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The Relationship between Ratings and Default (2009) - Default Ratio and Rating Transition Matrix -

Rating & Investment Information, Inc. (R&I) has updated its default ratio by adding rating and default data for FY2008. The survey covers a total of 1,423 issuers rated by R&I from April 1, 1978 to April 1, 2008. There were five default cases (legal bankruptcy) during FY2008 (April 1, 2008 to March 31, 2009). The default ratio has generally risen from FY2007.

1. Definition of default

The following events are defined as a default. As a rule, the facts are confirmed from press reports in national newspapers, the brief statement of financial results following the end of a fiscal period or the fiscal year financial statements.

The definition of default takes into consideration a situation in which the pledge of the obligor to creditors concerning the issuer's financial obligations is not fulfilled. Legal bankruptcy means either the obligor itself or a third party petitions for application of the Bankruptcy Law or other bankruptcy statutes. Abandonment of claims, debt-equity swaps, reductions in interest rates and extensions of the principal or interest payment date, on the other hand, are regarded as restructuring of financial obligation. R&I may consider debt-equity swaps of obligations held by a holding company as a default of its subsidiary on a case-by-case basis.

- (1) Legal bankruptcy
- (2) Failure to perform payment on a financial obligation
- (3) Petition for or implementation of restructuring of a financial obligation substantially disadvantageous to creditors

2. Issuers Covered

As a rule, the sample of issuers covered includes all of the issuing entities domiciled in Japan that received an R&I rating. Sovereign issuers, local government bodies, life insurance companies and issuers of asset-backed securities, however, are excluded. The sample also encompasses schools and investment companies (such as J-REIT). Altogether, there were 1,423 such issuers during the period from April 1, 1978 to April 1, 2008, of which 673 had ratings as of April 1, 2008.

3. Ratings

The ratings used for the default ratio calculation are Issuer Ratings. The calculation does not include insurance claims paying ability or short-term ratings. It also excludes ratings for bonds backed by guarantees by parent companies, banks, or financial guarantee companies. For the fiscal years through March 31, 1998, the calculation uses ratings issued by the Japan Bond Research Institute (JBRI) and Nippon Investors Services (NIS), the two companies that merged to form R&I. It also includes publicly announced trial ratings assigned prior to these two companies' commencement of business ratings. In instances when there are ratings from both JBRI and NIS, the lower of the two ratings is used.

When R&I assigns an Long-term Issue Rating, it first analyzes that company's default risk to determine the likelihood the issuer will fall into default or other management difficulties (default risk analysis). The next step is to analyze recovery risk, which means gauging the likely extent of the recovery of the principal of corporate bonds and other specific obligations in the event of default (recovery risk analysis). Analysis of default risk constitutes the essence of the rating process. Such analysis evaluates an issuer's ability to meet all of its financial obligations, and

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Credit ratings are statements of R&I's opinions regarding an issuer's general capacity to repay its financial obligations and its individual obligations (creditworthiness) and are not statements of fact. Further, R&I does not state its opinions about any risks other than credit risk, give advice regarding investment decisions or financial matters, or endorse the merits of any investment. R&I does not undertake any independent verification of the accuracy or other aspects of the related information when issuing a credit rating and makes no related representations or warranties. R&I is not liable in any way for any damage arising in relation to credit ratings (including amendment or withdrawal thereof). As a general rule, R&I issues a credit rating for a fee paid by the issuer. For details, please refer to <http://www.r-i.co.jp/eng/about.html>.

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represents an evaluation of company's creditworthiness. The rating at this stage, known as an Issuer Rating, is used for the default ratio.

<Definition of the Issuer Rating>

In principle, an Issuer Rating is R&I's opinion on an issuer's overall capacity to repay its financial obligations as agreed and is assigned to all issuers.

4. Calculation Method

To reflect corporate mergers and divisions in the default statistics, R&I introduced two rules for the latest statistics to address succession and termination of inclusion in the survey. In the process of preparing the default ratio and Rating Transition Matrix, R&I adopted the concept of cohorts for both measures. Each cohort is a group composed of issuers for which R&I had issued a rating at a certain point in time. Specifically, for each year from 1978 to 2008, all of the issuers that had a rating on April 1 were organized into a cohort for that respective year. For the process of creating the default ratio and the Rating Transition Matrix, R&I surveyed the changes in Issuer Ratings and occurrences of default within a cohort for each year passed.

