



## DATA REPORT

15 February 2017

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### Analyst Contacts

Sharon Ou <i>VP-Sr Credit Officer</i> sharon.ou@moodys.com	212-553-4403
Sumair Irfan <i>Associate Analyst</i> sumair.irfan@moodys.com	212-553-1035
Yang Liu <i>Associate Analyst</i> yang.liu@moodys.com	212-553-2961
Kumar Kanthan <i>Senior Vice President</i> kumar.kanthan@moodys.com	212-553-1428

### CLIENT SERVICES

Americas	1-212-553-1653
Asia Pacific	852-3551-3077
Japan	81-3-5408-4100
EMEA	44-20-7772-5454

## Default Research

# Annual Default Study: Corporate Default and Recovery Rates, 1920-2016

### Summary

- » We expect the default rate for Moody's-rated speculative-grade issuers to decline to 3.0% in 2017 from 4.5% in 2016. The prediction suggests annual spec-grade default rates have peaked for now after rising from 1.9% in 2014 and 3.6% in 2015.
- » We also expect the default rate for all of Moody's-rated corporate issuers to retreat to 1.5% in 2017 from 2.1% in 2016. In 2015 and 2014, the comparable rates stood at 1.7% and 0.9%, respectively. The 1.5% predicted default rate implies approximately 95 defaults for 2017.
- » In addition to tightening high yield spreads and sufficient liquidity in the capital markets, our benign default outlook is also driven by the recovery in commodity sectors (i.e. Oil & Gas, Metals & Mining) as many weaker companies have already defaulted and the remaining, healthier issuers have seen improved access to the capital markets because the rebound in oil prices has driven more favorable investor sentiment.
- » We expect the default rate for the commodity sectors to fall sharply to 3.4% in 2017 from 12.6% in 2016, encompassing investment-grade and speculative-grade issuers.
- » The default tally was 144 in 2016, almost 25% more than the prior year's 116. Default volume rose to \$135 billion in 2016 from \$100 billion in 2015. The largest defaulter in 2016 was Oi S.A., which filed for bankruptcy in Brazil with approximately \$14 billion of debt.
- » By sector, more than half of the 2016 defaults were from commodity sectors (66 from Energy: Oil & Gas and 16 from Metals & Mining); by region, defaults remained concentrated in North America (109), followed by Europe (19) and Latin America (12).
- » Credit quality continued to weaken in 2016 as downgrades outpaced upgrades. The rating drift, measured in percent of a rating notch, fell to -15% from the prior year's -9%. Quality deterioration was most significant in Oil & Gas (-100%), followed by Energy: Electricity (-82%) and Metals & Mining (-80%).
- » Measured by post-default trading prices, the issuer-weighted average recovery rate for senior unsecured bonds was 31.3% in 2016, down from 37.6% in 2015.

- » Rating accuracy measures like Average Default Position (AP) generally show that Moody's ratings have been successfully rank ordering credit risk. Since 1983, the average one-year AP has measured 91.5%.

This report comprises Moody's 30th annual default study, in which we update statistics on the default, loss and rating transition experience of corporate bond, loan and deposit issuers for 2016, as well as for the historical period since 1920. This study covers financial institutions, corporates and regulated utilities that have long-term debt ratings.

## Introduction

This report is primarily concerned with the statistical documentation of corporate defaults among Moody's-rated long-term debt issuers and the performance of Moody's ratings for the year 2016, as well as the historical period since 1920. The first section of this study reviews some of the major trends characterizing defaults, recoveries and rating actions in 2016, including analyses by industry and geography. The second section discusses the default rate outlook and the drivers behind our forecasts. The final section examines the performance of Moody's ratings since 1983.

Results presented in this study are based on a proprietary database of ratings and defaults for industrial and transportation companies, utilities and financial institutions. This database covers the credit experiences of more than 20,000 corporate issuers that had long-term rated bonds, loans and/or deposits between 1920 and 2016.

## Default pace continued to rise in 2016

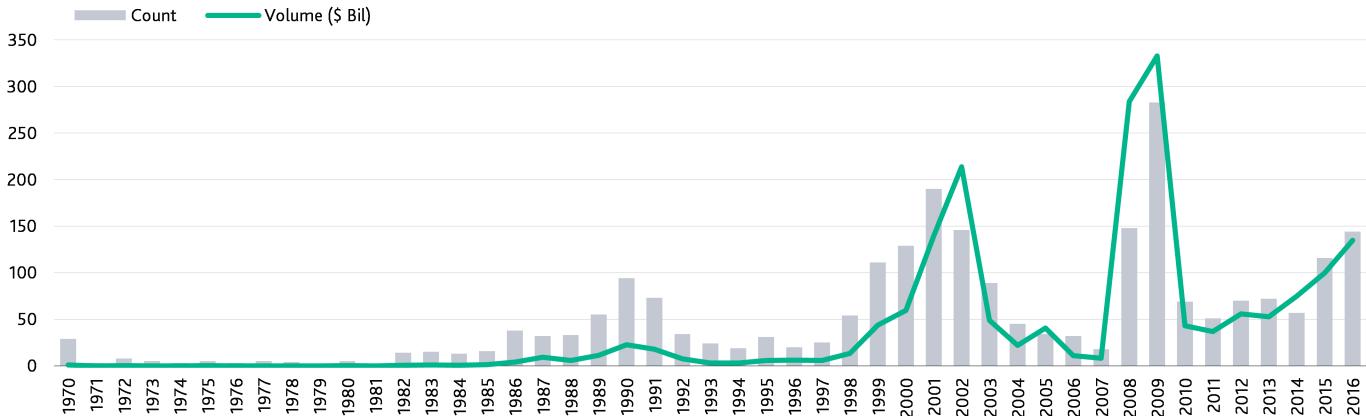
### Defaults remained elevated in the first half but eased in the second

The pace of defaults continued its rising trend for the second consecutive year in 2016, sending the default tally to the highest level since 2009. Worldwide, 144 Moody's-rated corporate issuers defaulted in 2016, almost 25% higher than 2015's count of 116. During 2016, defaults were more frequent in the first half at 15 per month, on average. In the second half, the comparable count fell to below nine as stress in the commodity sectors eased following the rebound of commodity prices from their low levels at the beginning of the year. Measured by volume, approximately \$135 billion of debt went into default in 2016, which was comprised of \$92 billion in bonds and \$43 billion in loans. In comparison, the default volume was \$100 billion in 2015 consisting of \$79 billion in bonds and \$21 billion in loans. The largest 2016 default was Oi S.A., which filed for bankruptcy in June with nearly \$14 billion in debt.

Like any other year, most of the corporate defaults happened in North America where a majority of Moody's-rated issuers are domiciled. Of the 144 defaults, 109 (76%) were in North America. Europe had 19 (13%) while the default count in Latin America (12) surpassed its 2009 peak of 11. Compared to 2015, the default count has increased noticeably in North America (to 109 from 68) but fallen noticeably in Europe (to 19 from 28) and in Asia Pacific (to two from 10). In terms of volume, \$90 billion (66%) of defaulted debt was from North America, followed by Latin America and Europe, which contributed \$26 billion (19%) and \$16 billion (12%), respectively.<sup>1</sup>

By default type, about 42% of last year's defaults were distressed exchanges. The rest were roughly split between bankruptcies (30%) and payment defaults (28%). Exhibit 1 presents the annual default counts and defaulted debt volumes for the period 1970-2016.

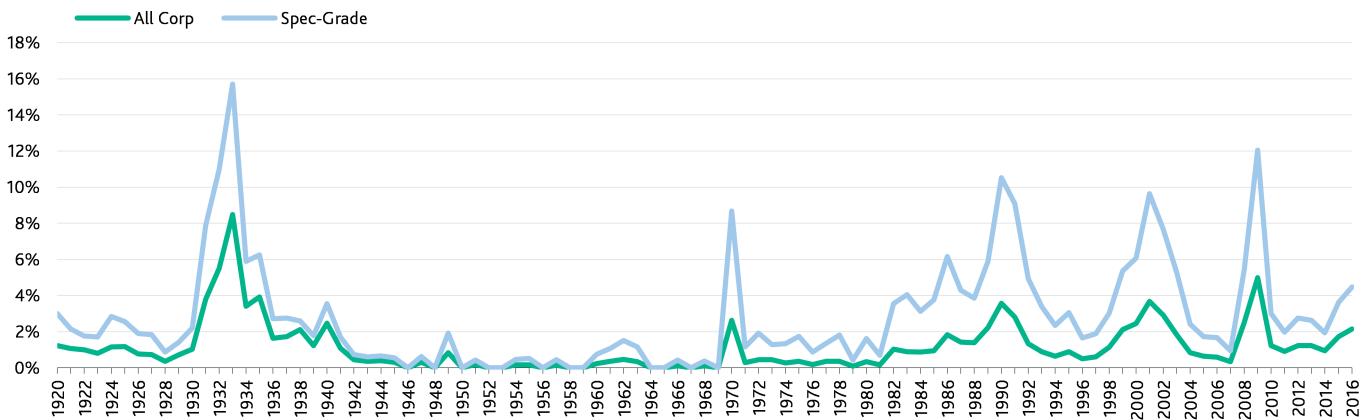
Exhibit 1  
Defaults Rose in 2016



**Default rate highest in seven years**

As the default count rose by almost 25% in 2016 from 2015, the issuer-weighted annual default rate jumped to 2.1% in 2016 from 1.7% in 2015 (see Exhibit 2). This marked the highest annual rate since 2009. Among speculative-grade issuers, the default rate showed a similar trend, rising to 4.5% from 3.6% and also reaching the highest level since the 2008-2009 global financial crisis. To put these figures in historical perspective, the one-year default rate has averaged 1.7% for all rated issuers and 4.3% for speculative-grade credits since 1983. Measured on a dollar volume basis, however, Moody's corporate bond default rates did not rise as Caesars Entertainment Operating Company, Inc. rolled out of the 12-month window and Oi S.A.'s bonds were excluded from the calculation.<sup>2</sup> For all of Moody's-rated issuers, the volume-weighted default rates finished 2016 at 0.7%, slightly below 2015's 0.8%. Among speculative-grade issuers, the comparable rate held steady at 3.5%.

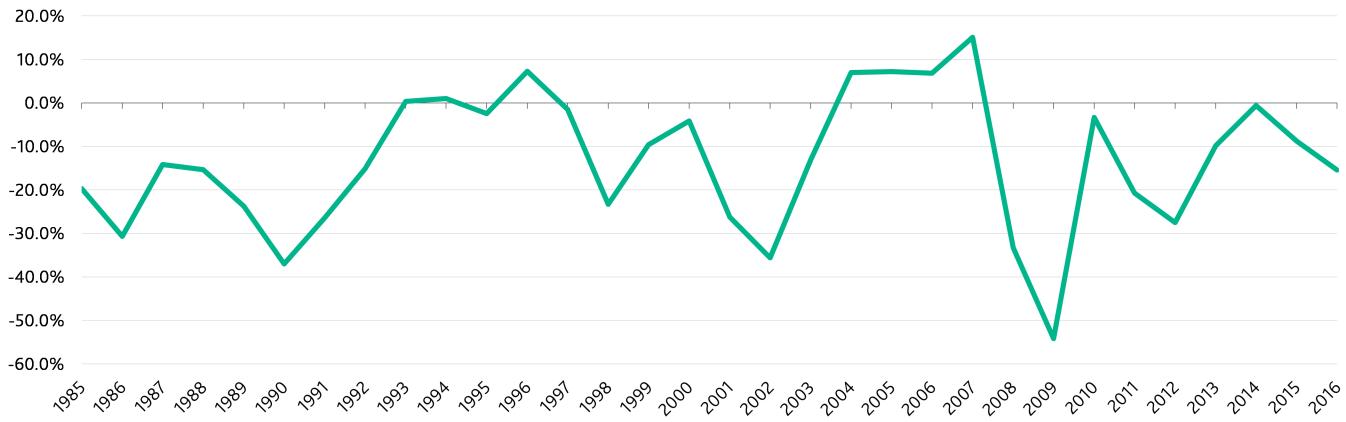
Exhibit 2  
Issuer-Weighted Default Rates Highest Since 2009



## Credit quality deteriorated especially in commodity sectors

Credit quality among Moody's-rated issuers continued to weaken in 2016 with rating downgrades outpacing upgrades. Rating drift, which is calculated as the average upgraded notches per issuer minus the average downgraded notches per issuer, fell to -15% of a rating notch in 2016 from -9% in 2015 (see Exhibit 3).

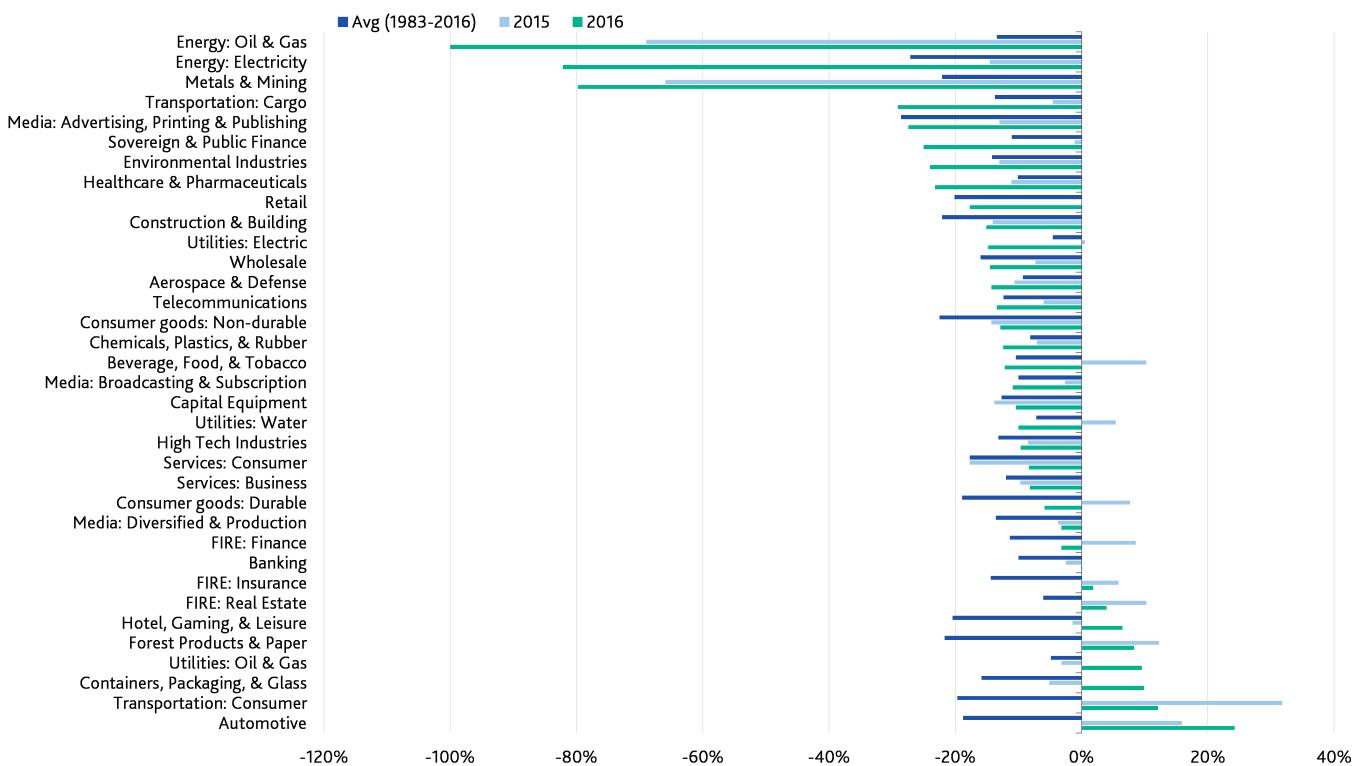
Exhibit 3  
Rating Drift Fell in 2016



Across sectors, we find that credit deterioration was most severe in commodity sectors, especially for Oil & Gas, Energy: Electricity and Metals & Mining (see Exhibit 4). Specifically, Oil & Gas saw its one-year rating drift fall to -100% (one rating notch) in 2016 from -69% a year earlier. This is followed by Energy: Electricity, whose comparable metrics declined to -82% from -15%, and Metals & Mining, which fell to -80% from -66%. All of these sectors' one-year rating drifts were significantly below their historical averages of -13%, -27% and -22%, respectively. On the other hand, automotive issuers benefited from low commodity prices and the sector saw its rating drift jumping to 24% in 2016 from 16% in 2015. Historically, the sector's drift has averaged -19%.

Exhibit 4

## Credit Quality Weakened Most in Commodity Sectors



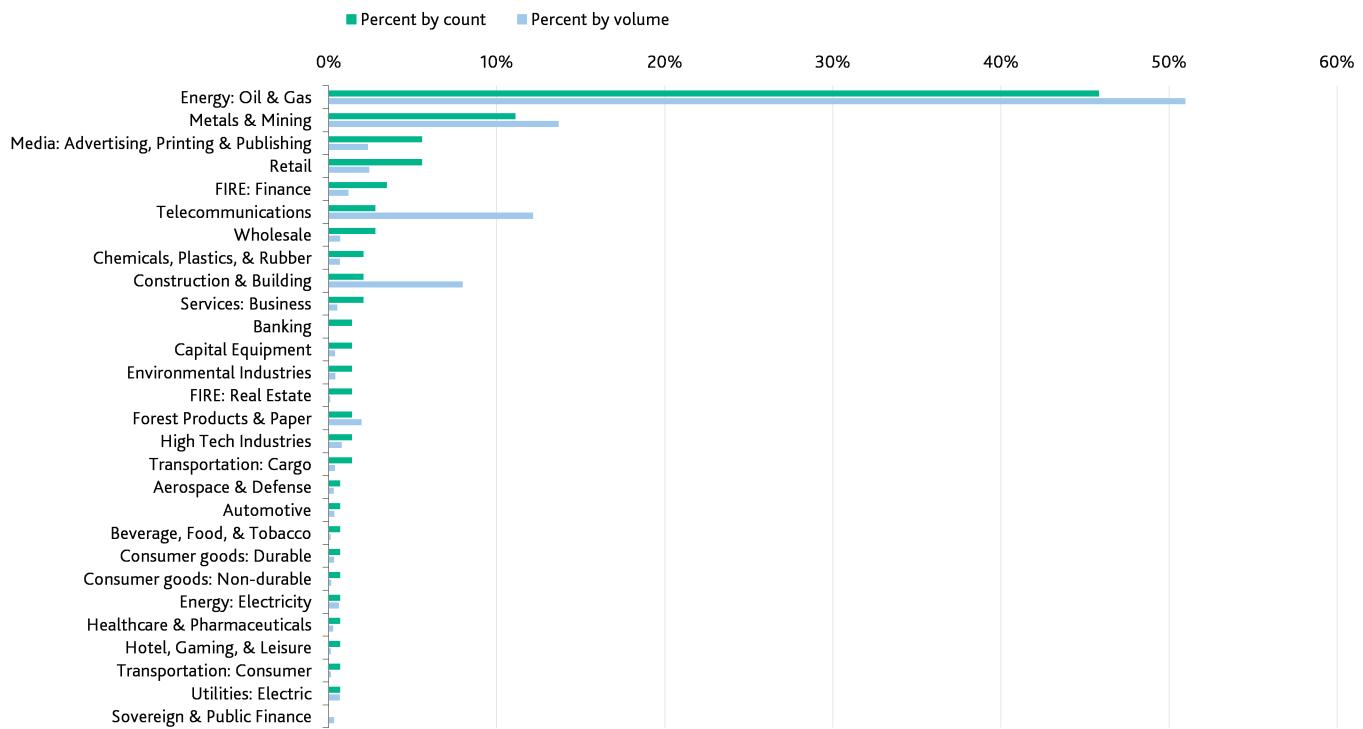
## Oil &amp; Gas accounted for half of the defaults

Similar to 2015, last year's defaults reflected sector-specific problems and resulted in a high concentration of defaults in particular pockets. Among non-financial corporates, Oil & Gas recorded 66 defaults and contributed the largest proportion of corporate defaults, comprising 46% of the total count. Metals & Mining followed with 16 defaults, accounting for another 11%. Among financial institutions, seven of the nine defaults were by non-bank finance companies.

When measured by default volume, Oil & Gas topped the list again by accounting for 51% of the total, with the next highest shares coming from Metals & Mining (14%) and Telecommunications (12%). Besides Oi S.A., 2016 has observed other sizable defaults including Abengoa S.A.<sup>3</sup> (\$9 billion) and Linn Energy, LLC (\$8 billion). Exhibit 5 shows the distribution of 2016 defaults by specific industries.

## Exhibit 5

## Oil &amp; Gas Remained the Largest Contributor to Defaults



Although the Oil & Gas sector accounted for roughly half of the defaults last year, it was not the sector with the highest rate of default: that distinction belongs to Media: Advertising, Printing & Publishing, which had a 15.8% default rate in 2016. Oil & Gas followed right behind with a rate of 14.1% (see Exhibit 6).<sup>4</sup>

## Exhibit 6

**One-Year Default Rate Highest in the Advertising, Printing & Publishing Sector**

Industry	Default Rates*	Industry	Default Rates*
Media: Advertising, Printing &	15.8%	FIRE: Real Estate	1.0%
Energy: Oil & Gas	14.1%	Capital Equipment	0.9%
Metals & Mining	8.9%	High Tech Industries	0.8%
Environmental Industries	8.2%	Automotive	0.8%
Wholesale	6.1%	Hotel, Gaming, & Leisure	0.7%
Forest Products & Paper	4.2%	Healthcare & Pharmaceuticals	0.6%
Retail	3.6%	Beverage, Food, & Tobacco	0.5%
FIRE: Finance	2.3%	Utilities: Electric	0.2%
Consumer goods: Durable	2.3%	Banking	0.2%
Transportation: Cargo	2.0%	Containers, Packaging, & Glass	0.0%
Energy: Electricity	2.0%	FIRE: Insurance	0.0%
Chemicals, Plastics, & Rubber	1.7%	Media: Broadcasting & Subscription	0.0%
Transportation: Consumer	1.6%	Media: Diversified & Production	0.0%
Telecommunications	1.6%	Services: Consumer	0.0%
Consumer goods: Non-durable	1.4%	Sovereign & Public Finance	0.0%
Construction & Building	1.3%	Utilities: Oil & Gas	0.0%
Aerospace & Defense	1.3%	Utilities: Water	0.0%
Services: Business	1.2%		

\* issuer-weighted

**Senior unsecured bond recovery rate lower in 2016**

In Exhibit 7, we present the average recovery rates for debt defaulted in the past two years and put them in context with the historical averages.<sup>5</sup> The table shows that over the past three decades, recovery rates have been generally correlated with the priority of claim in the capital structure, with a higher priority of claim enjoying a higher average rate of recovery.<sup>6</sup> For example, first lien bank loans' recovery rates average 66.9% on an issuer-weighted basis and 62.9% on a dollar volume basis; both are highest of all defaulted instruments. This is not surprising given their secured nature, seniority in capital structure, and strong protective covenants.

Exhibit 7 further shows that 2016's average senior unsecured bond recovery rate drifted lower to 31.3% in 2016, from 2015's 37.6%. Last year's number was mainly driven by Oil & Gas defaults, which experienced a recovery rate of 22.6% on average. To put this in historical perspective, the 2016 senior unsecured bond recovery rate was lower than its long-term average of 37.2%. Measured by dollar volume, the senior unsecured bond recovery rate averaged 26.3% in 2016, also lower than the 33.1% rate in 2015. For first lien bank loans, the volume-weighted average recovery rate was 78.0% in 2016, up from 2015's 53.6%.

## Exhibit 7

## Average Corporate Debt Recovery Rates Measured by Trading Prices

Lien Position	Issuer-weighted recoveries			Volume-weighted recoveries		
	2016	2015	1983-2016	2016	2015	1983-2016
<b>Panel A - Recoveries</b>						
1st Lien Bank Loan	75.0%	64.1%	66.9%	78.0%	53.6%	62.9%
2nd Lien Bank Loan	22.5%	25.1%	31.3%	22.5%	20.4%	27.3%
Sr. Unsecured Bank Loan	n.a.	n.a.	46.4%	n.a.	n.a.	40.2%
1st Lien Bond	43.4%	54.8%	52.8%	36.4%	58.7%	52.7%
2nd Lien Bond	34.1%	25.3%	44.6%	35.8%	20.6%	44.1%
Sr. Unsecured Bond	31.3%	37.6%	37.2%	26.3%	33.1%	33.1%
Sr. Subordinated Bond	36.7%	36.6%	31.1%	56.1%	20.3%	26.2%
Subordinated Bond	24.5%	58.5%	31.9%	24.5%	56.8%	27.1%
Jr. Subordinated Bond	0.6%	14.0%	23.2%	0.6%	14.0%	14.2%
<b>Panel B - Observation count</b>						
Lien Position	2016	2015	1983-2016	2016	2015	1983-2016
1st Lien Bank Loan	17	16	463	10.7	7.0	271.6
2nd Lien Bank Loan	1	3	68	0.2	1.5	11.7
Sr. Unsecured Bank Loan	0	0	66	0.0	0.0	33.8
1st Lien Bond	11	26	304	3.9	17.1	125.1
2nd Lien Bond	19	7	64	9.1	7.1	34.2
Sr. Unsecured Bond	61	62	993	51.1	44.4	679.9
Sr. Subordinated Bond	3	5	510	1.3	1.1	113.6
Subordinated Bond	1	6	412	0.0	2.2	80.4
Jr. Subordinated Bond	1	1	24	0.7	0.0	3.8

The above recovery data are based on trading prices at or post default.<sup>7</sup> An alternative recovery measure is based on ultimate recoveries, or the value creditors realize at the resolution of a default event. For example, for issuers filing for bankruptcy, the ultimate recovery is the present value of the cash and/or securities that the creditors actually receive when the issuer exits bankruptcy, typically one to two years following the initial default date.<sup>8</sup>

In Exhibit 8, we present data on ultimate recovery rates for North American companies included in Moody's Ultimate Recovery Database.<sup>9</sup> The average "firm-wide" recovery rate<sup>10</sup> for the 21 default resolutions was 39.6% in 2016 compared with 55.8% for the 26 companies that emerged from default in 2015. In 2016, the overall average recovery was skewed to a lower end of the recovery spectrum due to poor recoveries of the battered energy companies that ended up in bankruptcy, and dominated the population of recorded default resolutions in 2016. On average, those companies recovered 30.1% on a family level, well below historical norms. On the other hand, firm-wide recoveries of 2015 default resolutions were almost on par with a long-term historical average of 54.9%, exceeding it by 98 basis points (bps). Although in 2015 we also recorded a majority of defaults in the energy sector, they were mostly in the form of distressed exchanges, which drove the overall average higher since defaults using this form of debt restructuring exhibit higher than average recoveries.

Poor family-level recoveries of bankrupt energy companies and a distribution of defaults dominated by bankruptcies rather than distressed exchanges in 2016 translated into lower recoveries. As can be seen in Exhibit 8, pretty much every class of debt had lower recoveries in 2016 than the long-term historical average and relative to 2015.

