

DATA REPORT

15 February 2018

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Cross-Sector

Annual Default Study: Corporate Default and Recovery Rates, 1920 - 2017

Summary

We expect the default rate for our rated speculative-grade corporate issuers to decline to 1.7% in 2018 from 2.9% in 2017. Faster GDP growth in the G-20 countries, a sustained recovery in commodity prices, generally healthy corporate earnings and relatively low refunding risk will support credit conditions and keep defaults low. Our 2018 forecast is below the 1.9% rate at the end of 2014¹, reflecting our view that the default cycle driven by low commodity prices has ended.

- » We expect the default rate for all of our rated corporate issuers to retreat to 0.8% in 2018 from 1.4% in 2017, implying about 53 defaults in 2018, which would be the fewest since 2011.
- » Defaults will decline in the commodity² and retail sectors, which had the most defaults in 2017. We expect the commodity sector default rate to fall to 1.8% in 2018 from 4.9% in 2017, and the retail sector default rate to decline to 3.9% from 7.0%.
- » Total defaults declined by more than one third to 91 in 2017 from the prior year's 143. The dollar volume of defaults was \$78 billion in 2017, down from \$136 billion a year earlier. The largest defaulter in 2017 was Petroleos de Venezuela, S.A., which missed payments on more than \$20 billion in debt.
- » By sector, 31% of the 2017 defaults were from commodity sectors (25 from Energy: Oil & Gas and three from Metals & Mining) and 14% (13) were from the retail sector; by region, defaults remained concentrated in North America (61), followed by Europe (21) and Asia-Pacific (6).
- » Corporate credit quality improved in 2017, with rating upgrades catching up with downgrades. Rating drift, which is calculated as the average upgraded notches per issuer minus the average downgraded notches per issuer, rose to zero in 2017 from -16% of a rating notch in 2016. Rating drift improved the most in Metals & Mining and weakened the most in Media: Diversified & Production.
- » Measured by post-default trading prices, the issuer-weighted average recovery rate for senior unsecured bonds was 53.9% in 2017, up sharply from 31.5% in 2016, reflecting higher recoveries in distressed exchanges and improved recoveries in commodity sectors.

- » Rating accuracy measures like Average Default Position (AP) show that our ratings have been successfully rank ordering credit risk. Since 1983, the average one-year AP has measured 91.6%.

Introduction

We saw strong fundamentals in 2017, with steady economic growth, strong debt issuance, improving corporate earnings and low defaults. Potentially transformational elections took place in several major developed countries, but none led to material changes in the credit markets. The year also marked a decisive reversal of accommodative monetary policy by the Federal Reserve. Other major central banks are expected to follow in the same direction over the next few years. Nonetheless, global central bank policy remained generally supportive to credit markets, with rate increases that were gradual and well communicated to the market.

Against this favorable credit backdrop, we update our annual default report, which examines corporate defaults among our rated long-term debt issuers and the performance of our ratings in 2017, as well as the historical period since 1920. The first section of this study reviews some of the major trends in defaults, recoveries and rating actions in 2017, 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 our 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 25,000 corporate issuers that had long-term rated bonds, loans and/or deposits between 1920 and 2017.

Defaults fall below 100 in 2017

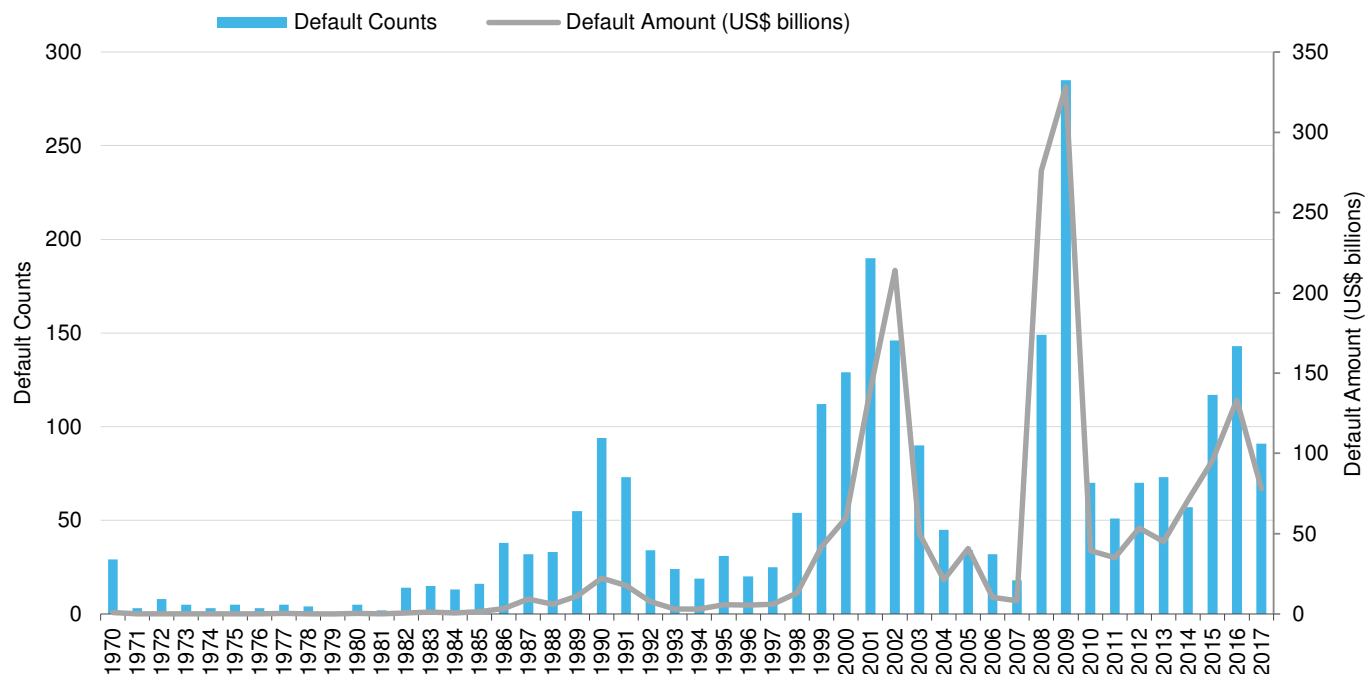
The end of a two-year rise

The number of corporate defaults declined in 2017 after rising significantly during the prior two years as a result of stress in the commodity sector. Last year, 91 of our rated corporate issuers defaulted, the first year since 2014 that global defaults numbered fewer than 100, as the surge of defaults in the commodity sectors subsided.³ Measured by volume, about \$78 billion of debt went into default in 2017, which was comprised of \$52 billion in bonds and \$26 billion in loans. In comparison, the default volume was \$136 billion in 2016, consisting of \$93 billion in bonds and \$43 billion in loans. The largest defaulter in 2017 was Petroleos de Venezuela, S.A., which missed payments on more than \$20 billion in debt.

Most of the corporate defaults occurred in North America, where the majority of our rated issuers are domiciled. Of the 91 defaults, 61, or two thirds, were in North America. Europe had 21 (23%) while the rest were in Asia-Pacific (6), Latin America (2) and the Middle East (1). In terms of dollar volume, \$39 billion, or half of defaulted debt, was from North America, followed by Latin America and Europe, which had defaulted debt of \$21 billion (27%) and \$16 billion (20%), respectively.⁴

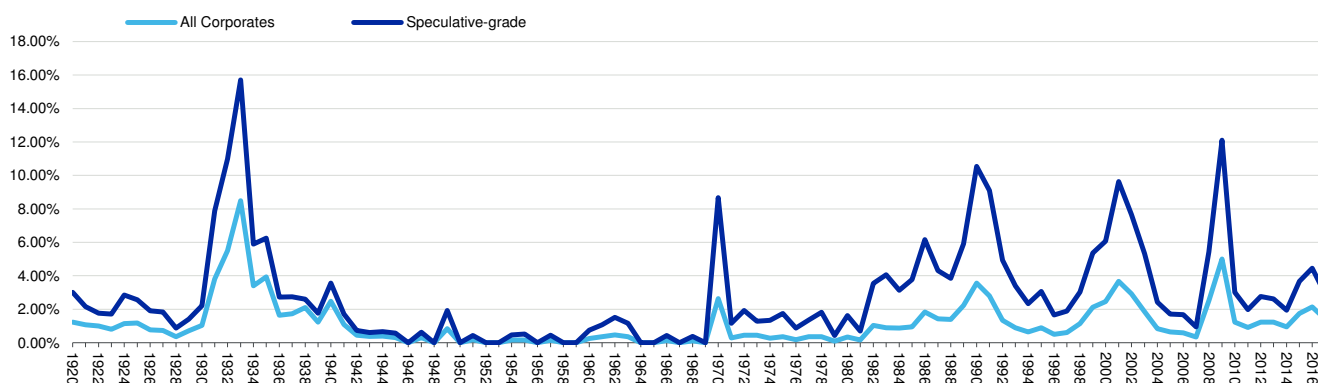
Last year's defaults were mainly due to distressed exchanges and bankruptcies, each accounting for 40% of the defaults. The rest were payment defaults. Exhibit 1 presents the annual default counts and defaulted debt volumes for the period 1970-2017.

Exhibit 1

Defaults fell in 2017**Default rate fell below historical average**

The issuer-weighted annual default rate finished at 1.4% in 2017, down from 2.1% in 2016 (see Exhibit 2). The decline came as financial distress in commodity sectors receded rapidly. Among speculative-grade issuers, the default rate showed a similar trend, declining to 2.9% from 4.5%. The latest figures are below the average one-year default rate since 1983 of 1.6% for all rated issuers and 4.2% for speculative-grade issuers. Measured on a dollar volume basis, our speculative-grade corporate bond default rates dropped to 1.5% in 2017 from 3.5% in 2016 and the rate for all of our rated issuers finished 2017 at 0.3%, down from 0.7% in 2016.⁵

Exhibit 2

Default rate fell below historical average**Oil & Gas had the most defaulters but risk shifted to the Retail sector**

Amid a growing economy, defaults are usually driven by sector-specific issues. Last year, commodity sectors, especially the Oil & Gas industry, still had the most defaulters as they struggled with the lingering credit effects of the 2015-2016 commodities downturn. Oil &

Gas recorded 25 defaults, or 27% of the total count. Retail had the second most defaults at 13, or 14% of the total, as it suffered from structural shifts in consumer buying behavior and rising e-commerce penetration.