To address successions, when an issuer merges or divides R&I will determine which firm to include in future surveys according to the successor to the financial obligation. For mergers, the post-merger firm will be surveyed because the post-merger firm will succeed to the obligations of the pre-merger firms. In cases of corporate division, R&I will decide which corporation to include by focusing on the size of the obligations taken over by the successor entities. When a new enterprise group is formed through business reorganization, however, R&I will make its decision by considering the capital procurement structure of the group. For example, when a certain firm establishes a new holding company and the holding company becomes the main capital procurement entity, R&I will follow the holding company regardless of which firm succeeds to the debt obligation.

When the corporate character of Issuer A that had a rating in a given year is extinguished through a merger in the following year and the merger counterparty B is the surviving entity, under R&I's former methodology the Issuer A was treated as "unrated" one year later. After introducing the succession methodology, R&I will treat the rating of merger counterparty B (if a rating has been assigned) as the rating of Issuer A after one year. If merger counterparty B defaults after four years, this will be totaled in the statistics as a default by Issuer A after four years.

When monitoring the occurrence of a default becomes difficult, R&I will cease including the issuer in the statistics. When a firm that no longer has a rating becomes a wholly-owned subsidiary of another operating company and sufficient information can no longer be obtained, or when several corporations succeed to an obligation in the case of a corporate division and it becomes difficult to determine adequately which firm to include in the survey as the successor, R&I will no longer track the firm. For the specific methodology used to terminate inclusion in the survey, please refer to the default ratio calculation method described below. Note there is no relationship between a decision to terminate inclusion in the statistics and a decline in the creditworthiness of the firm.

<Default Ratio by Cohort>

The results from examining the relationship between the rating and default for each cohort are shown in Appendix 1. The time axis is divided into intervals of one-year periods. The one-year default ratio is determined by dividing the number of issuers that defaulted in each period by the number of issuers at the beginning of the period. The one-year non-default ratio (one-year survival rate) is then determined for each past period by subtracting the one-year default ratio from 1. In addition, the cumulative survival rate for multiple years is determined by multiplying the one-year survival rates. The cumulative default ratio is determined by subtracting the cumulative survival

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rate from 1. This is further explained by the mathematical expression shown below. For the group of issuers with rating i belonging to cohort c , the one-year survival rate after t year(s) since the cohort was composed, $S(c,i,t)$, is determined as shown below.

$$S(c,i,t) = 1 - \frac{d(c,i,t)}{u(c,i,t-1)}$$

In this expression, $d(c,i,t)$ is the number of issuers that belong to cohort c , had rating i when the cohort was composed and defaulted during the one-year period after $t-1$ year(s) since the cohort was composed. $u(c,i,t-1)$ is the number of issuers that belong to cohort c , had rating i when the cohort was composed and those who still remain to be traced after $t-1$ year(s) since the cohort was composed. (These are the number of issuers that had not defaulted and those who remained to be traced for the survey until then.) Therefore $S(c,i,t)$ shows the one-year period survival rate (non-default ratio) for cohort c , rating i , after $t-1$ years since the cohort was composed. The T year(s) cumulative default ratio $D(c,i,T)$ for cohort c , rating i is then stipulated as follows.

$$D(c,i,T) = 1 - \prod_{t=1}^T S(c,i,t)$$

< Average Cumulative Default Ratio >

Appendix 2 shows the average cumulative default ratios calculated from the cohorts from 1978 to 2008. The average cumulative default ratio is determined by first calculating the average of the one-year survival rate of all cohorts weighted by the number of issuers which was used to calculate each one-year survival rate. Next, the average cumulative survival rate is obtained by multiplying the average one-year survival rates, and finally, the average cumulative default rate is determined by subtracting this result from 1.

For the issuer group with rating i , the average one-year survival rate $S(i,t)$ is determined as

$$S(i,t) = \frac{\sum_{c \in \{1978, 1979, \dots, 2008-t\}} u(c,i,t-1) \times S(c,i,t)}{\sum_{c \in \{1978, 1979, \dots, 2008-t\}} u(c,i,t-1)}$$

The t year(s) average cumulative default ratio $D(i,T)$ for rating i is determined as follows.

$$D(i,T) = 1 - \prod_{s=1}^T S(i,s)$$

Users of this statistic must note carefully the fact this cumulative average default ratio does not illustrate the default ratio at any given time in the past.