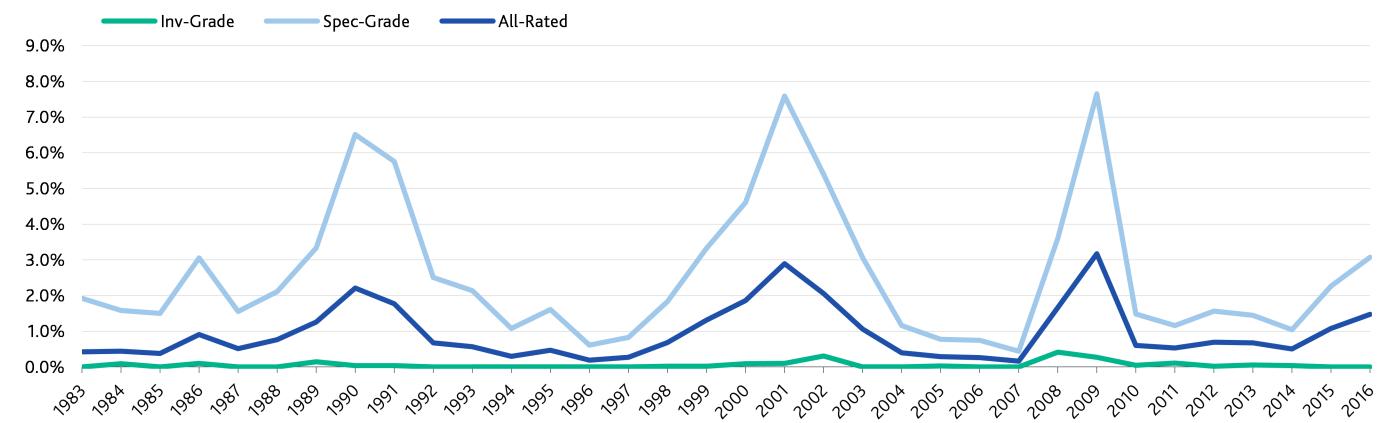
Exhibit 8

**Average Corporate Debt Recovery Rates Measured by Ultimate Recoveries, 1987-2016\***

Lien Position	Emergence Year			Default Year		
	2016	2015	1987-2016	2016	2015	1987-2016
Loans	80.0%	95.3%	80.6%	84.0%	88.0%	80.6%
Senior Secured Bonds	31.3%	73.8%	62.6%	36.9%	59.2%	62.6%
Senior Unsecured Bonds	13.6%	47.0%	48.4%	14.1%	43.0%	48.4%
Subordinated Bonds	7.3%	25.1%	28.0%	10.0%	21.2%	28.0%

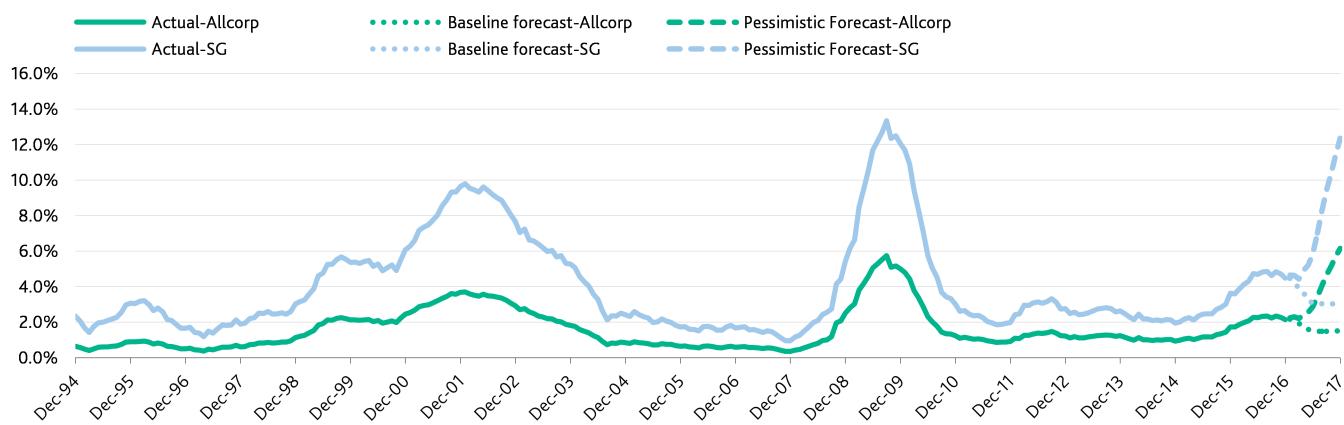
Moody's credit ratings are opinions of relative expected credit losses, which are a function of both the probability of default and severity of default ("LGD"). Exhibit 9 shows annual average credit loss rates from 1983 through 2016 for Moody's-rated corporate issuers. The chart indicates that the average credit loss rate among all Moody's-rated issuers rose to 1.5% in 2016 from 1.1% in 2015. Historically, the average annual credit loss rate for Moody's-rated issuers is 1.0% since 1983.

Exhibit 9

**Annual Credit Loss Rates Up in 2016****Default Rate Expected to Fall in 2017****Default rates to end below historical averages this year**

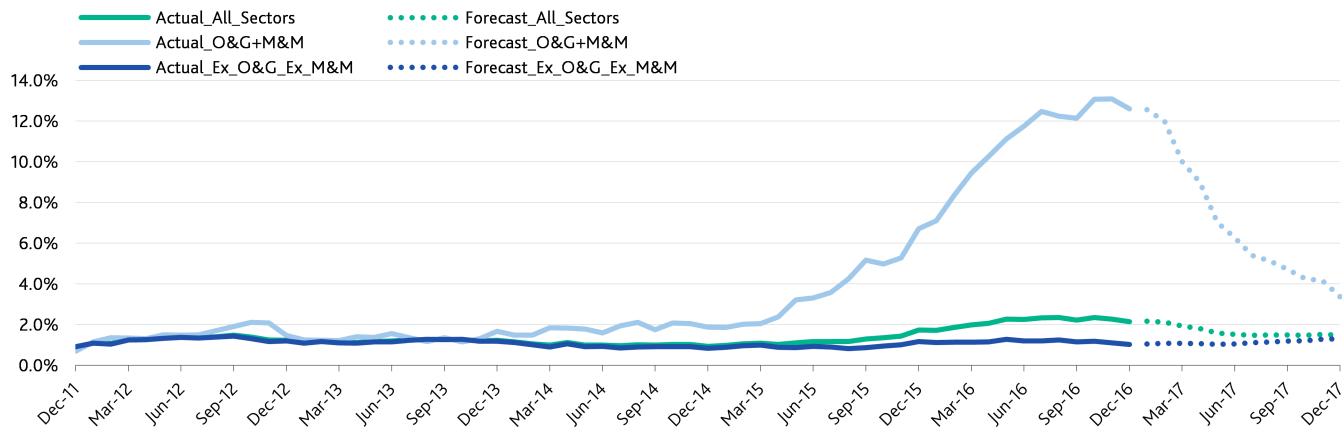
In the past two years, the global default rate has risen due to increased defaults from the commodity sectors. Moving into 2017, however, we expect the rate to fall below the historical average mark by year-end. Based on Moody's default rate forecast model, the default rate for all of Moody's-rated issuers is expected to fall to 1.5% by the end of 2017, which—if realized—will be lower than the average of 1.7% since 1983. Among speculative-grade issuers, the default rate is predicted to decline to 3.0%, also below the historical average of 4.3% (see dotted lines in Exhibit 10). These forecasts are made under our baseline scenario, which assumes the US high yield spread will tighten from the latest quarter's average of 447 bps to 411 bps in the fourth quarter of 2017, whereas the unemployment rate will remain stable at about 4.7%.<sup>11</sup>

Exhibit 10

**Default Rates to Fall Below Their Historical Averages****Commodity woes to dissipate**

Major factors supporting our benign default forecast include stabilizing commodity prices, an anticipated slight tightening in high yield spreads, an improving US economy and accommodative monetary policies in most advanced countries, which have, and will likely continue to provide sufficient liquidity to the capital markets. Also, we note that defaults and downgrade momentum in commodity sectors have eased in recent months and we expect this to continue in 2017, which should reduce the driving force of corporate defaults over the past two years. Specifically, our model predicts that the default rate for the combined portfolio of Oil & Gas and Metals & Mining issuers will fall to 3.4% in 2017 from 12.6% in 2016. The slowdown in commodity sector defaults can be explained by many weaker issuers having already defaulted in these sectors as well as the remaining, healthier issuers having improved access to the capital markets due to the rebound in oil prices driving more favorable investor sentiment (see Exhibit 11).

Exhibit 11

**Commodity Sectors' Default Rates to Fall by Almost 75%**

In Exhibit 11, we also plot the default rate for all sectors both with and without the combined Oil & Gas and Metals & Mining sector. As shown in the chart, while the default rate for the entire Moody's-rated universe jumped to 2.1% in 2016 from 1.7% in 2015, the comparable rate actually fell to 1.0% from 1.2% when we exclude issuers in the Oil & Gas and Metals & Mining sectors. Looking into 2017, we expect default risk to increase outside of the commodity sectors, finishing at 1.3% in December.

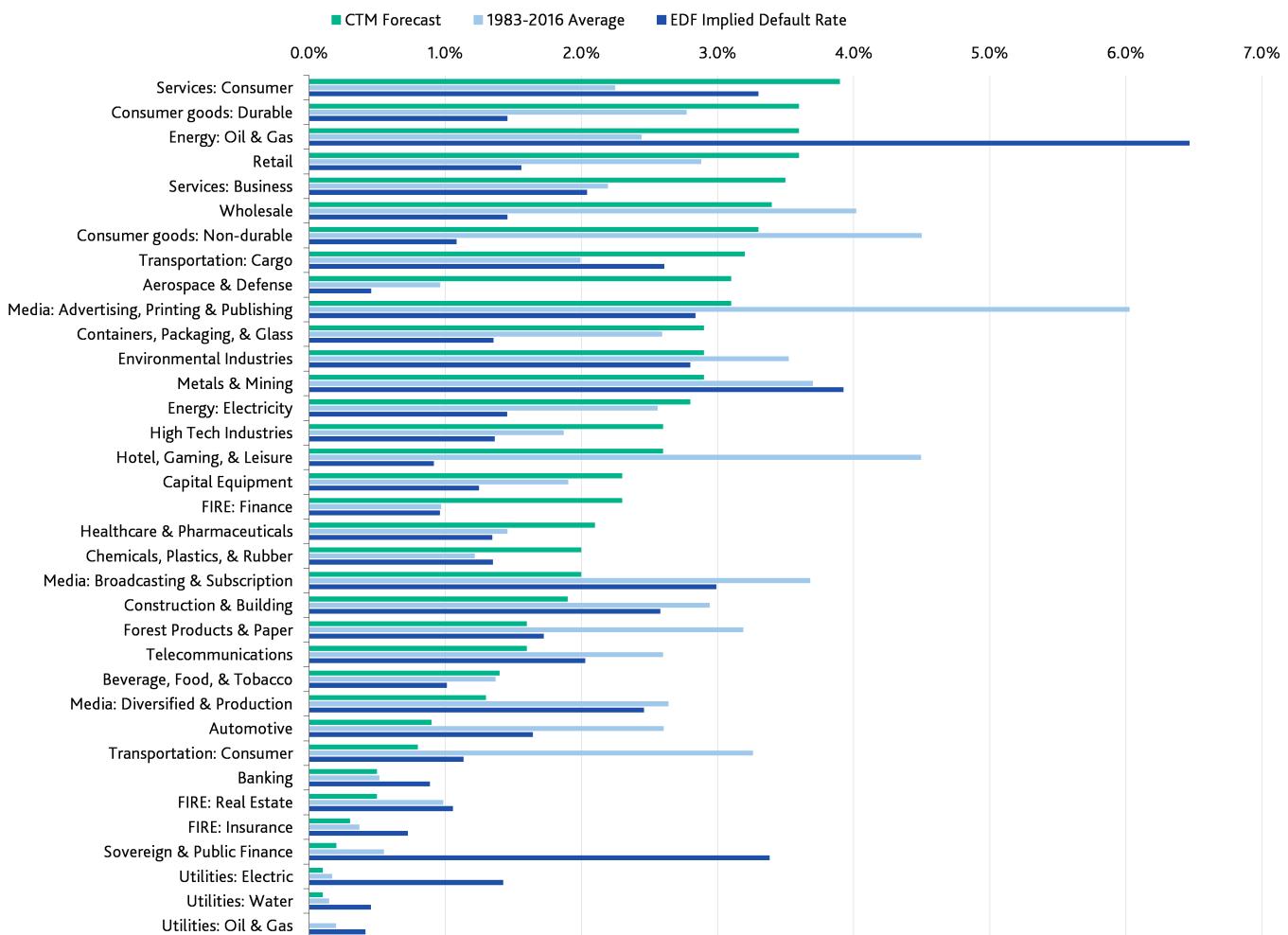
To take a closer look at industry-specific default risk, we provide the one-year baseline global default forecasts by industry in Exhibit 12.<sup>12</sup> In this chart, we apply the same economic assumption to all industries, so the only factor driving the different forecasted default rates is the underlying rating histories and current ratings of the issuers in those industries. Measured by default rate, the most troubled

sector is Consumer Services (3.9%). The next highest forecast belongs to Durable Consumer Goods (3.6%). These forecasts, if realized, will be higher than their historical averages of 2.2% and 2.8%, respectively.

Exhibit 12 also shows the default rate forecast implied by Expected Default Frequency (EDF).<sup>13</sup> As shown in the chart, EDF-implied ratings indicate a worse default rate outlook for commodity sectors than those suggested by the Credit Transition Model. This certainly reflects the volatility in the equity market, which may not be fully captured in the high yield spread or rating actions. In addition, the EDF-implied default rate may also be higher as that portfolio includes some unrated issuers that may have relatively weak credit qualities. When compared with those EDF-implied forecasts from a year ago, the latest EDF predictions reinforce the message that default rates are expected to drift noticeably lower in 2017 relative to 2016 for both Oil & Gas (6.5% vs. 9.4%) and Metals & Mining (3.9% vs. 8.6%).

Exhibit 12

### One-Year Corporate Default Rate Forecasts by Industry



While our baseline forecast represents our central view, we acknowledge that global economic conditions pose significant risks in 2017. For example, the prospect of interest rate hikes by the US Federal Reserve can create challenges for low-rated companies with weaker operating performance. In addition, credit conditions in 2017 could also be affected by political risks stemming from the negotiations surrounding the UK's exit from the European Union as well as potential changes of US trade policies. In particular, policies that result in disruptions to US trade would be credit negative for sectors including autos, oil and technology. Moreover, the possibility of a faster-than-expected slowdown in China's economy is another risk factor that may lead to a possible decline in commodity prices and result

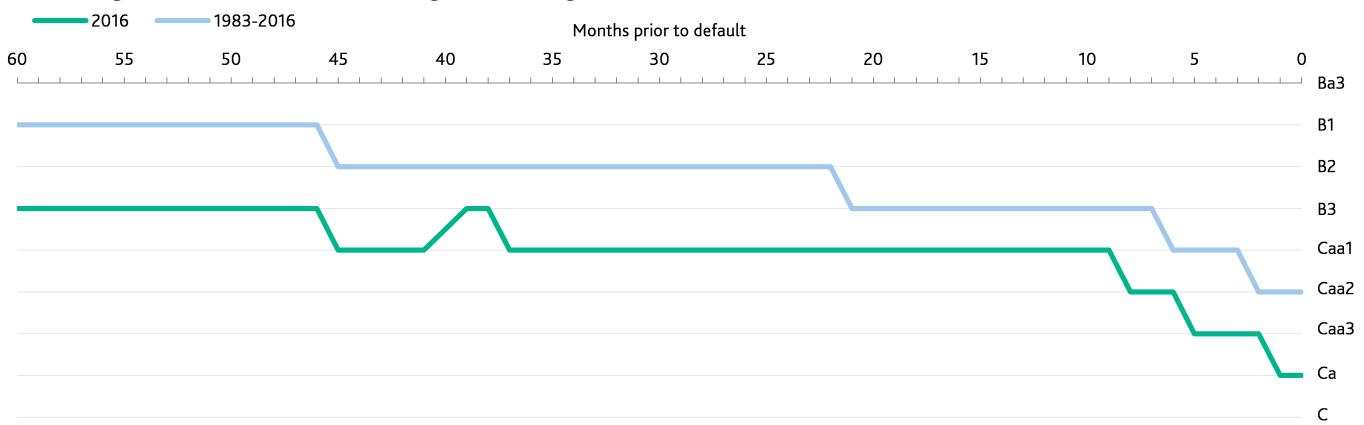
in another wave of commodity defaults. In our pessimistic scenario, which will occur at a 4% chance, the worldwide economy could fall back into a deep recession with the unemployment rate rising to 8.9% and the high yield bond spread widening to 1,163 bps.<sup>14</sup> In that case, the global default rate is expected to rise to 6.2% for all rated issuers and 12.4% for speculative-grade issuers (see dashed lines in Exhibit 10).

## Rating Accuracy Metrics

Moody's ratings have historically proven to be effective predictors of default. This can be seen in Exhibit 13, which plots the median ratings of more than 2,000 corporate issuers that defaulted from 1983 to 2016. The chart demonstrates that, historically, Moody's-rated issuers have been downgraded to the B1 level as early as five years prior to default. The comparable rating was lower at B3 among issuers that defaulted in 2016. The median rating one year prior to default was Caa1 among last year's defaulters, one notch below the rating measured over the entire period 1983-2016.

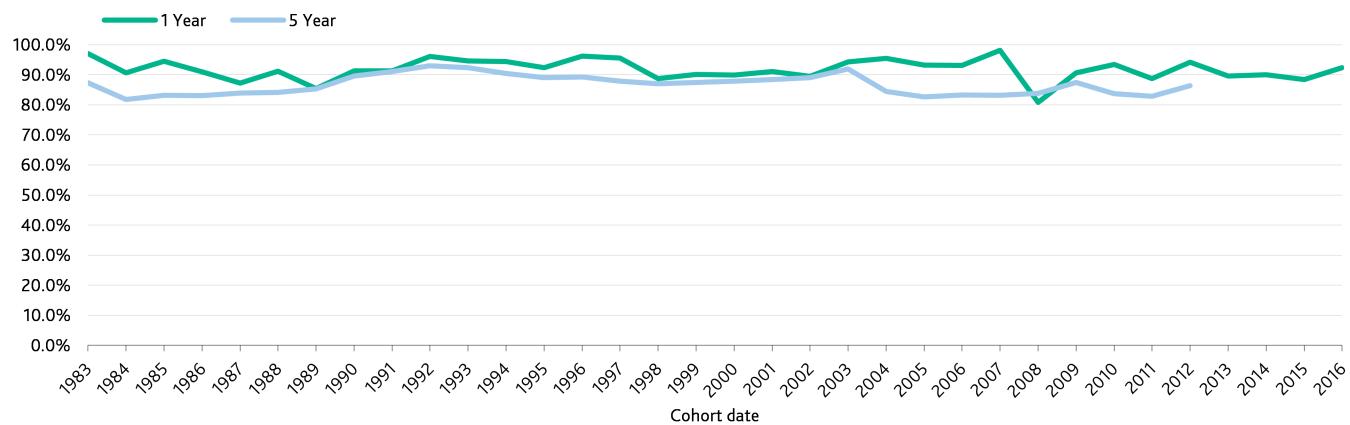
Exhibit 13

Median Ratings Prior to Default, 2016 vs. Long-Term Average



The evolution of median ratings presented in Exhibit 13 above demonstrate that Moody's corporate ratings are correlated with subsequent default experience. To further demonstrate the ability of ratings to separate issuers with low credit risk from those with high credit risk, we use the Average Position of defaults (AP) to evaluate the accuracy of Moody's ordinal rating systems (see Exhibit 14).<sup>15</sup> AP measures the average position for defaulters with position defined as the percentage of issuers with higher or equal ratings. A greater AP indicates a more discriminatory rating system as there are more issuers rated higher than the defaulters, or equivalently that defaulters are generally found in lower rating categories. Exhibit 14 reveals that between 1983 and 2016, the AP of defaults has been consistently high during the entire period, with an average of 91.5% for the one-year horizon and 86.6% for the five-year horizon. This indicates that Moody's ratings have been effective in predicting defaults over both the short- and long-term periods. The lowest one-year AP was observed in 2008 when Lehman Brothers and several other high-grade financial institutions failed. Since then, the AP has quickly recovered and reached 92.4% in 2016.

Exhibit 14

**One- and Five-Year Accuracy Default Position by Cohort Year, 1983-2016**

## Methodology and Data Sources

### Moody's Definition of Default

Moody's definition of default is applicable only to debt or debt-like obligations (e.g., swap agreements). For details, please refer to [Moody's Rating Symbols and Definitions](#).

### Methodology

The methodology used in this study can be found in the [Glossary of Moody's Ratings Performance Metrics](#). The Glossary report is a technical paper that explains how Moody's calculates default rates, transition rates and rating performance metrics in detail.

### Changes in this Year's Report

Moody's occasionally discovers historical defaults, leading to minor revisions of the historical data. As always, the data contained in the most recently published Moody's default study supersede the data published in previous reports.

### Data Sources

Moody's bases the results of this study on its proprietary database of ratings and defaults for corporate bond and loan issuers. Municipal and sub-sovereign debt issuers, structured finance securities, private placements and issuers with only short-term debt ratings are excluded unless otherwise noted. In total, Moody's data covers the credit experiences of over 20,000 corporate issuers that sold long-term public debt at some time between 1920 and 2016. As of January 1, 2016, over 6,000 corporate issuers held a Moody's long-term bond, loan, deposit or corporate family rating.

Moody's database of corporate defaults covers more than 3,000 long-term bond and loan defaults by issuers both rated and non-rated by Moody's. Additional data sources, such as Barclay's Fixed Income Index data, supplemented Moody's proprietary data in the construction of the aggregate dollar volume-weighted default rates. Defaulted bond pricing data was derived from Bloomberg, Reuters, IDC and TRACE. The majority of these market quotes represent an actual bid on the debt instrument, although no trade may have occurred at that price. Over the 1982-2016 period, the dataset includes post-default prices for approximately 5,000 defaulted instruments issued by over 1,700 defaulting corporations. Moody's makes the 1970-2016 credit rating, default and recovery rate data used in this study available through its Default and Recovery Database (DRD).

### Guide to Data Tables and Charts in Appendix

In this section, we briefly describe the interpretation of some of the Exhibits contained in this report. Exhibit 13 was derived by mapping Moody's ratings to a linear scale, then taking the median values of the numerically mapped ratings.

Exhibit 21 shows average senior unsecured recovery rates by letter rating and year prior to default. Each cell in the table indicates the average recovery rate on senior unsecured bonds with a specific rating within T years of default. For example, the 36.6% two-year B recovery rate reported in Exhibit 21 indicates the average recovery rate on B- rated issues that default at some time within a two-year period, not recovery rate for issuers rated B exactly two years before default. Together with issuer-weighted average cumulative default rates, these multi-period recovery estimates are used to calculate cumulative expected credit loss rates, as presented in Exhibit 22.

Exhibits 32 through 37 show issuer-weighted historical average default rates by rating category over various investment horizons. These data were generated by averaging the multi-year default rates of cohorts formed at monthly intervals. In addition to their being statements of historical fact, these data are also useful proxies for expected default rates. For example, over a five-year period a portfolio of B-rated issuers defaulted at a 22.0% average rate between 1983 and 2016 (see Exhibit 34). For an investor with a five-year exposure to a B-rated debt obligation or counterparty, this estimate also happens to be the best estimate of the expected risk of default for a B-rated exposure based on the available historical data, particularly over long investment horizons.

Exhibit 40 shows average cumulative volume-weighted default rates by rating category. Whereas issuerbased default rates weight each issuer equally, these data weight each issuer by the total volume of defaulted debt; larger defaults receive relatively more weight. Average default rates based on debt volume affected are less suitable estimates of expected default risk. One reason is that issuer default volumes vary considerably over time. On average, a leveraged corporate issuer defaults on approximately \$300 million of bonds. However, that total has been as high as \$30 billion (WorldCom). Issuer-based default rates receive particular emphasis in the rating process because the expected likelihood of default of a debt issuer holding a given rating is expected to be the same regardless of differences in the nominal sizes of the exposures.

Exhibit 41 shows the cumulative issuer-weighted historical default rates of cohorts formed between the years 1970 and 2016 (January 1 of each year). These data are a subset of the data used to calculate the issuer-weighted averages shown in Exhibits 32 through 34 (which, again, are based on cohorts formed at monthly time intervals). The default rates in Exhibit 41 may be useful for scenario analysis. For example, if one believed that future default rates for a given pool of issuers will behave as they did in, say, 1997, then one can use the January 1, 1997 cohort cumulative default rates as proxies for expected default rates.

## Appendix

Exhibit 15

### Moody's-Rated 2016 Corporate Bond And Loan Defaults<sup>1,2,3</sup>

<b>Company</b>	<b>Country</b>	<b>Default Month</b>	<b>Broad Default Type</b>	<b>Bonds (US\$ mil)</b>	<b>Loans (US\$ mil)</b>	<b>In Jan 2016 cohort?</b>
21st Century Oncology, Inc	United States	2016-12	Missed interest payment	357		1
A.M. Castle & Co.	United States	2016-2	Distressed exchange	206		1
Abengoa S.A.	Spain	2016-2	Missed principal and interest payments	4,043	4,984	1
American Gilsonite Company	United States	2016-10	Missed interest payment	270		1
Arch Coal, Inc.	United States	2016-1	Prepackaged Chapter 11	3,225	1,874	1
Ascent Resources - Marcellus LLC	United States	2016-11	Distressed exchange		102	1
Aspect Software, Inc.	United States	2016-3	Chapter 11	295	445	1
Atlas Energy Holdings Operating Company, LLC	United States	2016-7	Chapter 11	668		1
Atlas Iron Limited	Australia	2016-5	Distressed exchange		132	1
Avanti Communications Group plc	United Kingdom	2016-10	Distressed exchange	560		1
Basic Energy Services, Inc.	United States	2016-9	Missed interest payment	775	216	1
Berry Petroleum Company	United States	2016-5	Chapter 11	834	925	1
Bill Barrett Corp	United States	2016-5	Distressed exchange	85		1
Boardriders SA	Luxembourg	2016-3	Distressed exchange	201		1
Breitburn Energy Partners L.P.	United States	2016-5	Chapter 11	1,802	1,229	1
Bridge Finco LLC	United Kingdom	2016-6	Distressed exchange		395	1
California Resources Corp.	United States	2016-8	Distressed exchange	1,416		1
Camposol S.A.	Peru	2016-5	Distressed exchange	147		1
Cenveo Corporation	United States	2016-6	Distressed exchange	150		1
Cenveo, Inc.	United States	2016-6	Distressed exchange	0		0
Chaparral Energy, Inc.	United States	2016-3	Missed interest payment	1,224	549	1
CHC Group Ltd.	Canada	2016-5	Chapter 11	0	111	1
CHC Helicopter S.A.	Canada	2016-5	Chapter 11	1,108	142	1
CJ Holding Co.	United States	2016-7	Chapter 11		1,343	1
Claire's Stores, Inc.	United States	2016-5	Distressed exchange	174		1
Claire's Stores, Inc.	United States	2016-9	Distressed exchange	574		0
Cliffs Natural Resources Inc.	United States	2016-3	Distressed exchange	512		1
Cloud Peak Energy Resources LLC	United States	2016-10	Distressed exchange	381		1
Cobre del Mayo, S.A. de C.V.	Mexico	2016-1	Distressed exchange	205		1
Community Choice Financial Inc.	United States	2016-1	Distressed exchange	42		1
Comstock Resources, Inc.	United States	2016-9	Distressed exchange	1,137		0
Consolidated Minerals Limited	Jersey	2016-6	Distressed exchange	320		1
Constellation Enterprises, LLC	United States	2016-2	Distressed exchange	130		1
Denbury Resources Inc.	United States	2016-5	Distressed exchange	1,058		1
Denver Parent Corporation	United States	2016-3	Chapter 11	323		1
Dex Media East, Inc	United States	2016-5	Chapter 11		321	1
Dex Media West, Inc.	United States	2016-5	Chapter 11		296	1
DFC Finance Corp.	United States	2016-8	Distressed exchange	745		1
DTEK ENERGY B.V.	Ukraine	2016-4	Missed interest payment	910		1
DynCorp International Inc.	United States	2016-6	Distressed exchange	416		1
Edcon Holdings Limited	South Africa	2016-4	Missed interest payment	0		1
Edcon Limited	South Africa	2016-4	Missed interest payment	945		1

Company	Country	Default Month	Broad Default Type	Bonds (US\$ mil)	Loans (US\$ mil)	In Jan 2016 cohort?
Energy XXI Gulf Coast, Inc.	United States	2016-4	Prepackaged Chapter 11	2,183	378	1
EnQuest plc	United Kingdom	2016-11	Missed interest payment	650		1
EP Energy LLC	United States	2016-3	Distressed exchange	571	618	1
EPL Oil & Gas, Inc.	United States	2016-4	Prepackaged Chapter 11	214	0	1
Erickson Incorporated	United States	2016-11	Chapter 11	355	124	1
EV Energy Partners, L.P.	United States	2016-4	Distressed exchange	147		1
Fairway Group Acquisition Company	United States	2016-5	Chapter 11		306	1
Fieldwood Energy LLC	United States	2016-5	Distressed exchange		1,158	1
Finprombank	Russia	2016-9	Missed principal payment			1
Forbes Energy Services Ltd.	United States	2016-7	Missed interest payment	280		1
Foresight Energy, LLC	United States	2016-3	Missed interest payment	600	657	1
FTS International Inc.	United States	2016-7	Distressed exchange	31	46	1
General Shopping Brasil S.A.	Brazil	2016-8	Distressed exchange	34		1
Gol Linhas Aereas Inteligentes S.A.	Brazil	2016-7	Distressed exchange	175		1
Goodrich Petroleum Corporation	United States	2016-4	Prepackaged Chapter 11	195		1
Gymboree Corporation (The)	United States	2016-3	Distressed exchange	135		1
Halcon Resources Corporation	United States	2016-7	Chapter 11	2,481	450	1
Hercules Offshore, Inc.	United States	2016-6	Prepackaged Chapter 11		430	1
Horsehead Holding Corp.	United States	2016-2	Chapter 11	343		1
Illinois Power Generating Company	United States	2016-12	Chapter 11	825		1
Intelsat Jackson Holdings S.A.	Luxembourg	2016-7	Distressed exchange	2,119		1
Intelsat S.A.	Luxembourg	2016-7	Distressed exchange	0		0
ION Geophysical Corporation	United States	2016-4	Distressed exchange	147		1
Iracore International Holdings, Inc.	United States	2016-12	Missed interest payment	125		1
IronGate Energy Services, LLC	United States	2016-7	Missed interest payment	210		1
Jack Cooper Enterprises, Inc.	United States	2016-12	Distressed exchange	131		1
Jones Energy Holdings, LLC	United States	2016-2	Distressed exchange	191		1
Kazinvestbank	Kazakhstan	2016-12	Placed under administration			1
Key Energy Services, Inc.	United States	2016-10	Missed interest payment	675	704	1
Legacy Reserves LP	United States	2016-5	Distressed exchange	184		1
Light Tower Rentals, Inc.	United States	2016-8	Chapter 11	330		1
Lightstream Resources Ltd	Canada	2016-7	Missed interest payment	904	282	1
Linn Energy, LLC	United States	2016-5	Chapter 11	4,023	3,600	1
Logan's Roadhouse Inc.	United States	2016-5	Missed interest payment	144	30	1
Lonestar Resources America Inc.	United States	2016-8	Distressed exchange	68		1
Memorial Production Partners LP	United States	2016-12	Missed interest payment	328		1
Midstates Petroleum Company Inc.	United States	2016-4	Prepackaged Chapter 11	891	255	1
Modular Space Corporation	United States	2016-8	Missed interest payment	375		1
Mongolian Mining Corporation	Mongolia	2016-3	Missed principal and interest payments	600	93	1
New World Resources N.V.	Netherlands	2016-5	Bankruptcy	615	56	1
Noranda Aluminum Acquisition Corporation	United States	2016-2	Chapter 11	175	516	1
Norske Skogindustrier ASA	Norway	2016-4	Distressed exchange	188		1
Novasep Holding SAS	France	2016-10	Distressed exchange	188		1
Nuverra Environmental Solutions, Inc.	United States	2016-4	Distressed exchange	328		1
Oi S.A.	Brazil	2016-6	Bankruptcy	10,751	2,957	1