Although Oil & Gas had the most defaults in 2017, its contribution to the total default count fell significantly from 46% in 2016 to 27% in 2017. In contrast, Retail's contribution increased noticeably from 6% to 14%. When measured by dollar volume, Oil & Gas topped the list again by accounting for 49% of the total, with the next highest share coming from Retail (12%). Besides Petroleos de Venezuela, S.A., there were other sizeable defaults in 2017 including Avaya, Inc. (\$6 billion) and Toys 'R' Us-Delaware, Inc. (\$2.5 billion).⁶ Exhibit 3 shows the distribution of defaults by specific industries in 2016 and 2017 as well as the changes between those two years.

Exhibit 3

Oil & Gas still had the most defaults but risk shifted to Retail

| Industry Group* | Percent by count | | | Percent by volume | | |
|---|------------------|------|--------|-------------------|------|--------|
| | 2017 | 2016 | Change | 2017 | 2016 | Change |
| Aerospace & Defense | 2% | 1% | 1% | 0% | 0% | 0% |
| Automotive | 0% | 1% | -1% | 0% | 0% | 0% |
| Banking | 5% | 1% | 4% | 3% | 0% | 3% |
| Beverage, Food, & Tobacco | 0% | 1% | -1% | 0% | 0% | 0% |
| Capital Equipment | 1% | 1% | 0% | 1% | 0% | 0% |
| Chemicals, Plastics, & Rubber | 2% | 2% | 0% | 0% | 1% | 0% |
| Construction & Building | 1% | 2% | -1% | 1% | 8% | 0% |
| Consumer goods: Durable | 0% | 1% | -1% | 0% | 0% | 0% |
| Consumer goods: Non-durable | 0% | 1% | -1% | 0% | 0% | 0% |
| Energy: Electricity | 3% | 1% | 3% | 3% | 1% | 3% |
| Energy: Oil & Gas | 27% | 46% | -19% | 49% | 51% | -5% |
| Environmental Industries | 2% | 1% | 1% | 1% | 0% | 0% |
| FIRE: Finance | 2% | 3% | -1% | 1% | 1% | -1% |
| FIRE: Real Estate | 1% | 1% | 0% | 3% | 0% | 3% |
| Forest Products & Paper | 4% | 1% | 3% | 2% | 2% | 0% |
| Healthcare & Pharmaceuticals | 1% | 1% | 0% | 1% | 0% | 1% |
| High Tech Industries | 3% | 1% | 2% | 2% | 1% | 1% |
| Hotel, Gaming, & Leisure | 0% | 1% | -1% | 0% | 0% | 0% |
| Media: Advertising, Printing & Publishing | 0% | 6% | -6% | 0% | 2% | -2% |
| Media: Broadcasting & Subscription | 4% | 0% | 4% | 4% | 0% | 4% |
| Media: Diversified & Production | 1% | 0% | 1% | 1% | 0% | 1% |
| Metals & Mining | 3% | 11% | -8% | 1% | 14% | -14% |
| Retail | 14% | 6% | 9% | 12% | 2% | 10% |
| Services: Business | 10% | 2% | 8% | 3% | 1% | 2% |
| Services: Consumer | 1% | 0% | 1% | 0% | 0% | 0% |
| Sovereign & Public Finance | 0% | 0% | 0% | 0% | 0% | 0% |
| Telecommunications | 3% | 3% | 0% | 10% | 12% | -3% |
| Transportation: Cargo | 3% | 1% | 2% | 1% | 0% | 1% |
| Transportation: Consumer | 0% | 1% | -1% | 0% | 0% | 0% |
| Utilities: Electric | 0% | 1% | -1% | 0% | 1% | -1% |
| Wholesale | 2% | 3% | -1% | 0% | 1% | 0% |

*We omitted those industries which had no defaults in 2016 and 2017

Although the Oil & Gas sector accounted for more than a quarter of the defaults last year, it was not the sector with the highest rate of default: that distinction belongs to Forest Products & Paper, which had a 9.0% default rate in 2017.⁷ Retail followed right behind with a rate of 7.0% (see Exhibit 4).

Exhibit 4

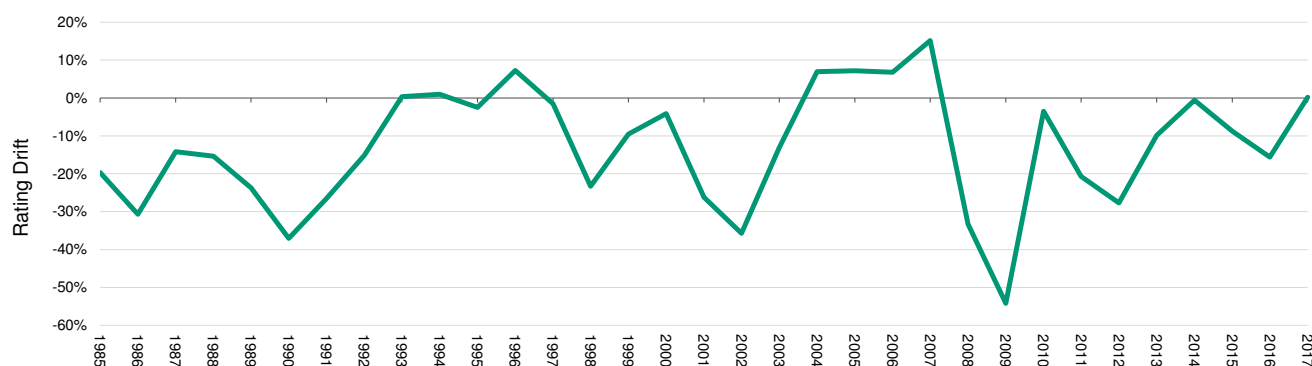
One year default rate led by Forest Products and Paper, followed by Retail

| Industry Group | Default Rate* | Industry Group | Default Rate* |
|------------------------------------|---------------|---|---------------|
| Forest Products & Paper | 8.99% | FIRE: Real Estate | 0.49% |
| Retail | 7.01% | Construction & Building | 0.44% |
| Energy: Oil & Gas | 6.09% | Capital Equipment | 0.43% |
| Environmental Industries | 5.56% | Banking | 0.38% |
| Energy: Electricity | 5.36% | Automotive | 0.00% |
| Media: Broadcasting & Subscription | 3.74% | Beverage, Food, & Tobacco | 0.00% |
| Media: Diversified & Production | 3.57% | Consumer goods: Durable | 0.00% |
| Services: Business | 3.09% | Consumer goods: Non-durable | 0.00% |
| Wholesale | 3.01% | Containers, Packaging, & Glass | 0.00% |
| Transportation: Cargo | 2.93% | FIRE: Insurance | 0.00% |
| Aerospace & Defense | 2.63% | Hotel, Gaming, & Leisure | 0.00% |
| Metals & Mining | 1.91% | Media: Advertising, Printing & Publishing | 0.00% |
| Telecommunications | 1.61% | Sovereign & Public Finance | 0.00% |
| High Tech Industries | 1.28% | Transportation: Consumer | 0.00% |
| Services: Consumer | 1.18% | Utilities: Electric | 0.00% |
| Chemicals, Plastics, & Rubber | 1.02% | Utilities: Oil & Gas | 0.00% |
| Healthcare & Pharmaceuticals | 0.62% | Utilities: Water | 0.00% |
| FIRE: Finance | 0.50% | | |

*Issuer-weighted.⁸**Credit quality improved, especially in Metals & Mining and Oil & Gas**

Credit quality among our rated issuers improved in 2017, with rating upgrades catching up and breaking even with downgrades. Rating drift, which is calculated as the average upgraded notches per issuer minus the average downgraded notches per issuer, rose to zero in 2017 from -16% of a rating notch in 2016 (see Exhibit 5). Of our 35 industry groups, 24 had better rating drifts in 2017 than in 2016, while 31 recorded higher drifts relative to their historical averages.

