-year exposures over 13 years of study. As mentioned in Section 3.4, exposures (by number) were not evenly distributed among the quality ratings. The most populous of the earliest quality ratings was investment-grade bonds (equivalent to S&P ratings AAA through BBB), which together accounted for 89,877, or 89.2%, of exposure. Below Investment Grade bonds constituted 6.1% of exposure in the study, as follows:
    - BB: 3.9%
    - B: 1.4%
    - <B: 0.8%

The earliest quality rating of the remaining Not Reported 4.7% of exposures could not be inferred and is unknown.

Note that there were fewer investment grade bonds based on most recent quality rating compared to earliest quality rating. This results from, on average, downward rating migration over the bonds' lives.

3.5.3 INCIDENCE AND ECONOMIC LOSS RATES

- As with the results by the most recent rating, the incidence rates and economic loss rates rose with lower quality ratings, but not as steeply.
- Incidence rates were measured by number and amount of exposure. Incidence by number was as high or greater for all earliest ratings, except for B and <B rated bonds. As with most recent ratings, this implies that, on average, smaller bonds were more likely to experience a CRE than larger ones, but this occurred across more of the individual ratings for earliest rating versus most recent rating.
- The economic loss rate by Earliest Quality Rating was higher than the economic loss rate by Most Recent Quality Rating in investment grades and BB grade, but lower in highly speculative grades below BB. This is to be expected because most assets that originated as investment grade migrate to speculative grade before the onset of a CRE.

3.5.4 LOSS SEVERITY

- Loss severity did not show a discernible pattern by earliest rating. Because the number of CREs was relatively low in all ratings but BBB and BB, the loss severity of the other ratings cells has low credibility.

Figure 54
INCIDENCE, LOSS SEVERITY, AND ECONOMIC LOSS BY EARLIEST RATING 2003-2015

	AAA	AA	A	BBB	BB	B	<B	NR	All
Incid by Number	0.04%	0.02%	0.17%	0.51%	1.24%	1.94%	4.88%	0.40%	0.44%
Incid by Amount	0.01%	0.02%	0.15%	0.43%	1.20%	2.66%	7.05%	0.14%	0.36%
Economic Loss	0.00%	0.01%	0.10%	0.10%	0.31%	1.81%	2.51%	0.02%	0.11%
Loss Severity	-8.7%	41.7%	63.8%	23.9%	25.4%	68.3%	35.5%	18.1%	31.6%
# of CREs	1	2	46	260	49	27	37	19	441
Exposure by #	2.4%	8.1%	27.6%	51.1%	3.9%	1.4%	0.8%	4.7%	100.0%
Exposure by Amt	2.7%	7.8%	24.7%	54.2%	2.5%	0.8%	0.3%	7.1%	100.0%
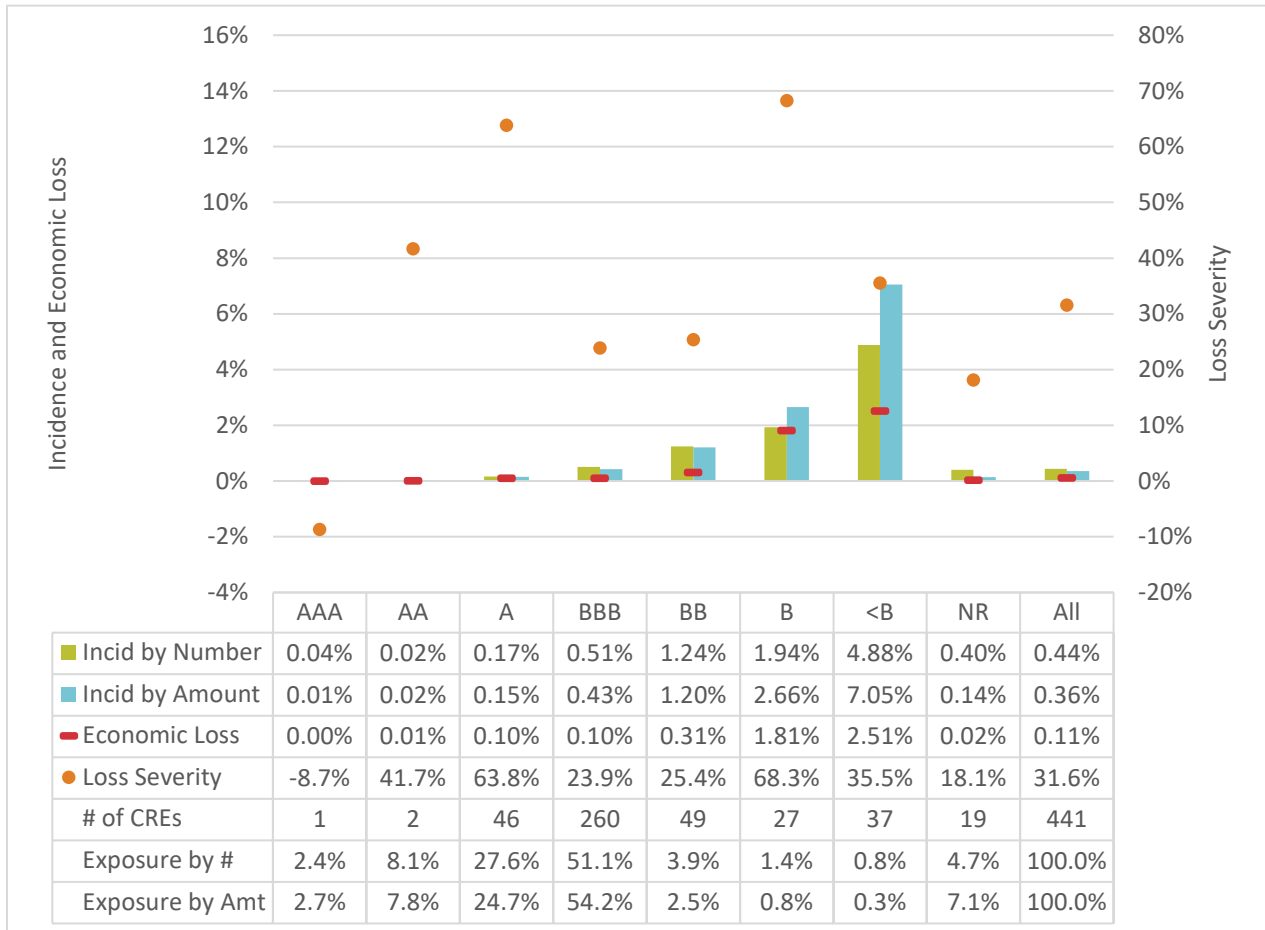
3.6 PRIVATE PLACEMENT 2003-2015: NAIC RATING