Company	Country	Default Month	Broad Default Type	Bonds (US\$ mil)	Loans (US\$ mil)	In Jan 2016 cohort?
Optima Specialty Steel, Inc.	United States	2016-12	Chapter 11	162		1
Pacific Exploration and Production Corp	Colombia	2016-2	Missed interest payment	4,104	1,324	1
Paragon Offshore plc	United States	2016-2	Prepackaged Chapter 11	984	1,273	1
PDG Realty S.A. Empreend. e Part	Brazil	2016-3	Missed principal and interest payments	90		1
Peabody Energy Corporation	United States	2016-4	Chapter 11	2,636	3,037	1
Penn Virginia Corporation	United States	2016-5	Chapter 11	1,075	149	1
Performance Sports Group Ltd	United States	2016-10	Chapter 11		451	1
Perpetual Energy Inc.	Canada	2016-4	Distressed exchange	120		1
Perstorp Holding AB	Sweden	2016-11	Distressed exchange		88	1
Petroleos de Venezuela, S.A.	Venezuela	2016-10	Distressed exchange	2,802		1
Petroleum Geo-Services ASA	Norway	2016-12	Distressed exchange	424		1
PetroQuest Energy, Inc	United States	2016-2	Distressed exchange	214		1
PetroQuest Energy, Inc	United States	2016-9	Distressed exchange	244		0
Postmedia Network Inc.	Canada	2016-10	Distressed exchange	463		1
Prospect Holding Company, LLC	United States	2016-3	Distressed exchange	88		1
PTC Group Holdings Corp.	United States	2016-4	Missed interest payment		120	1
R.H. Donnelley Inc.	United States	2016-5	Chapter 11		583	1
Rex Energy Corporation	United States	2016-3	Distressed exchange	633		1
RGL Reservoir Management Inc.	Canada	2016-3	Distressed exchange		106	1
SAExploration Holdings, Inc.	United States	2016-7	Distressed exchange	138		1
Samarco Mineracao S.A.	Brazil	2016-10	Missed interest payment	2,200		1
SandRidge Energy, Inc.	United States	2016-5	Chapter 11	3,641	499	1
Seventy Seven Energy Inc.	United States	2016-6	Chapter 11	450	10	1
Seventy Seven Operating LLC	United States	2016-6	Chapter 11	648	492	1
SFX Entertainment, Inc.	United States	2016-2	Chapter 11	295	24	1
Sheridan Investment Partners I, LLC	United States	2016-1	Distressed exchange		156	1
Sidewinder Drilling Inc.	United States	2016-2	Distressed exchange	133		1
Sidewinder Drilling Inc.	United States	2016-12	Missed interest payment	117		0
SoLocal Group S.A.	France	2016-12	Missed interest payment	369		1
Southcross Holdings Borrower LP	United States	2016-3	Prepackaged Chapter 11		575	1
Sports Authority Inc. (The)	United States	2016-2	Missed interest payment	342	295	1
SquareTwo Financial Corporation	United States	2016-4	Missed interest payment	290	137	1
Stallion Oilfield Holdings, Inc.	United States	2016-3	Missed principal and interest payments		375	0
Sterling Mid-Holdings Limited	United Kingdom	2016-8	Distressed exchange	0		1
Stone Energy Corporation	United States	2016-12	Chapter 11	1,075	354	1
SuperMedia Inc.	United States	2016-5	Chapter 11		978	1
Templar Energy LLC	United States	2016-5	Missed interest payment		1,450	1
Tervita Corporation	Canada	2016-6	Missed interest payment	933		1
Toys "R" Us, Inc.	United States	2016-8	Distressed exchange	192		1
Transtar Holding Company	United States	2016-7	Missed interest payment		586	1
Triangle USA Petroleum Corporation	United States	2016-6	Chapter 11	381	462	1
TwentyEighty, Inc.	United States	2016-12	Missed interest payment		37	1
UCI INTERNATIONAL, LLC	United States	2016-3	Missed interest payment	400	71	1
Ultra Petroleum Corp.	United States	2016-3	Missed principal and interest payments	2,260	999	1
Ultrapetrol (Bahamas) Limited	Argentina	2016-1	Missed interest payment	225	149	1

Company	Country	Default Month	Broad Default Type	Bonds (US\$ mil)	Loans (US\$ mil)	In Jan 2016 cohort?
United Central Industrial Supply	United States	2016-5	Distressed exchange		135	1
United Distribution Group, Inc.	United States	2016-5	Distressed exchange		0	1
Usinas Siderurgicas de Minas Gerais S.A.	Brazil	2016-3	Payment moratorium		0	1
Vanguard Natural Resources, LLC	United States	2016-2	Distressed exchange	168		1
Venoco, Inc.	United States	2016-3	Missed interest payment	633	75	1
Verso Paper Holdings LLC	United States	2016-1	Chapter 11	1,722	736	1
Vertellus Specialties Inc.	United States	2016-4	Missed interest payment		555	1
Viver Incorporadora e Construtora S.A.	Brazil	2016-9	Bankruptcy	19		1
W&T Offshore, Inc.	United States	2016-9	Distressed exchange	710		1
Warren Resources, Inc.	United States	2016-3	Missed interest payment	167	286	1
Waste Italia S.p.A.	Italy	2016-6	Missed interest payment	225		1
White Star Petroleum, LLC	United States	2016-3	Distressed exchange	148		1

1. This list only includes companies that have rated bonds, loans and/or deposits within one year prior to default.

2. The list only includes 144 companies, which initially defaulted in 2016. Besides these 144 companies, there are nine issuers, which initially defaulted in prior years but experienced follow-on defaults on \$2.6 billion of debt in 2016 (\$2.0 billion in bonds and \$0.6 billion in loans). We include such \$2.6 billion in the 2016 default volume.

3. Only issuers included in the Jan 1st cohort are included in the annual default rates in this report.

## Exhibit 16

## Annual Moody's-Rated Global Corporate Issuer Default Counts, 1920-2016\*

Year	Inv-Grade	Spec-Grade	All-Rated
1920	8	25	33
1921	7	25	32
1922	10	23	33
1923	5	22	27
1924	3	37	40
1925	7	34	41
1926	4	18	22
1927	1	15	16
1928	0	8	8
1929	3	12	15
1930	2	21	23
1931	6	78	84
1932	10	108	118
1933	9	188	197
1934	5	60	65
1935	9	51	60
1936	3	19	22
1937	4	18	22
1938	9	17	26
1939	2	13	15
1940	2	22	24
1941	0	10	10
1942	0	4	4
1943	0	3	3
1944	0	3	3
1945	0	2	2
1946	0	0	0
1947	0	2	2
1948	0	0	0
1949	0	5	5
1950	0	0	0
1951	0	1	1
1952	0	0	0
1953	0	0	0
1954	0	1	1
1955	0	1	1
1956	0	0	0
1957	0	1	1
1958	0	0	0
1959	0	0	0
1960	0	2	2
1961	0	3	3
1962	0	4	4
1963	0	3	3

Year	Inv-Grade	Spec-Grade	All-Rated
1964	0	0	0
1965	0	0	0
1966	0	1	1
1967	0	0	0
1968	0	1	1
1969	0	0	0
1970	2	25	27
1971	0	3	3
1972	0	5	5
1973	2	3	5
1974	0	3	3
1975	0	4	4
1976	0	2	2
1977	1	3	4
1978	0	4	4
1979	0	1	1
1980	0	4	4
1981	0	2	2
1982	2	11	13
1983	0	13	13
1984	2	11	13
1985	0	16	16
1986	3	33	36
1987	0	31	31
1988	0	33	33
1989	4	50	54
1990	1	89	90
1991	1	68	69
1992	0	33	33
1993	0	23	23
1994	0	19	19
1995	0	29	29
1996	0	18	18
1997	0	25	25
1998	1	51	52
1999	1	107	108
2000	4	124	128
2001	4	186	190
2002	14	133	147
2003	0	90	90
2004	0	41	41
2005	2	31	33
2006	0	31	31
2007	0	19	19
2008	21	118	139
2009	14	257	271
2010	3	61	64
2011	6	42	48
2012	1	67	68
2013	3	67	70
2014	2	54	56
2015	0	108	108
2016	0	137	137

\* Only include issuers in the Jan 1st cohort.

## Exhibit 17

## Annual Rated Global Corporate Bond And Loan Default Volumes, 1970-2016\*

Year	Investment Grade			Speculative Grade			All Ratings		
	Bond	Loan	Total	Bond	Loan	Total	Bond	Loan	Total
1970	\$154	\$0	\$154	\$756	\$0	\$756	\$910	\$0	\$910
1971	\$0	\$0	\$0	\$132	\$0	\$132	\$132	\$0	\$132
1972	\$0	\$0	\$0	\$215	\$0	\$215	\$215	\$0	\$215
1973	\$17	\$0	\$17	\$94	\$0	\$94	\$112	\$0	\$112
1974	\$0	\$0	\$0	\$69	\$0	\$69	\$69	\$0	\$69
1975	\$0	\$0	\$0	\$176	\$0	\$176	\$176	\$0	\$176
1976	\$0	\$0	\$0	\$34	\$0	\$34	\$34	\$0	\$34
1977	\$68	\$0	\$68	\$179	\$0	\$179	\$247	\$0	\$247
1978	\$0	\$0	\$0	\$112	\$0	\$112	\$112	\$0	\$112
1979	\$0	\$0	\$0	\$18	\$0	\$18	\$18	\$0	\$18
1980	\$0	\$0	\$0	\$302	\$0	\$302	\$302	\$0	\$302
1981	\$0	\$0	\$0	\$47	\$0	\$47	\$47	\$0	\$47
1982	\$243	\$0	\$243	\$515	\$0	\$515	\$758	\$0	\$758
1983	\$0	\$0	\$0	\$1,110	\$0	\$1,110	\$1,110	\$0	\$1,110
1984	\$215	\$0	\$215	\$367	\$0	\$367	\$582	\$0	\$582
1985	\$0	\$0	\$0	\$1,354	\$0	\$1,354	\$1,354	\$0	\$1,354
1986	\$138	\$0	\$138	\$3,213	\$0	\$3,213	\$3,351	\$0	\$3,351
1987	\$0	\$0	\$0	\$8,941	\$242	\$9,182	\$8,941	\$242	\$9,182
1988	\$0	\$0	\$0	\$5,642	\$361	\$6,003	\$5,642	\$361	\$6,003
1989	\$1,506	\$0	\$1,506	\$9,657	\$0	\$9,657	\$11,162	\$0	\$11,162
1990	\$0	\$0	\$0	\$20,429	\$1,831	\$22,260	\$20,429	\$1,831	\$22,260
1991	\$1,348	\$0	\$1,348	\$15,546	\$678	\$16,224	\$16,894	\$678	\$17,572
1992	\$0	\$0	\$0	\$6,667	\$956	\$7,623	\$6,667	\$956	\$7,623
1993	\$0	\$0	\$0	\$2,617	\$487	\$3,103	\$2,617	\$487	\$3,103
1994	\$0	\$0	\$0	\$2,687	\$299	\$2,986	\$2,687	\$299	\$2,986
1995	\$0	\$0	\$0	\$5,401	\$372	\$5,773	\$5,401	\$372	\$5,773
1996	\$0	\$0	\$0	\$4,106	\$1,435	\$5,541	\$4,106	\$1,435	\$5,541
1997	\$0	\$0	\$0	\$5,024	\$948	\$5,972	\$5,024	\$948	\$5,972
1998	\$399	\$0	\$399	\$9,469	\$3,299	\$12,768	\$9,868	\$3,299	\$13,167
1999	\$461	\$1,225	\$1,686	\$26,217	\$14,107	\$40,324	\$26,678	\$15,332	\$42,010
2000	\$4,115	\$3,950	\$8,065	\$25,360	\$26,206	\$51,566	\$29,475	\$30,156	\$59,631
2001	\$21,195	\$5,363	\$26,558	\$78,864	\$34,103	\$112,967	\$100,059	\$39,466	\$139,525
2002	\$44,214	\$13,658	\$57,872	\$115,631	\$40,471	\$156,101	\$159,845	\$54,129	\$213,973
2003	\$0	\$870	\$870	\$37,596	\$10,308	\$47,904	\$37,596	\$11,178	\$48,774
2004	\$0	\$0	\$0	\$16,409	\$4,712	\$21,122	\$16,409	\$4,712	\$21,122
2005	\$2,155	\$2,825	\$4,980	\$26,923	\$8,745	\$35,668	\$29,078	\$11,570	\$40,648
2006	\$0	\$0	\$0	\$7,758	\$2,630	\$10,388	\$7,758	\$2,630	\$10,388
2007	\$0	\$0	\$0	\$6,214	\$1,983	\$8,197	\$6,214	\$1,983	\$8,197
2008	\$183,055	\$10,380	\$193,434	\$51,862	\$32,322	\$84,184	\$234,917	\$42,701	\$277,618
2009	\$35,704	\$21,931	\$57,634	\$147,817	\$122,350	\$270,166	\$183,520	\$144,280	\$327,801
2010	\$4,047	\$0	\$4,047	\$21,488	\$14,042	\$35,530	\$25,535	\$14,042	\$39,576
2011	\$6,561	\$1,411	\$7,972	\$22,108	\$4,906	\$27,014	\$28,669	\$6,317	\$34,986
2012	\$323	\$0	\$323	\$34,835	\$18,289	\$53,125	\$35,159	\$18,289	\$53,448
2013	\$2,408	\$0	\$2,408	\$28,781	\$14,249	\$43,030	\$31,189	\$14,249	\$45,438
2014	\$939	\$0	\$939	\$43,542	\$30,029	\$73,571	\$44,481	\$30,029	\$74,510
2015	\$0	\$0	\$0	\$75,515	\$19,794	\$95,309	\$75,515	\$19,794	\$95,309
2016	\$0	\$0	\$0	\$89,952	\$42,508	\$132,460	\$89,952	\$42,508	\$132,460

\* Default volume in millions of USD

Only include companies in the Jan 1st cohort

Exhibit 18

## Annual Issuer Default Counts And Volume Totals By Geographical Region, 1986-2016\*

Year	Issuer Counts					Dollar Volumes (US\$ mil)																		
	Africa & Middle East		Asia Pacific			Europe		Latin America			North America		Africa & Middle East		Asia Pacific			Europe		Latin America			North America	
	East	Asia Pacific	Europe	Latin America	North America	East	Asia Pacific	Europe	Latin America	North America	East	Asia Pacific	Europe	Latin America	North America	East	Asia Pacific	Europe	Latin America	North America				
1986	0	0	0	0	38	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$4,142			
1987	0	0	0	0	32	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$9,262			
1988	0	0	0	0	33	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,003			
1989	0	4	0	0	51	\$0	\$969	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$10,253			
1990	0	1	1	0	92	\$0	\$200	\$516	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$22,097			
1991	0	0	2	0	71	\$0	\$0	\$1,228	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$16,753			
1992	0	0	0	0	34	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$7,673			
1993	0	0	0	0	24	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$3,104			
1994	0	0	1	0	18	\$0	\$0	\$774	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,212			
1995	0	0	0	1	30	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$5,774			
1996	0	0	0	1	19	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$5,930			
1997	0	2	0	2	21	\$0	\$614	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$5,048			
1998	0	5	5	0	44	\$0	\$1,444	\$707	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$11,241			
1999	0	8	9	8	86	\$0	\$4,458	\$3,950	\$0	\$2,018	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$33,353			
2000	0	3	4	3	118	\$0	\$4,453	\$866	\$0	\$305	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$54,074			
2001	4	15	15	6	150	\$2,758	\$7,832	\$10,540	\$0	\$2,034	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$116,675			
2002	0	2	25	17	102	\$0	\$1,842	\$45,418	\$0	\$10,424	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$156,289			
2003	0	2	7	11	69	\$0	\$625	\$3,708	\$0	\$4,152	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$40,414			
2004	1	0	5	1	38	\$183	\$0	\$2,311	\$0	\$1,093	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$18,304			
2005	0	0	1	1	32	\$0	\$0	\$207	\$0	\$100	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$40,445			
2006	0	0	7	2	23	\$0	\$0	\$1,601	\$0	\$167	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$9,113			
2007	0	0	3	0	15	\$0	\$0	\$2,230	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$5,967			
2008	0	3	51	2	92	\$0	\$625	\$54,356	\$0	\$555	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$228,230			
2009	1	16	31	11	224	\$650	\$6,989	\$28,013	\$0	\$3,031	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$294,108			
2010	0	3	11	2	53	\$0	\$6,913	\$10,490	\$0	\$487	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$25,270			
2011	0	0	15	1	35	\$0	\$0	\$10,064	\$0	\$358	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$26,599			
2012	1	1	12	5	51	\$48	\$1,805	\$17,275	\$0	\$3,077	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$33,780			
2013	0	2	25	10	35	\$0	\$546	\$24,095	\$0	\$4,880	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$23,091			
2014	1	5	14	5	32	\$350	\$3,397	\$13,385	\$0	\$4,539	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$53,092			
2015	1	10	28	9	68	\$456	\$4,271	\$15,993	\$0	\$4,314	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$74,989			
2016	2	2	19	12	109	\$945	\$1,806	\$16,335	\$0	\$26,135	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$89,687			

\* Include defaults outside of the Jan 1st cohorts

Exhibit 19

## 2016 Defaulted Corporate Bond And Loan Recoveries\*

Company	Default Type	Bank Loans			Bonds			
		1st Lien	2nd Lien	1st Lien	2nd Lien	Sr. Unsec.	Sr. Sub.	Sub.
21st Century Oncology, Inc	payment default					68.0%		
A.M. Castle & Co.	distressed exchange				72.0%			
Abengoa S.A.	payment default					9.5%		
American Gilsonite Company	payment default			62.8%				
Arch Coal, Inc.	bankruptcy				1.0%	0.7%		
Aspect Software, Inc.	bankruptcy	99.8%			35.0%			
Atlas Energy Holdings Operating Company, LLC	bankruptcy				20.0%			
Automotores Gildemeister S.A.	payment default				38.0%			
Basic Energy Services, Inc.	payment default				47.8%			
Berry Petroleum Company	bankruptcy	77.0%			28.4%			
Bill Barrett Corp	distressed exchange				80.0%			
Boardriders SA	distressed exchange				88.8%			
Breitburn Energy Partners L.P.	bankruptcy	79.6%			15.9%			
Camposol S.A.	distressed exchange				77.0%			
Cenveo Corporation	distressed exchange				91.5%			
Chaparral Energy, Inc.	payment default	82.5%			41.0%			
CHC Helicopter S.A.	bankruptcy			43.5%		7.5%		
CJ Holding Co.	bankruptcy	74.0%						
Claire's Stores, Inc.	distressed exchange				50.0%			
Cliffs Natural Resources Inc.	distressed exchange			11.0%	10.0%			
Cloud Peak Energy Resources LLC	distressed exchange				73.0%			
Comstock Resources, Inc.	distressed exchange				11.0%			
Constellation Enterprises, LLC	distressed exchange			70.0%				
Constellation Enterprises, LLC	bankruptcy			30.0%				
Denbury Resources Inc.	distressed exchange				59.7%			
Denver Parent Corporation	bankruptcy				0.0%			
DTEK ENERGY B.V.	payment default				58.8%			
DynCorp International Inc.	distressed exchange				76.0%			
Edcon Limited	payment default			32.6%				
Empresas ICA, S.A.B. de C.V.	payment default				18.1%			
Energy XXI Gulf Coast, Inc.	bankruptcy			36.5%	4.7%			
EPL Oil & Gas, Inc.	bankruptcy				7.0%			
Erickson Incorporated	bankruptcy			28.5%				
F+W Media, Inc.	payment default	81.8%						
Forbes Energy Services Ltd.	payment default				38.5%			
Foresight Energy, LLC	payment default	77.2%			64.8%			
General Shopping Brasil S.A.	distressed exchange					24.5%		
Gol Linhas Aereas Inteligentes S.A.	distressed exchange				39.6%			
Goodrich Petroleum Corporation	bankruptcy			4.8%	0.0%			
Gymboree Corporation (The)	distressed exchange				32.5%			
Halcon Resources Corporation	bankruptcy			94.0%	23.7%			
Hercules Offshore, Inc.	bankruptcy	97.6%						
Horsehead Holding Corp.	bankruptcy			56.0%	16.1%			
Intelsat Jackson Holdings S.A.	distressed exchange				65.0%			

Company	Default Type	Bank Loans			Bonds			
		1st Lien	2nd Lien	1st Lien	2nd Lien	Sr. Unsec.	Sr. Sub.	Sub.
IronGate Energy Services, LLC	payment default			24.0%				
Jack Cooper Enterprises, Inc.	distressed exchange					11.0%		
Jones Energy Holdings, LLC	distressed exchange					49.8%		
Key Energy Services, Inc.	payment default	99.5%				24.0%		
Legacy Reserves LP	distressed exchange					35.9%		
Light Tower Rentals, Inc.	bankruptcy			45.0%				
Lightstream Resources Ltd	payment default					4.5%		
Linn Energy, LLC	bankruptcy	78.5%			33.0%	17.8%		
Logan's Roadhouse Inc.	payment default					10.5%		
Midstates Petroleum Company Inc.	bankruptcy					54.5%	1.0%	
Modular Space Corporation	payment default					41.5%		
Mongolian Mining Corporation	payment default					22.5%		
Norske Skogindustrier ASA	distressed exchange					26.0%		
Novasep Holding SAS	distressed exchange			95.5%				
Nuverra Environmental Solutions, Inc.	distressed exchange					40.0%		
Oi S.A.	bankruptcy					21.1%		
Pacific Exploration and Production Corp	payment default					18.4%		
Paragon Offshore plc	bankruptcy					26.5%		
Peabody Energy Corporation	bankruptcy				12.0%	11.1%	0.6%	
Penn Virginia Corporation	bankruptcy	75.0%				36.8%		
PetroQuest Energy, Inc	distressed exchange					52.5%		
Postmedia Network Inc.	distressed exchange				93.0%			
Rex Energy Corporation	distressed exchange					10.0%		
SAExploration Holdings, Inc.	distressed exchange			46.8%				
Samarco Mineracao S.A.	payment default					48.2%		
SandRidge Energy, Inc.	bankruptcy	71.8%			39.8%	4.0%		
Seventy Seven Energy Inc.	bankruptcy					6.0%		
Seventy Seven Operating LLC	bankruptcy					50.0%		
SFX Entertainment, Inc.	bankruptcy				3.3%			
Sheridan Investment Partners I, LLC	distressed exchange	54.9%						
Sheridan Investment Partners II, LP	distressed exchange	53.3%						
Sports Authority Inc. (The)	payment default	14.5%						
SquareTwo Financial Corporation	payment default			13.0%				
Tervita Corporation	payment default				7.0%			
Toys 'R' US, Inc.	distressed exchange				89.0%			
Transtar Holding Company	payment default	71.5%	22.5%					
Triangle USA Petroleum Corporation	bankruptcy	87.5%				23.0%		
UCI INTERNATIONAL, LLC	payment default					21.4%		
Ultra Petroleum Corp.	payment default					55.0%		
Ultrapetrol (Bahamas) Limited	payment default			19.0%				
Vanguard Natural Resources, LLC	distressed exchange					12.0%		
Venoco, Inc.	payment default					2.0%		
Verso Paper Holdings LLC	bankruptcy			15.4%	1.4%		0.5%	
W&T Offshore, Inc.	distressed exchange					30.3%		
Warren Resources, Inc.	payment default					0.1%		

\* Measured by trading prices.

## Exhibit 20

## Annual Defaulted Corporate Bond And Loan Recoveries\*

Year	Loan		Bond				
	Sr. Sec. (1st Lien)	Sr. Sec. (1st Lien)	Sr. Unsec.	Sr. Sub.	Sub.	Jr. Sub.	All Bonds
1983		40.0%	52.7%	43.5%	41.1%		44.5%
1984			49.4%	67.9%	44.3%		45.5%
1985		83.6%	60.2%	29.6%	39.7%	48.5%	43.6%
1986		59.2%	50.4%	46.8%	40.4%		46.8%
1987		71.0%	63.8%	46.5%	46.9%		51.3%
1988		55.4%	45.2%	31.4%	33.8%	36.5%	38.5%
1989		46.5%	43.6%	35.7%	26.8%	16.9%	32.5%
1990	72.0%	33.8%	38.2%	25.5%	19.5%	10.7%	25.8%
1991	67.9%	48.4%	36.7%	41.8%	24.4%	7.8%	35.5%
1992	60.6%	62.1%	49.2%	49.4%	38.0%	13.5%	45.9%
1993	53.4%		37.1%	51.9%	44.1%		43.1%
1994	67.6%	69.3%	53.7%	29.6%	38.0%	40.0%	45.6%
1995	75.4%	62.0%	47.6%	34.3%	41.5%		43.3%
1996	85.5%	47.6%	62.8%	43.8%	22.6%		41.5%
1997	81.3%	72.0%	56.1%	44.7%	33.1%	30.6%	47.6%
1998	56.7%	46.8%	39.5%	45.0%	18.2%	62.0%	38.3%
1999	73.5%	39.1%	38.0%	26.9%	35.6%		34.3%
2000	68.8%	39.2%	24.2%	20.8%	31.9%	15.5%	25.2%
2001	64.9%	31.7%	21.2%	19.8%	15.9%	47.0%	21.6%
2002	58.4%	50.6%	29.5%	21.4%	23.4%		29.5%
2003	73.4%	69.2%	41.9%	37.8%	12.3%		41.4%
2004	87.7%	73.3%	52.1%	42.3%	94.0%		58.5%
2005	83.8%	69.2%	54.9%	32.8%	51.3%		56.5%
2006	83.6%	74.6%	55.0%	41.4%	56.1%		55.0%
2007	68.6%	82.3%	53.7%	56.2%			55.1%
2008	61.7%	52.5%	33.5%	23.3%	29.5%		34.1%
2009	53.6%	37.3%	36.5%	23.1%	45.3%		33.8%
2010	70.9%	57.6%	50.7%	37.5%	33.7%		51.5%
2011	70.9%	70.5%	41.3%	36.7%	31.9%		45.7%
2012	66.4%	57.6%	43.3%	33.7%	37.3%		44.5%
2013	75.1%	68.1%	45.0%	20.7%	26.4%		46.1%
2014	78.4%	73.6%	46.1%	39.1%	38.8%		47.9%
2015	64.1%	54.8%	37.6%	36.6%	58.5%	14.0%	40.6%
2016	75.0%	43.4%	31.3%	36.7%	24.5%	0.6%	35.0%

\* Based on trading prices.

## Exhibit 21

## Average Sr. Unsecured Bond Recovery Rates By Year Prior To Default, 1983-2016\*

	Year 1	Year 2	Year 3	Year 4	Year 5
Aaa**		3.33%	3.33%	61.88%	69.58%
Aa	37.24%	39.02%	38.08%	43.95%	43.18%
A	30.36%	42.57%	44.97%	44.48%	44.17%
Baa	42.89%	44.16%	43.99%	43.79%	43.52%
Ba	44.07%	42.79%	41.65%	41.15%	41.16%
B	37.70%	36.59%	36.87%	37.26%	37.86%
Caa-C	36.85%	37.12%	37.12%	37.41%	37.46%
Investment Grade	40.04%	43.33%	43.96%	44.11%	43.85%
Speculative Grade	37.58%	37.40%	37.49%	37.81%	38.16%
All Rated	37.67%	37.74%	37.96%	38.35%	38.72%

\* Issuer-weighted, based on post default trading prices

\*\* The Aaa recovery rates are based on five observations, three of which are Icelandic banks that have an average recovery rate of 3.33%.