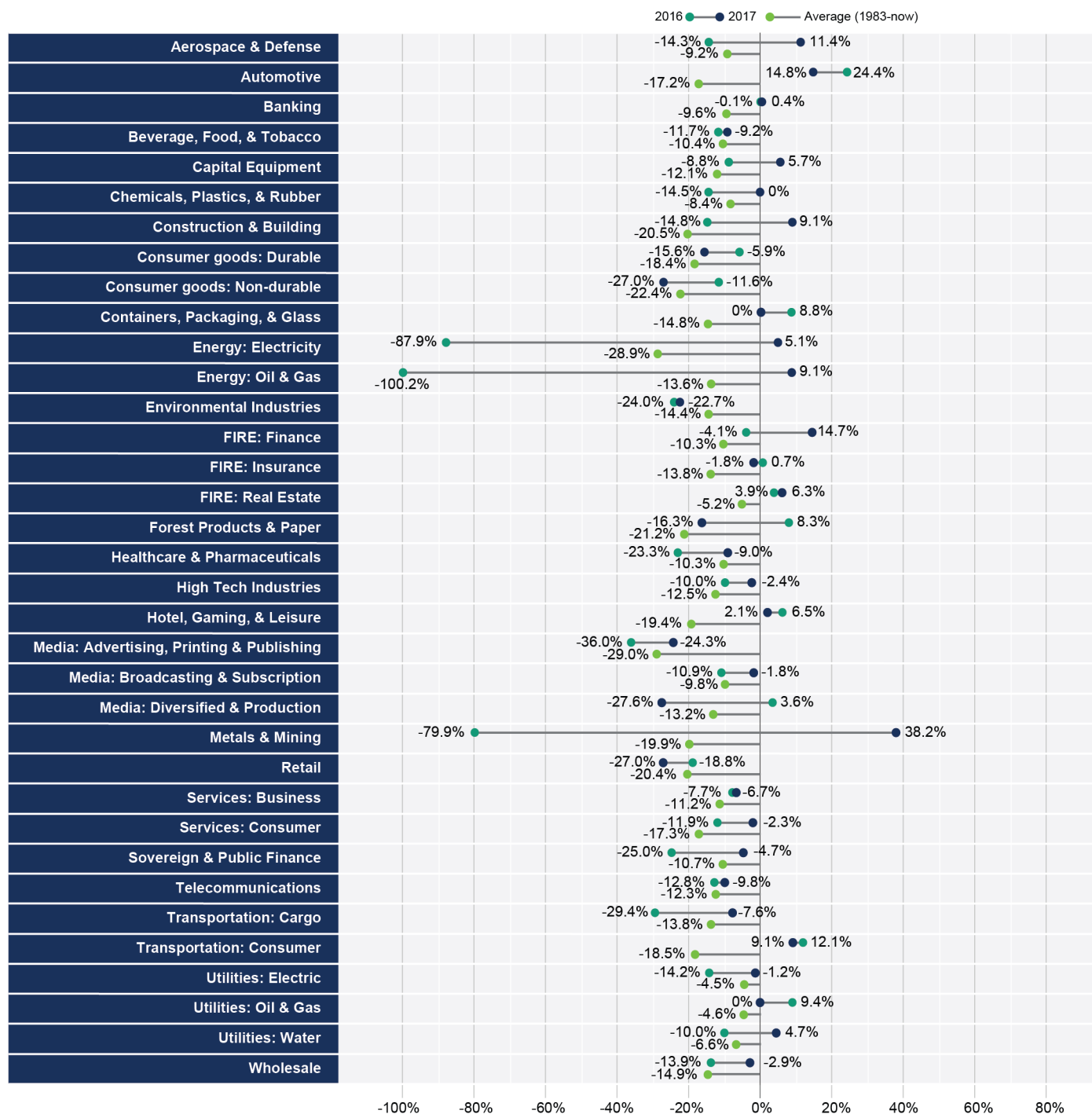
Exhibit 5

Upgrades broke even with downgrades

Across sectors, the most notable credit improvement was found in Metals & Mining, which had a one-year rating drift of 38% of a rating notch in 2017, compared with -80% a year earlier (see Exhibit 6). Similarly, Oil & Gas saw its comparable metrics increase to 9% from -100%. On the other hand, Media: Diversified & Production had the largest deterioration in rating drift, closing at -28% in 2017, down from 4% in 2016. Forest Products & Paper followed (-16% down from 8%). Ranked by the 2017 rating drift alone, Metals & Mining had the highest drift while Media: Diversified & Production had the lowest. Retail, and Non-durable Consumer goods were close to the bottom, both had drifts of -27%.

Exhibit 6

Credit quality improved significantly in commodity sectors*



*Rating drift, which is shown above, is the average upgraded notches per issuer minus the average downgrade notches per issuer.

Distressed exchanges push senior unsecured bond recovery rates higher

In Exhibit 7, we present the average recovery rates for debt that defaulted in the past two years and compare them with historical averages.⁹ 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.¹⁰ For example, first lien bank loans'

recovery rates average 67% on an issuer-weighted basis and 64% on a dollar volume basis; the highest recovery rates across security classes. This makes logical sense given their secured nature and seniority in the capital structure.

Exhibit 7 shows that the average senior unsecured bond recovery rate increased to 54% in 2017 from 31% in 2016 and above its long-term average of 38%. The relatively high recovery rate in 2017 primarily stemmed from distressed exchanges, which experienced an average recovery rate of 69% in 2017 versus 41% for other types of defaults.¹¹ In addition, recovery rates in the Oil & Gas sector, the main default driver in the past three years, were higher last year (57% in 2017 versus 23% in 2016). Measured by dollar volume, the senior unsecured bond recovery rate averaged 40% in 2017, also substantially higher than the 27% rate in 2016. For first lien bank loans, the volume-weighted average recovery rate was 75% in 2017, down from 78% in 2016.

Exhibit 7

Average corporate debt recovery rates measured by trading prices

| Panel A - Recoveries | | Issuer-weighted recoveries | | | Volume-weighted recoveries | | |
|------------------------------------|-------------|-----------------------------------|------------------|-------------|---|------------------|--|
| Priority Position | 2017 | 2016 | 1983-2017 | 2017 | 2016 | 1983-2017 | |
| 1st Lien Bank Loan | 69.04% | 75.05% | 67.07% | 74.73% | 77.95% | 63.74% | |
| 2nd Lien Bank Loan | 17.87% | 22.50% | 30.38% | 30.29% | 22.50% | 27.73% | |
| Sr. Unsecured Bank Loan | 9.00% | n.a. | 45.87% | 9.00% | n.a. | 40.21% | |
| 1st Lien Bond | 62.43% | 48.72% | 53.62% | 66.21% | 40.89% | 53.80% | |
| 2nd Lien Bond | 52.75% | 34.07% | 45.18% | 36.61% | 35.82% | 43.63% | |
| Sr. Unsecured Bond | 53.85% | 31.45% | 37.74% | 39.79% | 27.10% | 33.48% | |
| Sr. Subordinated Bond | 38.00% | 36.72% | 31.10% | 50.62% | 56.10% | 26.34% | |
| Subordinated Bond | 74.38% | 24.50% | 32.05% | 76.37% | 24.50% | 27.55% | |
| Jr. Subordinated Bond | 17.50% | 0.63% | 22.79% | 4.84% | 0.63% | 13.97% | |
| Panel B - Observation count | | Issuer count | | | Dollar volume (in billions of USD) | | |
| Priority Position | 2017 | 2016 | 1983-2017 | 2017 | 2016 | 1983-2017 | |
| 1st Lien Bank Loan | 25 | 17 | 487 | 20.3 | 10.7 | 291.9 | |
| 2nd Lien Bank Loan | 5 | 1 | 72 | 1.2 | 0.2 | 12.9 | |
| Sr. Unsecured Bank Loan | 1 | 0 | 67 | 0.0 | 0.0 | 33.8 | |
| 1st Lien Bond | 20 | 14 | 326 | 10.4 | 4.5 | 136.2 | |
| 2nd Lien Bond | 5 | 19 | 69 | 2.5 | 9.1 | 36.7 | |
| Sr. Unsecured Bond | 39 | 64 | 1028 | 34.1 | 53.1 | 715.7 | |
| Sr. Subordinated Bond | 2 | 3 | 511 | 0.9 | 1.3 | 114.5 | |
| Subordinated Bond | 2 | 1 | 413 | 0.8 | 0.0 | 81.2 | |
| Jr. Subordinated Bond | 2 | 1 | 26 | 0.1 | 0.7 | 3.9 | |

The recovery data above are based on trading prices at or post default.¹² 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 or securities that creditors actually receive when the issuer exits bankruptcy, typically one to two years following the initial default date.

In Exhibit 8, we present data on ultimate recovery rates for North American companies included in Moody's Ultimate Recovery Database.¹³ In 2017, the average "firm-wide" recovery rate^{14,15} for the 17 default resolutions was 64%, compared with 39% for the 30 companies that emerged from default in 2016. Unlike the preceding year, in 2017 the overall firm-wide average recovery was above the historical average (55%), buoyed by a significant improvement in recoveries of bankrupt oil & gas companies. The sector represented more than half of the 2017 default resolutions that we studied. Out of nine bankruptcy resolutions in the oil and gas sector, six experienced high family recoveries averaging 83%. This turnaround in recovery rates of oil and gas companies may be attributable to improved investor sentiment. As the market became more optimistic and commodity prices rebounded, investors started bidding up asset prices, leading to higher valuations for defaulted securities and for assets of companies in bankruptcy. Other than bankruptcy

resolutions, three distressed exchanges that we recorded in 2017 also helped to lift the overall firm-wide recovery rate by returning 85 cents on the dollar at the firm-wide level.

Improved family-level recoveries of defaulters emerging in 2017 mainly stemmed from a sharp rise in recoveries from companies in the energy sector and benefitted all creditor classes. As shown in Exhibit 8, in 2017 every debt instrument type realized on average a higher recovery rate than in 2016.

Exhibit 8

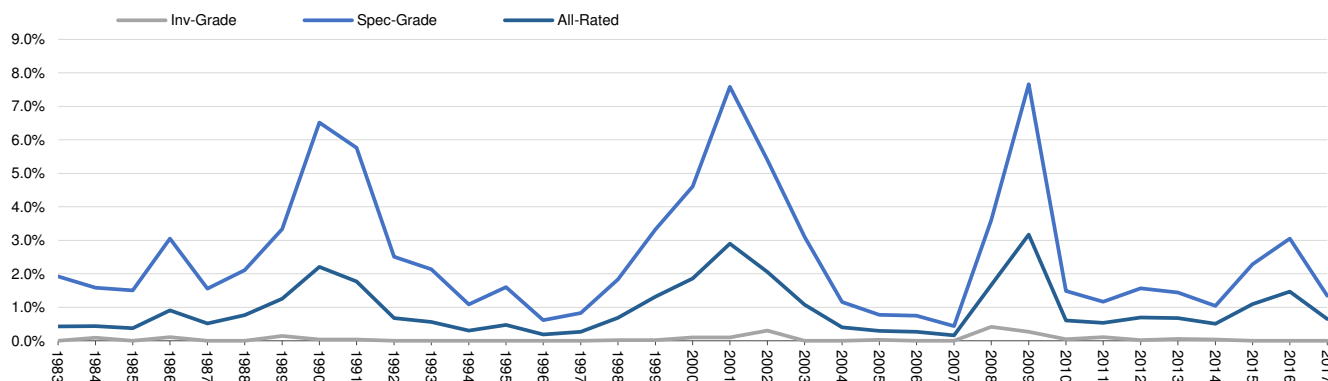
Average Corporate Debt Recovery Rates Measured by Ultimate Recoveries, 1987-2017

| Priority Position | Emergence Year | | | Default Year | | |
|------------------------|----------------|-------|-----------|--------------|-------|-----------|
| | 2017 | 2016 | 1987-2017 | 2017 | 2016 | 1987-2017 |
| Loans | 81.3% | 72.6% | 80.4% | 80.2% | 78.3% | 80.4% |
| Senior Secured Bonds | 52.3% | 35.9% | 62.3% | 57.5% | 46.9% | 62.3% |
| Senior Unsecured Bonds | 54.1% | 11.7% | 47.9% | 47.4% | 29.2% | 47.9% |
| Subordinated Bonds | 4.5% | 6.6% | 28.0% | n.a. | 8.0% | 28.0% |

Our credit ratings are opinions of relative expected credit losses, which are a function of both the probability of default and loss given default (LGD). Exhibit 9 shows annual average credit loss rates from 1983 through 2017 for our rated corporate issuers. The chart indicates that the average credit loss rate among all of our rated issuers fell to 0.7% in 2017 from 1.5% in 2016. Historically, the average annual credit loss rate for our rated issuers has been 0.9% since 1983.