3.6.1 HIGHLIGHTS

NAIC designations (commonly referred to as NAIC ratings) are specific alphanumeric ratings used by the NAIC to denote the credit quality of the financial instrument. NAIC 1 is assigned to debt instruments with the lowest credit risk, whereas NAIC 6 is assigned to instruments that are in or near default. The NAIC rating scale has not been changed since the 1990s. NAIC ratings in this section are effective as of the year-end before the reported exposure year.
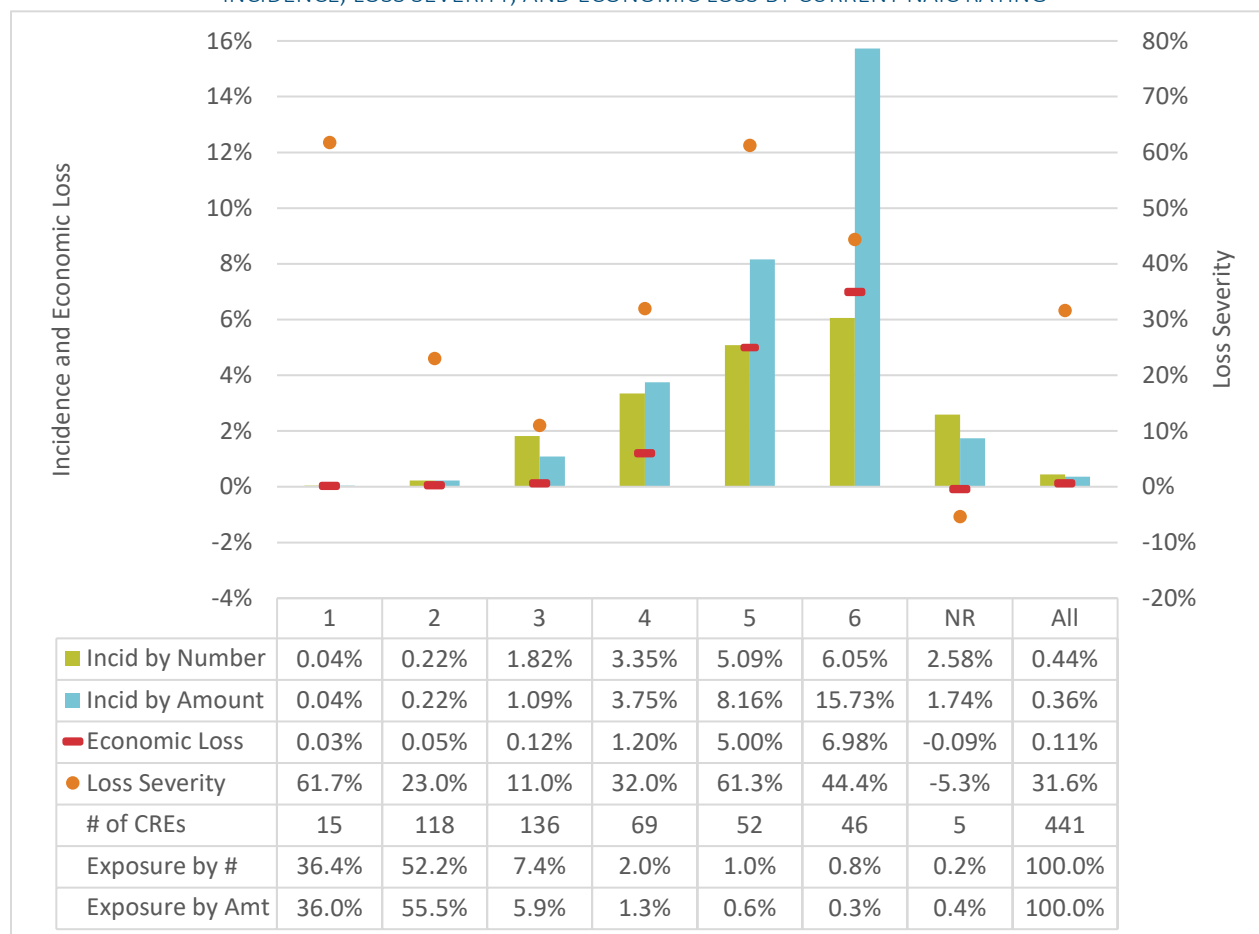
3.6.2 INCIDENCE AND ECONOMIC LOSS RATES

- The incidence of NAIC ratings increased with decreasing credit ratings. The sharp increase as ratings decreased to below an investment grade equivalent (NAIC 3 through NAIC 6) is like the pattern of most recent internal ratings. Incidence by number and amount varied by rating. Smaller than average NAIC 3 rated CREs in 2003 that were, by number, 55% of all NAIC 3 rated CREs, contributed the most to the difference between incidence by number and amount, 1.82% and 1.09%, respectively. The average NAIC 3 rated CRE was $8.3 million versus $13.8 million average exposure. The relationship reversed for assets rated NAIC 4 and lower. Each of these ratings had an average CRE amount greater than the ratings average exposure. The effect was greatest for NAIC 5 and 6 where the difference of incidence by number versus by amount was greatest. The average NAIC 4, 5, and 6 CREs were $12.6, $17.0, and $17.7, respectively, while corresponding average exposure per holding was $11.3, $10.6, and $6.8 million, respectively. The economic loss pattern paralleled the trend of incidence, which is to be expected because incidence (by amount) times loss severity is equal to economic loss. Thus, while loss severity modifies the trend of incidence, the variation of loss severity was not enough to override the rating trend of incidence by amount.

3.6.3 LOSS SEVERITY

- Loss severity varied notably by NAIC rating. NAIC 1 and 5 rated assets had the highest loss severity of about 61% each. Because there were only 15 NAIC 1 rated CREs, credibility may have affected the result for that rating. The losses for NAIC 1 were highly concentrated in financials. By amount, over 90% of the NAIC 1 CREs were financials that had a loss severity of 68%, of which over 90% was concentrated in 2007-2009. By comparison, financials had little impact on NAIC 5 rated assets, which were only 6% of that ratings CRE total. Loss severity for other ratings did not show a discernable pattern. NAIC 2, 3, 4, and 6 assets had loss severities of 23.0%, 11.0%, 32.0%, and 44%, respectively.

Figure 55
INCIDENCE, LOSS SEVERITY, AND ECONOMIC LOSS BY CURRENT NAIC RATING

	1	2	3	4	5	6	NR	All
Incid by Number	0.04%	0.22%	1.82%	3.35%	5.09%	6.05%	2.58%	0.44%
Incid by Amount	0.04%	0.22%	1.09%	3.75%	8.16%	15.73%	1.74%	0.36%
Economic Loss	0.03%	0.05%	0.12%	1.20%	5.00%	6.98%	-0.09%	0.11%
Loss Severity	61.7%	23.0%	11.0%	32.0%	61.3%	44.4%	-5.3%	31.6%
# of CREs	15	118	136	69	52	46	5	441
Exposure by #	36.4%	52.2%	7.4%	2.0%	1.0%	0.8%	0.2%	100.0%
Exposure by Amt	36.0%	55.5%	5.9%	1.3%	0.6%	0.3%	0.4%	100.0%