5. The Rating Transition Matrix

The rating transition matrix shows how ratings assigned to issuers composing a cohort have changed over a certain period of time. Table 1 is a concrete example of a rating transition matrix. The table indicates what specific issuer ratings as of April 1, 2004 had become one year later, on April 1, 2005. For example, on April 1, 2004, there were 61 issuers with a BBB- rating. Of these, 43 still had a BBB- rating on April 1, 2005, 10 had been upgraded to BBB, and 1 had been downgraded to BB+. The 7 remaining companies did not have ratings as of April 1, 2005, mainly because their rated bonds had been redeemed.



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There are instances when an issuer has a rating while it has been counted as a case of default. Such issuers are categorized as an instance of default in Table 1. For example, even when an issuer has an actual rating of B+, it will be tallied in the “Default” column and not in the column for a B+ rating if that issuer fits the definition of default.

Table 1: Sample Rating Transition Matrix

First survey year		Rating on April 1 of the final survey year																	Number of issuers with no rating on April 1 of the final survey year		Number of issuers ceased to be counted by April 1 of the final survey year					
2004 to	2005	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	CCC+	CCC	CCC-	CC	C	Default	(N.R)	Lost	Total
Rating on April 1 of the first survey year	AAA	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	8
	AA+	0	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
	AA	0	1	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	36
	AA-	0	0	1	36	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	40
	A+	0	0	1	1	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	67
	A	0	0	0	0	5	59	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	69
	A-	0	0	0	0	0	19	89	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	113
	BBB+	0	0	0	0	0	0	8	65	5	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	85
	BBB	0	0	0	0	0	1	6	50	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	65
	BBB-	0	0	0	0	0	0	0	10	43	1	0	0	0	0	0	0	0	0	0	0	0	0	7	0	61
	BB+	0	0	0	0	0	0	0	0	3	10	0	0	0	0	0	0	0	0	0	0	0	0	5	0	18
	BB	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BB-	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	3	2	0	8
	B+	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	1	0	5
	B	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	B-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CCC+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CCC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CCC-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

6. To Access the Data

Detailed calculation results can be downloaded from R&I’s web site (<http://www.r-i.co.jp/>). For a list of default bond issuers not covered in this news release and changes in their ratings, treatment of debt successions and termination of issuers from the survey, please contact R&I mentioned below.

R&I surveys on default cases and cases of surviving companies are based on widely available data such as newspaper articles and corporate financial reports. To achieve its objectives in announcing default ratios by clarifying on a time series basis the relationship between ratings and defaults, R&I adjusts data by reviewing whatever useful past information it can obtain.

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Exhibit 1: Default ratios for each rating, by cohort (Unit: %)

2008 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	-	-	-	-	-	-	-	-	-	14
AA	0.00	-	-	-	-	-	-	-	-	-	145
A	0.30	-	-	-	-	-	-	-	-	-	333
BBB	0.58	-	-	-	-	-	-	-	-	-	171
BB	11.11	-	-	-	-	-	-	-	-	-	9
B or lower	0.00	-	-	-	-	-	-	-	-	-	1
BBB or above	0.30	-	-	-	-	-	-	-	-	-	663
BB or lower	10.00	-	-	-	-	-	-	-	-	-	10
ALL	0.45	-	-	-	-	-	-	-	-	-	673

2007 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	-	-	-	-	-	-	-	-	10
AA	0.00	0.00	-	-	-	-	-	-	-	-	134
A	0.00	0.33	-	-	-	-	-	-	-	-	306
BBB	0.00	0.55	-	-	-	-	-	-	-	-	185
BB	7.14	14.29	-	-	-	-	-	-	-	-	14
B or lower	0.00	0.00	-	-	-	-	-	-	-	-	1
BBB or above	0.00	0.32	-	-	-	-	-	-	-	-	635
BB or lower	6.67	13.33	-	-	-	-	-	-	-	-	15
ALL	0.15	0.62	-	-	-	-	-	-	-	-	650