## Exhibit 22

## Average Cumulative Credit Loss Rates By Letter Rating, 1983-2016\*

	Year 1	Year 2	Year 3	Year 4	Year 5
Aaa	0.00%	0.01%	0.01%	0.01%	0.02%
Aa	0.01%	0.04%	0.07%	0.12%	0.18%
A	0.04%	0.10%	0.21%	0.32%	0.47%
Baa	0.11%	0.27%	0.46%	0.69%	0.92%
Ba	0.53%	1.52%	2.75%	4.04%	5.14%
B	2.22%	5.37%	8.49%	11.23%	13.68%
Caa-C	6.66%	11.67%	15.94%	19.36%	22.19%
Investment Grade	0.06%	0.15%	0.26%	0.39%	0.54%
Speculative Grade	2.66%	5.43%	8.05%	10.31%	12.23%
All Rated	1.03%	2.06%	3.00%	3.78%	4.44%

\* Based on average default rates and senior unsecured bond recoveries measured on issuer-weighted basis

## Exhibit 23

## Annual Credit Loss Rates By Letter Rating, 1983-2016\*

Year	Aaa	Aa	A	Baa	Ba	B	Caa-C	Inv-Grade	Spec-Grade	All Rated
1983	0.00%	0.00%	0.00%	0.00%	0.55%	1.09%	20.01%	0.00%	1.92%	0.43%
1984	0.00%	0.00%	0.00%	0.32%	0.26%	2.70%	9.20%	0.09%	1.58%	0.44%
1985	0.00%	0.00%	0.00%	0.00%	0.35%	2.91%	2.66%	0.00%	1.50%	0.38%
1986	0.00%	0.00%	0.00%	0.43%	1.17%	5.22%	8.48%	0.10%	3.06%	0.91%
1987	0.00%	0.00%	0.00%	0.00%	1.10%	1.97%	3.56%	0.00%	1.56%	0.52%
1988	0.00%	0.00%	0.00%	0.00%	0.74%	3.25%	6.85%	0.00%	2.11%	0.76%
1989	0.00%	0.28%	0.00%	0.30%	1.67%	4.26%	11.47%	0.14%	3.33%	1.26%
1990	0.00%	0.00%	0.00%	0.16%	2.33%	8.48%	27.15%	0.04%	6.51%	2.21%
1991	0.00%	0.00%	0.00%	0.16%	2.44%	8.36%	9.72%	0.04%	5.76%	1.78%
1992	0.00%	0.00%	0.00%	0.00%	0.17%	3.73%	8.38%	0.00%	2.51%	0.68%
1993	0.00%	0.00%	0.00%	0.00%	0.39%	2.75%	8.51%	0.00%	2.14%	0.57%
1994	0.00%	0.00%	0.00%	0.00%	0.00%	1.94%	2.49%	0.00%	1.08%	0.30%
1995	0.00%	0.00%	0.00%	0.00%	0.14%	2.10%	5.53%	0.00%	1.61%	0.47%
1996	0.00%	0.00%	0.00%	0.00%	0.00%	0.56%	3.84%	0.00%	0.61%	0.19%
1997	0.00%	0.00%	0.00%	0.00%	0.08%	0.88%	4.31%	0.00%	0.83%	0.27%
1998	0.00%	0.00%	0.00%	0.07%	0.54%	2.34%	5.04%	0.02%	1.83%	0.69%
1999	0.00%	0.00%	0.00%	0.06%	0.93%	3.03%	10.03%	0.02%	3.32%	1.32%
2000	0.00%	0.00%	0.00%	0.27%	0.96%	4.36%	13.58%	0.10%	4.61%	1.86%
2001	0.00%	0.00%	0.12%	0.14%	0.91%	7.28%	23.60%	0.10%	7.59%	2.90%
2002	0.00%	0.00%	0.11%	0.71%	0.99%	3.22%	19.04%	0.30%	5.40%	2.06%
2003	0.00%	0.00%	0.00%	0.00%	0.51%	1.50%	11.96%	0.00%	3.07%	1.06%
2004	0.00%	0.00%	0.00%	0.00%	0.18%	0.38%	5.66%	0.00%	1.16%	0.40%
2005	0.00%	0.00%	0.00%	0.07%	0.00%	0.37%	3.30%	0.03%	0.78%	0.29%
2006	0.00%	0.00%	0.00%	0.00%	0.09%	0.48%	2.65%	0.00%	0.75%	0.27%
2007	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.30%	0.00%	0.44%	0.16%
2008	0.00%	0.34%	0.27%	0.68%	1.56%	2.65%	7.11%	0.42%	3.61%	1.67%
2009	0.00%	0.00%	0.15%	0.59%	1.12%	4.58%	16.46%	0.27%	7.65%	3.17%
2010	0.00%	0.00%	0.08%	0.04%	0.00%	0.19%	4.20%	0.05%	1.49%	0.61%
2011	0.00%	0.11%	0.00%	0.21%	0.09%	0.20%	3.43%	0.11%	1.16%	0.53%
2012	0.00%	0.00%	0.00%	0.04%	0.08%	0.31%	4.40%	0.02%	1.56%	0.70%
2013	0.00%	0.00%	0.05%	0.07%	0.32%	0.50%	3.43%	0.05%	1.44%	0.68%
2014	0.00%	0.00%	0.05%	0.03%	0.08%	0.27%	2.47%	0.03%	1.04%	0.51%
2015	0.00%	0.00%	0.00%	0.00%	0.18%	1.40%	4.22%	0.00%	2.26%	1.08%
2016	0.00%	0.00%	0.00%	0.00%	0.09%	1.05%	6.26%	0.00%	3.07%	1.48%
Average	0.00%	0.02%	0.02%	0.13%	0.59%	2.48%	8.27%	0.06%	2.60%	0.96%
Max	0.00%	0.34%	0.27%	0.71%	2.44%	8.48%	27.15%	0.42%	7.65%	3.17%
Min	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.30%	0.00%	0.44%	0.16%

\* Based on issuer-weighted average default rates and issuer-weighted senior unsecured bond recovery rates.

## Exhibit 24

## 2016 One-Year Letter Rating Migration Rates

From/To:	Aaa	Aa	A	Baa	Ba	B	Caa	Ca-C	WR	Default
Aaa	100.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Aa	0.000%	91.722%	5.629%	0.000%	0.000%	0.000%	0.000%	0.000%	2.649%	0.000%
A	0.000%	0.697%	89.783%	5.650%	0.077%	0.000%	0.000%	0.000%	3.793%	0.000%
Baa	0.000%	0.000%	1.338%	87.144%	6.748%	0.756%	0.233%	0.000%	3.781%	0.000%
Ba	0.000%	0.000%	0.000%	5.208%	77.604%	8.594%	1.042%	0.000%	7.422%	0.130%
B	0.000%	0.000%	0.000%	0.191%	4.480%	71.878%	10.010%	0.191%	11.821%	1.430%
Caa	0.000%	0.000%	0.000%	0.000%	0.000%	5.522%	70.272%	4.387%	13.616%	6.203%
Ca-C	0.000%	0.000%	0.000%	0.000%	0.000%	1.136%	1.136%	42.045%	11.364%	44.318%

## Exhibit 25

## Average One-Year Letter Rating Migration Rates, 1920-2016

From/To:	Aaa	Aa	A	Baa	Ba	B	Caa	Ca-C	WR	Default
Aaa	86.746%	7.848%	0.784%	0.193%	0.030%	0.002%	0.000%	0.000%	4.397%	0.000%
Aa	1.059%	84.158%	7.642%	0.729%	0.160%	0.046%	0.012%	0.004%	6.129%	0.060%
A	0.070%	2.740%	84.952%	5.597%	0.646%	0.119%	0.036%	0.008%	5.747%	0.084%
Baa	0.036%	0.239%	4.261%	82.661%	4.632%	0.741%	0.129%	0.017%	7.027%	0.257%
Ba	0.006%	0.072%	0.496%	6.148%	73.923%	6.880%	0.669%	0.089%	10.553%	1.164%
B	0.005%	0.044%	0.162%	0.620%	5.574%	71.711%	6.175%	0.476%	11.940%	3.292%
Caa	0.000%	0.010%	0.028%	0.125%	0.567%	6.897%	67.342%	2.944%	13.675%	8.413%
Ca-C	0.000%	0.016%	0.108%	0.038%	0.616%	2.975%	8.034%	48.426%	18.719%	21.068%

## Exhibit 26

## Average One-Year Letter Rating Migration Rates, 1970-2016

From/To:	Aaa	Aa	A	Baa	Ba	B	Caa	Ca-C	WR	Default
Aaa	87.563%	8.050%	0.569%	0.073%	0.024%	0.003%	0.000%	0.000%	3.718%	0.000%
Aa	0.831%	85.232%	8.404%	0.431%	0.063%	0.035%	0.017%	0.001%	4.965%	0.021%
A	0.054%	2.513%	86.690%	5.410%	0.488%	0.110%	0.041%	0.005%	4.635%	0.054%
Baa	0.034%	0.149%	4.208%	85.489%	3.875%	0.709%	0.157%	0.021%	5.185%	0.174%
Ba	0.006%	0.043%	0.434%	6.108%	76.180%	7.245%	0.713%	0.114%	8.247%	0.910%
B	0.007%	0.030%	0.145%	0.452%	4.760%	73.494%	6.608%	0.544%	10.568%	3.391%
Caa	0.000%	0.008%	0.025%	0.094%	0.391%	6.713%	67.434%	2.838%	14.122%	8.376%
Ca-C	0.000%	0.000%	0.055%	0.000%	0.620%	2.458%	8.796%	39.527%	22.925%	25.618%

## Exhibit 27

## Average Five-Year Letter Rating Migration Rates, 1970-2016\*

From/To:	Aaa	Aa	A	Baa	Ba	B	Caa	Ca-C	WR	Default
Aaa	53.014%	23.665%	5.060%	0.649%	0.318%	0.030%	0.046%	0.000%	17.142%	0.075%
Aa	2.235%	45.663%	23.487%	4.037%	0.823%	0.269%	0.125%	0.029%	23.072%	0.260%
A	0.195%	7.442%	51.094%	14.584%	2.504%	0.821%	0.172%	0.017%	22.481%	0.691%
Baa	0.168%	1.093%	12.458%	48.972%	7.849%	2.587%	0.574%	0.093%	24.691%	1.515%
Ba	0.034%	0.198%	2.696%	14.131%	27.705%	11.367%	1.950%	0.129%	34.879%	6.912%
B	0.024%	0.073%	0.487%	2.440%	7.366%	21.989%	6.142%	0.630%	43.847%	17.002%
Caa	0.000%	0.000%	0.145%	0.769%	2.034%	8.196%	12.635%	0.951%	48.048%	27.222%
Ca-C	0.000%	0.000%	0.028%	0.725%	1.873%	4.819%	2.908%	3.398%	52.047%	34.202%

\* Last cohort formed on 1/1/2012

Exhibit 28

## 2016 One-Year Alphanumeric Rating Migration Rates\*

From/To:	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3	Ca-C	WR	Default	
Aaa	100.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
Aa1	0.000	72.727	11.364	13.636	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.273	0.000	
Aa2	0.000	0.990	86.139	8.911	1.980	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.980	0.000
Aa3	0.000	0.000	1.274	85.987	9.554	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.185	0.000
A1	0.000	0.000	0.000	2.516	83.019	6.918	2.830	0.629	0.000	0.000	0.000	0.314	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.774	0.000
A2	0.000	0.000	0.219	0.000	15.132	71.272	6.579	1.096	2.193	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.509	0.000
A3	0.000	0.000	0.000	0.000	0.000	2.703	82.432	8.880	1.544	0.386	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.054	0.000
Baa1	0.000	0.000	0.000	0.000	0.000	0.183	3.670	82.018	9.908	1.284	0.183	0.367	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.385	0.000
Baa2	0.000	0.000	0.000	0.000	0.000	0.169	0.000	6.071	76.560	7.251	2.867	1.180	0.337	0.506	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.059	0.000
Baa3	0.000	0.000	0.000	0.000	0.000	0.000	0.172	0.688	7.057	70.912	7.057	6.540	1.377	1.377	0.344	0.000	0.688	0.000	0.000	0.000	0.000	3.787	0.000
Ba1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.154	9.231	64.615	7.692	6.154	2.692	1.154	0.385	0.769	0.000	0.000	0.000	0.000	6.154	0.000
Ba2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.404	12.766	60.851	8.511	2.979	1.277	0.851	0.851	0.000	0.000	0.000	0.000	0.000	8.511	0.000
Ba3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.832	2.930	5.861	64.103	9.158	3.663	2.930	1.099	0.366	0.000	0.000	0.000	0.000	7.692	0.366
B1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.317	0.317	0.635	10.159	64.444	4.127	5.079	2.222	1.270	0.317	0.000	10.159	0.952		
B2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.322	0.000	0.965	1.929	8.682	58.521	7.074	5.788	2.894	0.643	0.000	12.219	0.965		
B3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.709	1.418	7.801	59.574	9.929	4.255	0.946	0.473	12.766	2.128		
Caa1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.148	1.331	8.432	58.432	11.243	2.071	1.183	13.462	3.698			
Caa2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.220	0.000	0.661	6.828	54.405	12.335	4.185	16.079	5.286			
Caa3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.521	0.000	0.521	1.042	7.292	48.958	16.146	8.333	17.188			
Ca-C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.136	0.000	1.136	0.000	42.045	11.364	44.318		

\* Data in percent

Exhibit 29

## Average One-Year Alphanumeric Rating Migration Rates, 1983-2016\*

From/To:	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3	Ca-C	WR	Default
Aaa	86.652	5.504	2.415	0.568	0.257	0.153	0.020	0.063	0.000	0.025	0.014	0.014	0.000	0.002	0.000	0.002	0.000	0.000	0.000	4.309	0.000	
Aa1	1.743	75.987	8.126	6.113	1.517	0.944	0.191	0.130	0.079	0.011	0.037	0.000	0.013	0.040	0.026	0.009	0.024	0.018	0.000	0.000	4.993	0.000
Aa2	1.076	4.445	72.852	10.287	3.650	1.708	0.411	0.095	0.167	0.074	0.029	0.016	0.000	0.028	0.007	0.025	0.000	0.020	0.000	0.003	5.108	0.000
Aa3	0.167	1.070	4.282	75.366	8.245	3.728	0.847	0.246	0.255	0.127	0.027	0.033	0.015	0.011	0.000	0.000	0.002	0.006	0.000	0.000	5.528	0.045
A1	0.056	0.105	1.048	5.177	75.454	7.805	2.935	0.670	0.492	0.228	0.193	0.120	0.050	0.062	0.015	0.011	0.016	0.009	0.006	0.000	5.477	0.071
A2	0.057	0.031	0.212	1.090	5.528	76.065	7.521	2.732	1.056	0.402	0.189	0.125	0.171	0.063	0.034	0.009	0.019	0.025	0.006	0.000	4.618	0.048
A3	0.047	0.047	0.104	0.326	1.634	6.400	74.560	6.969	2.845	0.953	0.389	0.167	0.135	0.115	0.038	0.020	0.032	0.011	0.004	0.016	5.129	0.057
Baa1	0.027	0.027	0.085	0.126	0.233	1.748	6.785	74.090	7.236	2.528	0.682	0.375	0.252	0.295	0.066	0.038	0.058	0.034	0.006	0.024	5.151	0.133
Baa2	0.039	0.042	0.021	0.068	0.189	0.614	2.151	6.503	74.776	6.620	1.464	0.684	0.490	0.356	0.214	0.091	0.118	0.014	0.019	0.008	5.342	0.175
Baa3	0.029	0.007	0.018	0.043	0.083	0.194	0.525	2.006	8.563	72.419	4.933	2.246	1.088	0.756	0.305	0.262	0.148	0.075	0.066	0.043	5.932	0.259
Ba1	0.018	0.002	0.018	0.018	0.167	0.135	0.229	0.789	2.642	9.844	65.082	5.112	4.355	1.687	0.662	0.554	0.125	0.220	0.035	0.119	7.734	0.455
Ba2	0.000	0.000	0.019	0.029	0.078	0.130	0.156	0.411	0.747	3.820	7.858	63.228	7.009	3.844	1.315	0.975	0.316	0.227	0.092	0.141	8.865	0.739
Ba3	0.000	0.015	0.009	0.015	0.069	0.183	0.201	0.099	0.474	0.798	2.819	6.532	63.889	7.387	3.288	1.933	0.631	0.432	0.101	0.136	9.587	1.402
B1	0.010	0.010	0.017	0.012	0.053	0.027	0.081	0.093	0.218	0.317	0.751	2.931	6.310	63.612	6.235	4.478	1.364	0.748	0.218	0.266	10.205	2.045
B2	0.000	0.013	0.000	0.013	0.019	0.023	0.104	0.133	0.144	0.271	0.201	0.678	2.037	7.161	62.051	7.937	3.708	1.749	0.434	0.512	9.759	3.055
B3	0.012	0.003	0.025	0.000	0.035	0.035	0.065	0.029	0.047	0.114	0.124	0.212	0.622	2.287	6.128	60.148	7.416	3.421	1.216	0.897	12.094	5.070
Caa1	0.000	0.014	0.000	0.000	0.000	0.017	0.003	0.022	0.003	0.037	0.072	0.138	0.252	0.400	1.389	7.751	59.228	7.882	2.888	1.481	13.610	4.814
Caa2	0.000	0.000	0.000	0.000	0.027	0.016	0.000	0.000	0.063	0.115	0.052	0.070	0.199	0.389	0.927	2.545	7.840	53.274	5.822	3.114	15.259	10.289
Caa3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.082	0.041	0.048	0.233	0.199	1.035	3.201	8.487	44.656	8.871	13.759	19.387
Ca-C	0.000	0.000	0.000	0.000	0.000	0.024	0.032	0.000	0.000	0.000	0.288	0.168	0.176	0.176	0.256	1.977	2.121	3.289	3.553	38.760	23.361	25.818

\* Data in percent

## Exhibit 30

## Annual Issuer-Weighted Corporate Default Rates By Letter Rating, 1920-2016\*

Year	Aaa	Aa	A	Baa	Ba	B	Caa-C	Inv Grade	Spec Grade	All rated
1920	0.000	0.000	0.323	0.942	2.153	4.382	0.000	0.427	3.009	1.234
1921	0.000	0.189	0.353	0.648	0.444	2.683	13.332	0.387	2.150	1.068
1922	0.000	0.185	0.165	1.100	1.078	1.705	7.629	0.506	1.762	1.007
1923	0.000	0.000	0.000	0.622	0.929	2.270	5.932	0.244	1.705	0.804
1924	0.000	0.367	0.000	0.126	2.065	2.705	12.835	0.140	2.852	1.152
1925	0.000	0.000	0.141	0.707	1.745	2.585	14.397	0.321	2.562	1.171
1926	0.000	0.395	0.147	0.113	1.387	2.900	3.704	0.188	1.909	0.768
1927	0.000	0.000	0.212	0.000	1.300	1.980	12.842	0.069	1.831	0.736
1928	0.000	0.000	0.000	0.000	0.164	1.320	10.477	0.000	0.877	0.363
1929	0.000	0.293	0.000	0.446	0.825	0.918	9.733	0.242	1.401	0.715
1930	0.000	0.000	0.000	0.402	0.917	3.163	7.720	0.151	2.204	1.040
1931	0.000	0.000	0.269	1.085	3.005	9.523	31.670	0.502	7.897	3.805
1932	0.000	0.670	1.099	0.929	6.097	13.978	24.062	0.861	10.989	5.503
1933	0.000	0.000	0.258	1.771	11.550	16.147	25.921	0.790	15.709	8.489
1934	0.000	0.617	0.306	0.857	2.529	4.224	16.504	0.586	5.897	3.405
1935	0.000	0.000	1.429	1.923	5.134	4.275	13.024	1.285	6.253	3.935
1936	0.000	0.847	0.543	0.327	1.234	2.385	7.795	0.482	2.720	1.634
1937	0.000	0.000	0.505	1.043	0.997	2.669	9.074	0.619	2.749	1.723
1938	0.000	0.855	1.639	1.990	0.991	1.467	12.808	1.550	2.599	2.110
1939	0.000	0.000	0.000	0.995	0.623	1.744	6.073	0.412	1.774	1.224
1940	0.000	0.000	0.000	1.370	0.433	3.307	11.829	0.592	3.562	2.472
1941	0.000	0.000	0.000	0.000	0.973	0.813	5.071	0.000	1.713	1.085
1942	0.000	0.000	0.000	0.000	0.000	0.791	2.004	0.000	0.736	0.456
1943	0.000	0.000	0.000	0.000	0.000	1.359	0.000	0.000	0.615	0.370
1944	0.000	0.000	0.000	0.000	0.000	0.495	2.551	0.000	0.666	0.389
1945	0.000	0.000	0.000	0.000	0.000	0.000	3.571	0.000	0.565	0.306
1946	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1947	0.000	0.000	0.000	0.000	0.000	0.719	2.778	0.000	0.636	0.315
1948	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1949	0.000	0.000	0.000	0.000	1.360	1.031	8.571	0.000	1.926	0.837
1950	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1951	0.000	0.000	0.000	0.000	0.000	0.000	4.762	0.000	0.433	0.176
1952	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1953	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1954	0.000	0.000	0.000	0.000	0.000	0.000	7.143	0.000	0.467	0.166
1955	0.000	0.000	0.000	0.000	0.000	1.613	0.000	0.000	0.518	0.166
1956	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1957	0.000	0.000	0.000	0.000	0.000	1.266	0.000	0.000	0.448	0.143
1958	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1959	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1960	0.000	0.000	0.000	0.000	1.251	0.000	0.000	0.000	0.750	0.245
1961	0.000	0.000	0.000	0.000	0.599	0.000	8.696	0.000	1.072	0.354
1962	0.000	0.000	0.000	0.000	1.749	1.471	0.000	0.000	1.516	0.471
1963	0.000	0.000	0.000	0.000	1.162	1.471	0.000	0.000	1.152	0.352

Year	Aaa	Aa	A	Baa	Ba	B	Caa-C	Inv Grade	Spec Grade	All rated
1964	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1965	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1966	0.000	0.000	0.000	0.000	0.000	2.439	0.000	0.000	0.439	0.122
1967	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1968	0.000	0.000	0.000	0.000	0.000	0.000	5.000	0.000	0.375	0.106
1969	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1970	0.000	0.000	0.000	0.543	4.237	19.444	50.000	0.271	8.678	2.631
1971	0.000	0.000	0.000	0.000	0.885	0.000	12.500	0.000	1.155	0.286
1972	0.000	0.000	0.000	0.000	0.000	6.897	37.500	0.000	1.922	0.453
1973	0.000	0.000	0.000	0.461	0.000	3.846	37.500	0.232	1.280	0.456
1974	0.000	0.000	0.000	0.000	0.513	7.162	0.000	0.000	1.332	0.275
1975	0.000	0.000	0.000	0.000	1.029	6.158	0.000	0.000	1.742	0.361
1976	0.000	0.000	0.000	0.000	0.995	0.000	0.000	0.000	0.868	0.176
1977	0.000	0.000	0.000	0.294	0.543	3.226	33.333	0.110	1.360	0.354
1978	0.000	0.000	0.000	0.000	1.124	5.405	0.000	0.000	1.823	0.354
1979	0.000	0.000	0.000	0.000	0.513	0.000	0.000	0.000	0.435	0.088
1980	0.000	0.000	0.000	0.000	0.000	5.000	33.333	0.000	1.630	0.344
1981	0.000	0.000	0.000	0.000	0.000	4.397	0.000	0.000	0.698	0.162
1982	0.000	0.000	0.256	0.329	2.786	2.222	23.077	0.214	3.553	1.040
1983	0.000	0.000	0.000	0.000	1.163	2.303	42.308	0.000	4.061	0.900
1984	0.000	0.000	0.000	0.625	0.518	5.340	18.182	0.175	3.130	0.869
1985	0.000	0.000	0.000	0.000	0.872	7.309	6.667	0.000	3.773	0.952
1986	0.000	0.000	0.000	0.870	2.365	10.536	17.105	0.211	6.163	1.830
1987	0.000	0.000	0.000	0.000	3.024	5.437	9.823	0.000	4.299	1.423
1988	0.000	0.000	0.000	0.000	1.353	5.934	12.500	0.000	3.850	1.393
1989	0.000	0.499	0.000	0.529	2.957	7.549	20.334	0.254	5.901	2.226
1990	0.000	0.000	0.000	0.265	3.766	13.707	43.910	0.060	10.527	3.572
1991	0.000	0.000	0.000	0.249	3.848	13.199	15.345	0.059	9.096	2.803
1992	0.000	0.000	0.000	0.000	0.337	7.345	16.494	0.000	4.933	1.337
1993	0.000	0.000	0.000	0.000	0.622	4.376	13.531	0.000	3.404	0.899
1994	0.000	0.000	0.000	0.000	0.000	4.191	5.386	0.000	2.341	0.651
1995	0.000	0.000	0.000	0.000	0.267	4.015	10.546	0.000	3.063	0.899
1996	0.000	0.000	0.000	0.000	0.000	1.505	10.309	0.000	1.651	0.506
1997	0.000	0.000	0.000	0.000	0.175	1.998	9.823	0.000	1.889	0.616
1998	0.000	0.000	0.000	0.109	0.896	3.875	8.341	0.035	3.028	1.137
1999	0.000	0.000	0.000	0.093	1.503	4.895	16.182	0.032	5.361	2.123
2000	0.000	0.000	0.000	0.350	1.269	5.744	17.904	0.126	6.074	2.455
2001	0.000	0.000	0.155	0.180	1.159	9.240	29.960	0.124	9.634	3.679
2002	0.000	0.000	0.161	1.014	1.400	4.573	27.022	0.431	7.663	2.924
2003	0.000	0.000	0.000	0.000	0.879	2.581	20.576	0.000	5.278	1.828
2004	0.000	0.000	0.000	0.000	0.378	0.796	11.816	0.000	2.418	0.834
2005	0.000	0.000	0.000	0.163	0.000	0.815	7.324	0.061	1.721	0.647
2006	0.000	0.000	0.000	0.000	0.194	1.070	5.893	0.000	1.669	0.593
2007	0.000	0.000	0.000	0.000	0.000	0.000	4.953	0.000	0.945	0.349
2008	0.000	0.506	0.406	1.024	2.343	3.989	10.694	0.627	5.426	2.507
2009	0.000	0.000	0.240	0.930	1.765	7.215	25.933	0.428	12.060	4.996
2010	0.000	0.000	0.171	0.075	0.000	0.383	8.527	0.095	3.013	1.232

Year	Aaa	Aa	A	Baa	Ba	B	Caa-C	Inv Grade	Spec Grade	All rated
2011	0.000	0.193	0.000	0.355	0.159	0.343	5.852	0.187	1.982	0.906
2012	0.000	0.000	0.000	0.071	0.143	0.543	7.759	0.033	2.756	1.230
2013	0.000	0.000	0.089	0.120	0.582	0.906	6.233	0.096	2.625	1.232
2014	0.000	0.000	0.088	0.059	0.141	0.498	4.587	0.063	1.938	0.939
2015	0.000	0.000	0.000	0.000	0.291	2.239	6.765	0.000	3.626	1.732
2016	0.000	0.000	0.000	0.000	0.134	1.531	9.111	0.000	4.474	2.149
Mean	0.000	0.058	0.092	0.269	1.029	3.191	10.541	0.147	2.811	1.152
Median	0.000	0.000	0.000	0.000	0.543	1.998	7.759	0.000	1.889	0.804
St Dev	0.000	0.175	0.263	0.456	1.608	3.812	11.273	0.273	2.977	1.365
Min	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Max	0.000	0.855	1.639	1.990	11.550	19.444	50.000	1.550	15.709	8.489