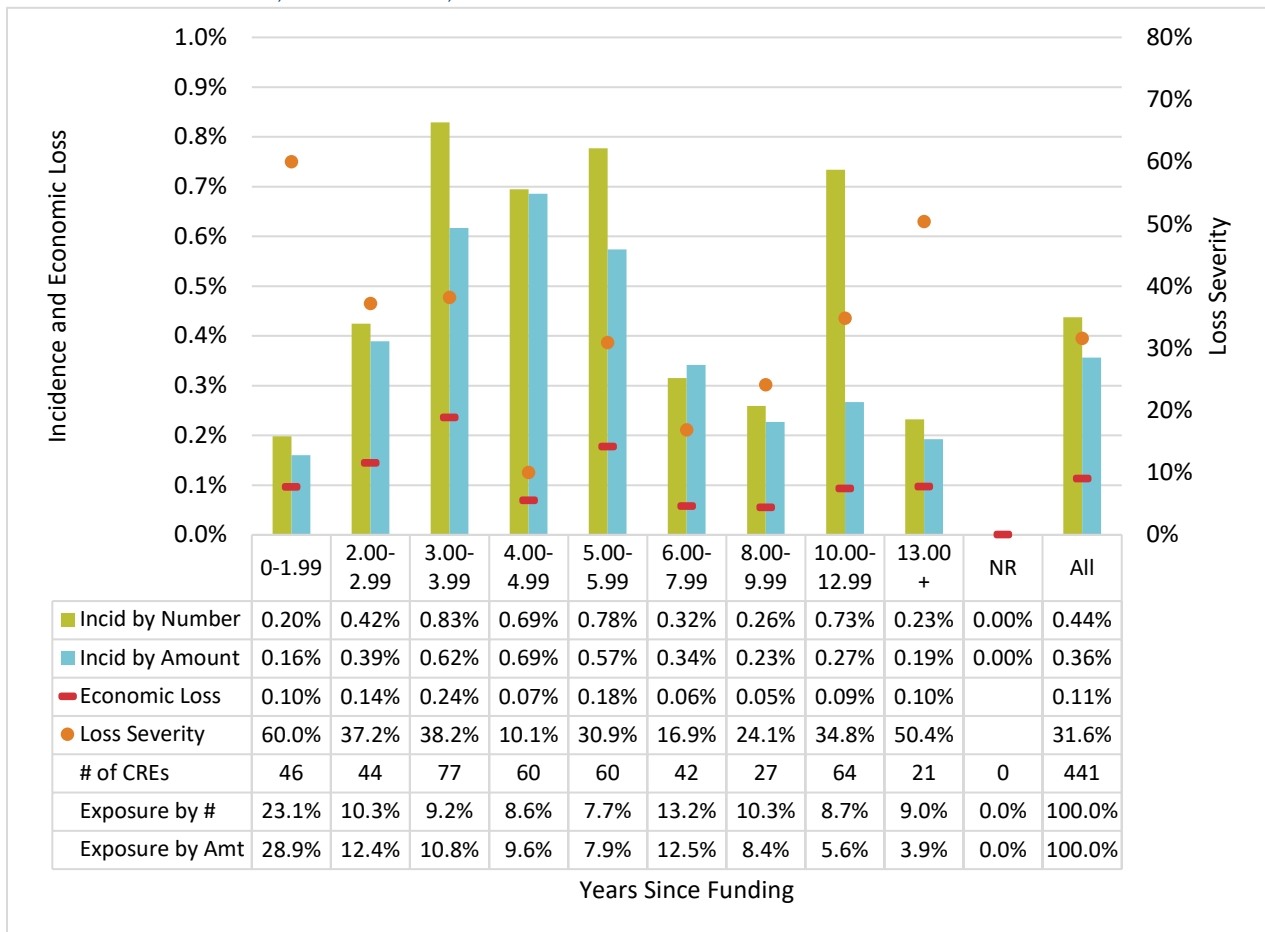## 3.7 PRIVATE PLACEMENT 2003-2015: YEARS SINCE FUNDING

3.7.1 HIGHLIGHTS

- There seemed to be an underwriting effect, which wore off within a 'select' period of two years after funding.

- The selected period was followed by a 'weeding out' middle period, after year 3 through year 6, when the incidence rates hovered at a relatively high level.

- Except for years 10 to 13, there appeared to be a 'tailing off' period from years 6 to 8 when the incidence rates trended to a lower level. The spike in incidence rates in years 10 to 13 was due to multiple CREs associated with a single issuer, whose bonds were owned by multiple contributing companies.

- Economic loss followed the pattern of incidence by amount except for 4.00-4.99 years since funding. The economic loss in that range was much lower than the two ranges immediately above and below it because the associated loss severity of 10.1% was the lowest of any range. The losses in this range were concentrated in 2008-2009 where 55%, by CRE amount, of total losses occurred with an average loss severity of -4.3% (negative value implies a gain).

3.7.2 DATA NOTES

- This variable is defined as the current experience year minus the funding year. As such, it is a discrete variable rather than a continuous one.

Figure 56
INCIDENCE, LOSS SEVERITY, AND ECONOMIC LOSS BY YEARS SINCE FUNDING 2003-2015

	0-1.99	2.00-2.99	3.00-3.99	4.00-4.99	5.00-5.99	6.00-7.99	8.00-9.99	10.00-12.99	13.00+	NR	All
Incid by Number	0.20%	0.42%	0.83%	0.69%	0.78%	0.32%	0.26%	0.73%	0.23%	0.00%	0.44%
Incid by Amount	0.16%	0.39%	0.62%	0.69%	0.57%	0.34%	0.23%	0.27%	0.19%	0.00%	0.36%
Economic Loss	0.10%	0.14%	0.24%	0.07%	0.18%	0.06%	0.05%	0.09%	0.10%		0.11%
Loss Severity	60.0%	37.2%	38.2%	10.1%	30.9%	16.9%	24.1%	34.8%	50.4%		31.6%
# of CREs	46	44	77	60	60	42	27	64	21	0	441
Exposure by #	23.1%	10.3%	9.2%	8.6%	7.7%	13.2%	10.3%	8.7%	9.0%	0.0%	100.0%
Exposure by Amt	28.9%	12.4%	10.8%	9.6%	7.9%	12.5%	8.4%	5.6%	3.9%	0.0%	100.0%

Years Since Funding

3.8 PRIVATE PLACEMENT 2003-2015: YEARS TO MATURITY

3.8.1 HIGHLIGHTS

- Incidence rates by amount and number decreased dramatically with years to maturity, with the lowest levels (below 0.2%) present when more than eight years remained to maturity.

- Becaue loss severity had relatively low variation, the pattern of economic loss across all years to maturity generally mirrored the steep drop of incidence with decreasing economic loss by increasing years to maturity.

3.8.2 DATA NOTES

- This variable is defined as the year of maturity minus the current experience year.

- Due to relatively lower numbers of CREs, the longer periods to maturity, eight years and higher, have less credibility than shorter periods to maturity.