2006 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	-	-	-	-	-	-	-	9
AA	0.00	0.00	0.00	-	-	-	-	-	-	-	117
A	0.00	0.00	0.00	-	-	-	-	-	-	-	283
BBB	0.51	1.03	1.54	-	-	-	-	-	-	-	195
BB	0.00	0.00	6.25	-	-	-	-	-	-	-	16
B or lower	0.00	0.00	0.00	-	-	-	-	-	-	-	3
BBB or above	0.17	0.33	0.50	-	-	-	-	-	-	-	604
BB or lower	0.00	0.00	5.26	-	-	-	-	-	-	-	19
ALL	0.16	0.32	0.65	-	-	-	-	-	-	-	623

2005 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	-	-	-	-	-	-	7
AA	0.00	0.00	0.00	0.00	-	-	-	-	-	-	111
A	0.00	0.00	0.00	0.00	-	-	-	-	-	-	265
BBB	0.00	0.00	0.00	0.00	-	-	-	-	-	-	206
BB	0.00	0.00	0.00	6.25	-	-	-	-	-	-	16
B or lower	0.00	0.00	0.00	0.00	-	-	-	-	-	-	6
BBB or above	0.00	0.00	0.00	0.00	-	-	-	-	-	-	589
BB or lower	0.00	0.00	0.00	4.55	-	-	-	-	-	-	22
ALL	0.00	0.00	0.00	0.17	-	-	-	-	-	-	611

2004 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	8
AA	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	107
A	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	249
BBB	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	211
BB	11.11	11.11	11.11	11.11	14.98	-	-	-	-	-	27
B or lower	16.67	16.67	16.67	16.67	16.67	-	-	-	-	-	6
BBB or above	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	575
BB or lower	12.12	12.12	12.12	12.12	15.26	-	-	-	-	-	33
ALL	0.66	0.66	0.66	0.66	0.83	-	-	-	-	-	608

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2003 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	7
AA	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	104
A	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	249
BBB	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	226
BB	2.50	10.20	10.20	10.20	10.20	12.76	-	-	-	-	40
B or lower	9.09	18.18	18.18	18.18	18.18	18.18	-	-	-	-	11
BBB or above	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-	586
BB or lower	3.92	11.93	11.93	11.93	11.93	13.93	-	-	-	-	51
ALL	0.31	0.95	0.95	0.95	0.95	1.11	-	-	-	-	637

2002 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	18
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	92
A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	261
BBB	0.00	0.00	0.00	0.00	0.00	0.00	0.43	-	-	-	238
BB	1.89	5.73	11.63	13.59	13.59	13.59	15.55	-	-	-	53
B or lower	25.00	33.33	33.33	33.33	41.67	41.67	41.67	-	-	-	12
BBB or above	0.00	0.00	0.00	0.00	0.00	0.00	0.17	-	-	-	609
BB or lower	6.15	10.85	15.62	17.21	18.81	18.81	20.40	-	-	-	65
ALL	0.59	1.04	1.49	1.64	1.79	1.79	2.10	-	-	-	674

2001 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	18
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	88
A	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	-	-	255
BBB	0.39	1.17	1.17	1.95	1.95	1.95	1.95	2.35	-	-	258
BB	0.00	1.72	6.99	8.78	10.57	12.35	12.35	14.14	-	-	60
B or lower	25.00	37.50	37.50	37.50	37.50	37.50	37.50	37.50	-	-	8
BBB or above	0.32	0.65	0.65	0.98	0.98	0.98	0.98	1.14	-	-	619
BB or lower	2.94	5.97	10.68	12.27	13.87	15.46	15.46	17.06	-	-	68
ALL	0.58	1.17	1.61	2.06	2.21	2.36	2.36	2.66	-	-	687

2000 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	18
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	92
A	0.00	0.38	0.76	0.76	0.76	0.76	0.76	0.76	0.76	-	263
BBB	0.00	0.36	0.73	0.73	1.46	1.46	1.46	1.46	1.83	-	279
BB	0.00	0.00	1.39	5.62	7.05	8.48	9.91	9.91	11.36	-	74
B or lower	18.18	36.36	54.55	54.55	54.55	65.91	65.91	65.91	65.91	-	11
BBB or above	0.00	0.31	0.62	0.62	0.93	0.93	0.93	0.93	1.09	-	652
BB or lower	2.35	4.71	8.32	12.04	13.30	15.81	17.07	17.07	18.34	-	85
ALL	0.27	0.82	1.51	1.92	2.34	2.62	2.76	2.76	3.05	-	737