Exhibit 9

Annual credit loss rates down in 2017



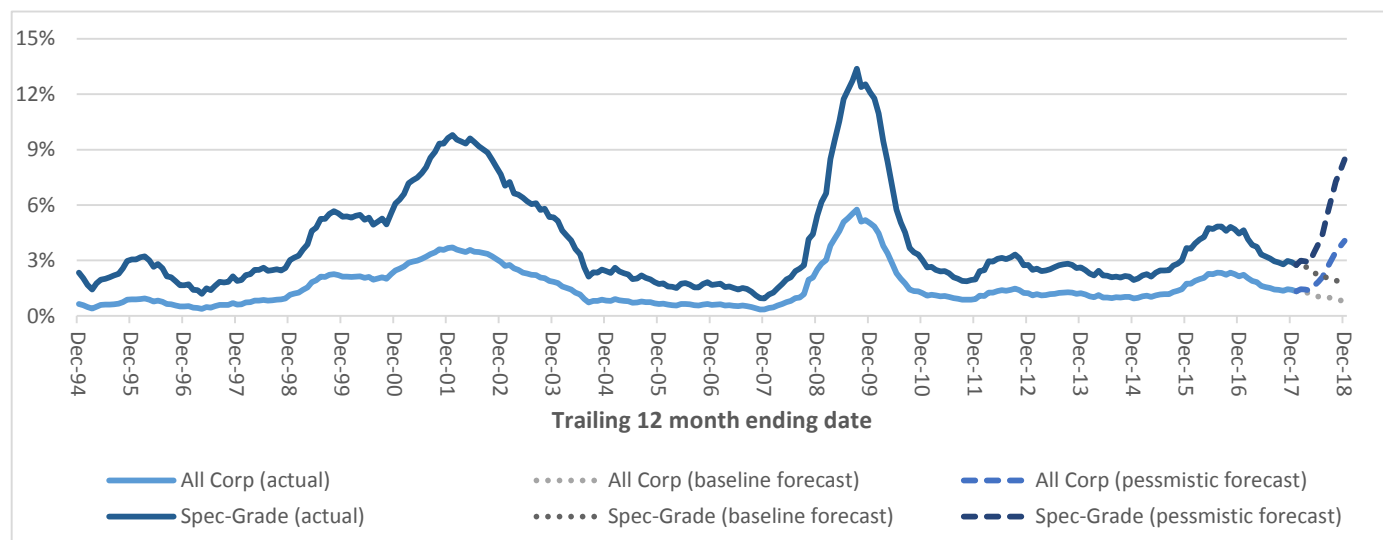
Default rates to slide further in 2018

Default rate to fall below 2% this year

In the past three years, the global default rate has moved with the rise and fall of defaults from the commodity sectors. For 2018, we expect the default outlook to remain benign for global corporate issuers. Underpinning this forecast is a strong fundamental credit environment. The anticipation of faster GDP growth in the G-20 countries, a sustained recovery in commodity prices, generally healthy corporate earnings and relatively low refunding risk after a wave of refinancing all support a low default rate forecast. Although many central banks have begun to reduce stimulus, monetary policies are still accommodative and provide sufficient liquidity to the credit market.

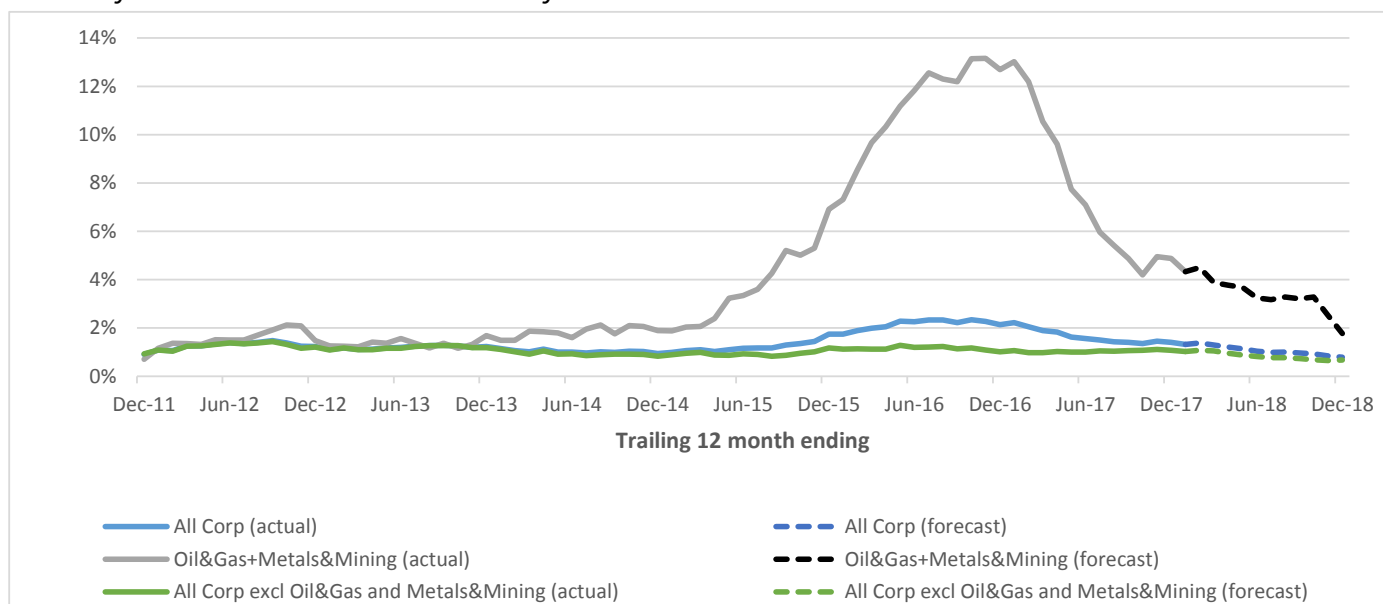
Based on Moody's Credit Transition Model, the default rate for all of our rated issuers is expected to fall to 0.8% by the end of 2018, which - if realized - will be lower than the average of 1.6% since 1983. Among speculative-grade issuers, the default rate is predicted to decline to 1.7%, also below the historical average of 4.2% (see dotted lines in Exhibit 10). These forecasts are made under our baseline scenario, which assumes the US high-yield spread will remain thin from the latest quarter's average of 335 basis points (bps) to 373 bps in the fourth quarter of 2018, whereas the US unemployment rate will ease to 3.5% from 4.1%.¹⁶

Exhibit 10

Default rates to trend down in 2018**Commodity stress to recede**

Commodity sectors have been the major driving force of defaults in the past three years, but we expect defaults in these sectors to be relatively muted in 2018, with the default rate for the combined portfolio of Oil & Gas and Metals & Mining issuers falling to 1.8% in 2018 from 4.9% in 2017. This forecast reflects the sectors' stabilizing fundamentals following the rise in commodity prices. In addition, most of the weakest companies have already restructured or defaulted. Our industry outlooks for commodities anticipate stable credit conditions.¹⁷ In Oil & Gas, three out of the five subsectors—exploration & production, oilfield services & drilling, and midstream—have positive outlooks, while the other two—integrated oil and refining & marketing—are stable. Moreover, commodity companies have taken advantage of market access in recent years to refinance their debt and push out near-term maturities (see Exhibit 11).

Exhibit 11

Commodity sectors' default rates to slide further this year

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 our rated universe fell to 1.4% in 2017 from 2.1% in 2016, the comparable rate actually

edged higher to 1.1% from 1.0% when we exclude issuers in the Oil & Gas and Metals & Mining sectors. Looking into 2018, we expect default risk to decline outside of the commodity sectors, finishing at 0.7% in December.

In order to take a closer look at industry-specific default risk, we provide the one-year baseline global default forecasts by industry in Exhibit 12.¹⁸ In this chart, we apply the same economic assumption to all industries, so the only factor driving the different forecasted default rates is the rating histories and current ratings of the companies in those industries. Measured by default rate, the most troubled sector is Durable Consumer Goods (4.1%). The next highest forecast belongs to Retail (3.9%). These forecasts, if realized, will be higher than their historical averages of 2.7% and 3.1%, respectively. While our Credit Transition Model predicts that Retail will have the second-highest default risk in 2018, the risk is concentrated in only some pockets of the sector. Take US retailers as an example, out of the 14 retail sub-sectors, five are forecast to have operating income growth above 5% this year—led by online retailers, dollar stores and home improvement.¹⁹ On the other hand, department stores, office supply, discounters/warehouses, drug stores and apparel & footwear are sectors that will be a drag on broader industry performance in 2018.