\* Data in percent

## Exhibit 31

## Annual Issuer-Weighted Corporate Default Rates By Alphanumeric Rating, 1983-2016\*

Year	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3	Ca-C	Inv Grade	Spec Grade	All rated	
1983	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.081	1.010	0.000	8.523		42.308				0.000	4.061	0.900		
1984	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.835	0.000	1.667	0.000	6.494	0.000	3.333		18.182			0.175	3.130	0.869		
1985	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.639	1.149	4.530	5.556	14.213		6.667			0.000	3.773	0.952		
1986	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.813	1.935	1.235	1.099	4.002	8.659	7.143	15.798		17.105			0.211	6.163	1.830		
1987	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.000	0.935	3.110	4.166	5.660	8.202		10.157	0.000	0.000	4.299	1.423			
1988	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.757	4.238	4.456	11.272		10.526	50.000	0.000	3.850	1.393				
1989	0.000	0.000	0.000	1.081	0.000	0.000	0.000	0.735	0.806	0.990	1.835	4.575	6.705	5.300	13.447		21.432	0.000	0.254	5.901	2.226			
1990	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.971	1.064	5.837	3.982	6.820	16.716	25.211		45.157	33.333	0.060	10.527	3.572			
1991	0.000	0.000	0.000	0.000	0.000	0.000	0.699	0.000	0.000	1.053	0.000	7.263	7.412	7.162	30.141		15.300	16.667	0.059	9.096	2.803			
1992	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.763	1.419	1.408	23.630		18.409	7.692	0.000	4.933	1.337				
1993	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.031	0.000	0.794	2.811	1.351	12.003		14.426	9.091	0.000	3.404	0.899			
1994	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.509	2.705	9.504		5.096	7.143	0.000	2.341	0.651			
1995	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.676	3.681	5.743	1.973		6.232	23.073	0.000	3.063	0.899				
1996	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.376	1.267	4.057		11.135	5.882	0.000	1.651	0.506					
1997	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.448	0.324	0.513	7.204		8.684	15.188	0.000	1.889	0.616				
1998	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.292	0.000	0.000	1.156	1.535	2.688	4.426	5.275	4.545	8.057	37.500	5.263	0.035	3.028	1.137		
1999	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.305	0.472	0.911	3.016	3.052	3.846	8.915	10.720	26.352	14.435	18.960	0.032	5.361	2.123			
2000	0.000	0.000	0.000	0.000	0.000	0.000	0.267	0.000	0.880	0.476	1.380	1.981	2.280	4.217	11.806	13.082	26.387	19.192	17.191	0.126	6.074	2.455		
2001	0.000	0.000	0.000	0.000	0.410	0.000	0.276	0.249	0.000	0.000	0.998	2.544	3.265	9.632	15.603	27.229	28.316	37.888	34.625	0.124	9.634	3.679		
2002	0.000	0.000	0.000	0.000	0.000	0.432	0.991	0.905	1.184	2.074	1.138	0.986	2.552	5.077	6.240	18.839	21.545	31.955	39.126	0.431	7.663	2.924		
2003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.541	0.621	1.385	0.697	2.336	5.210	9.684	22.388	27.419	30.318	0.000	5.278	1.828		
2004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.976	0.000	0.561	2.198	7.813	9.169	11.908	29.134	0.000	2.418	0.834			
2005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.217	0.288	0.000	0.000	0.000	0.000	0.505	2.012	4.504	6.067	23.482	13.816	0.061	1.721	0.647		
2006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.633	0.654	0.306	2.099	2.371	7.509	13.709	14.586	0.000	1.669	0.593			
2007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.850	10.518	6.914	41.392	0.000	0.945	0.349			
2008	0.000	0.000	0.000	1.487	1.053	0.232	0.000	0.976	1.381	0.610	0.917	2.984	3.282	3.041	3.982	4.603	5.931	17.524	34.301	42.401	0.627	5.426	2.507	
2009	0.000	0.000	0.000	0.000	0.000	0.692	1.021	0.868	0.910	1.429	1.213	2.571	3.374	6.887	10.004	11.613	34.567	53.331	64.807	0.428	12.060	4.996		
2010	0.000	0.000	0.000	0.308	0.000	0.224	0.000	0.000	0.244	0.000	0.000	0.000	0.844	0.000	0.282	1.771	7.330	23.526	25.202	0.095	3.013	1.232		
2011	0.000	0.000	0.000	0.418	0.000	0.000	0.000	0.198	0.868	0.000	0.571	0.000	0.000	0.459	0.516	1.957	7.650	15.517	20.111	0.187	1.982	0.906		
2012	0.000	0.000	0.000	0.000	0.000	0.000	0.217	0.000	0.000	0.000	0.412	0.000	0.762	0.751	2.723	9.122	17.036	44.887	0.033	2.756	1.230			
2013	0.000	0.000	0.000	0.000	0.000	0.221	0.000	0.158	0.192	0.000	0.000	1.554	0.704	1.251	0.846	2.266	6.587	10.230	57.967	0.096	2.625	1.232		
2014	0.000	0.000	0.000	0.395	0.000	0.000	0.000	0.000	0.181	0.000	0.000	0.347	0.345	1.075	0.231	2.002	4.178	11.050	25.549	0.063	1.938	0.939		
2015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.905	0.000	0.000	0.698	3.237	2.539	4.337	5.084	14.816	34.130	0.000	3.626	1.732		

Year	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3	Ca-C	Inv Grade	Spec Grade	All rated
2016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.379	1.008	0.999	2.320	3.996	5.730	17.713	46.202		0.000	4.474	2.149	
Mean	0.000	0.000	0.000	0.088	0.052	0.019	0.046	0.131	0.171	0.330	0.505	0.705	1.594	2.540	3.369	7.940	7.223	15.144	22.206	25.791	0.091	4.405	1.599
Median	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.981	2.394	2.521	5.758	4.504	10.522	17.713	24.137	0.033	3.700	1.232
StDev	0.000	0.000	0.000	0.316	0.196	0.080	0.145	0.305	0.346	0.535	0.967	1.174	1.701	2.427	3.515	7.548	6.767	10.654	12.056	17.206	0.148	2.716	1.057
Min	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.771	4.178	6.914	0.000	0.000	0.945	0.349	
Max	0.000	0.000	0.000	1.487	1.053	0.410	0.692	1.021	1.381	1.935	5.000	5.837	7.263	8.659	16.716	30.141	27.229	45.157	53.331	64.807	0.627	12.060	4.996

\* Data in percent

#### Exhibit 32

#### Average Cumulative Issuer-Weighted Global Default Rates By Letter Rating, 1920-2016\*

Rating	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	0.000	0.008	0.027	0.074	0.143	0.216	0.309	0.436	0.568	0.723	0.856	0.965	1.080	1.114	1.144	1.206	1.268	1.318	1.376	1.415
Aa	0.063	0.180	0.285	0.438	0.670	0.939	1.212	1.470	1.708	1.975	2.282	2.616	2.947	3.263	3.498	3.679	3.843	4.038	4.278	4.479
A	0.086	0.259	0.528	0.826	1.151	1.502	1.871	2.243	2.652	3.067	3.496	3.917	4.302	4.690	5.136	5.532	5.854	6.172	6.473	6.776
Baa	0.265	0.748	1.308	1.927	2.572	3.216	3.831	4.465	5.125	5.782	6.444	7.124	7.808	8.422	8.984	9.578	10.158	10.687	11.191	11.702
Ba	1.231	2.917	4.783	6.736	8.618	10.410	12.049	13.626	15.162	16.784	18.190	19.590	20.934	22.135	23.276	24.382	25.476	26.538	27.498	28.373
B	3.507	7.962	12.410	16.430	20.027	23.157	25.996	28.406	30.535	32.352	33.968	35.416	36.845	38.297	39.679	41.017	42.222	43.175	43.869	44.421
Caa-C	10.423	18.193	24.401	29.372	33.394	36.598	39.335	41.811	44.222	46.320	48.295	50.134	51.716	53.317	55.003	56.653	58.183	59.646	61.107	62.591
Inv Grade	0.145	0.414	0.742	1.112	1.515	1.934	2.349	2.769	3.207	3.652	4.110	4.574	5.022	5.439	5.842	6.224	6.566	6.897	7.223	7.540
Spec Grade	3.739	7.500	11.009	14.148	16.918	19.337	21.492	23.413	25.192	26.874	28.355	29.763	31.108	32.378	33.595	34.775	35.899	36.927	37.823	38.636
All rated	1.500	3.022	4.435	5.698	6.822	7.814	8.701	9.509	10.278	11.016	11.706	12.375	13.013	13.602	14.165	14.700	15.190	15.647	16.071	16.470

\*Data in percent

#### Exhibit 33

#### Average Cumulative Issuer-Weighted Global Default Rates By Letter Rating, 1970-2016\*

Rating	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	0.000	0.011	0.011	0.031	0.085	0.138	0.195	0.254	0.318	0.386	0.458	0.536	0.614	0.658	0.705	0.754	0.806	0.824	0.824	0.824
Aa	0.021	0.060	0.110	0.192	0.298	0.409	0.525	0.626	0.701	0.778	0.874	0.999	1.141	1.252	1.336	1.427	1.540	1.688	1.922	2.151
A	0.055	0.165	0.345	0.536	0.766	1.025	1.297	1.592	1.909	2.224	2.539	2.844	3.158	3.491	3.876	4.257	4.641	5.039	5.409	5.793
Baa	0.177	0.461	0.804	1.216	1.628	2.058	2.472	2.908	3.393	3.925	4.500	5.121	5.760	6.384	7.006	7.695	8.389	9.062	9.673	10.236
Ba	0.945	2.583	4.492	6.518	8.392	10.133	11.667	13.159	14.692	16.283	17.793	19.321	20.747	22.137	23.576	25.009	26.297	27.491	28.750	29.733
B	3.573	8.436	13.377	17.828	21.908	25.556	28.857	31.644	34.121	36.177	37.857	39.302	40.704	42.213	43.658	44.932	46.055	46.997	47.702	48.644
Caa_C	10.624	18.670	25.443	30.974	35.543	39.051	42.132	45.115	47.955	50.258	51.809	52.628	53.063	53.160	53.377	53.807	53.930	53.930	53.930	53.930
Inv Grade	0.090	0.244	0.446	0.682	0.938	1.210	1.481	1.764	2.066	2.381	2.711	3.055	3.409	3.754	4.111	4.483	4.859	5.238	5.602	5.957
Spec Grade	4.124	8.357	12.357	15.889	18.982	21.651	23.987	26.046	27.964	29.697	31.196	32.575	33.857	35.131	36.412	37.645	38.736	39.719	40.688	41.542
All rated	1.537	3.069	4.472	5.681	6.717	7.602	8.367	9.050	9.696	10.296	10.849	11.379	11.891	12.385	12.883	13.379	13.851	14.301	14.731	15.132

\*Data in percent

Exhibit 34

## Average Cumulative Issuer-Weighted Global Default Rates By Letter Rating, 1983-2016\*

Rating	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	0.000	0.013	0.013	0.038	0.067	0.100	0.136	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	
Aa	0.023	0.065	0.120	0.206	0.313	0.408	0.501	0.583	0.650	0.728	0.826	0.959	1.091	1.180	1.261	1.344	1.447	1.611	1.849	2.053
A	0.059	0.179	0.379	0.585	0.836	1.111	1.396	1.697	2.003	2.298	2.586	2.865	3.172	3.532	3.952	4.376	4.800	5.259	5.636	6.011
Baa	0.189	0.485	0.821	1.223	1.632	2.049	2.441	2.828	3.226	3.662	4.158	4.697	5.290	5.854	6.412	7.066	7.752	8.404	9.021	9.459
Ba	0.943	2.656	4.708	6.862	8.735	10.444	11.969	13.401	14.798	16.197	17.420	18.650	19.785	20.966	22.239	23.428	24.481	25.569	26.843	27.680
B	3.561	8.467	13.444	17.906	22.011	25.702	29.023	31.813	34.223	36.188	37.776	39.146	40.513	41.998	43.349	44.522	45.685	46.748	47.553	48.658
Caa-C	10.541	18.555	25.344	30.925	35.487	38.950	41.994	44.937	47.850	50.322	51.995	52.879	53.351	53.457	53.697	54.178	54.316	54.316	54.316	54.316
Inv Grade	0.096	0.257	0.463	0.700	0.959	1.225	1.486	1.745	2.004	2.272	2.557	2.856	3.178	3.499	3.838	4.199	4.568	4.954	5.313	5.618
Spec Grade	4.259	8.671	12.870	16.570	19.774	22.533	24.957	27.061	28.953	30.603	31.952	33.158	34.286	35.451	36.611	37.675	38.644	39.594	40.567	41.397
All rated	1.651	3.311	4.836	6.140	7.242	8.171	8.968	9.657	10.276	10.833	11.328	11.796	12.258	12.719	13.186	13.649	14.099	14.552	14.976	15.331

\*Data in percent

Exhibit 35

## Average Cumulative Issuer-Weighted Global Default Rates By Alphanumeric Rating, 1983-2016\*

Rating	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	0.000	0.013	0.013	0.038	0.067	0.100	0.136	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	
Aa1	0.000	0.000	0.000	0.055	0.100	0.147	0.150	0.150	0.150	0.150	0.150	0.227	0.318	0.419	0.456	0.456	0.456	0.456	0.456	
Aa2	0.000	0.013	0.113	0.240	0.356	0.441	0.533	0.634	0.748	0.907	1.046	1.201	1.338	1.400	1.468	1.607	1.856	2.131	2.396	2.557
Aa3	0.047	0.124	0.177	0.251	0.382	0.504	0.639	0.745	0.812	0.871	0.985	1.158	1.311	1.415	1.495	1.562	1.616	1.774	2.090	2.408
A1	0.073	0.217	0.437	0.650	0.861	1.093	1.306	1.495	1.650	1.834	2.036	2.241	2.469	2.754	3.040	3.321	3.609	3.873	4.014	4.160
A2	0.049	0.150	0.316	0.530	0.781	1.125	1.475	1.851	2.238	2.631	3.010	3.346	3.679	4.073	4.523	5.029	5.638	6.233	6.693	7.122
A3	0.058	0.178	0.395	0.586	0.874	1.114	1.394	1.719	2.077	2.371	2.640	2.926	3.284	3.685	4.218	4.702	5.048	5.559	6.112	6.692
Baa1	0.135	0.369	0.640	0.934	1.200	1.455	1.702	1.882	2.067	2.328	2.671	3.137	3.640	4.076	4.628	5.309	5.967	6.466	6.712	6.884
Baa2	0.178	0.452	0.761	1.167	1.532	1.931	2.337	2.720	3.145	3.624	4.229	4.860	5.522	6.119	6.664	7.131	7.581	8.134	8.825	9.363
Baa3	0.263	0.653	1.098	1.620	2.256	2.891	3.444	4.103	4.739	5.351	5.903	6.416	7.039	7.738	8.323	9.195	10.238	11.234	12.253	12.908
Ba1	0.470	1.542	2.846	4.146	5.470	6.761	7.797	8.636	9.461	10.355	11.280	12.204	13.012	13.692	14.666	15.644	16.357	17.325	18.924	20.310
Ba2	0.765	1.976	3.470	5.004	6.326	7.395	8.393	9.547	10.891	12.320	13.461	14.591	15.355	16.268	17.428	18.155	18.919	19.526	20.359	20.485
Ba3	1.472	4.115	7.253	10.673	13.508	16.166	18.639	20.938	22.991	24.909	26.558	28.264	30.201	32.345	34.195	36.242	38.162	40.041	41.366	42.077
B1	2.164	5.796	9.742	13.478	17.257	20.712	24.166	27.232	29.909	32.012	33.801	35.360	37.202	39.242	40.770	41.887	42.988	44.197	45.520	47.128
B2	3.213	8.157	13.088	17.647	21.492	24.991	28.004	30.417	32.708	34.711	36.309	37.760	38.983	40.242	41.905	43.520	44.891	46.037	46.306	47.008
B3	5.360	11.631	17.866	23.145	28.057	32.435	36.103	39.126	41.353	43.096	44.332	45.197	45.742	46.275	46.381	46.684	47.749	48.098	48.098	48.098
Caa1	5.159	11.952	18.273	23.623	28.206	31.911	34.957	37.645	41.021	44.537	46.810	48.078	48.903	49.203	49.203	49.203	49.203	49.203	49.203	49.203
Caa2	10.841	19.533	27.028	33.736	39.010	42.995	46.450	50.584	54.266	57.025	58.843	59.288	59.288	60.063	61.555	61.963	61.963	61.963	61.963	61.963
Caa3	20.448	32.123	39.902	44.802	49.410	52.456	56.102	59.060	59.707	59.707	59.707	59.707	59.707	59.707	59.707	59.707	59.707	59.707	59.707	59.707
Ca-C	30.032	39.350	46.014	50.417	52.765	53.685	55.145	56.246	56.696	56.696	57.330	58.330	58.944	58.944	58.944	58.944	58.944	58.944	58.944	58.944
Inv Grade	0.096	0.257	0.463	0.700	0.959	1.225	1.486	1.745	2.004	2.272	2.557	2.856	3.178	3.499	3.838	4.199	4.568	4.954	5.313	5.618
Spec Grade	4.259	8.671	12.870	16.570	19.774	22.533	24.957	27.061	28.953	30.603	31.952	33.158	34.286	35.451	36.611	37.675	38.644	39.594	40.567	41.397
All rated	1.651	3.311	4.836	6.140	7.242	8.171	8.968	9.657	10.276	10.833	11.328	11.796	12.258	12.719	13.186	13.649	14.099	14.552	14.976	15.331

\*Data in percent

Exhibit 36

## Average Cumulative Issuer-Weighted Global Default Rates By Alphanumeric Rating, 1998-2016\*

Rating/Year	1	2	3	4	5	6	7	8	9	10
Aaa	0.000	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Aa1	0.000	0.000	0.000	0.000	0.029	0.091	0.097	0.097	0.097	0.097
Aa2	0.000	0.010	0.145	0.294	0.389	0.494	0.611	0.744	0.897	1.082
Aa3	0.053	0.139	0.187	0.258	0.403	0.566	0.812	0.992	1.095	1.205
A1	0.119	0.264	0.448	0.674	0.935	1.252	1.563	1.848	2.107	2.399
A2	0.073	0.208	0.409	0.615	0.902	1.321	1.725	2.199	2.774	3.461
A3	0.074	0.204	0.443	0.674	1.018	1.221	1.513	1.882	2.361	2.830
Baa1	0.159	0.414	0.692	0.977	1.182	1.414	1.629	1.834	2.033	2.365
Baa2	0.204	0.465	0.747	1.049	1.306	1.606	1.861	2.074	2.405	2.737
Baa3	0.271	0.641	1.036	1.463	1.974	2.375	2.786	3.402	3.975	4.682
Ba1	0.329	1.243	2.236	3.150	4.315	5.379	6.349	7.172	8.178	9.262
Ba2	0.706	1.666	2.961	4.294	5.412	6.226	6.916	8.128	9.549	11.222
Ba3	1.002	2.773	4.805	7.051	8.634	10.258	12.005	14.006	15.823	17.308
B1	1.394	4.260	7.410	10.560	13.435	15.996	18.663	21.144	23.472	25.590
B2	2.908	7.578	12.433	17.106	20.676	23.860	26.590	28.934	31.228	33.147
B3	4.026	9.764	15.918	20.935	25.434	29.301	32.513	35.177	37.562	39.373
Caa1	5.151	11.916	18.215	23.506	28.052	31.767	34.816	37.495	40.890	44.425
Caa2	10.223	19.178	26.923	33.532	38.687	42.693	46.416	50.674	54.232	54.948
Caa3	20.388	31.983	39.788	44.708	49.337	52.393	56.043	59.005	59.654	59.654
Ca-C	32.706	43.198	50.579	54.935	57.410	58.416	60.019	61.230	61.722	61.722
Inv Grade	0.123	0.301	0.517	0.744	0.998	1.256	1.522	1.812	2.133	2.505
Spec Grade	4.248	8.622	12.750	16.274	19.152	21.548	23.668	25.625	27.514	29.157
All rated	1.776	3.541	5.145	6.464	7.528	8.400	9.164	9.877	10.577	11.242

\*Data in percent

Exhibit 37

## Average Cumulative Issuer-Weighted Global Default Rates By Broad Industry Group, 1970-2016\*

Industry Group	1	2	3	4	5	6	7	8	9	10
Aerospace & Defense	0.790	1.643	2.380	2.897	3.349	3.645	3.810	3.923	3.923	3.923
Automotive	2.404	4.894	7.287	9.525	11.660	13.623	15.464	17.251	18.891	20.082
Banking	0.511	1.012	1.499	1.963	2.403	2.794	3.138	3.471	3.813	4.160
Beverage, Food, & Tobacco	1.202	2.383	3.558	4.534	5.299	5.991	6.548	6.997	7.463	7.793
Capital Equipment	1.632	3.381	5.072	6.573	7.854	8.837	9.711	10.498	11.244	11.942
Chemicals, Plastics, & Rubber	1.087	2.292	3.434	4.500	5.486	6.267	6.836	7.281	7.750	8.269
Construction & Building	2.711	5.612	8.371	10.982	13.292	15.447	17.356	19.230	20.944	22.395
Consumer Goods: Durable	2.455	5.382	8.478	11.343	14.299	16.748	18.553	20.277	22.231	24.027
Consumer Goods: Non-Durable	3.841	8.038	11.956	15.090	17.587	19.741	21.754	23.451	24.724	25.689
Containers, Packaging, & Glass	2.416	5.108	7.489	9.683	11.644	13.354	14.802	16.266	17.527	18.678
Energy: Electricity	2.420	4.935	7.178	8.887	10.509	11.988	13.402	14.586	15.757	17.072
Energy: Oil & Gas	2.203	4.216	5.967	7.455	8.737	9.767	10.649	11.403	12.121	12.741
Environmental Industries	3.509	6.747	9.401	11.619	13.254	14.623	15.804	17.131	18.616	20.274
Fire: Finance	0.915	1.859	2.707	3.308	3.868	4.431	4.996	5.571	6.179	6.853
Fire: Insurance	0.373	0.791	1.222	1.690	2.164	2.640	3.105	3.571	4.061	4.554
Fire: Real Estate	0.981	2.030	2.991	3.875	4.477	4.943	5.340	5.658	5.973	6.335
Forest Products & Paper	2.792	5.439	7.981	10.228	12.055	13.661	15.126	16.329	17.209	17.910
Healthcare & Pharmaceuticals	1.372	2.813	4.120	5.356	6.413	7.429	8.396	9.127	9.874	10.396
High Tech Industries	1.804	3.738	5.493	7.072	8.322	9.477	10.686	11.952	13.200	14.498
Hotel, Gaming, & Leisure	4.340	8.668	12.460	15.854	18.730	21.105	23.107	25.037	26.981	29.007
Media: Advertising, Printing & Publishing	5.824	11.535	16.621	20.900	24.939	28.403	30.965	32.752	34.400	36.222
Media: Broadcasting & Subscription	3.536	7.309	11.190	14.492	17.599	20.360	22.636	24.706	26.518	28.201
Media: Diversified & Production	2.340	4.642	6.590	7.811	8.619	9.280	9.660	9.932	10.237	10.575
Metals & Mining	3.157	6.317	9.251	11.821	13.891	15.782	17.534	19.059	20.541	22.048
Retail	2.653	5.361	8.074	10.488	12.666	14.539	16.141	17.633	19.110	20.466
Services: Business	2.066	4.184	6.090	7.654	9.247	10.826	12.378	13.743	15.001	16.160
Services: Consumer	2.223	4.367	6.008	7.527	8.893	10.232	11.781	13.486	15.079	16.597
Sovereign & Public Finance	0.544	1.086	1.555	1.909	2.123	2.253	2.297	2.297	2.297	2.297
Telecommunications	2.238	4.396	6.305	7.800	8.896	9.644	10.201	10.535	10.749	10.908
Transportation: Cargo	1.973	3.606	4.939	5.981	6.824	7.563	8.164	8.694	9.171	9.689
Transportation: Consumer	3.015	5.841	8.650	11.394	13.770	15.724	17.620	19.594	21.641	23.634
Utilities: Electric	0.137	0.262	0.376	0.485	0.590	0.693	0.786	0.883	0.987	1.097
Utilities: Oil & Gas	0.152	0.279	0.415	0.561	0.681	0.808	0.920	0.968	1.019	1.074
Utilities: Water	0.129	0.273	0.338	0.338	0.338	0.338	0.338	0.338	0.338	0.338
Wholesale	3.642	7.812	11.681	14.553	16.686	18.586	19.640	20.496	21.362	22.346

\*Data in percent

Exhibit 38

## Annual Default Rates By Broad Industry Group, 1970-2016\*

first half 1/2

Year	Aerospace & Defense	Automotive	Banking	Beverage, Food, & Tobacco	Chemicals, Capital Equipment	Plastics, & Rubber	Construction & Building	Consumer Goods: Durable	Consumer Goods: Non-Durable	Containers, Packaging, & Glass	Energy: Electricity	Energy: Oil & Gas	Environmental Industries	Fire: Finance	Fire: Insurance	Fire: Real Estate	Forest Products & Paper
1970	0.000	0.000		0.000	0.000	0.000	0.000	10.000	0.000	0.000	0.000	0.000	0.000	0.000	25.000	0.000	
1971	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1972	0.000	0.000		0.000	1.099	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1973	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	7.143	0.000	0.000	0.000	0.000	0.000	0.000	
1974	0.000	0.000	0.000	0.000	1.124	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1975	0.000	3.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1976	0.000	0.000	0.000	0.000	1.042	0.000	0.000	0.000	2.632	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1977	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.703	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1978	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.703	0.000	0.000	1.316	0.000	0.000	0.000	0.000	
1979	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1980	0.000	0.000	0.000	0.000	0.000	0.000	3.226	0.000	0.000	0.000	0.000	0.000	33.333	0.000	0.000	0.000	
1981	0.000	0.000	0.000	0.000	1.176	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1982	0.000	2.857	0.000	0.000	0.000	0.000	3.333	0.000	0.000	0.000	0.000	0.980	0.000	0.000	0.000	0.000	
1983	0.000	8.108	0.000	1.471	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.440	0.000	0.000	0.000	0.000	
1984	0.000	2.941	0.000	1.449	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.007	0.000	0.000	0.000	0.000	
1985	0.000	0.000	0.000	0.000	1.844	2.041	0.000	0.000	1.818	0.000	0.000	3.430	0.000	0.000	3.448	0.000	
1986	2.857	0.000	0.000	1.205	0.000	1.852	1.786	5.882	0.000	0.000	0.000	8.369	0.000	0.000	0.000	0.000	
1987	0.000	1.818	0.282	0.000	2.474	0.000	4.642	0.000	0.000	0.000	0.000	5.537	0.000	0.000	0.000	0.000	
1988	2.326	0.000	1.452	0.000	0.000	1.639	2.818	4.348	3.735	0.000	4.545	2.128	0.000	0.000	1.515	0.000	
1989	0.000	7.547	1.492	2.247	0.000	0.000	8.848	0.000	3.846	5.556	0.000	0.000	0.000	3.586	1.351	8.333	
1990	0.000	3.815	1.844	5.611	2.611	0.000	16.934	4.762	10.026	0.000	8.000	1.466	0.000	0.000	0.000	0.000	
1991	2.222	4.103	1.398	0.000	4.542	0.000	7.547	5.882	6.089	5.556	4.167	3.083	0.000	0.000	1.235	0.000	
																3.333	

first half 2/2

Year	Aerospace & Defense	Automotive	Banking	Beverage, Food, & Tobacco	Capital Equipment	Chemicals, Plastics, & Rubber	Construction & Building	Consumer Goods: Durable	Consumer Goods: Non-Durable	Containers, Packaging, & Glass	Energy: Electricity	Energy: Oil & Gas	Environmental Industries	Fire: Finance	Fire: Insurance	Fire: Real Estate	Forest Products & Paper
1992	0.000	0.000	0.322	1.220	2.928	0.000	0.000	0.000	5.978	5.263	0.000	0.800	0.000	0.000	0.000	4.762	0.000
1993	2.222	0.000	0.302	1.136	4.789	0.000	1.695	0.000	2.000	0.000	0.000	2.268	0.000	0.000	0.000	0.000	0.000
1994	0.000	0.000	0.000	1.064	0.820	0.000	0.000	0.000	0.000	0.000	3.571	0.000	0.000	0.000	0.000	0.000	2.778
1995	0.000	0.000	0.000	1.942	0.806	0.000	5.075	0.000	7.514	0.000	0.000	0.637	0.000	0.000	0.820	5.714	2.222
1996	0.000	0.000	0.000	0.833	0.709	0.000	1.064	0.000	4.311	3.226	0.000	0.565	5.263	0.000	0.000	0.000	0.000
1997	0.000	1.333	0.000	0.775	0.000	0.000	1.124	0.000	6.426	2.564	0.000	0.000	0.000	0.000	0.629	0.000	0.000
1998	0.000	1.064	0.301	0.699	0.000	2.439	0.000	0.000	4.415	0.000	0.000	1.278	5.882	0.699	0.000	2.681	1.333
1999	0.000	0.893	0.144	1.864	1.376	1.521	6.435	10.600	4.328	0.000	0.000	6.152	4.545	1.903	0.000	0.719	2.439
2000	1.587	4.829	0.000	2.882	4.155	1.478	1.981	3.448	14.342	8.275	0.000	0.392	16.667	0.629	1.476	0.000	4.457
2001	4.666	5.043	0.074	2.268	5.103	5.849	3.843	3.448	15.501	8.424	1.695	1.175	11.765	1.826	0.000	2.273	16.844
2002	0.000	1.626	0.395	1.631	2.014	0.000	5.044	3.125	6.011	5.263	10.196	2.315	14.286	0.000	0.450	0.847	2.759
2003	0.000	2.433	0.079	1.670	2.491	4.554	2.410	0.000	2.740	0.000	10.143	0.000	0.000	0.629	0.811	0.000	1.333
2004	0.000	2.350	0.000	1.664	0.952	0.000	2.273	2.703	4.486	1.563	0.000	0.350	0.000	0.000	0.392	0.000	1.429
2005	0.000	4.890	0.072	0.000	0.947	0.000	0.000	4.082	1.587	3.228	3.774	0.361	0.000	0.654	0.000	0.000	1.613
2006	0.000	4.490	0.000	1.121	1.502	0.000	2.053	1.887	3.044	1.667	0.000	0.000	0.000	0.000	0.714	0.000	0.000
2007	0.000	1.544	0.000	1.053	0.495	0.000	1.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.297
2008	1.538	4.031	3.030	1.570	2.722	2.020	5.273	2.000	6.278	8.707	0.000	1.605	5.556	4.194	0.000	2.308	7.119
2009	4.524	17.671	0.861	4.259	9.976	7.894	14.720	23.452	6.725	9.333	1.961	1.953	0.000	5.658	0.333	6.364	17.374
2010	0.000	1.031	0.410	0.559	3.561	0.000	1.755	0.000	3.815	1.639	6.000	0.965	10.526	1.991	0.385	0.862	2.041
2011	0.000	0.909	0.542	0.000	1.912	0.000	2.273	0.000	0.000	3.511	2.000	0.968	0.000	0.595	0.380	0.800	1.818
2012	1.282	0.000	0.486	1.596	2.290	1.461	0.000	0.000	0.000	1.563	5.455	1.182	4.545	1.752	0.377	0.000	3.931
2013	1.250	0.840	1.203	1.589	0.585	0.680	2.450	0.000	2.083	1.563	1.818	1.597	4.762	0.000	0.388	0.680	0.000
2014	1.266	0.000	0.588	0.000	0.000	0.599	0.513	2.174	0.000	0.000	7.273	0.488	0.000	0.526	0.000	0.000	2.000
2015	2.569	0.000	1.545	1.932	0.000	0.000	2.209	2.000	4.571	0.000	0.000	6.770	4.348	0.518	0.751	0.535	4.167
2016	1.250	0.763	0.152	0.498	0.851	1.685	1.317	2.326	1.429	0.000	1.961	14.084	8.174	2.340	0.000	1.015	4.167