1999 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90
A	0.00	0.00	0.37	0.75	0.75	0.75	0.75	0.75	0.75	1.13	271
BBB	0.00	0.33	1.00	1.34	2.03	2.71	2.71	2.71	2.71	2.71	305
BB	3.45	8.62	8.62	10.34	13.93	15.80	17.67	19.54	19.54	21.46	58
B or lower	0.00	12.50	37.50	50.00	50.00	50.00	62.50	62.50	62.50	62.50	8
BBB or above	0.00	0.15	0.59	0.89	1.18	1.48	1.48	1.48	1.48	1.64	690
BB or lower	3.03	9.09	12.12	15.15	18.29	19.93	23.20	24.83	24.83	26.50	66
ALL	0.26	0.93	1.60	2.14	2.69	3.10	3.38	3.52	3.52	3.79	756

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NEWS RELEASE

1998 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	118
A	0.00	0.33	0.33	0.67	1.34	1.34	2.36	2.36	2.36	2.36	302
BBB	0.31	0.62	1.26	1.58	1.90	2.88	2.88	2.88	3.22	3.22	324
BB	14.29	14.29	20.00	20.00	20.00	22.96	22.96	29.13	29.13	29.13	35
B or lower	25.00	25.00	50.00	50.00	75.00	75.00	75.00	75.00	75.00	75.00	4
BBB or above	0.13	0.39	0.65	0.92	1.32	1.72	2.12	2.12	2.26	2.26	773
BB or lower	15.38	15.38	23.08	23.08	25.64	28.30	28.30	33.81	33.81	33.81	39
ALL	0.86	1.11	1.73	1.99	2.49	3.00	3.39	3.65	3.78	3.78	812

1997 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86	0.86	0.86	120
A	0.35	0.35	0.69	0.69	1.05	1.75	1.75	2.46	2.46	2.46	288
BBB	0.29	1.16	1.45	2.64	2.94	3.24	4.46	4.46	5.39	5.70	347
BB	2.86	11.43	11.43	14.29	14.29	17.14	17.14	17.14	17.14	17.14	35
B or lower	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
BBB or above	0.25	0.64	0.90	1.41	1.68	2.07	2.60	3.00	3.40	3.53	785
BB or lower	2.78	11.11	11.11	13.89	13.89	16.67	16.67	16.67	16.67	16.67	36
ALL	0.37	1.10	1.34	1.96	2.21	2.71	3.22	3.60	3.98	4.11	821

1996 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.93	110
A	0.35	0.70	1.05	1.75	1.75	2.11	2.82	2.82	3.55	3.55	285
BBB	0.00	0.29	1.16	1.16	2.65	2.95	3.56	4.47	4.47	5.40	345
BB	0.00	0.00	4.76	4.76	4.76	4.76	16.97	16.97	19.49	19.49	43
B or lower	25.00	25.00	25.00	25.00	25.00	25.00	50.00	50.00	50.00	50.00	4
BBB or above	0.13	0.39	0.91	1.18	1.84	2.10	2.64	3.04	3.45	3.85	769
BB or lower	2.13	2.13	6.48	6.48	6.48	6.48	19.84	19.84	22.13	22.13	47
ALL	0.25	0.49	1.23	1.48	2.10	2.35	3.61	3.99	4.50	4.89	816

1995 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.02	101
A	0.00	0.37	0.37	0.74	1.11	1.48	1.85	2.61	2.61	3.37	271
BBB	0.00	0.00	0.29	1.46	1.46	2.65	2.65	3.26	3.87	3.87	347
BB	0.00	0.00	2.63	2.63	5.26	5.26	5.26	18.42	21.05	23.68	38
B or lower	25.00	25.00	25.00	25.00	25.00	25.00	25.00	50.00	50.00	50.00	4
BBB or above	0.00	0.13	0.27	0.94	1.07	1.75	1.89	2.44	2.72	3.14	750
BB or lower	2.38	2.38	4.76	4.76	7.14	7.14	7.14	21.43	23.81	26.19	42
ALL	0.13	0.25	0.51	1.14	1.40	2.04	2.17	3.47	3.87	4.40	792