Exhibit 12

One-year corporate default rate forecasts by industry

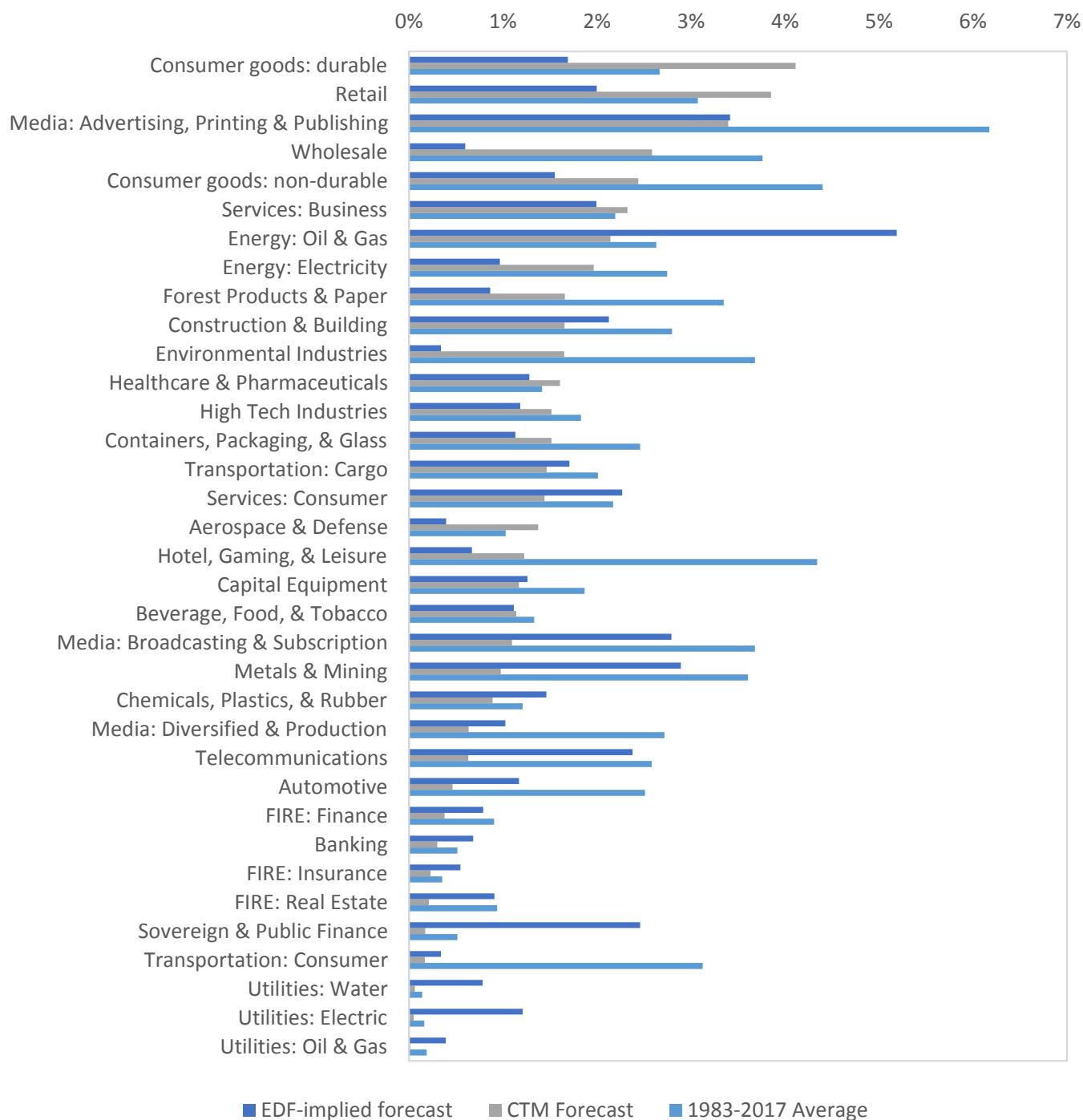


Exhibit 12 also shows the default rate forecast implied by Expected Default Frequency (EDF).^{20,21} As shown in the chart, EDF-implied ratings indicate a worse default rate outlook for commodity sectors than those suggested by the Credit Transition Model. This certainly reflects the volatility in the 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 quality. 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 2018 relative to 2017 for both Oil & Gas (5.2% vs. 6.5%) and Metals & Mining (2.9% vs. 3.9%).

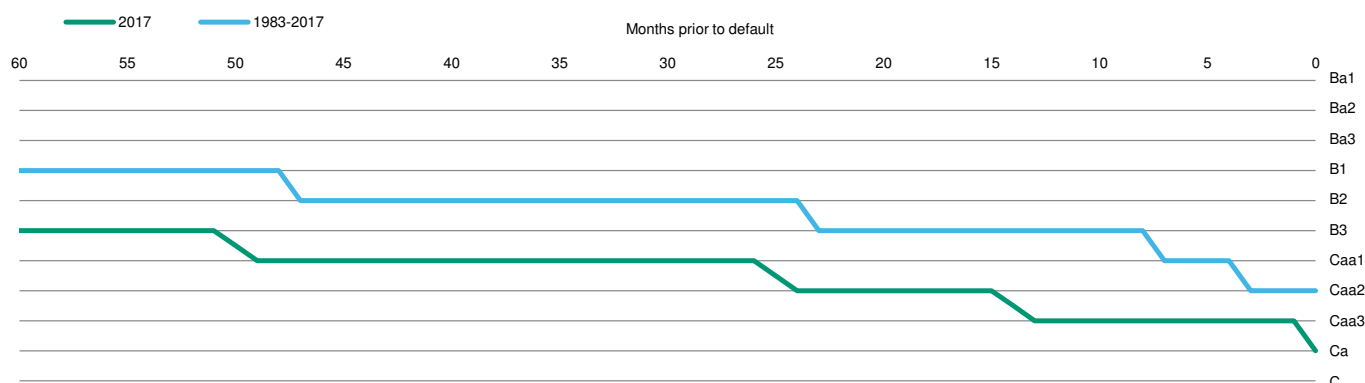
While our baseline forecast represents our central view, we acknowledge that global economic conditions can pose significant risks in 2018. Potential disruptions to the benign outlook include the possibility of the US Federal Reserve and European Central Bank tapering their quantitative easing policies faster than expected. In addition, a number of lingering political risks, such as the Italian general elections, Brexit negotiations and US mid-term elections will remain a challenge for global credit in 2018 and beyond. Furthermore, risk associated with loosening credit terms and increased issuance of lower-quality debt may also add upward pressure once the cycle turns and credit conditions tighten. In our pessimistic scenario,²² which has a 4% chance probability of materializing, the worldwide economy could fall back into a deep recession with the US unemployment rate rising to 8.2% and the US high-yield bond spread widening to 1,063 bps. In that case, the global default rate is expected to rise to 4.1% for all rated issuers and 8.5% for speculative-grade issuers (see dashed lines in Exhibit 10).

Rating Accuracy Metrics

Our 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 2017. The chart demonstrates that, historically, our 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 2017. The median rating one year prior to default was Caa3 among last year's defaulters, three notches below the rating measured over the entire period 1983-2017.

Exhibit 13

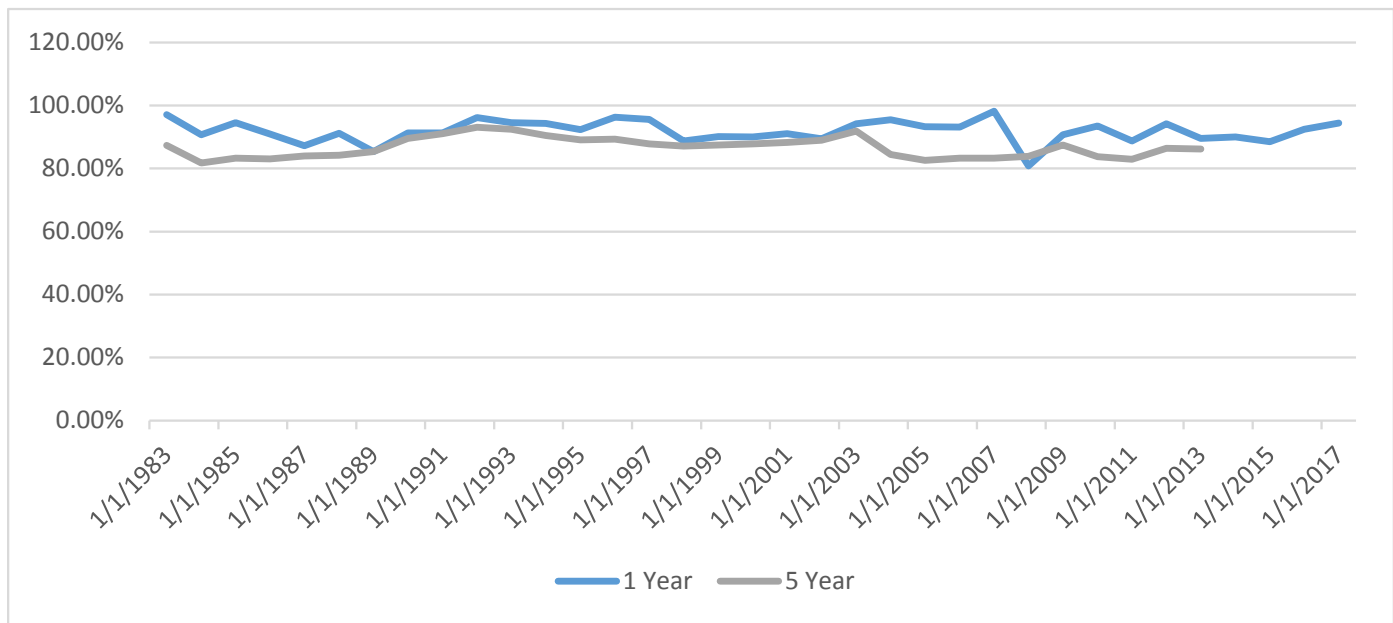
Median Ratings Prior to Default, 2017 vs. Long-Term Average



The evolution of median ratings presented in Exhibit 13 above demonstrate that our 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 (AP) of defaults to evaluate the accuracy of our ordinal rating systems (see Exhibit 14).²³ 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 2017, the AP of defaults has been consistently high during the entire period, with an average of 91.6% for the one-year horizon and 86.6% for the five-year horizon. This indicates that our ratings have been effective in predicting defaults over both the short- and long-term periods.

Exhibit 14

One- and Five-Year Average Default Position by Cohort Year, 1983-2017



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 2017. As of January 1, 2017, 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 nonrated 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 1982-2017 period, the dataset includes post-default prices for approximately 5,000 defaulted instruments issued by over 1,700 defaulting corporations. Moody's makes the 1970-2017 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 36.8% 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 21.4% average rate between 1983 and 2017 (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 issuer-based 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 2017 (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 2017 Corporate Bond And Loan Defaults*