Figure 57
INCIDENCE, LOSS SEVERITY, AND ECONOMIC LOSS BY YEARS TO MATURITY 2003-2015

	0-1.99	2.00-2.99	3.00-3.99	4.00-4.99	5.00-5.99	6.00-7.99	8.00-9.99	10.00-12.99	13.00+	NR	Grand Total
Incid by Number	0.67%	0.91%	0.72%	0.51%	0.67%	0.47%	0.16%	0.17%	0.12%	0.00%	0.44%
Incid by Amount	0.94%	0.59%	0.46%	0.60%	0.60%	0.39%	0.14%	0.13%	0.13%	0.00%	0.36%
Economic Loss	0.20%	0.20%	0.15%	0.22%	0.11%	0.14%	0.08%	0.05%	0.05%		0.11%
Loss Severity	21.2%	34.8%	32.3%	37.2%	17.7%	36.8%	54.8%	39.3%	38.1%		31.6%
# of CREs	92	70	58	42	52	68	20	17	22	0	441
Exposure by #	13.7%	7.6%	8.0%	8.1%	7.8%	14.4%	12.7%	10.1%	17.6%	0.0%	100.0%
Exposure by Amt	8.6%	6.1%	6.7%	7.3%	7.2%	14.4%	13.7%	10.5%	25.4%	0.0%	100.0%

Years to Maturity

Appendix 1: Technical Aspects of the Study

1.A DEFINITION OF CREDIT RISK EVENT

In general, any failure (other than for known non-credit-related reasons, such as administrative problems) to pay interest or principal under the terms of the investment contract is considered a credit risk event. Specifically, the occurrence of any of the following is considered a credit risk event:

a) a missed or delayed disbursement of a contractually-obligated interest or principal payment (excluding missed payments cured within a contractually-allowed grace period), as defined in credit agreements, note purchase agreements, and indentures;

b) a bankruptcy filing or legal receivership by the debt issuer or obligor that will likely cause a miss or delay in future contractually-obligated debt service payments;

c) a distressed exchange whereby 1) an obligor offers creditors a new or restructured debt, or a new package of securities, cash, or assets that amount to a diminished financial obligation relative to the original obligation, and 2) the exchange has the effect of allowing the obligor to avoid a bankruptcy or payment default in the future;

d) a change in the payment terms of a credit agreement, note purchase agreement, or indenture imposed by the sovereign that results in a diminished financial obligation, such as a forced currency re-denomination (imposed by the debtor himself or his sovereign) or a forced change in some other aspect of the original promise, such as indexation or maturity;

e) the sale of a private placement bond at a price less than or equal to 70 cents on the dollar; or

f) any other credit event that a contributor substantiated as a default-like credit deterioration but, due to the nuances of the private placement market, does not fit the definitions above.[15] The purpose of including these types of events as CREs is to avoid understatement of the incidence of CREs for situations that, in similar circumstances with public bonds, would have most likely resulted in a default.

The opportunity cost associated with the call or contractually allowed prepayment of an asset in a low interest rate environment is excluded as a credit risk loss because the call or prepayment is an exercise of the borrower's right and is, therefore, not credit-related. However, the opportunity cost associated with a restructuring or default in a low interest rate environment is captured as part of the credit loss in the economic loss calculation, see Section 1.C.5, Cashflow Discounting, below.

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[15] All CREs submitted by the contributors were reviewed for consistency of classification as a CRE. Where contributors had initial opposing views of the CRE status of a CUSIP, they were asked to substantiate their opinion. Some contributors revised their views in that process, which reduced the number of conflicting opinions. The remaining unresolved conflicting opinions were reviewed by a panel of investment professionals from the contributing companies who determined whether or not those CUSIPS experienced a CRE.

1.B DATE OF CREDIT RISK EVENT AND LOSS CALCULATION DATE

The credit risk event date is considered to be the earliest occurring date of the six CRE triggers listed above in Section 1.A. The loss calculation date is the same as the CRE date, except for bankruptcy. In the case of bankruptcy prior to default, rather than being the bankruptcy filing date, the loss calculation date is the date of the first missed payment or, if earlier, the date of modification or the date of sale of the asset.

1.C ACTUARIAL METHODOLOGY

1. Basic Model

The actuarial model used as a basis to formulate this study is the incidence and severity model. It is described in Section 1.4 of this report.

2. Definition
    a) Incidence

    Incidence of an event is generally defined as the number of actual occurrences of that event out of the total possible number of occurrences in a given time interval. For credit risk, incidence can be measured either by number of assets or by $ volume (also referred to as by amount). It is the number ($ volume) of assets experiencing a CRE in a given year (the unit of time interval used for the study) divided by the total number ($ volume) of assets exposed. The measurement can be made for the entire database or by any predefined component thereof, referred to as a "cell."

    b) Economic Loss and Loss Severity

    Loss severity with respect to a particular asset is defined as the loss actually sustained, given the occurrence of a CRE, as a proportion of the maximum possible loss on that asset. The maximum possible loss is calculated as the present value on the Loss Calculation Date (LCD) of originally scheduled cashflows still remaining. The "recovery rate," or "salvage rate," is the present value on the LCD of the revised cashflows the investor received (and expects to receive in the future) on the CRE, divided by the maximum loss. The severity is then one minus the salvage rate.

    Economic loss on a particular asset is defined as its exposure, which is its carrying value or book value at the time of the CRE, multiplied by the loss severity.

    Present values are calculated using interest rates described in 1.C.5 of this Appendix.

    For a group of assets, each of which experienced a CRE, the economic loss is the sum of the asset-by-asset economic losses, while the loss severity is that sum divided by the sum of the corresponding exposures.

    Economic loss and loss severity can also be calculated on a by number basis.

c) Economic Loss per unit of Exposure

Economic loss per unit of exposure is defined as the total economic loss with respect to those assets in the cell that experience a CRE, divided by the book value (outstanding principal) of all assets exposed in the cell (for a precise description of how to calculate the exposure, please refer to 1.C.4 of this Appendix). This measure can be derived by $ volume or by number of assets.

Equivalently, the economic loss per unit of exposure may be expressed as the product of the incidence and loss severity by amount (number) for the cell.

It may be interpreted (after multiplying by 10,000) as the cost, in basis points, of credit risk in the particular year. In other words, it is the reduction of investment yield on the exposed assets, compared to their contractually promised yield, caused by the occurrence of CREs on the exposed assets during the particular year.

3. Loss Statistics

Consistent with the model, the following loss statistics are calculated for each exposure year. The primary analysis in the report is done by amount for Loss Severity and Economic Loss per unit of Exposure. These measures were also available by number in the experience database used to develop this report.

a) Incidence rate by number, IR#:

$$IR^{\#} = \frac{Number\ of\ CREs\ in\ cell}{Total\ number\ of\ Exposure\ units\ in\ cell}$$

b) Incidence rate by amount, IRAmt:

$$IR^{Amt} = \frac{Amount\ of\ CREs\ in\ cell}{Total\ amount\ of\ Exposure\ in\ cell}$$

c) Loss Severity, LS:

$$LS = \frac{Economic\ Loss\ for\ cell}{Amount\ of\ CREs\ in\ cell}$$

d) Economic Loss per unit of Exposure, EL/E:

$$\frac{EL}{E} = IR^{Amt} * LS = \frac{Economic\ Loss\ for\ cell}{Total\ amount\ of\ Exposure\ in\ cell}$$

4. Loss Statistics Calculations

This subsection provides a detailed description of the general formulas listed in 1.C.3 just preceding this. These more detailed formulas apply to the determination of the measures by amount. They can be modified easily for comparable measures by number. The formulas apply to all CREs held by all companies for a particular calendar year, t. They can be modified to capture any prescribed cell such as an industry type, a rating, or the aggregate of the data. A hypothetical example of the calculations is provided following the generalized formulas.