second half 1/2

Year	Media:												Sovereign & Public Finance	Telecommunications	Transportation: Cargo	Transportation: Consumer	Utilities: Electric	Utilities: Oil & Gas	Utilities: Water	Utilities: Wholesale
	Healthcare & Pharmaceuticals	High Tech Industries	Hotel, Gaming, & Leisure	Advertising, Printing & Publishing	Broadcasting & Subscription	Media: Diversified & Production	Metals & Mining	Retail	Services: Business	Services: Consumer										
1970	0.000	3.704	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	18.045	0.000	0.000	0.000	0.000	0.000	0.000	
1971	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.852	4.762	0.000	0.000	0.000	0.000	0.000	
1972	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.636	0.000	0.000	0.000	0.000	0.000	0.000	
1973	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.448	0.000	0.000	0.000	0.000	1.942	0.000	0.000	0.000	0.000	0.000	0.000	
1974	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.479	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1975	4.762	0.000	0.000	11.111	0.000	0.000	0.000	1.754	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1976	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1977	0.000	0.000	0.000	14.286	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.198	0.000	0.000	0.000	0.000	0.000	0.000	
1978	0.000	3.125	0.000	0.000	0.000	0.000	0.000	1.852	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1979	0.000	2.778	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1980	0.000	2.703	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.000	0.000	0.000	0.000	0.000	0.000	
1981	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.111	0.000	0.000	0.000	0.000	0.000	0.000	
1982	0.000	3.846	0.000	14.286	0.000	0.000	2.381	5.846	0.000	0.000	0.000	0.000	1.220	1.176	5.556	0.000	0.000	0.000	0.000	
1983	0.000	1.695	0.000	0.000	0.000	0.000	1.887	0.000	0.000	0.000	0.000	0.000	0.000	19.048	0.000	0.000	0.000	0.000	0.000	
1984	2.222	4.762	0.000	0.000	0.000	0.000	0.000	0.000	5.263	0.000	0.000	0.000	1.205	0.000	0.000	0.000	0.000	0.000	0.000	
1985	0.000	1.493	5.263	0.000	0.000	0.000	3.509	0.000	0.000	0.000	0.000	0.000	1.190	0.000	0.000	0.000	0.000	0.000	0.000	
1986	1.429	0.000	2.381	0.000	3.846	5.263	19.784	0.000	0.000	0.000	0.000	0.000	1.163	8.174	0.000	0.000	0.000	0.000	5.000	
1987	3.738	1.111	6.494	5.882	0.000	0.000	0.000	1.042	9.524	12.500	0.000	0.000	1.087	0.000	0.000	0.000	1.587	0.000	4.545	
1988	4.735	1.681	2.041	0.000	4.255	3.704	0.000	1.887	4.167	0.000	0.000	0.000	0.000	0.000	0.000	0.543	0.000	0.000	0.000	
1989	2.532	1.762	13.813	0.000	4.352	11.706	0.000	2.501	4.167	0.000	10.526	0.980	1.136	3.571	0.000	0.000	0.000	0.000	0.000	
1990	1.136	5.682	26.100	11.765	6.431	5.000	3.962	6.287	16.667	11.111	0.000	0.000	0.000	24.138	0.000	0.000	0.000	0.000	0.000	
1991	4.818	2.222	2.703	0.000	4.941	4.762	2.041	11.276	0.000	0.000	0.000	0.901	2.581	30.000	0.543	1.818	0.000	0.000	0.000	

second half 2/2

Year	Media:															Transportation:				
	Healthcare & Pharmaceuticals	High Tech Industries	Hotel, Gaming, & Leisure	Advertising, Printing & Publishing	Broadcasting & Subscription	Media: Diversified & Production	Metals & Mining	Retail	Services: Business	Services: Consumer	Sovereign & Public Finance	Telecommunications	Transportation: Cargo	Transportation: Consumer	Utilities: Electric	Utilities: Oil & Gas	Utilities: Water	Utilities: Wholesale		
1992	1.429	3.423	5.271	0.000	10.811	10.836	6.167	2.805	0.000	0.000	0.000	0.000	0.000	0.000	1.579	0.000	0.000	0.000		
1993	0.000	0.000	2.326	0.000	9.007	0.000	1.754	2.807	5.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1994	1.042	3.065	5.357	0.000	2.439	0.000	0.000	2.447	3.704	0.000	0.000	0.000	1.250	2.941	0.000	0.000	0.000	0.000	4.000	
1995	1.010	1.887	2.649	0.000	0.000	0.000	0.000	1.429	4.000	0.000	0.000	0.000	0.000	5.637	0.000	0.000	0.000	0.000	3.704	
1996	0.000	1.042	2.290	0.000	0.000	18.750	0.000	0.730	3.226	0.000	0.000	0.680	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
1997	0.870	1.802	2.059	0.000	2.299	0.000	0.000	3.512	0.000	0.000	0.000	0.541	1.205	0.000	0.000	0.000	0.000	0.000	2.857	
1998	3.074	0.735	2.896	2.326	2.552	5.556	2.915	5.337	0.000	0.000	0.000	0.946	1.064	0.000	0.000	0.000	0.000	0.000	7.500	
1999	5.362	2.690	6.538	3.774	3.678	0.000	4.175	1.891	4.308	7.143	4.762	1.993	7.611	0.000	0.000	1.471	0.000	5.821		
2000	4.785	3.174	6.154	1.515	1.550	3.448	6.868	4.777	2.667	8.824	4.651	2.703	4.043	5.455	0.000	0.000	0.000	10.411		
2001	1.521	4.504	8.763	3.125	3.823	3.571	13.751	6.451	5.740	3.125	2.439	10.237	4.918	1.786	0.755	0.000	0.000	13.010		
2002	0.725	2.718	1.854	3.370	13.826	8.523	7.242	2.762	2.925	3.030	0.000	14.369	4.638	8.964	0.000	1.205	3.704	9.014		
2003	2.955	3.483	2.973	1.639	5.333	0.000	4.334	2.846	1.471	0.000	0.000	8.259	3.821	3.604	0.339	1.235	0.000	9.787		
2004	0.758	0.000	4.140	0.000	4.682	0.000	1.905	0.709	2.869	0.000	0.000	1.521	0.000	5.172	0.311	0.000	0.000	2.941		
2005	0.000	0.000	0.971	0.000	1.010	0.000	0.862	1.585	0.000	0.000	0.000	0.429	0.000	8.197	0.310	0.000	0.000	3.030		
2006	0.000	2.627	0.840	0.000	3.032	0.000	0.000	0.735	0.000	0.000	0.000	0.000	3.601	0.000	0.000	0.000	0.000	2.632		
2007	0.769	0.000	0.000	3.104	0.000	0.000	0.000	2.223	0.870	2.326	0.000	0.926	1.149	0.000	0.000	0.000	0.000	0.000		
2008	0.794	0.000	10.071	7.159	1.953	7.407	0.769	2.854	0.714	0.000	0.000	2.428	4.915	0.000	0.000	0.000	0.000	0.000		
2009	0.746	6.995	17.285	33.864	22.519	0.000	9.889	3.711	4.202	6.209	0.000	5.911	7.070	3.201	0.303	0.000	0.000	11.765		
2010	1.444	1.563	4.497	13.914	2.075	0.000	0.000	4.024	2.041	0.000	0.000	1.540	1.389	0.000	0.000	1.000	0.000	3.030		
2011	0.000	0.000	3.519	8.209	0.000	0.000	0.000	3.208	1.453	1.613	0.000	0.000	5.735	5.655	0.000	0.000	0.000	0.000		
2012	0.694	1.167	3.919	14.897	1.000	0.000	2.133	2.113	1.805	6.097	0.000	1.661	1.124	1.961	0.555	0.000	0.000	0.000		
2013	1.833	0.595	2.397	18.816	0.877	0.000	1.880	1.334	2.061	0.000	0.000	1.619	2.162	0.000	0.000	0.000	0.000	0.000		
2014	0.000	2.728	1.558	8.224	0.000	0.000	5.101	2.335	2.637	2.999	1.099	1.596	0.962	0.000	0.000	0.000	0.000	0.000		
2015	0.000	0.469	2.325	2.273	0.962	3.704	6.592	2.106	2.288	4.143	0.000	0.546	0.000	0.000	0.255	0.000	0.000	1.667		
2016	0.613	0.815	0.730	15.818	0.000	0.000	8.939	3.633	1.163	0.000	0.000	1.565	1.990	1.587	0.249	0.000	0.000	6.121		

## Exhibit 39

## Annual Volume-Weighted Corporate Bond Default Rates By Letter Rating, 1994-2016\*

Year	Aaa	Aa	A	Baa	Ba	B	Caa-C	Inv-Grade	Spec-Grade	All- Rated
1994	0.000	0.000	0.000	0.000	0.000	2.294	22.243	0.000	2.105	0.429
1995	0.000	0.000	0.000	0.000	0.000	4.793	9.108	0.000	3.081	0.714
1996	0.000	0.000	0.000	0.000	0.000	2.288	18.461	0.000	2.341	0.668
1997	0.000	0.000	0.000	0.000	0.051	3.065	6.415	0.000	1.909	0.494
1998	0.000	0.000	0.000	0.000	0.654	3.285	11.306	0.000	2.872	0.853
1999	0.000	0.000	0.000	0.140	1.154	5.499	21.441	0.031	5.904	1.136
2000	0.000	0.000	0.000	0.623	1.696	5.484	19.959	0.137	5.655	1.307
2001	0.000	0.000	0.720	0.957	1.276	14.441	54.337	0.545	15.843	3.049
2002	0.000	0.000	2.718	1.979	5.250	16.056	78.059	1.758	21.556	4.819
2003	0.000	0.000	0.000	0.000	3.622	3.203	17.012	0.000	5.911	1.033
2004	0.000	0.000	0.000	0.000	0.000	0.258	9.190	0.000	1.879	0.328
2005	0.000	0.000	0.000	0.201	0.000	0.899	18.181	0.073	3.787	0.754
2006	0.000	0.000	0.000	0.000	0.033	1.065	3.999	0.000	1.050	0.212
2007	0.000	0.000	0.000	0.000	0.000	0.000	4.834	0.000	0.796	0.155
2008	0.000	0.816	2.370	1.108	8.274	1.813	9.556	1.466	5.802	2.220
2009	0.000	0.000	0.014	0.751	3.601	6.466	37.583	0.217	16.176	2.741
2010	0.000	0.000	0.147	0.021	0.000	0.130	6.021	0.077	1.643	0.339
2011	0.000	0.114	0.000	0.403	0.000	0.173	6.890	0.149	1.411	0.387
2012	0.000	0.000	0.000	0.018	0.000	0.142	11.103	0.007	2.006	0.390
2013	0.000	0.000	0.060	0.024	0.000	0.841	4.365	0.039	1.073	0.254
2014	0.000	0.000	0.023	0.000	0.108	0.324	9.244	0.010	1.737	0.388
2015	0.000	0.000	0.000	0.000	0.813	1.353	16.970	0.000	3.450	0.785
2016	0.000	0.000	0.000	0.000	0.134	0.938	19.271	0.000	3.482	0.737
Mean	0.000	0.040	0.263	0.271	1.159	3.253	18.067	0.196	4.846	1.052
Median	0.000	0.000	0.000	0.000	0.051	1.813	11.306	0.007	2.872	0.714
StDev	0.000	0.171	0.737	0.502	2.112	4.253	17.454	0.465	5.479	1.133
Min	0.000	0.000	0.000	0.000	0.000	0.000	3.999	0.000	0.796	0.155
Max	0.000	0.816	2.718	1.979	8.274	16.056	78.059	1.758	21.556	4.819

\*Data in percent

## Exhibit 40

## Average Volume-Weighted Corporate Bond Default Rates By Letter Rating, 1994-2016\*

Rating / Year					
Aaa	0.000	0.046	0.046	0.046	0.046
Aa	0.033	0.086	0.118	0.160	0.222
A	0.264	0.502	0.707	0.862	1.050
Baa	0.165	0.355	0.504	0.772	1.147
Ba	0.768	1.963	3.065	4.188	4.955
B	2.913	6.707	10.257	13.361	15.402
Caa-C	15.441	24.955	31.762	34.988	37.099
Inv-Grade	0.181	0.363	0.510	0.672	0.884
Spec-Grade	4.181	7.900	11.034	13.367	14.916
All Rated	0.963	1.832	2.548	3.115	3.570

\*Data in percent

## Exhibit 41

## Cumulative Issuer-Weighted Default Rates By Annual Cohort, 1970-2016 (Data in percent)

1/1/70		n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	39	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.703	2.703	2.703	
Aa	77	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.449	1.449	1.449	1.449	2.942	2.942	2.942	2.942	
A	254	0.000	0.000	0.000	0.413	0.413	0.835	0.835	0.835	0.835	0.835	1.292	1.292	1.292	1.292	1.292	1.292	1.793	1.793	2.844	2.844	
Baa	372	0.543	0.543	0.543	1.123	1.415	1.415	1.728	2.368	3.038	3.038	3.396	3.396	4.589	4.999	5.425	5.869	7.247	8.286	9.347	9.920	
Ba	238	4.237	5.120	5.565	6.050	7.042	8.072	8.606	9.208	10.456	10.456	10.456	12.020	14.560	15.489	15.489	17.575	21.076	23.608	23.608	25.077	
B	36	19.444	19.444	22.321	22.321	22.321	22.321	22.321	22.321	22.321	22.321	22.321	22.321	30.498	30.498	30.498	30.498	36.290	36.290	36.290	36.290	
Caa-C	16	50.000	56.250	75.000	81.250	81.250	81.250	81.250	90.625	90.625	90.625	90.625	90.625	90.625	90.625	90.625	90.625	90.625	90.625	90.625	90.625	
IG	742	0.271	0.271	0.271	0.698	0.841	0.989	1.138	1.443	1.756	1.756	2.088	2.088	2.613	2.968	3.151	3.338	4.297	4.905	5.733	5.949	
SG	290	8.678	9.764	11.601	12.382	13.192	14.035	14.471	15.443	16.450	16.450	16.450	17.693	21.008	21.733	21.733	23.347	26.969	28.932	28.932	30.097	
All	1032	2.631	2.929	3.434	3.955	4.271	4.598	4.821	5.282	5.757	5.757	6.014	6.276	7.371	7.794	7.940	8.389	9.789	10.614	11.291	11.648	
1/1/71		n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.703	2.703	2.703	2.703	
Aa	74	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.754	
A	282	0.000	0.000	0.366	0.366	0.739	0.739	0.739	0.739	0.739	1.140	1.140	1.550	1.964	1.964	1.964	2.399	2.399	3.303	3.303	3.303	
Baa	398	0.000	0.000	0.534	0.802	1.075	1.366	1.966	2.595	2.595	2.930	2.930	4.063	4.451	4.855	5.276	6.579	7.553	8.547	9.079	10.223	
Ba	228	0.885	1.332	1.815	2.810	3.844	4.381	4.986	6.241	6.241	6.241	7.798	10.322	11.247	11.247	13.311	17.937	20.487	20.487	21.959	21.959	
B	27	0.000	3.846	3.846	3.846	3.846	3.846	3.846	3.846	3.846	3.846	3.846	15.865	15.865	15.865	15.865	23.514	23.514	23.514	23.514	23.514	
Caa-C	8	12.500	50.000	62.500	62.500	62.500	62.500	81.250	81.250	81.250	81.250	81.250	81.250	81.250	81.250	81.250	81.250	81.250	81.250	81.250	81.250	
IG	794	0.000	0.000	0.394	0.526	0.797	0.936	1.219	1.511	1.511	1.819	1.819	2.472	2.804	2.974	3.148	3.863	4.428	5.195	5.396	6.023	
SG	263	1.155	3.112	3.942	4.806	5.706	6.173	7.216	8.295	8.295	8.295	9.620	13.174	13.950	13.950	15.671	20.478	22.588	22.588	23.837	23.837	
All	1057	0.286	0.769	1.268	1.572	1.988	2.203	2.648	3.106	3.106	3.353	3.606	4.795	5.203	5.344	5.776	7.124	7.916	8.564	8.906	9.443	

1/1/72

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	41	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.632	2.632	2.632	2.632	2.632	
Aa	78	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.667	1.667	
A	303	0.000	0.339	0.339	0.339	0.339	0.339	0.339	0.339	0.339	0.339	0.718	1.100	1.100	1.100	1.502	1.502	2.340	2.340	2.796	3.266
Baa	431	0.000	0.489	0.735	1.246	1.513	2.061	2.639	2.639	3.274	3.274	3.980	4.341	5.091	5.478	6.677	7.566	8.477	9.481	11.070	13.825
Ba	224	0.000	0.476	1.455	2.474	3.001	3.589	4.810	4.810	4.810	6.291	9.477	10.348	10.348	13.240	17.526	19.852	19.852	21.188	22.621	28.729
B	29	6.897	6.897	6.897	6.897	6.897	6.897	6.897	6.897	6.897	6.897	17.850	17.850	17.850	25.318	25.318	25.318	25.318	25.318	25.318	25.318
Caa-C	8	37.500	50.000	50.000	50.000	50.000	66.667	66.667	66.667	66.667	66.667	66.667	66.667	66.667	66.667	66.667	66.667	66.667	66.667	66.667	66.667
IG	853	0.000	0.365	0.487	0.737	0.866	1.128	1.397	1.397	1.684	1.684	2.140	2.448	2.766	2.927	3.591	4.113	4.826	5.206	6.187	7.399
SG	261	1.922	2.734	3.578	4.459	4.914	5.920	6.963	6.963	6.963	8.216	12.233	12.965	12.965	15.405	19.910	21.865	21.865	23.014	24.276	29.695
All	1114	0.453	0.921	1.206	1.596	1.797	2.213	2.641	2.641	2.872	3.109	4.219	4.600	4.863	5.399	6.654	7.388	7.991	8.475	9.485	11.222

1/1/73

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	41	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.632	2.632	2.632	2.632	2.632	
Aa	81	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.587	1.587	1.587
A	309	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.368	0.738	0.738	0.738	1.132	1.132	1.952	1.952	2.396	2.854	3.315
Baa	441	0.461	0.693	1.175	1.425	1.940	2.484	2.484	3.081	3.081	3.747	4.429	5.139	5.872	7.008	7.846	8.703	9.650	11.654	13.758	13.758
Ba	205	0.000	1.018	2.080	2.630	3.239	4.496	4.496	4.496	5.994	10.008	10.874	10.874	12.770	17.027	20.521	20.521	21.824	23.220	30.451	31.963
B	27	3.846	3.846	3.846	3.846	3.846	3.846	3.846	3.846	3.846	15.158	15.158	15.158	15.158	22.871	22.871	22.871	22.871	22.871	22.871	22.871
Caa-C	6	37.500	37.500	37.500	37.500	58.333	58.333	58.333	58.333	58.333	58.333	58.333	58.333	58.333	58.333	58.333	58.333	58.333	58.333	58.333	58.333
IG	872	0.232	0.348	0.588	0.710	0.960	1.217	1.217	1.491	1.491	1.929	2.372	2.677	2.988	3.628	4.131	4.817	5.182	6.314	7.289	7.486
SG	238	1.280	2.164	3.088	3.565	4.613	5.695	5.695	5.695	6.974	11.740	12.475	12.475	14.096	18.614	21.583	21.583	22.719	23.966	30.470	31.833
All	1110	0.456	0.733	1.113	1.309	1.713	2.129	2.129	2.352	2.582	3.779	4.270	4.525	5.045	6.264	7.121	7.706	8.175	9.314	10.998	11.340

1/1/74

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	44	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.500	2.500	2.500	2.500	2.500	2.500	2.500	
Aa	89	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.266	1.266	1.266	1.266	1.266	1.266	1.266	1.266	2.739	2.739	2.739	
A	307	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.366	0.735	0.735	0.735	1.125	1.125	1.932	1.932	2.368	2.818	3.270	
Baa	431	0.000	0.480	0.730	1.244	1.786	1.786	2.381	2.381	3.048	3.728	4.440	5.175	5.559	6.404	7.271	8.223	9.717	11.829	11.829	
Ba	197	0.513	1.601	2.166	2.793	4.090	4.090	4.090	4.851	8.921	9.805	9.805	11.704	17.935	21.390	21.390	22.723	25.533	32.821	34.348	
B	29	7.162	7.162	7.162	7.162	7.162	7.162	11.804	22.180	22.180	22.180	22.180	29.962	29.962	29.962	29.962	29.962	29.962	29.962		
Caa-C	3	0.000	0.000	0.000	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	
IG	871	0.000	0.236	0.356	0.602	0.855	0.855	1.125	1.125	1.700	2.137	2.438	2.744	3.060	3.557	4.233	4.593	5.516	6.473	6.667	
SG	229	1.332	2.270	2.756	3.825	4.928	4.928	4.928	6.226	11.030	11.778	11.778	13.412	19.682	22.647	22.647	23.801	26.341	32.984	34.380	
All	1100	0.275	0.652	0.845	1.246	1.658	1.658	1.879	2.106	3.411	3.897	4.150	4.664	5.869	6.717	7.295	7.758	8.882	10.544	10.881	

1/1/75

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	52	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.041	2.041	2.041	2.041	2.041	2.041	2.041	
Aa	103	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.053	1.053	1.053	1.053	1.053	1.053	2.231	2.231	3.453	3.453	3.453	3.453	
A	321	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.353	0.353	0.353	0.353	0.727	0.727	1.505	1.505	1.926	2.794	3.236	3.725	
Baa	412	0.000	0.000	0.268	0.825	0.825	1.436	1.436	2.448	3.137	3.855	4.594	4.981	5.826	6.258	7.213	9.211	11.299	11.299	11.299	
Ba	200	1.029	2.117	3.266	3.886	3.886	3.886	4.593	8.443	9.275	9.275	11.089	17.015	20.310	21.465	22.732	24.064	29.619	31.055	32.737	
B	33	6.158	6.158	6.158	9.510	9.510	9.510	13.444	22.100	22.100	22.100	22.100	28.591	28.591	28.591	28.591	38.793	48.994	48.994	48.994	
Caa-C	3	0.000	0.000	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	
IG	888	0.000	0.000	0.119	0.363	0.363	0.622	0.622	1.172	1.589	1.876	2.167	2.467	2.938	3.581	3.921	4.971	6.053	6.236	6.438	
SG	236	1.742	2.659	4.117	5.135	5.135	5.135	6.329	10.801	11.497	11.497	13.037	18.908	21.686	22.653	23.712	26.024	32.042	33.301	34.751	
All	1124	0.361	0.546	0.930	1.323	1.323	1.534	1.750	2.990	3.453	3.692	4.180	5.320	6.123	6.809	7.244	8.455	10.168	10.484	10.832	

1/1/76

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	66	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695
Aa	112	0.000	0.000	0.000	0.000	0.000	0.971	0.971	0.971	0.971	0.971	0.971	2.059	2.059	3.185	3.185	3.185	3.185	3.185	3.185	3.185
A	367	0.000	0.000	0.000	0.000	0.000	0.000	0.613	0.613	0.613	1.274	1.274	2.317	2.317	3.068	4.236	4.236	4.676	4.676	5.157	
Baa	371	0.000	0.288	0.584	0.584	0.906	0.906	2.349	3.086	3.855	4.650	5.062	5.958	5.958	6.979	9.118	10.791	11.356	11.356	11.356	
Ba	206	0.995	2.044	3.163	3.163	3.788	4.425	7.202	7.957	7.957	9.586	14.850	17.801	18.828	19.956	21.151	27.300	28.576	30.033	30.033	30.033
B	27	0.000	0.000	4.000	4.000	4.000	8.800	19.529	19.529	19.529	19.529	28.471	28.471	28.471	42.776	57.082	57.082	57.082	57.082	57.082	
Caa-C	3	0.000	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	
IG	916	0.000	0.113	0.228	0.228	0.349	0.349	0.996	1.520	1.791	2.067	2.495	2.942	3.551	3.874	5.033	6.057	6.229	6.420	6.420	6.631
SG	236	0.868	2.248	3.691	3.691	4.235	5.355	8.959	9.618	9.618	11.064	16.540	19.160	20.068	21.067	23.215	29.961	31.149	32.499	32.499	32.499
All	1152	0.176	0.539	0.912	0.912	1.110	1.314	2.482	3.027	3.254	3.716	4.919	5.681	6.330	6.743	8.028	9.795	10.094	10.423	10.423	10.606

1/1/77

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	67	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695
Aa	119	0.000	0.000	0.000	0.000	0.000	0.909	0.909	0.909	0.909	0.909	0.909	1.941	1.941	2.996	2.996	2.996	2.996	2.996	2.996	2.996
A	388	0.000	0.000	0.000	0.000	0.000	0.000	0.576	0.576	0.576	1.197	1.197	2.843	2.843	3.896	5.000	5.000	5.420	5.420	5.877	5.877
Baa	355	0.294	0.595	0.595	0.595	0.595	2.059	2.807	3.587	4.397	4.819	5.728	5.728	6.768	8.400	10.086	10.655	10.655	10.655	10.655	
Ba	195	0.543	1.674	1.674	2.273	2.920	5.721	6.481	6.481	8.107	13.365	16.300	17.320	18.438	19.637	25.808	27.088	28.546	28.546	28.546	
B	31	3.226	6.563	6.563	10.625	14.881	24.895	24.895	24.895	33.333	33.333	33.333	33.333	33.333	46.592	59.944	59.944	59.944	59.944	59.944	
Caa-C	3	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	
IG	929	0.110	0.221	0.221	0.221	0.849	1.358	1.621	1.889	2.305	2.739	3.631	3.944	5.066	6.057	6.224	6.410	6.410	6.615	6.615	
SG	229	1.360	2.788	2.788	3.843	4.955	8.551	9.209	9.209	10.638	16.052	18.633	19.527	20.509	22.643	29.341	30.519	31.855	31.855	31.855	
All	1158	0.354	0.717	0.717	0.911	1.109	2.248	2.778	3.000	3.451	4.623	5.365	6.255	6.655	7.904	9.620	9.910	10.232	10.232	10.411	

1/1/78

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	71	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.563	1.563	1.563	3.150	3.150	3.150	3.150	3.150	3.150	3.150	3.150	
Aa	131	0.000	0.000	0.000	0.000	0.826	0.826	0.826	0.826	0.826	0.826	1.745	1.745	1.745	1.745	1.745	1.745	1.745	1.745	1.745	
A	380	0.000	0.000	0.000	0.000	0.581	0.581	0.581	0.581	1.210	1.210	2.554	2.554	3.995	4.741	4.741	5.170	5.170	5.637	5.637	
Baa	341	0.000	0.000	0.000	0.000	1.420	1.784	2.545	2.940	3.349	4.654	5.104	6.106	7.680	9.859	10.409	10.409	10.409	10.409	10.409	
Ba	187	1.124	1.124	1.124	1.770	4.583	6.092	6.092	9.330	15.441	17.431	18.437	19.555	21.939	28.124	29.407	32.288	32.288	32.288	32.288	
B	37	5.405	5.405	11.712	14.982	22.375	22.375	26.941	26.941	32.561	38.692	38.692	47.450	60.587	60.587	60.587	60.587	60.587	60.587	60.587	
Caa-C	3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	
IG	923	0.000	0.000	0.000	0.000	0.611	0.983	1.240	1.371	1.776	2.338	3.207	3.511	4.761	5.727	5.890	6.072	6.072	6.272	6.272	
SG	227	1.823	1.823	2.841	3.909	7.370	8.614	9.281	12.009	18.681	21.156	22.004	22.943	26.013	32.611	33.773	36.370	36.370	36.370	36.370	
All	1150	0.354	0.354	0.542	0.735	1.843	2.359	2.681	3.229	4.598	5.436	6.300	6.689	8.172	9.844	10.128	10.596	10.596	10.770	10.770	