1994 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	110
A	0.00	0.00	0.39	0.77	1.16	1.54	1.93	2.32	3.11	3.11	259
BBB	0.00	0.00	0.00	0.00	1.36	1.36	2.74	3.08	4.13	4.49	301
BB	0.00	0.00	0.00	3.03	3.03	6.06	6.06	6.06	18.18	21.21	33
B or lower	25.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	4
BBB or above	0.00	0.00	0.14	0.29	1.01	1.16	1.89	2.18	2.92	3.07	699
BB or lower	2.70	5.41	5.41	8.11	8.11	10.81	10.81	10.81	21.62	24.32	37
ALL	0.14	0.27	0.41	0.68	1.37	1.64	2.34	2.61	3.87	4.16	736

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1993 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90	0.90	112
A	0.00	0.00	0.00	0.40	0.79	1.58	1.98	2.77	2.77	3.58	253
BBB	0.00	0.00	0.00	0.00	0.41	1.63	1.63	2.05	2.88	4.56	249
BB	0.00	0.00	0.00	0.00	0.00	0.00	3.70	3.70	3.70	14.81	27
B or lower	0.00	20.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	5
BBB or above	0.00	0.00	0.00	0.16	0.47	1.25	1.41	1.88	2.36	3.31	645
BB or lower	0.00	3.13	6.25	6.25	6.25	6.25	9.48	9.48	9.48	19.18	32
ALL	0.00	0.15	0.30	0.44	0.74	1.49	1.78	2.24	2.69	4.06	677

1992 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35
AA	0.00	0.00	0.00	0.00	0.84	1.68	1.68	1.68	1.68	2.54	119
A	0.00	0.00	0.00	0.00	0.00	0.00	0.81	1.21	2.02	2.02	247
BBB	0.43	0.43	0.43	0.43	0.43	0.87	2.19	2.64	2.64	3.53	232
BB	0.00	0.00	4.17	4.17	4.17	8.33	12.50	12.50	12.50	12.50	24
B or lower	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	33.33	3
BBB or above	0.16	0.16	0.16	0.16	0.32	0.64	1.43	1.75	2.07	2.56	633
BB or lower	0.00	0.00	3.70	3.70	3.70	7.41	11.11	11.11	14.81	14.81	27
ALL	0.15	0.15	0.30	0.30	0.46	0.91	1.83	2.14	2.60	3.06	660

1991 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	2.38	2.38	2.38	2.38	2.38	42
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.91	0.91	0.91	0.91	110
A	0.00	0.44	0.44	0.44	0.44	0.44	0.89	2.22	2.67	3.56	225
BBB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.92	0.92	0.92	224
BB	0.00	0.00	0.00	4.35	4.35	4.35	8.90	13.46	13.46	13.46	24
B or lower	0.00	0.00	0.00	0.00	0.00	0.00	33.33	33.33	33.33	66.67	3
BBB or above	0.00	0.17	0.17	0.17	0.17	0.34	0.67	1.51	1.68	2.02	601
BB or lower	0.00	0.00	0.00	3.85	3.85	3.85	11.86	15.87	15.87	19.87	27
ALL	0.00	0.16	0.16	0.32	0.32	0.48	1.13	2.09	2.26	2.74	628

1990 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	2.22	2.22	2.22	2.22	45
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.93	0.93	108
A	0.00	0.00	0.51	0.51	0.51	0.51	0.51	1.01	2.02	2.02	198
BBB	0.00	0.41	0.41	0.41	0.41	0.41	0.41	0.41	1.68	1.68	244
BB	0.00	0.00	0.00	0.00	4.76	4.76	4.76	9.77	9.77	9.77	22
B or lower	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00	50.00	2
BBB or above	0.00	0.17	0.34	0.34	0.34	0.34	0.51	0.85	1.70	1.70	595
BB or lower	0.00	0.00	0.00	0.00	4.35	4.35	4.35	13.46	13.46	13.46	24
ALL	0.00	0.16	0.32	0.32	0.49	0.49	0.65	1.31	2.13	2.13	619

1989 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.14	1.14	1.14	88
A	0.00	0.00	0.00	0.59	0.59	0.59	0.59	0.59	1.18	1.76	170
BBB	0.00	0.00	0.36	0.36	0.36	0.36	0.36	0.36	0.36	1.48	275
BB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.35	4.35	25
B or lower	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00	2
BBB or above	0.00	0.00	0.18	0.35	0.35	0.35	0.35	0.53	0.70	1.41	572
BB or lower	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	27
ALL	0.00	0.00	0.17	0.34	0.34	0.34	0.34	0.50	1.01	1.69	599