The CRE cashflow experience of one company is used to represent other companies' experience when a CUSIP is owned by more than one company. This approach was used to minimize the data submission requirements of participating companies. The company that provides the cashflows is referred to as the proxy company. The present value of the cashflows is dependent on each company's reported quality rating of the CUSIP at acquisition, or earliest rating, and at the time of the CRE as described in the subsection below.

$$Incidence\ Rate_t = \frac{\sum_i OP_t^{CRE_i}}{TotalOPExposure_t}$$

Where:

CREi = an asset, with a unique CUSIP, that resulted in a credit risk event.

i = a counter for each unique CUSIP that resulted in a credit risk event, CREi. Will vary from 1 to the total number of CREs in this study.

t = calendar year of the CRE.

$OP_t^{CRE_i}$ = Total Outstanding Principal, (OP), of CREi, occurring in year t for all companies holding CREi

$$= (\ ParValue_{LCD}^{Co\#,CRE_i}/ParValue_{YE-1}^{Co\#,CRE_i}\ )*(\sum_j OP_{YE-1}^{CO_j,CRE_i}\ )$$

Where: Co# is the proxy cashflow company for all companies holding the same asset. The purpose of the par value adjustment is to allow for principal payments that are made after year-end, but before the LCD. Ideally, this adjustment would be based on a ratio of outstanding principal, but those values were not available in the database at the LCD. The par value change before the LCD, if any, is gathered from the submitted CRE cashflows. The adjustment reduces the sum of outstanding principal of the CREs for all companies at year-end to what it was at the time of the CRE.

YE = year-end date of the current calendar year t.

j = a counter for each company, Coj, holding CREi.

$TotalOPExposure_t = Total\ Outstanding\ Principal\ Exposed\ in\ Year\ t$

The calculation of exposure is based on year-end values of outstanding principal and the outstanding principal that has a CRE in calendar year t as follows:

a) Assets that are not credit risk events

    i.   Assets in both year-end t-1 and year-end t exposure data files

$$Exposure_t = (OP_{YE-1} + OP_{YE})/2$$

    ii.   Assets only in year-end t-1 exposure date file (e.g., maturity)

$$Exposure_t = (OP_{YE-1})/2$$

    iii.   Assets only in year-end t exposure data file (e.g., new acquisition during year)

$$Exposure_t = (OP_{YE})/2$$

b) Assets that incurred a credit risk event during year t

$$Exposure_t = \sum_i OP_t^{CRE_i}$$

This is the same formula that is used for the numerator of the Incidence Rate.

c) Assets that incurred a credit risk event prior to year t

$$Exposure_t = 0$$

Aggregate exposure is the sum of the exposure for the individual assets. Exposure by number of assets is calculated using the same principles.

$$Loss\ Severity_t = \frac{\sum_i EL_t^{CRE_i}}{\sum_i OP_t^{CRE_i}}$$

Where:

$$EL_t^{CRE_i} = \text{Economic Loss of } CRE_i \text{ occurring in year } t$$

$$= \left(\sum_j OP_t^{Co_j,CRE_i} * \left[1 - PVRCF_{ValDate}^{Co_j,CRE_i} \Big/ \left\{ \left(\frac{ParValueRCF_{LCD}^{Co\#,CRE_i}}{ParValueOCF_{LCD}^{Co\#,CRE_i}} \right) * \left(PVOCF_{ValDate}^{Co_j,CRE_i} \right) \right\} \right] \right)$$

Where:

a. $OP_t^{Co_j,CRE_i}$, is a subset of $OP_t^{CRE_i}$ as defined for the Incidence Rate calculation. It is the total outstanding principal (OP) at the time of CRE_i, occurring in year t for company j holding CRE_i.

b. $ParValueRCF_{LCD}^{Co\#,CRE_i}$ is the par value of CRE_i held by the proxy cashflow company, Co#, in year t at the LCD. Whereas the CRE date is substituted for the LCD in determining the Incidence Rate when the CRE is caused by bankruptcy and that data is available, no substitution is made for this value. It is always based on the par value at the LCD.

c. $ParValueOCF_{LCD}^{Co\#,CRE_i}$ is the par value of CRE_i held by Co# in year t assuming payments since inception followed their expected schedule at inception of the security. Generally, the par values of the original and revised cashflows will be equal unless unscheduled principal payments are made or scheduled principal payments are not made before the LCD.

d. $PVOCF_{ValDate}^{Co_j,CRE_i}$ is Company j's present value at the valuation date of the proxy cashflow company's original cashflows of CRE_i occurring in year t valued using the Company j's rating of the asset at acquisition.

e. $PVRCF_{ValDate}^{Co_j,CRE_i}$ is Company j's present value at the valuation date of the proxy cashflow company's revised cashflows of CRE_i occurring in year t valued using Company j's rating of the asset at the time of the CRE.

The present value of original cashflows is normalized with the ratios of par values shown to adjust for unscheduled principal payments made or scheduled payments not made as respects the original and revised cashflows of the proxy cashflow company.

Sample Calculations - All samples are hypothetical and not actual 2008 results.

2008 Incidence Rate:

Start by deriving measures to support Incidence Rate by amount calculations.

First derive total Outstanding Principal (OP) exposed in 2008 that had a CRE. Calculation of CRE1 exposed outstanding principal is shown below.

Assume the following for CRE1:

CRE$_1$ LCD = 5/14/2008					
		Outstanding Principal from Exposure File	Par Value from Revised Cashflows		Outstanding Principal at CRE
		12/31/2007	12/31/2007	5/14/2008	
		(000's)	(000's)	(000's)	(000's)
Company					
1		10,000			9,857
2		14,750			14,539
3	= Co3	7,000	7,000	6,900	6,900
4		40,000			39,429
5		23,000			22,671
Total		94,750			93,396

$$OP^{CRE_1}_{2008} = 94{,}750*(6{,}900/7{,}000) = 93{,}396$$

This is the amount of exposed outstanding principal for 2008 attributable to CRE1. Company 3, Co3, is the proxy cashflow company. Companies 1, 2, 4, and 5 use the ratio of par value change of Co3 to state their outstanding principal at the CRE.

Follow the same process to determine the exposed outstanding principal for all other 2008 CREs.