1/1/79

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	75	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.471	1.471	1.471	2.963	2.963	2.963	2.963	2.963	2.963	2.963	2.963	
Aa	132	0.000	0.000	0.000	0.813	0.813	0.813	0.813	0.813	0.813	1.715	1.715	1.715	1.715	1.715	1.715	1.715	1.715	1.715	1.715	
A	376	0.000	0.000	0.000	0.000	0.573	0.573	0.573	0.573	1.192	1.192	2.524	2.524	3.588	4.323	4.323	4.746	4.746	5.204	5.204	5.204
Baa	336	0.000	0.313	0.313	1.701	2.057	2.431	2.815	2.815	4.087	4.527	5.515	8.120	10.279	10.826	10.826	10.826	10.826	10.826	10.826	
Ba	207	0.513	0.513	1.072	3.489	6.072	9.486	12.271	18.897	20.552	21.398	22.333	25.386	31.705	32.789	35.189	35.189	35.189	35.189	35.189	
B	34	0.000	6.452	9.793	17.009	17.009	21.620	26.519	38.954	45.737	45.737	45.737	56.589	56.589	56.589	56.589	56.589	56.589	56.589	56.589	
Caa-C	3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	
IG	919	0.000	0.112	0.112	0.712	1.076	1.202	1.330	1.594	2.142	2.995	3.294	4.677	5.625	5.785	5.963	5.963	6.160	6.160	6.160	
SG	244	0.435	1.345	2.293	5.351	7.546	11.058	14.063	21.817	23.963	24.701	25.520	29.154	34.998	36.030	38.314	38.314	38.314	38.314	38.314	
All	1163	0.088	0.360	0.546	1.611	2.307	3.027	3.659	5.192	5.997	6.828	7.204	8.901	10.518	10.792	11.245	11.245	11.414	11.414	11.414	

1/1/80

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	87	0.000	0.000	0.000	0.000	0.000	0.000	1.266	1.266	1.266	2.565	2.565	2.565	2.565	2.565	2.565	2.565	2.565	2.565	2.565	
Aa	130	0.000	0.000	0.000	0.000	0.000	0.000	0.901	1.802	1.802	1.802	1.802	1.802	1.802	1.802	1.802	1.802	1.802	1.802	1.802	
A	381	0.000	0.000	0.276	0.830	0.830	0.830	1.727	2.038	3.012	3.012	4.057	4.777	4.777	5.191	5.191	5.641	5.641	5.641	5.641	6.661
Baa	336	0.000	0.000	1.014	1.361	1.725	2.464	2.464	3.288	4.140	5.528	7.984	10.498	11.527	11.527	11.527	11.527	11.527	11.527	11.527	
Ba	207	0.000	0.524	3.887	5.092	8.864	12.096	18.211	20.477	21.256	23.942	26.807	32.979	35.276	37.719	37.719	37.719	39.238	39.238	39.238	
B	41	5.000	7.568	15.723	21.536	27.949	31.552	44.781	49.383	49.383	49.383	61.434	69.148	69.148	69.148	69.148	69.148	69.148	69.148	69.148	
Caa-C	6	33.333	33.333	33.333	33.333	33.333	33.333	55.556	55.556	55.556	55.556	55.556	55.556	55.556	55.556	55.556	55.556	55.556	55.556	55.556	
IG	934	0.000	0.000	0.463	0.814	0.936	1.182	1.562	2.225	3.046	3.476	4.806	5.866	6.179	6.350	6.350	6.540	6.540	6.540	6.540	6.977
SG	254	1.630	2.482	6.552	8.492	12.589	15.787	23.188	25.688	26.334	28.545	32.526	38.689	40.721	42.877	42.877	42.877	42.877	44.205	44.205	44.205
All	1188	0.344	0.520	1.714	2.375	3.251	4.051	5.713	6.693	7.482	8.195	9.927	11.715	12.252	12.683	12.683	12.844	12.844	13.015	13.015	13.388

1/1/81

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Aaa	91	0.000	0.000	0.000	0.000	0.000	0.000	1.220	1.220	1.220	2.486	2.486	2.486	2.486	2.486	2.486	2.486	2.486	2.486	2.486		
Aa	135	0.000	0.000	0.000	0.000	0.000	0.000	0.833	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	3.734		
A	386	0.000	0.269	0.269	0.269	0.269	1.152	1.463	2.113	2.113	3.154	3.876	3.876	4.290	4.290	4.741	4.741	4.741	4.741	5.749	6.267	
Baa	339	0.000	0.642	1.958	2.655	3.373	3.373	3.774	4.586	5.913	8.261	10.179	11.161	11.161	11.161	11.161	11.161	11.161	11.161	11.161	11.902	12.703
Ba	241	0.000	3.652	5.129	8.169	11.870	18.558	21.066	21.719	24.731	28.832	35.161	37.241	39.443	39.443	39.443	40.851	42.294	42.294	42.294	42.294	
B	46	4.397	11.393	16.315	24.335	27.245	41.234	41.234	41.234	41.234	51.518	57.578	57.578	57.578	57.578	57.578	57.578	57.578	57.578	57.578	57.578	
Caa-C	7	0.000	0.000	0.000	0.000	0.000	16.667	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333	33.333		
IG	951	0.000	0.332	0.780	1.014	1.253	1.619	2.135	2.929	3.346	4.635	5.515	5.820	5.985	5.985	6.169	6.169	6.169	6.169	6.800	7.456	
SG	294	0.698	4.785	6.776	10.508	13.983	21.890	24.468	25.004	27.469	32.224	38.312	40.090	41.962	41.962	41.962	43.147	44.356	44.356	44.356	44.356	
All	1245	0.162	1.352	2.139	3.135	4.068	6.005	6.928	7.670	8.456	10.331	12.031	12.543	12.954	12.954	13.107	13.107	13.270	13.438	13.968	14.521	

1/1/82

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	94	0.000	0.000	0.000	0.000	1.176	1.176	1.176	2.412	2.412	2.412	2.412	2.412	2.412	2.412	2.412	2.412	2.412	2.412	2.412	
Aa	147	0.000	0.000	0.000	0.000	0.758	2.284	2.284	2.284	2.284	2.284	2.284	2.284	3.292	3.292	3.292	3.292	3.292	4.457	4.457	
A	395	0.256	0.256	0.256	0.256	1.110	1.110	1.741	1.741	3.097	3.801	3.801	4.199	4.199	4.199	4.199	4.199	4.199	4.685	5.184	8.268
Baa	326	0.329	0.329	1.393	2.129	2.513	3.322	4.156	5.498	7.868	9.808	10.810	10.810	10.810	10.810	10.810	10.810	10.810	12.336	13.147	13.147
Ba	254	2.786	5.360	8.052	11.794	18.634	20.842	21.416	24.076	28.538	32.633	34.535	36.549	36.549	36.549	37.899	39.378	39.378	39.378	42.655	
B	45	2.222	9.101	14.084	16.769	29.169	29.169	29.169	29.169	34.618	53.192	53.192	53.192	53.192	53.192	53.192	53.192	53.192	53.192	53.192	
Caa-C	13	23.077	46.154	46.154	46.154	55.128	64.103	64.103	64.103	64.103	64.103	64.103	64.103	64.103	64.103	64.103	64.103	64.103	64.103	64.103	
IG	962	0.214	0.214	0.554	0.786	1.264	1.768	2.544	2.951	4.354	5.219	5.518	5.681	5.681	5.861	5.861	5.861	5.861	6.478	7.120	8.433
SG	312	3.553	7.664	10.573	13.998	21.658	23.901	24.368	26.562	30.881	36.348	37.963	39.662	39.662	39.662	40.780	41.988	41.988	41.988	44.686	
All	1274	1.040	2.031	2.975	3.950	6.065	6.945	7.653	8.407	10.329	11.970	12.466	12.864	12.864	13.012	13.012	13.171	13.335	13.852	14.390	15.852

1/1/83

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	99	0.000	0.000	0.000	0.000	2.273	2.273	2.273	3.526	3.526	3.526	3.526	3.526	3.526	3.526	3.526	3.526	3.526	3.526	3.526	
Aa	234	0.000	0.000	0.000	0.000	0.469	1.905	1.905	1.905	1.905	1.905	1.905	1.905	2.564	2.564	2.564	2.564	2.564	2.564	3.343	4.169
A	475	0.000	0.000	0.000	0.230	0.230	0.989	0.989	2.343	3.465	4.046	4.362	4.362	4.362	4.362	4.362	4.362	4.362	4.774	6.035	6.468
Baa	324	0.000	0.989	1.341	2.798	3.210	3.631	4.551	6.953	8.966	8.966	8.966	8.966	8.966	8.966	8.966	8.966	10.502	12.115	13.821	17.304
Ba	178	1.163	2.435	4.444	10.315	11.986	15.589	19.868	23.352	26.929	26.929	28.589	28.589	28.589	28.589	28.589	30.970	33.526	36.185	41.503	44.162
B	135	2.303	7.128	13.843	24.317	27.156	28.128	30.392	37.598	48.552	53.346	55.802	55.802	55.802	59.485	59.485	59.485	59.485	59.485	59.485	
Caa-C	20	42.308	53.846	59.615	59.615	73.077	73.077	73.077	73.077	73.077	73.077	73.077	73.077	73.077	73.077	73.077	73.077	73.077	73.077	73.077	
IG	1132	0.000	0.277	0.373	0.863	1.280	2.041	2.268	3.554	4.525	4.777	4.915	4.915	5.068	5.068	5.068	5.068	5.416	5.959	7.072	8.229
SG	333	4.061	7.426	11.641	19.114	22.021	24.232	27.369	32.159	38.076	39.669	41.470	41.470	41.470	42.664	44.063	45.535	47.091	50.203	51.810	
All	1465	0.900	1.836	2.803	4.750	5.662	6.704	7.443	9.285	11.001	11.430	11.776	11.776	11.906	11.906	12.045	12.189	12.642	13.268	14.548	15.713

1/1/84

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Aaa	85	0.000	0.000	0.000	1.282	1.282	1.282	2.734	2.734	2.734	2.734	2.734	2.734	2.734	2.734	2.734	2.734	2.734	2.734	2.734		
Aa	250	0.000	0.000	0.000	0.862	1.755	1.755	1.755	1.755	1.755	1.755	1.755	1.755	1.755	1.755	1.755	1.755	1.755	3.087	3.844	3.844	
A	496	0.000	0.213	0.428	0.658	1.599	1.599	3.109	4.153	4.690	4.690	4.690	4.690	4.690	4.690	4.690	4.690	4.690	5.068	6.226	6.623	7.070
Baa	331	0.625	0.625	0.963	1.364	1.773	2.669	3.624	5.117	5.117	5.685	5.685	5.685	5.685	6.400	6.400	7.200	8.903	11.565	14.310	14.310	
Ba	195	0.518	2.155	9.112	11.683	15.161	18.397	24.389	29.686	30.767	31.941	31.941	31.941	31.941	31.941	35.778	37.785	39.791	43.805	43.805		
B	154	5.340	12.259	21.656	24.736	27.983	33.675	41.811	47.801	49.666	53.692	53.692	53.692	53.692	57.254	57.254	57.254	57.254	57.254	57.254	57.254	
Caa-C	11	18.182	29.870	29.870	47.403	47.403	47.403	47.403	47.403	47.403	47.403	47.403	47.403	47.403	47.403	47.403	47.403	47.403	47.403	47.403	47.403	
IG	1162	0.175	0.267	0.452	0.949	1.676	1.894	2.907	3.727	3.972	4.106	4.106	4.255	4.255	4.414	4.414	4.587	5.120	6.393	7.342	7.549	
SG	360	3.130	7.281	15.120	18.184	21.481	25.746	32.428	37.706	38.957	41.062	41.062	41.062	41.062	42.196	44.606	45.894	47.183	49.792	49.792		
All	1522	0.869	1.905	3.854	4.927	6.217	7.248	9.331	10.941	11.345	11.781	11.781	11.905	11.905	12.038	12.175	12.611	13.212	14.441	15.561	15.734	

1/1/85

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	91	0.000	0.000	0.000	0.000	0.000	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	
Aa	303	0.000	0.000	0.000	0.771	0.771	0.771	0.771	0.771	0.771	0.771	0.771	1.332	1.332	1.332	1.332	1.332	1.989	2.680	2.680	2.680
A	557	0.000	0.192	1.217	2.307	2.307	3.966	4.951	5.207	5.207	5.207	5.207	5.207	5.207	5.207	5.207	5.571	6.319	6.702	7.130	7.130
Baa	336	0.000	1.011	1.361	1.757	2.645	3.104	4.600	5.113	5.685	5.685	5.685	5.685	6.439	6.439	8.946	10.767	13.578	16.536	16.536	
Ba	236	0.872	5.927	8.654	12.090	17.175	23.345	29.113	30.723	31.611	31.611	31.611	31.611	31.611	33.165	34.879	38.306	41.734	41.734	41.734	
B	182	7.309	16.033	20.974	24.295	30.013	38.323	43.779	45.483	49.521	49.521	52.045	52.045	52.045	55.470	55.470	55.470	55.470	55.470	55.470	
Caa-C	15	6.667	13.333	22.000	31.750	31.750	31.750	31.750	31.750	31.750	31.750	31.750	31.750	31.750	31.750	31.750	31.750	31.750	31.750	31.750	
IG	1287	0.000	0.336	0.871	1.638	1.842	2.787	3.558	3.789	3.915	3.915	4.057	4.057	4.210	4.210	4.702	5.215	6.265	7.178	7.377	7.377
SG	433	3.773	10.459	14.350	17.923	23.141	29.906	35.269	36.800	38.523	38.523	40.678	40.678	41.577	42.602	43.727	45.978	48.254	48.254	48.254	
All	1720	0.952	2.897	4.257	5.702	7.028	9.183	10.841	11.305	11.708	11.708	12.174	12.174	12.298	12.428	12.976	13.547	14.716	15.778	15.943	15.943

1/1/86

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	136	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	352	0.000	0.000	0.639	0.639	1.335	1.335	1.335	1.335	1.335	1.792	1.792	1.792	1.792	1.792	2.380	2.987	2.987	2.987	2.987	
A	625	0.000	0.176	0.725	0.916	1.898	2.507	2.507	2.507	2.507	2.507	2.507	2.507	2.507	3.158	3.829	4.533	4.923	4.923	5.340	
Baa	364	0.870	1.169	2.546	3.661	5.219	6.481	7.375	7.871	8.400	8.400	8.400	9.050	9.050	10.460	11.232	12.789	14.397	14.397	14.397	
Ba	314	2.365	6.918	9.385	13.630	20.326	26.420	28.435	30.620	31.418	31.418	31.418	32.441	32.441	32.441	33.879	39.726	42.667	42.667	42.667	
B	223	10.536	14.882	19.027	24.039	31.754	39.124	43.843	46.517	46.517	48.656	48.656	48.656	51.101	56.854	59.936	59.936	59.936	59.936	59.936	
Caa-C	19	17.105	23.482	31.134	31.134	31.134	31.134	31.134	31.134	77.045	77.045	77.045	77.045	77.045	77.045	77.045	77.045	77.045	77.045	77.045	
IG	1477	0.211	0.358	1.064	1.394	2.332	2.867	3.054	3.156	3.263	3.378	3.378	3.504	3.504	3.778	4.215	4.958	5.733	5.901	5.901	6.083
SG	556	6.163	10.688	14.025	18.476	25.413	31.811	34.697	36.979	37.492	39.230	39.230	39.913	40.646	42.341	44.146	47.918	49.829	49.829	49.829	50.920
All	2033	1.830	3.140	4.526	5.834	8.085	9.827	10.508	10.997	11.170	11.545	11.545	11.753	11.861	12.322	12.925	14.042	14.941	15.081	15.081	15.382

1/1/87

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	156	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	365	0.000	0.000	0.000	0.318	0.318	0.318	0.318	0.318	0.739	0.739	0.739	0.739	0.739	0.739	0.739	1.273	1.827	1.827	1.827	1.827
A	595	0.000	0.000	0.186	1.140	1.731	1.731	1.731	1.731	1.731	1.731	1.731	1.731	1.731	2.052	2.710	3.401	4.148	4.148	4.550	4.965
Baa	400	0.000	0.876	1.804	3.438	4.855	6.332	7.572	7.572	7.572	8.116	8.705	9.906	10.573	11.934	12.633	12.633	12.633	12.633	12.633	
Ba	423	3.024	4.965	8.688	15.870	23.771	26.415	28.923	30.627	31.257	31.945	33.501	33.501	33.501	34.647	38.087	44.023	44.023	44.023	45.459	46.933
B	303	5.437	11.871	19.384	29.452	38.073	43.129	44.852	44.852	46.051	46.051	46.051	47.592	51.086	56.521	58.412	60.491	60.491	60.491	60.491	
Caa-C	33	9.823	16.759	16.759	50.056	50.056	50.056	50.056	50.056	75.028	75.028	75.028	75.028	75.028	75.028	75.028	75.028	75.028	75.028	75.028	
IG	1516	0.000	0.217	0.518	1.377	1.949	2.290	2.572	2.572	2.678	2.678	2.794	2.919	3.173	3.444	4.133	4.707	5.013	5.013	5.180	5.350
SG	759	4.299	8.323	13.431	22.356	30.307	33.730	35.862	36.898	38.467	38.894	39.850	40.387	41.629	44.284	46.994	51.261	51.261	51.261	52.132	53.052
All	2275	1.423	2.873	4.643	7.779	10.320	11.404	12.101	12.327	12.731	12.816	13.089	13.283	13.691	14.332	15.322	16.463	16.707	16.707	16.973	17.248

1/1/88

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	154	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	401	0.000	0.531	0.803	0.803	0.803	0.803	0.803	1.159	1.159	1.159	1.159	1.159	1.612	2.065	2.538	2.538	2.538	2.538	2.538	
A	606	0.000	0.176	0.896	1.451	1.451	1.451	1.451	1.451	1.451	1.451	1.451	1.451	1.451	2.096	2.428	3.159	3.159	3.554	3.961	3.961
Baa	378	0.000	0.293	1.205	2.512	4.209	5.725	5.725	5.725	5.725	6.232	6.232	6.797	7.414	9.305	11.258	11.258	11.258	11.258	11.258	
Ba	464	1.353	6.441	11.929	20.006	22.465	24.887	25.828	26.346	27.484	28.746	29.504	30.279	31.161	35.756	41.559	41.559	42.830	44.224	47.417	
B	385	5.934	12.967	26.184	34.769	39.251	42.289	43.759	46.348	46.348	47.380	52.014	54.756	59.192	60.762	62.545	62.545	62.545	62.545	62.545	
Caa-C	40	12.500	15.741	44.547	44.547	44.547	44.547	44.547	72.274	72.274	72.274	72.274	72.274	72.274	72.274	72.274	72.274	72.274	72.274	72.274	
IG	1539	0.000	0.278	0.852	1.375	1.765	2.109	2.109	2.205	2.205	2.312	2.312	2.430	2.683	3.457	4.128	4.412	4.412	4.567	4.725	4.725
SG	889	3.850	9.708	18.941	27.026	30.228	32.812	33.906	35.772	36.461	37.590	39.763	41.201	43.295	46.612	50.725	50.725	50.725	51.507	52.343	54.178
All	2428	1.393	3.581	6.945	9.776	10.948	11.866	12.133	12.636	12.789	13.115	13.551	13.918	14.498	15.698	16.945	17.167	17.167	17.409	17.661	17.926

1/1/89

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	171	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	412	0.499	0.499	0.499	0.499	0.499	0.499	0.828	0.828	0.828	0.828	0.828	1.256	1.683	2.126	2.126	2.126	2.126	2.126	2.126	
A	643	0.000	0.324	0.832	0.832	0.832	0.832	0.832	0.832	0.832	0.832	0.832	0.832	1.734	2.044	2.388	2.388	2.757	3.137	3.137	4.412
Baa	396	0.529	1.624	2.219	4.061	4.747	4.747	4.747	4.747	5.194	5.194	5.693	6.232	8.452	10.162	10.773	10.773	10.773	10.773	10.773	11.549
Ba	438	2.957	9.794	17.765	20.034	22.655	23.082	23.579	24.674	25.905	28.084	28.811	30.466	34.667	40.951	40.951	40.951	40.951	42.109	44.684	46.179
B	423	7.549	21.062	29.530	34.628	37.935	40.214	43.563	44.347	46.803	49.587	51.879	55.699	55.699	58.762	58.762	58.762	61.053	61.053	61.053	66.246
Caa-C	49	20.334	49.035	55.405	55.405	55.405	55.405	55.405	55.405	55.405	55.405	55.405	55.405	77.703	77.703	77.703	77.703	77.703	77.703	77.703	77.703
IG	1622	0.254	0.645	0.986	1.415	1.573	1.573	1.662	1.662	1.759	1.759	1.867	2.098	3.046	3.658	3.919	3.919	4.062	4.208	4.208	5.175
SG	910	5.901	16.401	24.515	27.968	30.805	32.010	33.672	34.607	36.307	38.695	39.988	42.354	45.311	50.141	50.141	50.141	50.824	51.548	53.125	55.762
All	2532	2.226	5.962	8.750	10.059	10.942	11.245	11.703	11.913	12.358	12.836	13.171	13.790	15.069	16.402	16.605	16.605	16.827	17.059	17.301	18.449

1/1/90

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	192	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	462	0.000	0.000	0.000	0.000	0.000	0.278	0.278	0.278	0.278	0.278	0.640	1.018	1.018	1.018	1.018	1.018	1.018	2.039	3.580	
A	668	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.273	0.550	0.838	1.153	1.153	1.493	1.493	1.493	2.680	4.302	
Baa	389	0.265	0.842	1.145	1.499	1.499	1.499	1.499	1.499	1.994	2.527	5.260	8.064	8.657	8.657	8.657	9.394	9.394	10.225	12.743	
Ba	422	3.766	12.231	14.719	17.540	17.948	18.897	19.423	20.598	22.706	23.415	25.760	31.441	35.721	35.721	35.721	35.721	36.890	39.390	40.768	42.145
B	448	13.707	23.098	29.940	33.067	35.411	38.199	39.530	42.500	45.039	47.199	51.032	51.032	54.198	54.198	54.198	56.379	56.379	56.379	64.077	66.840
Caa-C	56	43.910	47.916	56.597	56.597	56.597	56.597	56.597	56.597	78.298	78.298	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
IG	1711	0.060	0.185	0.251	0.325	0.325	0.405	0.405	0.405	0.504	0.715	1.472	2.258	2.496	2.496	2.627	2.762	2.762	3.669	5.203	
SG	926	10.527	19.223	23.826	26.688	27.986	29.723	30.572	32.452	34.703	36.331	39.045	42.873	46.474	46.474	46.474	47.169	47.893	49.426	52.729	54.502
All	2637	3.572	6.437	7.854	8.702	9.033	9.509	9.701	10.109	10.551	10.935	11.588	12.858	14.090	14.278	14.278	14.487	14.704	14.931	16.137	17.614

1/1/91

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	179	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	493	0.000	0.000	0.000	0.000	0.254	0.254	0.254	0.254	0.254	0.254	0.594	0.949	0.949	0.949	0.949	0.949	0.949	1.906	3.829	3.829
A	656	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.260	0.524	0.796	1.095	1.095	1.419	1.419	1.419	2.561	4.112	4.529
Baa	414	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.668	1.113	3.401	5.777	6.272	6.272	6.272	6.885	7.523	8.208	9.588	9.588
Ba	356	3.848	5.162	7.072	7.485	7.979	8.534	9.761	11.998	12.744	15.285	20.569	24.289	24.289	25.491	25.491	26.821	26.821	28.315	30.063	30.063
B	374	13.199	22.013	26.638	29.002	32.274	33.597	35.890	38.616	40.894	45.034	46.560	51.635	51.635	51.635	54.053	54.053	56.605	65.284	71.596	71.596
Caa-C	62	15.345	18.601	22.140	26.466	31.718	31.718	37.409	37.409	47.840	47.840	60.880	60.880	60.880	60.880	60.880	60.880	60.880	60.880	60.880	60.880
IG	1742	0.059	0.059	0.059	0.059	0.133	0.133	0.133	0.133	0.225	0.421	1.122	1.854	2.075	2.075	2.197	2.323	2.457	3.304	4.732	4.884
SG	792	9.096	14.057	17.302	18.797	20.776	21.624	23.500	25.788	27.489	30.374	34.459	38.261	38.261	38.962	39.716	40.509	41.324	44.867	47.832	47.832
All	2534	2.803	4.211	5.071	5.440	5.953	6.137	6.527	6.951	7.320	7.948	9.171	10.361	10.542	10.638	10.840	11.051	11.272	12.442	13.994	14.121

1/1/92

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	165	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	499	0.000	0.000	0.000	0.234	0.234	0.234	0.234	0.234	0.234	0.544	0.544	0.544	0.544	0.544	0.544	0.544	0.544	1.461	1.949	1.949
A	756	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.227	0.457	0.932	1.194	1.194	1.194	1.194	1.194	2.864	4.904	5.638	6.391	
Baa	425	0.000	0.000	0.000	0.000	0.000	0.000	0.392	0.804	2.933	4.270	4.737	4.737	5.272	5.836	6.421	7.040	8.293	8.293	8.957	
Ba	338	0.337	1.090	1.090	1.592	1.592	2.773	4.886	6.333	7.984	13.085	17.570	17.570	18.731	20.001	21.380	21.380	24.725	26.518	26.518	26.518
B	301	7.345	13.822	17.213	21.206	23.206	25.536	28.242	30.543	36.004	37.492	44.012	44.012	44.012	44.012	44.012	49.344	58.139	58.139	58.139	58.139
Caa-C	73	16.494	22.061	26.752	29.465	32.671	36.037	36.037	43.144	43.144	51.266	51.266	51.266	51.266	51.266	67.511	67.511	67.511	67.511	67.511	67.511
IG	1845	0.000	0.000	0.000	0.067	0.067	0.067	0.067	0.150	0.327	0.967	1.444	1.647	1.647	1.759	1.875	1.999	2.774	4.092	4.512	4.945
SG	712	4.933	8.551	10.409	12.534	13.626	15.429	17.616	19.669	22.461	26.374	31.067	31.067	31.724	32.450	33.254	34.078	37.820	41.984	41.984	41.984
All	2557	1.337	2.258	2.696	3.217	3.444	3.807	4.201	4.614	5.197	6.337	7.448	7.618	7.707	7.897	8.097	8.305	9.411	10.999	11.362	11.738

1/1/93

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	134	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	502	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.420	0.883	0.883	0.883	
A	824	0.000	0.000	0.000	0.000	0.000	0.000	0.196	0.593	1.007	1.236	1.236	1.236	1.236	1.236	2.402	3.907	4.228	4.550	4.885	
Baa	478	0.000	0.000	0.250	0.250	0.530	0.836	1.471	2.142	3.876	4.971	5.744	5.744	6.178	6.638	7.125	8.672	10.772	11.323	12.475	13.082
Ba	353	0.622	0.622	1.857	2.744	3.688	5.388	7.791	8.474	12.685	17.116	17.116	17.116	18.103	19.180	19.180	21.746	24.400	24.400	24.400	24.400
B	289	4.376	8.428	14.034	15.594	18.162	20.376	23.929	31.867	35.182	38.768	40.018	40.018	40.018	41.782	43.790	48.384	56.625	56.625	56.625	56.625
Caa-C	75	13.531	19.279	23.892	26.610	26.610	26.610	32.726	32.726	40.201	40.201	40.201	48.744	48.744	48.744	48.744	48.744	48.744	48.744	48.744	
IG	1938	0.000	0.000	0.059	0.059	0.127	0.199	0.348	0.584	1.157	1.585	1.859	1.859	1.960	2.065	2.177	2.995	4.191	4.574	4.969	5.242
SG	717	3.404	5.611	8.952	10.280	11.791	13.588	16.584	19.933	23.911	27.706	28.155	28.675	29.241	30.473	31.128	34.166	38.260	38.260	38.260	38.260
All	2655	0.899	1.452	2.276	2.572	2.945	3.350	4.017	4.787	5.933	6.919	7.220	7.299	7.468	7.734	7.920	9.012	10.541	10.869	11.208	11.443

1/1/94

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	136	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	474	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.446	0.446	0.446	0.446	
A	1003	0.000	0.000	0.000	0.000	0.000	0.151	0.456	0.772	1.117	1.117	1.117	1.117	1.117	2.033	3.453	3.707	4.501	4.773	4.773	
Baa	539	0.000	0.200	0.200	0.419	0.654	1.866	2.379	3.708	4.545	5.135	5.135	5.471	5.826	6.206	7.879	10.075	10.529	11.491	12.003	
Ba	397	0.000	0.896	1.212	2.239	4.314	7.425	10.350	13.476	17.408	18.011	18.011	18.815	20.641	20.641	23.988	30.100	30.100	30.100	31.654	
B	381	4.191	9.149	12.619	14.265	17.176	21.898	27.286	33.118	37.910	41.385	43.307	43.307	44.488	45.809	48.906	52.153	52.153	52.153	52.153	
Caa-C	84	5.386	10.405	14.374	14.374	14.374	23.739	23.739	32.213	32.213	32.213	43.511	43.511	43.511	43.511	43.511	43.511	43.511	43.511	43.511	
IG	2152	0.000	0.049	0.049	0.105	0.165	0.475	0.670	1.145	1.499	1.799	1.799	1.884	1.971	2.066	2.856	3.987	4.315	4.885	5.122	
SG	862	2.341	5.362	7.343	8.559	10.877	14.937	18.685	23.012	27.086	28.788	29.956	30.408	31.897	32.437	35.581	40.321	40.321	40.321	41.199	
All	3014	0.651	1.490	2.000	2.338	2.894	3.970	4.851	6.048	7.080	7.628	7.822	7.961	8.257	8.412	9.496	11.056	11.336	11.823	12.128	