| Company | Country | Default Month | Broad Default Type | Bond (US \$ mil) | Loans (US \$ mil) | In Jan 2017 cohort? |
|--|----------------|---------------|---------------------|------------------|-------------------|---------------------|
| 99 Cents Only Stores LLC | United States | 2017-11 | Distressed exchange | 242 | 590 | 1 |
| Agrokor D.D. | Croatia | 2017-5 | Payment default | 337 | | 1 |
| Ameriforge Group, Inc. | United States | 2017-4 | Bankruptcy | | 690 | 1 |
| Approach Resources Inc. | United States | 2017-1 | Distressed exchange | 131 | | 1 |
| Appvion, Inc. | United States | 2017-10 | Bankruptcy | 250 | 211 | 1 |
| Armstrong Energy, Inc. | United States | 2017-7 | Payment default | 200 | | 1 |
| Artel, LLC | United States | 2017-4 | Distressed exchange | 15 | | 1 |
| Ascent Resources - Marcellus LLC | United States | 2017-6 | Payment default | | 750 | 1 |
| Aurora Diagnostics Holdings, LLC | United States | 2017-5 | Distressed exchange | 198 | | 1 |
| Avaya, Inc. | United States | 2017-1 | Bankruptcy | 2683 | 3309 | 1 |
| Banco Popular Espanol, S.A. | Spain | 2017-6 | Distressed exchange | 770 | | 1 |
| Bibby Offshore Holdings Ltd | United Kingdom | 2017-12 | Bankruptcy | 0 | 20 | 1 |
| Bibby Offshore Services Plc | United Kingdom | 2017-12 | Bankruptcy | 234 | | 1 |
| Boart Longyear Management Pty Limited | United States | 2017-9 | Distressed exchange | 396 | | 1 |
| Bonanza Creek Energy, Inc. | United States | 2017-1 | Bankruptcy | 800 | 192 | 1 |
| Brunswick Rail Limited | Russia | 2017-10 | Distressed exchange | 600 | | 1 |
| Carboclor S.A. | Argentina | 2017-1 | Bankruptcy | | 2 | 1 |
| CGG Holding (U.S.) Inc | United States | 2017-6 | Bankruptcy | 0 | 0 | 1 |
| CGG SA | France | 2017-6 | Bankruptcy | 1921 | 325 | 1 |
| CHARMING CHARLIE LLC | United States | 2017-12 | Bankruptcy | | 132 | 1 |
| Chinos Intermediate Holdings A, Inc. | United States | 2017-7 | Distressed exchange | 566 | | 1 |
| Concordia International Corp. | Canada | 2017-10 | Payment default | | 33 | 1 |
| Cumulus Media Holdings Inc. | United States | 2017-11 | Bankruptcy | 610 | 1729 | 1 |
| Denbury Resources Inc. | United States | 2017-12 | Distressed exchange | 610 | | 1 |
| Drill Rigs Holdings Inc. | Cyprus | 2017-3 | Bankruptcy | 460 | | 1 |
| Drillships Financing Holding Inc. | Cyprus | 2017-3 | Bankruptcy | | 1834 | 1 |
| Drillships Ocean Ventures Inc. | Cyprus | 2017-3 | Bankruptcy | | 1268 | 1 |
| Eastcomtrans LLP | Kazakhstan | 2017-4 | Distressed exchange | 79 | | 1 |
| Emeco Holdings Limited | Australia | 2017-3 | Distressed exchange | 0 | | 1 |
| Emeco Pty Limited | Australia | 2017-3 | Distressed exchange | 283 | | 1 |
| EP Energy LLC | United States | 2017-12 | Distressed exchange | 1147 | | 1 |
| EXCO Resources, Inc. | United States | 2017-12 | Payment default | | 709 | 1 |
| Expro Holdings UK 3 Limited | United Kingdom | 2017-12 | Bankruptcy | | 1420 | 0 |
| Fieldwood Energy LLC | United States | 2017-9 | Distressed exchange | | 781 | 1 |
| Floworks International LLC | United States | 2017-9 | Distressed exchange | 221 | | 1 |
| GenOn Americas Generation, LLC | United States | 2017-6 | Bankruptcy | 694 | | 1 |
| GenOn Energy, Inc. | United States | 2017-6 | Bankruptcy | 1827 | | 1 |
| GenOn Mid-Atlantic, LLC | United States | 2017-7 | Payment default | 106 | | 1 |
| Global A&T Electronics Ltd. | Singapore | 2017-8 | Payment default | 1127 | | 1 |
| Goodman Networks, Inc. | United States | 2017-1 | Bankruptcy | 325 | 8 | 1 |
| GulfMark Offshore, Inc. | United States | 2017-4 | Payment default | 430 | | 1 |
| Gymboree Corporation (The) | United States | 2017-6 | Bankruptcy | 171 | 809 | 1 |
| HBC Holdings LLC | United States | 2017-3 | Distressed exchange | | 55 | 1 |
| iHeartCommunications, Inc. | United States | 2017-1 | Payment default | 795 | | 1 |
| Imperial Metals Corporation | Canada | 2017-11 | Distressed exchange | | 191 | 1 |
| Intelsat S.A. | Luxembourg | 2017-1 | Distressed exchange | 1027 | | 1 |
| International Bank of Azerbaijan | Azerbaijan | 2017-5 | Payment default | 500 | 100 | 1 |
| iPayment Inc. | United States | 2017-4 | Distressed exchange | 280 | | 1 |
| Jack Cooper Enterprises, Inc. | United States | 2017-6 | Distressed exchange | 429 | | 1 |
| Jack Cooper Holdings Corp. | United States | 2017-6 | Distressed exchange | 374 | | 1 |
| LB Media, Inc. | United States | 2017-4 | Distressed exchange | 23 | | 1 |
| Millar Western Forest Products Ltd. | Canada | 2017-5 | Distressed exchange | 210 | | 1 |
| Mood Media Corporation | Canada | 2017-5 | Bankruptcy | 350 | 236 | 1 |
| Neovia Logistics Intermediate Holdings, LP | United States | 2017-3 | Distressed exchange | 46 | | 1 |
| Norske Skogindustrier ASA | Norway | 2017-7 | Payment default | 461 | | 1 |

| | | | | | | |
|---------------------------------------|----------------------|---------|---------------------|-------|------|---|
| Novo Banco, S.A. | Portugal | 2017-10 | Distressed exchange | 785 | | 1 |
| Nuverra Environmental Solutions, Inc. | United States | 2017-5 | Bankruptcy | 397 | 61 | 0 |
| Ocean Rig UDW Inc. | Cyprus | 2017-3 | Bankruptcy | 131 | 0 | 1 |
| Onsite Rental Group Pty Ltd | Australia | 2017-10 | Distressed exchange | | 0 | 1 |
| Opal Acquisition, Inc. | United States | 2017-7 | Distressed exchange | 604 | | 1 |
| Orchard Acquisition Company, LLC | United States | 2017-12 | Bankruptcy | | 450 | 1 |
| Pacific Drilling S.A. | Luxembourg | 2017-11 | Bankruptcy | 750 | 1193 | 1 |
| Pacific Drilling V Ltd. | Luxembourg | 2017-11 | Bankruptcy | 439 | | 1 |
| Payless Inc. | United States | 2017-4 | Bankruptcy | | 665 | 1 |
| Perpetual Energy Inc. | Canada | 2017-1 | Distressed exchange | 13 | | 1 |
| Petroleos de Venezuela, S.A. | Venezuela | 2017-11 | Payment default | 20420 | | 1 |
| Pinnacle Holdco S.A.R.L. | United States | 2017-9 | Payment default | | 345 | 1 |
| Pinnacle Operating Corporation | United States | 2017-3 | Distressed exchange | 300 | | 1 |
| Production Resource Group, Inc. | United States | 2017-5 | Distressed exchange | 210 | | 1 |
| Quintis Limited | Australia | 2017-8 | Payment default | 250 | | 1 |
| Real Alloy Holding, Inc. | United States | 2017-11 | Bankruptcy | 305 | 100 | 1 |
| Reliance Communications Limited | India | 2017-11 | Payment default | 300 | | 1 |
| Rosenerbank | Russia | 2017-4 | Bankruptcy | | | 1 |
| rue21, inc. | United States | 2017-5 | Bankruptcy | 239 | 593 | 1 |
| Sable Permian Resources, LLC | United States | 2017-5 | Distressed exchange | 327 | | 1 |
| Sequa Corporation | United States | 2017-1 | Payment default | 350 | | 1 |
| Shelf Drilling Midco, Ltd. | United Arab Emirates | 2017-1 | Distressed exchange | 475 | 78 | 1 |
| Sierra Hamilton LLC | United States | 2017-1 | Payment default | 110 | | 1 |
| Spanish Broadcasting System, Inc. | United States | 2017-4 | Payment default | 275 | | 1 |
| Sprint Industrial Holdings, LLC | United States | 2017-4 | Distressed exchange | | 83 | 1 |
| Stafford Logistics, Inc. | United States | 2017-10 | Distressed exchange | | 166 | 1 |
| Tatfondbank | Russia | 2017-1 | Payment default | 67 | | 1 |
| The J.G. Wentworth Company | United States | 2017-12 | Bankruptcy | | 0 | 0 |
| Tops Holding II Corporation | United States | 2017-8 | Distressed exchange | 76 | | 1 |
| Toys 'R' US, Inc. | United States | 2017-9 | Bankruptcy | 791 | | 1 |
| Toys 'R' Us-Delaware, Inc. | United States | 2017-9 | Bankruptcy | 22 | 2453 | 1 |
| True Religion Apparel, Inc. | United States | 2017-7 | Bankruptcy | | 471 | 1 |
| Vanguard Natural Resources, LLC | United States | 2017-2 | Bankruptcy | 382 | 1250 | 1 |
| Velocity Pooling Vehicle, LLC | United States | 2017-11 | Bankruptcy | | 440 | 1 |
| Vivarte | France | 2017-6 | Distressed exchange | 891 | 2 | 1 |
| Walter Investment Management Corp | United States | 2017-11 | Bankruptcy | 820 | 1245 | 1 |

*This list only includes companies that have rated bonds, loans and/or deposits within one year prior to default. Only issuers included in the Jan 1st cohort are included in the annual default rates in this report. Furthermore, the list only includes 91 companies, which initially defaulted in 2017. Besides these 91 companies, there are five issuers, which initially defaulted in prior years but experienced follow-on defaults on \$1.4 billion of debt in 2017 (\$0.4 billion in bonds and \$0.9 billion in loans). We include such \$1.4 billion in the 2017 default volume.

Exhibit 16

Annual Moody's-Rated Global Corporate Issuer Default Counts, 1920-2017*

| Year | IG | SG | All |
|------|----|-----|-----|
| 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 |
| 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 | 91 | 91 |
| 2004 | 0 | 41 | 41 |
| 2005 | 2 | 31 | 33 |
| 2006 | 0 | 31 | 31 |
| 2007 | 0 | 19 | 19 |
| 2008 | 21 | 118 | 139 |
| 2009 | 14 | 258 | 272 |
| 2010 | 3 | 61 | 64 |
| 2011 | 6 | 42 | 48 |
| 2012 | 1 | 67 | 68 |
| 2013 | 3 | 67 | 70 |
| 2014 | 2 | 54 | 56 |
| 2015 | 0 | 109 | 109 |
| 2016 | 0 | 136 | 136 |
| 2017 | 0 | 88 | 88 |

*Only includes issuers in the Jan 1st cohort.