Assume the following for the other 2008 CREs, 2 - 8:

2008 CREs	$OP^{CRE_i}_{2008}$ (000's)
1	93,396
2	23,500
3	17,800
4	55,600
5	32,600
6	45,400
7	12,200
8	16,100
Total	296,596

This is the total outstanding principal exposed in 2008 that had a CRE. It is a consolidated view that lists the total of each of the CREs 1 - 8 held by all companies. The individual positions comprising the eight CREs are shown in the fifth table in this subsection.

$$\sum_i OP^{CRE_i}_{2008} = 296,596$$

Derive Total 2008 Exposure for Outstanding Principal (amount) and CUSIPs (count)

Assume the following:

End of Year:	2007 Outstanding Principal (000's)	2008 Outstanding Principal (000's)	2007 CUSIP Count	2008 CUSIP Count
Assets That Are Not CREs:				
Assets Held Begin and End of 2008	20,634,000	20,640,000	1,094	1,105
Assets Only Held Begin of 2008	2,579,250		156	
Assets Only Held End of 2008		2,837,180		164
Assets That Have Had a CRE:				
Assets with a CRE During 2008	296,596	222,447	17	13
Assets with a CRE Before 2008	1,186,780	949,109	68	54
Total 2008 Exposed OP		23,641,811		1,277

$$TotalOPExposure2008 = (20{,}634{,}000 + 20{,}640{,}000)/2 + 2{,}579{,}250/2 + 2{,}837{,}180/2 + 296{,}596$$

$$= 23{,}641{,}811$$

$$\textit{2008 Incidence Rate by Amount} = \frac{\sum\limits_{i} OP_{2008}^{CRE_i}}{TotalOPExposure_{2008}} =$$

$$(296{,}596/23{,}641{,}811) =$$

$$= 1.25\%$$

Assume the data from the above table to derive incidence by number.

Total Count Exposure = (1,094 + 1,105)/2 + 156/2 + 164/2 + 17 = 1,277

2008 Incidence Rate by Number = 17/1,277 = 1.33%

2008 Loss Severity:

Start by deriving the Economic Loss amount for a CRE-Company combination, e.g., CRE1 for Company 3, the proxy company, also referred to as Co#.

The Economic Loss calculation for Company 3's holding of CRE1 uses data from the first table in this subsection,

Outstanding Principal at Prior Year-end = 7,000

Par Value of Revised Cashflows at LCD = 6,900

Par Value of Revised Cashflows at Prior Year-end = 7,000

and the following values:

Present Value of Revised Cashflows = 5,040

Par Value of Original Cashflows at LCD = 7,000

Present Value of Original Cashflows = 7,200

$$= [(7{,}000)*(6{,}900/7{,}000)]*[1 - 5{,}040/((6{,}900/7{,}000)*7{,}200)] = 2{,}000$$

The first table in this subsection provides all values in the first bracket in the formula above. The value of 7,000 in the first set of brackets is the outstanding principal at the year-end before the LCD. The ratio of (6,900/7,000) in the first set of brackets is with respect to par values at the year-end before the LCD and at the LCD. The par value at the prior year-end to the LCD is calculated by adding principal payments paid, if any, after the year-end through the valuation date per the revised cashflows.

The ratio of (6,900/7,000) in the second set of brackets is the par value of the revised, (actual) and original, (scheduled or expected), cashflows at the LCD. The present value of the original cashflows are scaled by this ratio to make them comparable to the present value of the revised cashflows.

It is coincidental in this example that the outstanding principal at the year-end before the LCD, the par value at the prior year end based on the revised cashflows, and the par value of the original cashflows at the LCD are all equal to 7,000. Although these values are related to each other, they do not have to be the same.

Note that since the proxy cashflow company is the only source of the cashflows for all companies owning the asset, both the first and second ratios in parentheses in this formula are always based on the proxy cashflow company's experience that is shared with the other companies that did not report cashflows on a given asset. Conversely, each company uses its own present value of the original (PV OCF) and revised cashflows (PV RCF), which are based on the proxy cashflow company's cashflows, but valued using asset ratings designated by each company holding the asset.

The table below shows values for all of the companies comprising the Economic Loss calculation of CRE1. The values for $OP_{2008}^{Co_j,CRE_1}$, PV OCF and PV RCF, are specific to each company.

CRE₁ Company Economic Loss

Company	$OP_{2008}^{Co_j,CRE_1}$	PV OCF	PV RCF	Economic Loss	
				%	Amount
	(000's)	(000's)	(000's)		(000's)
1	9,857	7,345	5,040	30.4%	2,995
2	14,539	7,056	5,005	28.0%	4,077
3	6,900	7,200	5,040	29.0%	2,000
4	39,429	7,200	5,000	29.5%	11,651
5	22,671	7,100	5,039	28.0%	6,348
Total					27,071

The sum of the Economic Loss from CRE1 for all companies is $EL_{2008}^{CRE_1}$ = 27,071.

The loss percentage by company is derived per the following formula:

$$= (\sum_j OP_t^{Co_j,CRE_i} * [1 - PVRCF_{ValDate}^{Co_j,CRE_i} / \{(\frac{ParValueRCF_{LCD}^{Co\#,CRE_i}}{ParValueOCF_{LCD}^{Co\#,CRE_i}}) * (PVOCF_{ValDate}^{Co_j,CRE_i}$$

$$)\}])$$

where for all companies:

i = 1

$$ParValueOCF_{LCD}^{Co\#,CRE_1} = 7,000$$

$$ParValueRCF_{LCD}^{Co\#,CRE_1} = 6,900$$

Since each company uses its own asset ratings applied to the proxy company cashflows, each company can have a different loss percentage. The Company 1 Economic Loss % is:

$$= [1 - 5,040/((6,900/7,000)*7345)] = 30.387\%$$

The Economic Loss Amount is the outstanding principal at the time of the CRE times the Economic Loss %.

$$= 9,857*30.387\% = 2,995$$

The table below shows the combined company loss severity rate calculation by amount and number (also referred to as by count). CRE 1 data from the table above is listed along with corresponding information for CREs 2 - 8. The CRE amounts owned by each company, $OP_{2008}^{CRE_i,Co_j}$, total to the amount shown for each of the eight CREs in the second table in this subsection. The CRE 1 loss percentage data is determined as described in the explanations accompanying the table above. The CUSIP loss percentage values for CREs 2 - 8 in this table are not explicitly calculated as part of this demonstration.

CRE	Company	$OP_{2008}^{CRE_i,Co_j}$ (000's)	CUSIP Count	CUSIP Loss %	$EL_{2008}^{CRE_i,Co_j}$ (000's)
1	1	9,857	1	30.4%	2,995
1	2	14,539	1	28.0%	4,077
1	3	6,900	1	29.0%	2,000
1	4	39,429	1	29.5%	11,651
1	5	22,671	1	28.0%	6,348
2	4	7,000	1	67.0%	4,687
2	7	16,500	1	57.1%	9,413
3	3	17,800	1	11.6%	2,057
4	5	6,950	1	37.0%	2,572
4	7	24,325	1	29.0%	7,054
4	8	24,325	1	29.0%	7,054
5	3	27,943	1	71.0%	19,839
5	9	4,657	1	64.0%	2,981
6	1	45,400	1	20.0%	9,080
7	6	12,200	1	10.0%	1,220
8	5	14,950	1	79.5%	11,885
8	8	1,150	1	86.5%	995
Total		296,596	17	706.5%	105,908

This is the total economic loss in 2008 for all CREs.

$$\sum_i \sum_j EL_{2008}^{CRE_i,Co_j} = 105,908$$

The corollary measure by count is

$$\sum_i \sum_j CusipLoss\%^{CRE_i,Co_j}$$

$$= 706.5\%$$

2008 Loss Severity by amount

$$= \frac{\sum_i EL^{CRE_i}_{2008}}{\sum_i OP^{CRE_i}_{2008}} = 105,908/296,596 = \mathbf{35.7\%}$$