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1988 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.47	1.47	68
A	0.00	0.00	0.00	0.00	0.65	0.65	0.65	0.65	0.65	1.31	153
BBB	0.00	0.00	0.00	0.34	0.34	0.34	0.34	0.34	0.34	0.34	296
BB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.35	24
B or lower	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	3
BBB or above	0.00	0.00	0.00	0.18	0.37	0.37	0.37	0.37	0.55	0.74	547
BB or lower	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.69	27
ALL	0.00	0.00	0.00	0.17	0.35	0.35	0.35	0.35	0.53	1.06	574

1987 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.92	52
A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	117
BBB	0.00	0.00	0.00	0.00	0.37	0.37	0.37	0.37	0.37	0.37	271
BB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25
B or lower	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
BBB or above	0.00	0.00	0.00	0.00	0.21	0.21	0.21	0.21	0.21	0.43	469
BB or lower	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28
ALL	0.00	0.00	0.00	0.00	0.20	0.20	0.20	0.20	0.20	0.41	497

1986 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46
A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	96
BBB	0.00	0.00	0.00	0.00	0.00	0.44	0.44	0.44	0.44	0.44	230
BB	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	23
B or lower	-	-	-	-	-	-	-	-	-	-	0
BBB or above	0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.25	0.25	0.25	401
BB or lower	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	23
ALL	0.47	0.47	0.47	0.47	0.47	0.71	0.71	0.71	0.71	0.71	424

1985 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37
A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	92
BBB	0.00	1.02	1.02	1.02	1.02	1.02	1.53	1.53	1.53	1.53	197
BB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14
B or lower	-	-	-	-	-	-	-	-	-	-	0
BBB or above	0.00	0.56	0.56	0.56	0.56	0.56	0.84	0.84	0.84	0.84	357
BB or lower	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14
ALL	0.00	0.54	0.54	0.54	0.54	0.54	0.81	0.81	0.81	0.81	371

1984 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28
A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	78
BBB	0.00	0.00	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	168
BB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18
B or lower	11.11	22.22	22.22	22.22	22.22	22.22	22.22	22.22	22.22	22.22	9
BBB or above	0.00	0.00	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	303
BB or lower	3.70	7.41	7.41	7.41	7.41	7.41	7.41	7.41	7.41	7.41	27
ALL	0.30	0.61	1.21	1.21	1.21	1.21	1.21	1.21	1.21	1.21	330

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1983 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31
A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	74
BBB	0.00	0.00	0.00	1.29	1.29	1.29	1.29	1.29	1.29	1.29	155
BB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26
B or lower	0.00	10.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	10
BBB or above	0.00	0.00	0.00	0.70	0.70	0.70	0.70	0.70	0.70	0.70	284
BB or lower	0.00	2.78	5.56	5.56	5.56	5.56	5.56	5.56	5.56	5.56	36
ALL	0.00	0.31	0.63	1.25	1.25	1.25	1.25	1.25	1.25	1.25	320

1982 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32
A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	76
BBB	0.00	0.00	0.00	0.00	1.35	1.35	1.35	1.35	1.35	1.35	148
BB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29
B or lower	0.00	0.00	5.88	11.76	11.76	11.76	11.76	11.76	11.76	11.76	17
BBB or above	0.00	0.00	0.00	0.00	0.71	0.71	0.71	0.71	0.71	0.71	281
BB or lower	0.00	0.00	2.17	4.35	4.35	4.35	4.35	4.35	4.35	4.35	46
ALL	0.00	0.00	0.31	0.61	1.22	1.22	1.22	1.22	1.22	1.22	327

1981 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31
A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	73
BBB	0.00	0.00	0.00	0.00	0.00	1.47	1.47	1.47	1.47	1.47	136
BB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29
B or lower	5.56	5.56	5.56	11.11	16.67	16.67	16.67	16.67	16.67	16.67	18
BBB or above	0.00	0.00	0.00	0.00	0.00	0.75	0.75	0.75	0.75	0.75	265
BB or lower	2.13	2.13	2.13	4.26	6.38	6.38	6.38	6.38	6.38	6.38	47
ALL	0.32	0.32	0.32	0.64	0.96	1.60	1.60	1.60	1.60	1.60	312