1/1/95

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	139	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	560	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.382	0.785	0.785	0.785	0.785	0.785	
A	1079	0.000	0.000	0.000	0.000	0.000	0.133	0.402	0.828	1.132	1.132	1.132	1.132	1.132	1.961	3.032	3.265	3.993	4.244	4.244	
Baa	553	0.000	0.000	0.000	0.218	1.345	1.826	3.321	4.104	4.376	4.376	4.696	5.034	5.399	7.002	9.093	9.526	10.431	10.915	10.915	
Ba	409	0.267	0.547	1.760	3.562	7.054	9.583	12.711	15.136	16.695	16.695	17.407	18.959	18.959	21.934	29.669	29.669	29.669	31.076	31.076	
B	502	4.015	6.548	8.967	12.311	16.614	22.008	31.073	38.471	42.751	45.076	45.771	46.525	47.360	49.240	52.171	52.171	52.171	52.171	52.171	
Caa-C	94	10.546	16.483	16.483	20.675	31.325	41.891	55.726	63.105	63.105	63.105	63.105	63.105	63.105	63.105	63.105	63.105	63.105	63.105	63.105	
IG	2331	0.000	0.000	0.000	0.053	0.326	0.500	0.982	1.364	1.567	1.567	1.644	1.724	1.811	2.540	3.585	3.889	4.418	4.638	4.638	
SG	1005	3.063	4.921	6.641	9.403	13.625	17.811	24.033	28.921	31.740	32.906	33.585	34.695	35.096	37.450	42.504	42.504	42.504	43.188	43.188	
All	3336	0.899	1.429	1.896	2.636	3.841	4.906	6.633	7.972	8.714	8.941	9.127	9.388	9.526	10.494	12.122	12.374	12.812	13.087	13.185	

1/1/96

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	142	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	602	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.351	0.717	0.717	0.717	0.717	0.717	
A	1156	0.000	0.000	0.000	0.000	0.119	0.360	0.616	0.890	0.890	0.890	0.890	0.890	1.634	2.778	2.985	3.630	3.850	3.850	4.089	4.089
Baa	650	0.000	0.000	0.175	0.723	1.299	2.698	3.319	3.758	3.993	4.250	4.796	4.796	6.390	8.076	8.431	9.538	9.933	9.933	9.933	11.190
Ba	468	0.000	0.711	2.102	5.639	7.565	11.002	13.678	15.342	15.342	16.471	17.695	18.381	20.674	25.710	25.710	25.710	26.727	26.727	26.727	26.727
B	571	1.505	4.020	8.767	12.073	17.720	25.276	32.828	36.407	38.881	39.480	40.117	40.838	43.362	48.595	48.595	48.595	48.595	48.595	48.595	51.231
Caa-C	106	10.309	15.236	19.759	34.469	44.444	56.709	61.519	61.519	61.519	61.519	61.519	61.519	61.519	61.519	61.519	61.519	61.519	61.519	61.519	61.519
IG	2550	0.000	0.000	0.046	0.191	0.393	0.869	1.147	1.384	1.448	1.516	1.657	1.657	2.380	3.382	3.649	4.207	4.399	4.399	4.501	4.814
SG	1145	1.651	3.595	6.885	10.996	15.058	20.756	25.794	28.293	29.470	30.298	31.196	31.866	34.161	39.034	39.034	39.034	39.560	39.560	39.560	40.769
All	3695	0.506	1.081	2.036	3.230	4.395	6.139	7.532	8.262	8.556	8.770	9.053	9.173	10.144	11.760	11.978	12.432	12.669	12.669	12.753	13.183

1/1/97

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	138	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	681	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.303	0.622	0.622	0.622	0.622	0.622	0.622	
A	1178	0.000	0.000	0.000	0.105	0.317	0.543	1.018	1.018	1.018	1.018	1.018	2.001	3.010	3.193	3.953	4.343	5.153	5.364	5.364	
Baa	821	0.000	0.133	0.546	0.979	2.044	2.692	3.034	3.218	3.616	4.039	4.039	5.050	6.912	7.192	8.059	8.665	8.665	8.665	10.262	10.262
Ba	590	0.175	1.375	5.079	8.177	10.696	14.015	15.535	15.535	16.379	17.272	17.773	19.405	22.886	22.886	22.886	23.574	23.574	23.574	25.947	25.947
B	689	1.998	6.336	10.255	15.560	25.037	31.330	34.842	37.330	38.139	39.593	40.676	43.794	50.321	50.321	50.321	50.321	51.208	51.208	51.208	
Caa-C	127	9.823	17.382	30.822	47.398	58.861	62.601	62.601	62.601	62.601	62.601	62.601	62.601	62.601	62.601	62.601	62.601	62.601	62.601	62.601	
IG	2818	0.000	0.039	0.162	0.333	0.736	1.024	1.325	1.380	1.495	1.616	1.616	2.311	3.321	3.552	4.113	4.444	4.784	4.872	5.319	5.319
SG	1406	1.889	5.133	9.561	14.426	20.653	25.354	27.757	28.958	29.754	30.863	31.601	33.811	38.470	38.470	38.470	38.832	39.196	39.196	40.407	40.815
All	4224	0.616	1.656	3.052	4.546	6.550	8.009	8.832	9.155	9.419	9.747	9.898	10.870	12.556	12.738	13.179	13.506	13.841	13.911	14.480	14.553

1/1/98

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Aaa	125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	735	0.000	0.000	0.000	0.000	0.000	0.225	0.225	0.225	0.225	0.225	0.512	0.813	1.113	1.113	1.113	1.113	1.113	1.113	
A	1177	0.000	0.000	0.097	0.294	0.504	0.947	0.947	0.947	0.947	0.947	1.864	2.971	3.144	3.688	4.247	5.205	5.405	5.405	5.405
Baa	961	0.109	0.446	0.797	1.776	2.834	3.115	3.411	3.737	4.081	4.081	4.930	6.734	7.203	7.938	8.193	8.460	8.460	9.845	9.845
Ba	711	0.896	3.624	6.628	10.169	13.219	15.050	15.311	15.935	16.281	16.664	18.291	22.207	22.207	22.207	23.214	23.214	23.214	24.888	26.053
B	937	3.875	9.600	16.588	26.005	32.004	36.693	40.192	41.242	43.316	45.002	46.926	50.500	50.500	50.500	50.500	51.010	51.010	51.574	51.574
Caa-C	139	8.341	27.508	39.064	58.059	63.302	68.862	73.311	73.311	73.311	73.311	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
IG	2998	0.035	0.143	0.295	0.693	1.126	1.397	1.543	1.647	1.756	1.756	2.391	3.452	3.734	4.252	4.557	5.031	5.113	5.529	5.529
SG	1787	3.028	8.450	14.077	21.499	26.161	29.552	31.597	32.406	33.605	34.613	36.494	40.046	40.046	40.046	40.520	40.761	40.761	41.815	42.359
All	4785	1.137	3.130	5.162	7.929	9.753	10.988	11.692	11.986	12.377	12.629	13.548	15.181	15.387	15.765	16.101	16.504	16.564	17.116	17.243

1/1/99

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Aaa	112	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	731	0.000	0.000	0.000	0.000	0.000	0.209	0.209	0.209	0.209	0.209	0.472	1.027	1.304	1.304	1.304	1.304	1.304	1.304	
A	1218	0.000	0.000	0.182	0.277	0.685	0.685	0.685	0.685	0.685	1.677	2.844	2.844	3.503	4.019	4.905	5.090	5.090	5.090	5.090
Baa	1102	0.093	0.483	1.308	2.544	3.018	3.268	3.545	3.838	3.838	4.731	6.840	7.241	7.873	8.309	8.541	8.541	9.756	9.756	9.756
Ba	701	1.503	3.475	6.075	8.728	10.656	10.897	11.472	12.089	12.432	15.026	18.552	18.988	18.988	19.947	19.947	20.477	22.105		
B	1089	4.895	13.622	23.254	31.781	36.469	40.294	41.961	43.939	45.951	48.014	52.735	52.735	53.161	53.161	53.634	53.634	55.831	56.390	
Caa-C	299	16.182	24.340	40.361	43.585	47.789	49.475	49.475	49.475	49.475	50.919	50.919	50.919	52.611	52.611	52.611	52.611	52.611	52.611	
IG	3163	0.032	0.169	0.531	1.000	1.328	1.459	1.553	1.651	1.651	2.343	3.548	3.804	4.340	4.688	5.122	5.197	5.580	5.580	
SG	2089	5.361	11.720	19.729	25.494	29.072	31.302	32.358	33.553	34.621	36.757	40.294	40.473	40.845	41.243	41.445	41.445	42.551	43.457	
All	5252	2.123	4.635	7.874	10.283	11.721	12.530	12.910	13.319	13.611	14.659	16.434	16.661	17.136	17.484	17.843	17.896	18.444	18.670	

1/1/00

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Aaa	117	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	726	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.535	0.802	0.802	0.802	0.802	0.802	0.802	
A	1251	0.000	0.169	0.353	0.734	0.839	0.839	0.839	2.037	3.281	3.281	3.904	4.391	5.227	5.401	5.754	5.754	
Baa	1183	0.350	0.806	1.908	2.545	2.769	3.141	3.401	3.401	3.851	6.013	6.363	6.918	7.490	7.694	7.694	8.336	8.336
Ba	663	1.269	3.122	5.153	6.793	6.793	7.584	7.878	8.204	11.427	16.321	16.746	16.746	17.679	17.679	17.679	18.698	20.276
B	1167	5.744	15.659	24.411	29.497	33.377	35.357	38.217	40.002	42.437	48.255	48.604	48.988	48.988	49.432	49.904	51.967	53.023
Caa-C	313	17.904	40.048	49.429	56.181	60.143	60.143	60.143	60.143	61.955	61.955	63.957	63.957	63.957	63.957	63.957	63.957	63.957
IG	3277	0.126	0.358	0.827	1.206	1.328	1.458	1.549	1.549	2.182	3.408	3.646	4.143	4.531	4.933	5.003	5.358	5.358
SG	2143	6.074	15.023	21.599	25.591	28.056	29.387	30.924	31.907	34.342	39.182	39.518	39.873	40.255	40.448	40.652	41.940	43.040
All	5420	2.455	6.041	8.796	10.448	11.350	11.845	12.350	12.620	13.700	15.821	16.075	16.519	16.891	17.227	17.327	17.892	18.155

1/1/01

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Aaa	117	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aa	754	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.498	0.746	0.746	1.028	1.028	1.028	1.028
A	1298	0.155	0.410	0.674	0.674	0.674	0.674	0.674	2.011	3.156	3.292	3.863	4.157	4.923	5.244	5.732	5.732
Baa	1156	0.180	1.431	2.041	2.477	2.834	3.083	3.083	3.370	5.407	5.573	6.097	7.006	7.199	7.199	7.605	7.819
Ba	622	1.159	2.799	4.414	4.414	5.452	5.756	6.093	9.405	14.862	15.303	15.303	16.265	16.265	16.265	17.322	18.403
B	1110	9.240	18.935	24.500	28.380	30.353	33.425	35.219	38.078	45.840	46.211	46.618	46.618	47.090	47.604	49.917	51.729
Caa-C	309	29.960	41.665	54.714	60.204	61.251	61.251	61.251	61.251	63.013	63.013	64.959	64.959	64.959	64.959	64.959	64.959
IG	3325	0.124	0.659	0.976	1.127	1.248	1.333	1.333	1.971	3.106	3.327	3.790	4.213	4.650	4.781	5.112	5.181
SG	2041	9.634	16.923	21.825	24.432	25.935	27.610	28.615	31.283	37.254	37.605	37.976	38.375	38.579	38.795	40.175	41.359
All	5366	3.679	6.668	8.553	9.486	10.011	10.524	10.782	11.889	14.144	14.388	14.814	15.217	15.587	15.732	16.277	16.584

1/1/02

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Aaa	125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Aa	757	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.467	0.701	0.701	0.968	0.968	0.968	
A	1302	0.161	0.325	0.325	0.325	0.325	0.325	1.576	2.524	2.776	3.306	3.717	4.426	4.723	5.176	5.176
Baa	1247	1.014	1.460	1.552	1.761	1.872	1.872	2.252	4.054	4.054	4.210	5.024	5.196	5.196	5.559	5.750
Ba	601	1.400	3.506	4.377	5.339	6.155	6.475	9.268	14.449	14.849	14.849	16.220	16.220	16.220	17.708	18.219
B	892	4.573	9.709	12.883	15.232	18.303	19.955	24.230	33.958	35.516	36.836	36.836	37.333	37.878	39.731	42.291
Caa-C	360	27.022	41.198	48.619	49.994	52.855	53.977	55.511	60.173	60.173	61.983	61.983	61.983	61.983	61.983	61.983
IG	3431	0.431	0.657	0.690	0.764	0.804	0.804	1.433	2.428	2.631	2.948	3.392	3.795	3.915	4.220	4.284
SG	1853	7.663	13.095	15.978	17.628	19.693	20.682	23.900	30.869	31.723	32.477	33.079	33.283	33.501	34.893	36.092
All	5284	2.924	4.850	5.752	6.271	6.840	7.084	8.298	10.642	10.986	11.391	11.859	12.211	12.348	12.868	13.161

1/1/03

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Aaa	122	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aa	687	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.472	0.708	0.708	0.977	0.977	0.977	0.977
A	1289	0.000	0.000	0.000	0.000	0.000	1.213	2.021	2.267	2.910	3.181	3.879	4.171	4.617	4.617
Baa	1208	0.000	0.000	0.197	0.302	0.412	0.528	1.685	1.685	1.685	2.426	2.585	2.585	2.920	3.097
Ba	591	0.879	1.282	1.935	2.427	2.719	5.528	10.616	11.349	11.349	12.629	12.629	12.629	13.561	14.511
B	872	2.581	4.537	6.733	9.295	10.664	15.151	25.201	26.811	27.888	29.470	30.279	30.717	32.666	34.689
Caa-C	359	20.576	31.640	34.408	38.236	39.106	40.277	47.303	47.303	50.603	50.603	50.603	50.603	50.603	50.603
IG	3306	0.000	0.000	0.071	0.109	0.148	0.669	1.400	1.595	1.898	2.271	2.660	2.776	3.071	3.133
SG	1822	5.278	8.097	9.793	11.691	12.557	15.890	23.376	24.422	25.256	26.511	26.877	27.074	28.325	29.614
All	5128	1.828	2.744	3.307	3.870	4.129	5.344	7.737	8.136	8.558	9.128	9.506	9.639	10.139	10.468

**1/1/04**

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13
Aaa	142	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aa	654	0.000	0.000	0.000	0.000	0.203	0.203	0.674	0.909	0.909	1.182	1.182	1.182	1.182
A	1276	0.000	0.000	0.000	0.000	1.139	1.566	1.797	2.402	2.528	3.326	3.601	4.021	4.021
Baa	1267	0.000	0.177	0.177	0.177	0.281	1.909	1.909	1.909	2.708	2.846	2.846	3.300	3.459
Ba	569	0.378	0.578	1.292	1.829	4.542	9.864	10.219	10.219	11.060	11.060	11.060	12.490	13.457
B	966	0.796	2.069	4.038	4.905	9.109	20.135	21.396	22.236	24.115	24.763	25.123	26.336	27.629
Caa-C	314	11.816	18.476	22.851	25.863	28.623	40.243	41.370	47.139	48.649	48.649	48.649	48.649	50.882
IG	3339	0.000	0.066	0.066	0.066	0.589	1.357	1.539	1.821	2.169	2.584	2.693	3.026	3.084
SG	1849	2.418	4.119	5.977	6.998	10.455	19.439	20.351	21.375	22.799	23.126	23.306	24.461	25.667
All	5188	0.834	1.430	1.990	2.279	3.570	6.484	6.852	7.313	7.914	8.306	8.429	8.941	9.251

**1/1/05**

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12
Aaa	131	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aa	672	0.000	0.000	0.000	0.187	0.187	0.828	1.045	1.045	1.293	1.293	1.293	1.293
A	1326	0.000	0.000	0.000	0.759	1.253	1.468	2.031	2.150	2.776	3.036	3.436	3.436
Baa	1289	0.163	0.163	0.163	0.667	2.077	2.077	2.077	2.821	3.078	3.078	3.501	3.650
Ba	560	0.000	0.645	0.900	3.635	8.879	9.504	9.504	10.615	10.615	10.615	12.298	12.722
B	1050	0.815	2.647	3.666	8.535	20.335	21.556	22.500	24.365	25.477	25.792	27.201	29.082
Caa-C	346	7.324	11.291	14.486	21.745	37.490	40.703	48.597	49.793	51.114	52.743	54.561	56.537
IG	3418	0.061	0.061	0.061	0.582	1.296	1.506	1.770	2.094	2.481	2.582	2.895	2.950
SG	1956	1.721	3.552	4.692	9.200	19.375	20.650	22.025	23.511	24.213	24.524	26.028	27.252
All	5374	0.647	1.250	1.602	3.276	6.718	7.228	7.778	8.395	8.859	9.010	9.599	9.925

**1/1/06**

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11
Aaa	126	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aa	692	0.000	0.000	0.173	0.173	0.768	0.969	0.969	1.195	1.195	1.195	1.195
A	1385	0.000	0.000	0.686	1.044	1.240	1.752	1.859	2.652	2.888	3.252	3.252
Baa	1278	0.000	0.000	0.567	1.583	1.583	1.583	2.179	2.426	2.426	2.698	2.843
Ba	567	0.194	0.194	3.095	9.409	9.409	9.409	10.360	10.695	11.047	13.239	13.611
B	1116	1.070	2.027	8.196	19.009	21.294	22.889	25.372	26.353	26.905	29.369	32.105
Caa-C	375	5.893	9.922	19.782	38.427	43.801	49.410	50.253	52.248	53.442	54.772	59.295
IG	3481	0.000	0.000	0.515	1.027	1.222	1.465	1.724	2.174	2.268	2.511	2.563
SG	2058	1.669	2.865	8.600	19.210	21.213	22.770	24.461	25.304	25.838	27.995	29.835
All	5539	0.593	0.991	3.156	6.858	7.607	8.219	8.868	9.418	9.625	10.343	10.830

**1/1/07**

Rating	n(0)	1	2	3	4	5	6	7	8	9	10
Aaa	135	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aa	739	0.000	0.152	0.152	0.681	0.861	0.861	1.064	1.064	1.064	1.064
A	1378	0.000	0.722	1.059	1.241	1.719	1.923	2.880	3.102	3.445	3.445
Baa	1279	0.000	0.707	1.750	1.750	1.750	2.311	2.543	2.543	2.797	2.931
Ba	623	0.000	1.792	7.847	8.546	8.546	9.868	10.687	10.981	13.179	14.463
B	1145	0.000	6.481	17.837	20.882	22.735	25.474	26.826	27.852	30.645	33.438
Caa-C	423	4.953	16.172	34.489	38.937	42.889	45.399	48.347	49.208	50.204	58.143
IG	3531	0.000	0.570	1.077	1.257	1.484	1.764	2.266	2.354	2.580	2.628
SG	2191	0.945	6.899	17.928	20.490	22.009	24.166	25.511	26.201	28.458	31.007
All	5722	0.349	2.817	7.021	8.010	8.634	9.468	10.203	10.452	11.202	11.884

**1/1/08**

Rating	n(0)	1	2	3	4	5	6	7	8	9
Aaa	168	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aa	825	0.506	0.506	0.946	1.407	1.407	1.746	1.922	2.285	2.285
A	1298	0.406	0.920	1.103	1.391	1.804	2.790	2.906	3.146	3.146
Baa	1242	1.024	1.839	1.839	1.839	2.157	2.265	2.265	2.265	2.511
Ba	629	2.343	7.188	7.388	7.388	8.528	9.230	9.735	11.890	13.019
B	1020	3.989	14.948	17.820	19.590	21.987	23.078	24.089	27.387	29.554
Caa-C	655	10.694	28.554	34.170	37.551	40.874	43.756	46.356	48.535	54.926
IG	3533	0.627	1.104	1.272	1.484	1.747	2.220	2.302	2.474	2.562
SG	2304	5.426	16.607	19.474	21.082	23.267	24.613	25.748	28.259	30.650
All	5837	2.507	7.158	8.345	9.035	9.929	10.669	11.063	11.893	12.608

**1/1/09**

Rating	n(0)	1	2	3	4	5	6	7	8
Aaa	147	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aa	738	0.000	0.155	0.471	0.471	0.821	1.003	1.573	1.573
A	1289	0.240	0.412	0.682	0.975	1.906	2.016	2.244	2.244
Baa	1232	0.930	0.930	1.214	1.414	1.517	1.626	1.626	1.857
Ba	602	1.765	2.158	2.158	3.502	4.208	4.974	6.612	7.468
B	861	7.215	8.416	9.787	11.706	12.606	13.902	18.474	20.713
Caa-C	757	25.933	33.281	36.533	40.575	43.405	45.767	47.414	53.259
IG	3406	0.428	0.526	0.800	0.983	1.441	1.561	1.770	1.857
SG	2220	12.060	15.065	16.593	18.940	20.301	21.659	24.273	26.680
All	5626	4.996	6.198	6.908	7.816	8.558	9.050	9.946	10.674

**1/1/10**

Rating	n(0)	1	2	3	4	5	6	7
Aaa	98	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aa	574	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A	1230	0.171	0.523	0.807	1.608	1.925	2.362	2.362
Baa	1353	0.075	0.312	0.483	0.836	0.929	1.028	1.331
Ba	586	0.000	0.000	0.635	1.521	2.004	3.794	4.602
B	833	0.383	1.814	3.898	4.707	6.585	11.007	13.335
Caa-C	724	8.527	12.808	18.578	22.810	26.012	28.727	34.553
IG	3255	0.095	0.327	0.504	0.948	1.103	1.306	1.432
SG	2143	3.013	4.942	7.738	9.583	11.337	14.295	16.923
All	5398	1.232	2.079	3.175	4.084	4.744	5.777	6.629

**1/1/11**

Rating	n(0)	1	2	3	4	5	6
Aaa	85	0.000	0.000	0.000	0.000	0.000	0.000
Aa	543	0.193	0.193	0.193	0.193	0.193	0.193
A	1221	0.000	0.092	0.758	0.859	0.964	0.964
Baa	1445	0.355	0.432	0.828	1.079	1.167	1.530
Ba	640	0.159	1.231	1.980	2.805	4.974	5.885
B	968	0.343	2.116	3.420	5.294	9.686	13.353
Caa-C	746	5.852	12.736	17.503	21.358	25.127	30.874
IG	3294	0.187	0.255	0.672	0.819	0.896	1.054
SG	2354	1.982	5.057	7.129	9.164	12.587	15.679
All	5648	0.906	2.144	3.173	3.978	5.164	6.256

**1/1/12**

Rating	n(0)	1	2	3	4	5
Aaa	83	0.000	0.000	0.000	0.000	0.000
Aa	437	0.000	0.000	0.249	0.249	0.249
A	1191	0.000	0.093	0.093	0.093	0.093
Baa	1478	0.071	0.434	0.511	0.511	0.758
Ba	723	0.143	1.504	1.999	3.438	4.959
B	998	0.543	1.660	3.679	7.527	11.092
Caa-C	840	7.759	12.944	17.231	22.605	28.373
IG	3189	0.033	0.235	0.306	0.306	0.420
SG	2561	2.756	5.190	7.379	10.792	14.161
All	5750	1.230	2.367	3.279	4.558	5.839

**1/1/13**

Rating	n(0)	1	2	3	4
Aaa	59	0.000	0.000	0.000	0.000
Aa	298	0.000	0.000	0.000	0.000
A	1168	0.089	0.180	0.180	0.180
Baa	1666	0.120	0.185	0.185	0.323
Ba	711	0.582	1.061	1.951	3.254
B	1055	0.906	2.310	6.622	10.782
Caa-C	944	6.233	10.277	16.928	23.093
IG	3191	0.096	0.162	0.162	0.234
SG	2710	2.625	4.635	8.642	12.474
All	5901	1.232	2.127	3.737	5.251

**1/1/14**

Rating	n(0)	1	2	3
Aaa	54	0.000	0.000	0.000
Aa	292	0.000	0.000	0.000
A	1166	0.088	0.088	0.088
Baa	1728	0.059	0.059	0.187
Ba	745	0.141	0.615	1.601
B	1104	0.498	3.623	7.419
Caa-C	1138	4.587	11.652	18.471
IG	3240	0.063	0.063	0.131
SG	2987	1.938	5.763	9.803
All	6227	0.939	2.632	4.380

**1/1/15**

Rating	n(0)	1	2
Aaa	54	0.000	0.000
Aa	302	0.000	0.000
A	1240	0.000	0.000
Baa	1727	0.000	0.000
Ba	752	0.291	1.484
B	1106	2.239	5.831
Caa-C	1341	6.765	13.120
IG	3323	0.000	0.000
SG	3199	3.626	7.720
All	6522	1.732	3.615

1/1/16

Rating	n(0)	1
Aaa	53	0.000
Aa	302	0.000
A	1292	0.000
Baa	1719	0.000
Ba	768	0.134
B	1049	1.531
Caa-C	1410	9.111
IG	3366	0.000
SG	3227	4.474
All	6593	2.149

## Moody's Related Research

[Annual Default Study: Corporate Default and Recovery Rates, 1920-2015](#)

[Annual Default Study: Corporate Default and Recovery Rates, 1920-2014](#)

[Impairment and Loss Rates of Structured Finance Securities: 1993-2015](#)

[Default and Recovery Rates of European Financial and Non-Financial Corporate Issuers, 1985-2016 Q3](#)

[Default and Recovery Rates of Asia-Pacific Corporate Issuers, Excluding Japan, 1990-2016H1](#)

[Latin American Corporate Default and Recovery Rates, 1990 to June 2016](#)

[Default and Rating Transitions of Japanese Debt Issuers, 1990 - 2015](#)

[Infrastructure Default and Recovery Rates, 1983-2015](#)

[Glossary of Moody's Ratings Performance Metrics](#)

[Introducing Moody's Credit Transition Model](#)

To access any of these reports, click on the entry above. Note that these references are current as of the date of publication of this report and that more recent reports may be available. All research may not be available to all clients.

## Endnotes

- 1 2016 also recorded a sovereign default by Mozambique which completed a distressed exchange in April.
- 2 The dollar-weighted bond default rate only includes bonds issued by US and European issuers.
- 3 Abengoa S.A. initially defaulted on commercial paper in December 2015 and subsequently on long-term debt in 2016. For the purpose of this study, we report long-term debt defaults, therefore it is recorded as a 2016 default.
- 4 The high default rate for Media: Advertising, Printing & Publishing is affected by four defaulting families including one with multiple issuers. The industry default rates in this report refer to Moody's entire rated universe combining investment-grade and speculative-grade companies.
- 5 In Exhibit 7, we use market prices (bids) to proxy recoveries.
- 6 Average recovery rates of senior unsecured bonds and other debts can be based on different defaulters because some defaulters may have senior unsecured bonds and no other debts. Please see Exhibit 19 for more details.
- 7 For distressed exchanges, we take trading prices at default. For other types of defaults, we take trading prices approximately one month after default.
- 8 For details, see Moody's Special Comment [Moody's Ultimate Recovery Database](#), April 2007.
- 9 The analysis on ultimate recovery is provided by David Keisman and Julia Chursin. The data are from Moody's Ultimate Recovery Database, which includes robust detailed recovery information for more than 5,400 loans and bonds from more than 1,100 North American corporate defaulters since 1987.
- 10 For a given issuer, the firm-wide recovery rate is the weighted-average recovery rate across all of the issuer's debts where the weights are the size of the debts.
- 11 The high yield spreads are option-adjusted. The unemployment rate forecast is sourced from Moody's Economy.com.
- 12 The industry default rate forecasts include both investment-grade and speculative-grade issuers.
- 13 Note that the EDF-implied default rate forecast includes rated and unrated issuers.
- 14 The pessimistic scenario can be caused by multiple factors. First, after the initial surge of enthusiasm, the stock market falls significantly as investors begin to fear that the policies of the new presidential administration will weaken the economy. At the same time, bond prices jump because of the concern that deficits will rise greatly. Further, negotiations over the U.K.'s departure from the EU break down, causing other nations to consider leaving and global trade to weaken. Additionally, evidence builds that Chinese economic growth has declined sharply, leading to declines elsewhere in Asia. Consumer confidence plummets. Oil prices plunge again, lowering business investment in energy exploration.
- 15 For a detailed discussion of average default position and the mathematical derivation of accuracy ratio from the average default position, please refer to Moody's Special Comment, [Measuring Ratings Accuracy Using Average Default Position](#), Feb 2011.

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