Exhibit 17

Annual Rated Global Corporate Bond And Loan Default Volumes, 1970-2017*

| 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 | \$2,713 | \$299 | \$3,013 | \$2,713 | \$299 | \$3,013 |
| 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 | \$14,054 | \$40,270 | \$26,678 | \$15,279 | \$41,956 |
| 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 | \$38,667 | \$10,308 | \$48,976 | \$38,667 | \$11,178 | \$49,845 |
| 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 | \$182,073 | \$10,380 | \$192,452 | \$51,362 | \$32,322 | \$83,684 | \$233,435 | \$42,701 | \$276,136 |
| 2009 | \$35,704 | \$21,931 | \$57,634 | \$148,231 | \$122,350 | \$270,580 | \$183,934 | \$144,280 | \$328,215 |
| 2010 | \$4,047 | \$0 | \$4,047 | \$21,323 | \$14,042 | \$35,365 | \$25,370 | \$14,042 | \$39,411 |
| 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 | \$13,826 | \$42,607 | \$31,189 | \$13,826 | \$45,015 |
| 2014 | \$939 | \$0 | \$939 | \$39,811 | \$30,029 | \$69,839 | \$40,750 | \$30,029 | \$70,778 |
| 2015 | \$0 | \$0 | \$0 | \$75,662 | \$19,794 | \$95,456 | \$75,662 | \$19,794 | \$95,456 |
| 2016 | \$0 | \$0 | \$0 | \$90,603 | \$42,508 | \$133,112 | \$90,603 | \$42,508 | \$133,112 |
| 2017 | \$0 | \$0 | \$0 | \$51,704 | \$24,453 | \$76,157 | \$51,704 | \$24,453 | \$76,157 |

*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, 1986-2017*

| Year | Count | | | | | Dollar Volumes (US\$ mil) | | | | |
|------|----------------------|--------------|--------|---------------|---------------|---------------------------|--------------|--------|---------------|---------------|
| | Africa & Middle East | Asia Pacific | Europe | Latin America | North America | Africa & Middle East | Asia Pacific | Europe | Latin America | North America |
| 1986 | 0 | 0 | 0 | 0 | 38 | 0 | 0 | 0 | 0 | 4142 |
| 1987 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 9262 |
| 1988 | 0 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 | 6003 |
| 1989 | 0 | 4 | 0 | 0 | 51 | 0 | 969 | 0 | 0 | 10253 |
| 1990 | 0 | 1 | 1 | 0 | 92 | 0 | 200 | 516 | 0 | 22097 |
| 1991 | 0 | 0 | 2 | 0 | 71 | 0 | 0 | 1228 | 0 | 16753 |
| 1992 | 0 | 0 | 0 | 0 | 34 | 0 | 0 | 0 | 0 | 7673 |
| 1993 | 0 | 0 | 0 | 0 | 24 | 0 | 0 | 0 | 0 | 3104 |
| 1994 | 0 | 0 | 1 | 0 | 18 | 0 | 0 | 774 | 0 | 2238 |
| 1995 | 0 | 0 | 0 | 1 | 30 | 0 | 0 | 0 | 100 | 5774 |
| 1996 | 0 | 0 | 0 | 1 | 19 | 0 | 0 | 0 | 207 | 5930 |
| 1997 | 0 | 2 | 0 | 2 | 21 | 0 | 614 | 0 | 310 | 5048 |
| 1998 | 0 | 5 | 5 | 0 | 44 | 0 | 1444 | 707 | 0 | 11241 |
| 1999 | 0 | 8 | 9 | 8 | 87 | 0 | 4458 | 3950 | 2018 | 33299 |
| 2000 | 0 | 3 | 4 | 3 | 119 | 0 | 4453 | 866 | 305 | 54074 |
| 2001 | 4 | 15 | 15 | 6 | 150 | 2758 | 7832 | 10540 | 2034 | 116675 |
| 2002 | 0 | 2 | 25 | 17 | 102 | 0 | 1842 | 45418 | 10424 | 156289 |
| 2003 | 0 | 2 | 7 | 11 | 70 | 0 | 625 | 3708 | 4152 | 41485 |
| 2004 | 1 | 0 | 5 | 1 | 38 | 183 | 0 | 2311 | 1093 | 18304 |
| 2005 | 0 | 0 | 1 | 1 | 32 | 0 | 0 | 207 | 100 | 40445 |
| 2006 | 0 | 0 | 7 | 2 | 23 | 0 | 0 | 1601 | 167 | 9113 |
| 2007 | 0 | 0 | 3 | 0 | 15 | 0 | 0 | 2230 | 0 | 5967 |
| 2008 | 0 | 3 | 51 | 2 | 93 | 0 | 625 | 53374 | 555 | 227946 |
| 2009 | 1 | 16 | 31 | 11 | 226 | 650 | 6989 | 28013 | 3031 | 294547 |
| 2010 | 0 | 3 | 11 | 3 | 53 | 0 | 6913 | 9225 | 487 | 25270 |
| 2011 | 0 | 0 | 15 | 1 | 35 | 0 | 0 | 10064 | 358 | 26599 |
| 2012 | 1 | 1 | 12 | 5 | 51 | 48 | 1805 | 17275 | 3077 | 33780 |
| 2013 | 0 | 2 | 25 | 10 | 36 | 0 | 546 | 24095 | 4880 | 23112 |
| 2014 | 1 | 5 | 14 | 5 | 32 | 350 | 3397 | 9654 | 4539 | 53092 |
| 2015 | 1 | 9 | 29 | 9 | 69 | 456 | 4114 | 16149 | 4314 | 75136 |
| 2016 | 2 | 2 | 20 | 12 | 107 | 945 | 1806 | 18108 | 26135 | 88565 |
| 2017 | 1 | 6 | 21 | 2 | 61 | 553 | 1960 | 15856 | 20822 | 38844 |

* Include defaults outside of the Jan 1st cohorts.

Exhibit 19

2017 Defaulted Corporate Bond And Loan Recoveries*

| Company | Default Type | Loans | | | Bonds | | | | | |
|--|---------------------|----------|----------|------------|----------|----------|------------|----------|------|----------|
| | | 1st Lien | 2nd Lien | Sr. Unsec. | 1st Lien | 2nd Lien | Sr. Unsec. | Sr. Sub. | Sub. | Jr. Sub. |
| Perpetual Energy Inc. | distressed exchange | | | | | | 98.0 | | | |
| Approach Resources Inc. | distressed exchange | | | | | | 92.0 | | | |
| GenOn Americas Generation, LLC | bankruptcy | | | | | | 90.5 | | | |
| Tops Holding II Corporation | distressed exchange | | | | | | 90.0 | | | |
| Aurora Diagnostics Holdings, LLC | distressed exchange | | | | | | 88.3 | | | |
| 99 Cents Only Stores LLC | distressed exchange | 95.6 | | | | | 85.5 | | | |
| Opal Acquisition, Inc. | distressed exchange | | | | | | 84.8 | | | |
| Brunswick Rail Limited | distressed exchange | | | | | | 84.0 | | | |
| International Bank of Azerbaijan | payment default | | | | | | 83.4 | | | |
| Sable Permian Resources, LLC | distressed exchange | | | | 98.0 | 81.1 | | | | 31.0 |
| iHeartCommunications, Inc. | payment default | | | | | | 78.5 | | | |
| Real People Investment Holdings Limited | distressed exchange | | | | | | 78.1 | | 72.8 | |
| Production Resource Group, Inc. | distressed exchange | | | | | | 76.3 | | | |
| Neovia Logistics Intermediate Holdings, LP | distressed exchange | | | | | | 73.0 | | | |
| Vanguard Natural Resources, LLC | bankruptcy | 91.0 | | | | | 70.1 | | | |
| Chinos Intermediate Holdings A, Inc. | distressed exchange | | | | | | 68.5 | | | |
| GenOn Energy, Inc. | bankruptcy | | | | | | 64.7 | | | |
| Mood Media Corporation | bankruptcy | 99.6 | | | | | 64.0 | | | |
| EP Energy LLC | distressed exchange | | | | | | 62.8 | | | |
| Millar Western Forest Products Ltd. | distressed exchange | | | | | | 62.0 | | | |
| Walter Investment Management Corp | bankruptcy | 97.5 | | | | | 60.5 | 10.0 | | |
| Intelsat S.A. | distressed exchange | | | | | | 59.0 | | | |
| Frigoglass SAIC | payment default | | | | | | 57.0 | | | |
| Sequa Corporation | payment default | | | | | | 55.0 | | | |
| GulfMark Offshore, Inc. | payment default | | | | | | 47.0 | | | |
| Toys 'R' US, Inc. | bankruptcy | | | | 97.0 | | 41.5 | | | |
| Toys 'R' Us-Delaware, Inc. | bankruptcy | 47.4 | | | | | 41.0 | | | |
| Novo Banco, S.A. | distressed exchange | | | | | | 28.0 | | | |
| Petroleos de Venezuela, S.A. | payment default | | | | 76.8 | | 25.3 | | | |
| CGG SA | bankruptcy | 100.9 | | | | | 24.1 | | | |
| Boart Longyear Management Pty Limited | distressed exchange | | | | 80.5 | | 20.5 | | | |
| Cumulus Media Holdings Inc. | bankruptcy | 86.2 | | | | | 18.0 | | | |
| Agrokor D.D. | payment default | | | | | | 16.6 | | | |
| Jack Cooper Enterprises, Inc. | distressed exchange | | | | | | 13.0 | | | |
| Ocean Rig UDW Inc. | bankruptcy | | | | | | 11.0 | | | |
| rue21, inc. | bankruptcy | | | | | | 3.5 | | | |
| Norske Skogindustrier ASA | payment default | | | | | | 1.9 | | | 4.0 |
| Gymboree Corporation (The) | bankruptcy | 35.8 | | | | | 1.5 | | | |
| Nuverra Environmental Solutions, Inc. | bankruptcy | | | | | 20.0 | 0.5 | | | |
| 21st Century Oncology, Inc | payment default | 93.7 | | | | | | | | |
| Ameriforge Group, Inc. | bankruptcy | 61.5 | 10.5 | | | | | | | |
| Appvion, Inc. | bankruptcy | 96.5 | | | | 37.0 | | | | |
| Armstrong Energy, Inc. | payment default | | | | 11.5 | | | | | |
| Avanti Communications Group plc | distressed exchange | | | | 60.0 | | | | | |
| Avaya, Inc. | bankruptcy | 89.6 | | | 78.9 | 24.3 | | | | |
| Banco Popular Espanol, S.A. | distressed exchange | | | | | | | | 76.0 | |
| Bibby Offshore Services Plc | bankruptcy | | | | 13.8 | | | | | |
| CHARMING CHARLIE LLC | bankruptcy | 3.9 | | | | | | | | |
| Concordia International Corp. | payment default | | | 9.0 | | | | | | |
| Denbury Resources Inc. | distressed exchange | | | | | | | 66.0 | | |
| Drill Rigs Holdings Inc. | bankruptcy | | | | 29.5 | | | | | |
| Drillships Financing Holding Inc. | bankruptcy | 75.7 | | | | | | | | |
| Drillships Ocean Ventures Inc. | bankruptcy | 93.3 | | | | | | | | |
| Eastcomtrans LLP | distressed exchange | | | | 93.4 | | | | | |
| Emeco Pty Limited | distressed exchange | | | | 90.0 | | | | | |

| | | | |
|--|---------------------|-----------|-------|
| EXCO Resources, Inc. | payment default | 48.0 | |
| Expro Holdings UK 3 Limited | bankruptcy | 58.8 | |
| Fieldwood Energy LLC | distressed exchange | 41.6 | |
| Floworks International LLC | distressed exchange | | 60.0 |
| Global A&T Electronics Ltd. | payment default | | 62.3 |
| Jack Cooper Holdings Corp. | distressed exchange | | 52.8 |
| Onsite Rental Group Operations Pty Ltd | distressed exchange | 87.8 | |
| Orchard Acquisition Company, LLC | bankruptcy | 54.3 | |
| Pacific Drilling S.A. | bankruptcy | 64.4 | 38.0 |
| Pacific Drilling V Ltd. | bankruptcy | | 48.0 |
| Payless Inc. | bankruptcy | 51.0 5.3 | |
| Pinnacle Operating Corporation | distressed exchange | | 73.0 |
| Quintis Limited | payment default | | 70.0 |
| Real Alloy Holding, Inc. | bankruptcy | | 72.5 |
| Reliance Communications Limited | payment default | | 38.8 |
| Shelf Drilling Midco, Ltd. | distressed exchange | | 84.5 |
| Spanish Broadcasting System, Inc. | payment default | | 102.0 |
| Sprint Industrial Holdings, LLC | distressed exchange | 76.4 27.5 | |
| Stafford Logistics, Inc. | distressed exchange | 53.5 | |
| True Religion Apparel, Inc. | bankruptcy | 28.6 | |
| Velocity Pooling Vehicle, LLC | bankruptcy | 35.2 4.5 | |

*Measured by trading prices and in percents.