1980 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22
A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44
BBB	0.00	0.00	0.00	0.00	0.00	0.00	2.11	2.11	2.11	2.11	95
BB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23
B or lower	6.25	12.50	12.50	12.50	25.00	25.00	25.00	25.00	25.00	25.00	16
BBB or above	0.00	0.00	0.00	0.00	0.00	0.00	1.14	1.14	1.14	1.14	175
BB or lower	2.56	5.13	5.13	5.13	10.26	10.26	10.26	10.26	10.26	10.26	39
ALL	0.47	0.93	0.93	0.93	1.87	1.87	2.80	2.80	2.80	2.80	214

1979 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19
A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45
BBB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.04	1.04	1.04	96
BB	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	20
B or lower	0.00	0.00	6.25	6.25	6.25	18.75	18.75	18.75	18.75	18.75	16
BBB or above	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.57	0.57	175
BB or lower	2.78	2.78	5.56	5.56	5.56	11.11	11.11	11.11	11.11	11.11	36
ALL	0.47	0.47	0.95	0.95	0.95	1.90	1.90	2.37	2.37	2.37	211

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1978 Cohort

Year elapsed	1	2	3	4	5	6	7	8	9	10	Number of issuers
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19
A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48
BBB	0.00	1.04	1.04	1.04	1.04	1.04	1.04	1.04	2.08	2.08	96
BB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20
B or lower	12.50	12.50	12.50	18.75	18.75	18.75	25.00	25.00	25.00	25.00	16
BBB or above	0.00	0.57	0.57	0.57	0.57	0.57	0.57	0.57	1.14	1.14	176
BB or lower	5.56	5.56	5.56	8.33	8.33	8.33	11.11	11.11	11.11	11.11	36
ALL	0.94	1.42	1.42	1.89	1.89	1.89	2.36	2.36	2.83	2.83	212

Exhibit 2: Average Cumulative Default Ratio for each rating (Unit: %)

Year elapsed	1	2	3	4	5	6	7	8	9	10
AAA	0.00	0.00	0.00	0.00	0.00	0.15	0.29	0.29	0.29	0.29
AA	0.00	0.00	0.00	0.00	0.05	0.10	0.16	0.33	0.52	0.71
A	0.07	0.17	0.28	0.43	0.58	0.73	0.98	1.27	1.53	1.78
BBB	0.09	0.30	0.52	0.75	1.06	1.36	1.66	1.88	2.19	2.48
BB	1.95	3.38	4.95	6.09	6.92	7.89	9.30	10.80	11.99	13.15
B or lower	8.70	14.04	18.46	20.47	23.09	24.71	27.05	28.28	29.56	30.88
BBB or above	0.06	0.19	0.33	0.49	0.68	0.89	1.12	1.35	1.61	1.85
BB or lower	3.18	5.33	7.44	8.74	9.89	10.99	12.56	14.02	15.22	16.42
ALL	0.26	0.53	0.79	1.03	1.30	1.56	1.90	2.21	2.53	2.84

Exhibit 3: Average Cumulative Default Ratio for each rating by limiting the definition of defaults only to "Legal bankruptcy" and "Failure to perform payment on a financial obligation" (Unit: %)

Year elapsed	1	2	3	4	5	6	7	8	9	10
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.30	0.30	0.30
AA	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.17	0.30
A	0.05	0.10	0.14	0.18	0.22	0.26	0.33	0.40	0.45	0.51
BBB	0.03	0.12	0.22	0.28	0.43	0.58	0.74	0.83	0.97	1.11
BB	0.54	0.98	1.54	2.46	2.93	3.41	4.05	4.74	5.34	5.84
B or lower	2.90	4.84	6.80	7.80	8.32	8.32	8.32	8.32	8.96	9.63
BBB or above	0.03	0.09	0.15	0.19	0.27	0.36	0.46	0.54	0.63	0.74
BB or lower	0.97	1.69	2.51	3.44	3.92	4.32	4.84	5.40	6.01	6.54
ALL	0.09	0.19	0.30	0.41	0.51	0.63	0.76	0.87	1.00	1.13

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