2008 Loss Severity by number

= Average of CRE % Loss = 706.5%/17 = 41.6%

2008 Economic Loss Rate per unit of Exposure:

2008 Economic Loss Rate per unit of Exposure by amount

= Incidence Rate * Loss Severity

$$= \frac{\sum_i OP^{CRE_i}_{2008}}{TotalOPExposure_{2008}} * \frac{\sum_i EL^{CRE_i}_{2008}}{\sum_i OP^{CRE_i}_{2008}} = (105,908/23,641,811) = \mathbf{.45\%}$$

2008 Economic Loss Rate per unit of Exposure by number

= (17/1,277)*(707.5%/17) = 706.5%/1,277 = .55%

5. Cashflow Discounting

The determination of the interest rates to use to calculate the present values of the original and revised cashflows is a critical component because the ultimate quantification of the economic loss depends upon the interest rates used. There are different possible approaches to determining these rates. The following summarizes the approach used.

Set the interest rate by period as the yield curve spot rates derived from the sum of the associated Treasury rates and spreads determined as follows:

a) The rate source for the Treasury rates is the St. Louis Federal Reserve H.15 Treasury constant maturities.
b) The spreads were determined for calendar quarter-end valuation dates from 3/31/2002 through 12/30/2015. The present value of the combined original and revised cashflows discounted using the term structure of spreads was used to solve for the equivalent level spread. For this purpose, A, AA, and AAA spreads were weighted 70%, 25%, and 5%, respectively, to determine the combined AAA-A spread. The spreads are shown in the table below.

Table 33
Spread in Basis Points

Date	AAA-A	BBB	BB	B and Below
3/31/2002	214	269	513	743
6/30/2002	179	290	444	548
9/30/2002	207	298	573	951
12/31/2002	170	290	581	1,031
3/31/2003	162	272	549	950
6/30/2003	157	264	497	806
9/30/2003	117	232	441	960
12/31/2003	121	184	413	1,073
3/31/2004	126	177	267	508
6/30/2004	135	224	415	602
9/30/2004	133	163	378	616
12/31/2004	95	160	313	706
3/31/2005	96	125	181	383
6/30/2005	96	135	315	951
9/30/2005	86	149	271	879
12/31/2005	90	133	205	489
3/31/2006	97	127	284	618
6/30/2006	88	120	231	650
9/30/2006	87	130	305	619
12/31/2006	88	132	254	642
3/31/2007	73	119	352	640
6/30/2007	89	115	213	603
9/30/2007	119	162	358	984
12/31/2007	168	210	392	792
3/31/2008	251	303	528	986
6/30/2008	266	284	477	1,010
9/30/2008	330	335	733	1,085
12/31/2008	464	634	965	1,813
3/31/2009	359	536	776	651
6/30/2009	251	438	581	331
9/30/2009	320	283	706	1,338
12/31/2009	240	235	556	1,186
3/31/2010	176	228	435	1,481
6/30/2010	170	254	539	1,307
9/30/2010	150	253	661	1,204
12/31/2010	171	280	551	834
3/31/2011	129	175	457	627
6/30/2011	125	198	410	965
9/30/2011	126	278	517	1,140

Date	AAA-A	BBB	BB	B and Below
12/30/2011	206	319	811	1,022
3/30/2012	191	250	534	851
6/30/2012	191	242	379	590
9/30/2012	159	229	416	473
12/30/2012	118	294	454	416
3/30/2013	125	195	379	782
6/30/2013	111	221	404	471
9/30/2013	118	210	388	476
12/30/2013	125	199	371	481
3/30/2014	86	141	301	397
6/30/2014	99	172	298	400
9/30/2014	113	161	333	439
12/30/2014	128	199	379	725
3/30/2015	125	191	377	507
6/30/2015	130	184	383	535
9/30/2015	137	211	395	517
12/30/2015	147	220	391	555

The data used to develop the spreads is based on public corporate bond spreads and data provided by ACLI for private placement spreads at issue. Ideally, a full term structure of spreads would be used to develop the cashflow present values, but consistency of the supplied spreads at that degree of granularity did not support the use of a full term structure. For similar reasons of data consistency and a high concentration of A-rated assets, AAA, AA, and A ratings were combined into one rating group.

The loss severity calculation uses economic loss as an input, which is the difference of the present value of the original cashflows (the maximum amount that can be lost) and the present value of the revised cashflows (the amount recovered); see prior subsection for details. The present value of the original cashflows, PVOCF, is designed to use the current spread of the quality rating at acquisition. The present value of the revised cashflows, PVRCF, is designed to use the spread of the quality rating at the CRE. The spread difference contributes to capturing a market value-like difference of the asset in a before and after CRE state. The other contributing factor is the difference of the revised cashflows to those originally expected.

Data substitutions are made to the design of cashflow present values. As applicable, the earliest known reported rating is used if the rating at acquisition is not known. For all CREs, the quality rating at the year-end before CRE is used for the rating at the CRE. That is not ideal, but given that credit deterioration often affects ratings well before an actual default, much of the rating deterioration effect in the loss severity calculation is likely to be captured.

The valuation date of the cashflow present values is the most recent received interest or principal amount before the LCD. This point is selected to include interest that would be earned at the time of the CRE in the loss measures. Cashflow on the valuation date is excluded from the present values. Modifications are made as appropriate. For example, the valuation date of a zero-coupon bond is the LCD because, until a default occurs, interest is assumed to be earned with the amount defaulting equal to the accreted value on the LCD.

The quarter-end rate series used is the one that is closest to the valuation date. The formulas for PVOCF and PVRCF are shown below.

Equation (1)

$$PVOCF_{ValDate}^{CRE_i} = v_1^{t_1} * OCF_1 + v_2^{t_2} * OCF_2 + \dots + v_j^{t_j} * OCF_j + \dots + v_n^{t_n} * OCF_n$$

Where

$$v = \frac{1}{(1 + \frac{i_j^{(j)}}{2})^2}$$

$i_j^{(2)}$ = the spot rate for date j derived from the Treasury constant maturity plus spread yield curve defined above (assuming nominal annual rates compounded semi-annually)

t_j = (number of months from valuation date to date j)/12

date j = jth payment date

OCFj = jth original cashflow

n = number of remaining scheduled cashflows after the valuation date

Equation (2)

$$PVRCF_{ValDate}^{CRE_i} = v_1^{t_1} * RCF_1 + v_2^{t_2} * RCF_2 + \dots + v_j^{t_j} * RCF_j + \dots + v_k^{t_k} * RCF_k$$

RCFj = jth revised cashflow

k = number of revised cashflows after the valuation date

Notes:
The $v_j^{t_j}$ in Equations 1 and 2 usually are different from one another because the PVOCF and PVRCF use quality ratings from different points in time to select the current spread. The PVOCF uses the quality at acquisition, whereas the PVRCF uses the quality at the CRE. All payments are assumed to be made on the same day of the month. This results in an integral number of months from the valuation date to any payment date.

1.D DATA VALIDATION

Several checks were done to validate submitted exposure, CRE cashflow, and CRE characteristic data. The exposure data was analyzed in a multi-stage review process. The CRE data was examined as each CRE's set of cashflows was processed, peer reviewed, and then subjected to additional reasonableness checks. These processes were applied when the 2003-2012 study was done and applied for this report to the 2013-2015 data. They were also re-applied on a limited basis to the 2003-2012 data for this study.

1.D.1 EXPOSURE FILE

The initial exposure file check of 2013-2015 data used automated edits to check for syntax, logic, and consistency of inter and intra-company records. All fields had at least one file check, or flag, associated with them. The first set of flags was used to identify data gaps that could potentially be filled using S&P Global Market Intelligence (previously known as SNL Financial) as a third-party data source of publicly available information from life insurance company Schedule D's. That data was used to backfill some gaps in the exposure file. After the SNL data was inserted, a new round of flags was produced. Based on this revised set of flags, contributors were asked to fill in missing pieces (as feasible) and respond to specific flag findings that indicated potential data inconsistencies. When all contributor input was finalized, the exposure file was scrubbed with automated processes as a final step to prepare it for analysis.

Automated rule sets were applied without contributor involvement or input to make a final adjustment to the data where inferences could be made. These adjustments were applied to "static" fields which, by their nature, should have the same value for a CUSIP in a given year, e.g., NAIC rating, or across years, e.g., country of domicile. As applicable, static fields were first aligned within each contributor's data. If a determination could not be made within a contributor, a DQ1 value was assigned to that field and year. Where CUSIPs were commonly held, rule-sets were applied to determine, as feasible, a value that could be for a given year, or for all years depending on the type of static variable. The general rule was that, where a CUSIP was commonly held, the value or parameter stated by more than 50% of the holders became the assigned value. For this purpose, DQ1 and null submissions were excluded from the count to determine the percentage a parameter was stated by the commonly-holding contributors of a CUSIP. Where a contributor submitted null values and other contributors' data was successfully used to determine a valid value, the null value was replaced with the valid value. Where a value could not be determined, e.g., only two contributors held the CUSIP, and they differed, then a DQ2 value was assigned (in the instance of a DQ2, null values were not changed).

After the adjustments were completed, a before and after review of the mix of values within each static field was done. The "after" or adjusted basis was deemed a reasonable data adjustment if the overall distribution of values was not unexplainably altered. In this manner, the data was enhanced while retaining its fundamental character. The following fields were reviewed using this procedure: current NAIC rating, maturity year, current coupon, seniority, industry type, asset type, country of domicile, and currency type. The following fields were reviewed only within contributor: internal rating (applicable only for contributors that report more than one CUSIP record per year) and funding year. The original data submissions (as modified by previous authorized changes) were saved and corresponding revised fields, referred to as study fields, were created. This is a standard operating procedure for SOA experience studies to maintain the integrity of company data and be able to reconstruct what modifications were made.

In addition to field data revisions, the data review also revealed two asset types during the 2003-2012 study that were subsequently reviewed by all contributors at that time. They were treated the same way in the 2003-2015 study. The contributor review for the 2003-2012 study resulted in the elimination of Capital Company Programs (CAPCOs) from the study data. These assets are state-sponsored private venture capital funds that must invest in small businesses. The funds provide an ongoing non-guaranteed return through premium tax credits. Because the securities do not have an interest payment element, they were taken out of the study. State lottery annuities were also identified in the data. Because the contributors' opinions to retain them was not unanimous, these assets were left in the study, but because less than five companies supplied lottery deals, it was decided to exclude the indicator from the final database used for analysis to protect contributor confidentiality. Other assets were also eliminated from the data when their asset type did not qualify for inclusion, i.e., money market funds and asset-backed securities.

1.D.2 CRES

CRE characteristic data and the associated cashflows were also extensively reviewed. Generally, the characteristic files, which were submitted at an earlier stage of the project, were used to corroborate and fill in some of the needed information to determine the present value of the cashflows. When there were inconsistencies between the cashflows and the characteristic data, contributors were asked to explain the reasons for them or supply revised data. In some cases, the initially supplied cashflows did not meet the minimum standards to process. They were returned to the contributor for subsequent resubmission. Generally, there were very few problems with resolving 2013-2015 CRE data because there were only 13 CREs.

Each 2003-2012 CRE CUSIP was coded by SOA staff, MIB, or a contracted consultant to the project to determine the present values of the original and revised cashflows. As noted under Section 1.C, Actuarial Methodology, in this Appendix, where a CUSIP is owned by more than one contributor, one company's cashflows, the proxy company, was used for all companies owning that CUSIP. The cashflows were subjected to a rigorous review for consistency between the cashflows supplied and the associated characteristic data. Attention was given to the remaining loaned amount equating to the projected repaid par value amounts for the original cashflows and, as feasible, for the revised cashflows, too. Generally, each CRE cashflow processor worked to validate the consistency of key variables, i.e., funding date, maturity date, loss calculation date, and coupon of the cashflows with other corroborating data. The primary source for this was the characteristic data, but the exposure file was also used in some instances. Each CRE was peer reviewed as part of this process. Before or after a peer review, unresolved questions were posed to the contributors. Any changes to submitted cashflows were only made at the direction of a contributor. This process was re-applied for the 2013-2015 CREs, except that the team involved was smaller and each company submitted its own cashflows for each CRE.

The initial submissions of identified 2003-2012 CREs resulted in some conflicts with regard to whether a CUSIP experienced a CRE when it was owned by two or more companies. Because a unanimous view of the yes/no CRE status of all CUSIPs is critical to the study, the conflicts were resolved with direct contributor input. All contributors involved in a conflict for each CUSIP were asked to submit the rationale for their view. In some instances, opinions changed, which resolved some of the conflicts. After the revised yes/no views were compiled, the remaining CUSIPs in question were reviewed individually by a

subgroup of investment professionals from the contributing companies. Their determinations, through the authority of all contributors, resolved any remaining conflicts.

The low number of 2013-2015 CREs generated a re-check of the 2003-2012 CREs and a review of submitted 2013-2015 CREs for determination of their status as a CRE. Several discussions were held with the contributors and committee members about the nature of events to determine qualification as a CRE. The re-check of the 2003-2012 CREs resulted in revised values of some CRE amounts. While no CRE CUSIP loss severity percentage changed (CRE coding was unchanged), the CRE amount changed for some CUSIPs. These revisions were made based on synchronizing the independently submitted CRE exposure file amount and the implied CRE amount at the loss calculation date in the CRE cashflow coding. There were offsetting errors that decreased total 2003-2012 CREs by $9.5 million, which was 0.2% of the total CRE amount for those years. There was no material effect on the analysis from this revision.

Appendix 2: Committee Members

The Committee and Society of Actuaries staff would like to extend a special thanks to all of the participating companies for their patience and hard work in making this report possible. Without their support, such research projects would not be possible. Their contributions led to the development of these analyses, which provide important experience for valuation, pricing and evaluation. A list of the participating companies is shown in Section 1.3 of this report.

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