Exhibit 20

Annual Defaulted Corporate Bond And Loan Recoveries*

| Year | Loan | | Bond | | | | All Bonds |
|------|---------------------|---------------------|------------|----------|-------|----------|-----------|
| | Sr. Sec. (1st Lien) | Sr. Sec. (1st Lien) | Sr. Unsec. | Sr. Sub. | Sub. | Jr. Sub. | |
| 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% | 0.0% | | 55.1% |
| 2008 | 61.7% | 52.5% | 33.5% | 23.3% | 29.5% | | 34.1% |
| 2009 | 53.6% | 37.3% | 36.7% | 23.1% | 45.3% | | 33.9% |
| 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 | 76.2% | 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% | 48.7% | 31.5% | 36.7% | 24.5% | 0.6% | 36.1% |
| 2017 | 69.0% | 62.4% | 53.9% | 38.0% | 74.4% | 17.5% | 56.5% |

*Based on trading prices.

Exhibit 21

Average Sr. Unsecured Bond Recovery Rates By Year Prior To Default, 1983-2017*

| | 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 | 44.63% | 43.30% | 42.13% | 41.60% | 41.59% |
| B | 37.62% | 36.77% | 37.21% | 37.71% | 38.36% |
| Caa-C | 38.10% | 38.43% | 38.50% | 38.83% | 38.86% |
| Investment Grade | 40.04% | 43.33% | 43.96% | 44.11% | 43.85% |
| Speculative Grade | 38.34% | 38.19% | 38.31% | 38.66% | 38.99% |
| All Rated | 38.40% | 38.47% | 38.71% | 39.11% | 39.45% |

*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, 1983-2017*

| | 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% | 0.11% | 0.17% |
| A | 0.04% | 0.10% | 0.20% | 0.31% | 0.45% |
| Baa | 0.10% | 0.26% | 0.43% | 0.65% | 0.87% |
| Ba | 0.51% | 1.46% | 2.64% | 3.89% | 4.96% |
| B | 2.14% | 5.17% | 8.17% | 10.83% | 13.19% |
| Caa-C | 6.28% | 11.04% | 15.10% | 18.42% | 21.16% |
| Investment Grade | 0.06% | 0.14% | 0.25% | 0.38% | 0.52% |
| Speculative Grade | 2.58% | 5.26% | 7.80% | 9.99% | 11.86% |
| All Rated | 1.01% | 2.02% | 2.94% | 3.71% | 4.35% |

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

Exhibit 23

Annual Credit Loss Rates By Letter Rating, 1983-2017*

| Year | Aaa | Aa | A | Baa | Ba | B | Caa-C | Inv-Grade | Spec-Grade | All Rated |
|---------|------|------|------|------|------|------|-------|-----------|------------|-----------|
| 1983 | 0.0% | 0.0% | 0.0% | 0.0% | 0.6% | 1.1% | 20.0% | 0.0% | 1.9% | 0.4% |
| 1984 | 0.0% | 0.0% | 0.0% | 0.3% | 0.3% | 2.7% | 9.2% | 0.1% | 1.6% | 0.4% |
| 1985 | 0.0% | 0.0% | 0.0% | 0.0% | 0.3% | 2.9% | 2.7% | 0.0% | 1.5% | 0.4% |
| 1986 | 0.0% | 0.0% | 0.0% | 0.4% | 1.2% | 5.2% | 8.5% | 0.1% | 3.1% | 0.9% |
| 1987 | 0.0% | 0.0% | 0.0% | 0.0% | 1.1% | 2.0% | 3.6% | 0.0% | 1.6% | 0.5% |
| 1988 | 0.0% | 0.0% | 0.0% | 0.0% | 0.7% | 3.2% | 6.8% | 0.0% | 2.1% | 0.8% |
| 1989 | 0.0% | 0.3% | 0.0% | 0.3% | 1.7% | 4.3% | 11.5% | 0.1% | 3.3% | 1.3% |
| 1990 | 0.0% | 0.0% | 0.0% | 0.2% | 2.3% | 8.5% | 27.2% | 0.0% | 6.5% | 2.2% |
| 1991 | 0.0% | 0.0% | 0.0% | 0.2% | 2.4% | 8.4% | 9.7% | 0.0% | 5.8% | 1.8% |
| 1992 | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 3.7% | 8.4% | 0.0% | 2.5% | 0.7% |
| 1993 | 0.0% | 0.0% | 0.0% | 0.0% | 0.4% | 2.8% | 8.5% | 0.0% | 2.1% | 0.6% |
| 1994 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 1.9% | 2.5% | 0.0% | 1.1% | 0.3% |
| 1995 | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 2.1% | 5.5% | 0.0% | 1.6% | 0.5% |
| 1996 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.6% | 3.8% | 0.0% | 0.6% | 0.2% |
| 1997 | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.9% | 4.3% | 0.0% | 0.8% | 0.3% |
| 1998 | 0.0% | 0.0% | 0.0% | 0.1% | 0.5% | 2.3% | 5.0% | 0.0% | 1.8% | 0.7% |
| 1999 | 0.0% | 0.0% | 0.0% | 0.1% | 0.9% | 3.0% | 10.0% | 0.0% | 3.3% | 1.3% |
| 2000 | 0.0% | 0.0% | 0.0% | 0.3% | 1.0% | 4.4% | 13.6% | 0.1% | 4.6% | 1.9% |
| 2001 | 0.0% | 0.0% | 0.1% | 0.1% | 0.9% | 7.3% | 23.6% | 0.1% | 7.6% | 2.9% |
| 2002 | 0.0% | 0.0% | 0.1% | 0.7% | 1.0% | 3.3% | 18.9% | 0.3% | 5.4% | 2.1% |
| 2003 | 0.0% | 0.0% | 0.0% | 0.0% | 0.5% | 1.6% | 12.0% | 0.0% | 3.1% | 1.1% |
| 2004 | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 0.4% | 5.7% | 0.0% | 1.2% | 0.4% |
| 2005 | 0.0% | 0.0% | 0.0% | 0.1% | 0.0% | 0.4% | 3.3% | 0.0% | 0.8% | 0.3% |
| 2006 | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.5% | 2.7% | 0.0% | 0.8% | 0.3% |
| 2007 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 2.3% | 0.0% | 0.4% | 0.2% |
| 2008 | 0.0% | 0.3% | 0.3% | 0.7% | 1.6% | 2.7% | 7.1% | 0.4% | 3.6% | 1.7% |
| 2009 | 0.0% | 0.0% | 0.2% | 0.6% | 1.1% | 4.6% | 16.5% | 0.3% | 7.7% | 3.2% |
| 2010 | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% | 0.2% | 4.2% | 0.0% | 1.5% | 0.6% |
| 2011 | 0.0% | 0.1% | 0.0% | 0.2% | 0.1% | 0.2% | 3.4% | 0.1% | 1.2% | 0.5% |
| 2012 | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.3% | 4.4% | 0.0% | 1.6% | 0.7% |
| 2013 | 0.0% | 0.0% | 0.0% | 0.1% | 0.3% | 0.5% | 3.4% | 0.1% | 1.4% | 0.7% |
| 2014 | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.3% | 2.5% | 0.0% | 1.0% | 0.5% |
| 2015 | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | 1.4% | 4.3% | 0.0% | 2.3% | 1.1% |
| 2016 | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 1.1% | 6.2% | 0.0% | 3.1% | 1.5% |
| 2017 | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.1% | 3.0% | 0.0% | 1.3% | 0.7% |
| Average | 0.0% | 0.0% | 0.0% | 0.1% | 0.6% | 2.4% | 8.1% | 0.1% | 2.6% | 0.9% |
| Max | 0.0% | 0.3% | 0.3% | 0.7% | 2.4% | 8.5% | 27.2% | 0.4% | 7.7% | 3.2% |
| Min | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 2.3% | 0.0% | 0.4% | 0.2% |

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

Exhibit 24

2017 One-Year Letter Rating Migration Rates

| From/To | Aaa | Aa | A | Baa | Ba | B | Caa | Ca-C | WR | Default |
|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| Aaa | 100.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Aa | 0.00% | 75.08% | 20.20% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 4.71% | 0.00% |
| A | 0.00% | 1.35% | 90.08% | 3.89% | 0.24% | 0.00% | 0.08% | 0.00% | 4.37% | 0.00% |
| Baa | 0.00% | 0.06% | 2.88% | 90.13% | 1.29% | 0.29% | 0.00% | 0.00% | 5.35% | 0.00% |
| Ba | 0.00% | 0.00% | 0.00% | 6.74% | 82.07% | 3.97% | 0.12% | 0.00% | 6.86% | 0.24% |
| B | 0.00% | 0.00% | 0.00% | 0.10% | 7.23% | 72.15% | 5.45% | 0.00% | 14.77% | 0.30% |
| Caa | 0.00% | 0.08% | 0.00% | 0.00% | 0.08% | 4.99% | 70.38% | 3.07% | 17.65% | 3.76% |
| Ca-C | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.81% | 19.51% | 35.77% | 16.26% | 27.64% |

Exhibit 25

Average One-Year Letter Rating Migration Rates, 1920-2017

| From/To | Aaa | Aa | A | Baa | Ba | B | Caa | Ca-C | WR | Default |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| Aaa | 86.86% | 7.77% | 0.79% | 0.19% | 0.03% | 0.00% | 0.00% | 0.00% | 4.36% | 0.00% |
| Aa | 1.05% | 84.11% | 7.73% | 0.72% | 0.16% | 0.05% | 0.01% | 0.00% | 6.11% | 0.06% |
| A | 0.07% | 2.70% | 85.06% | 5.56% | 0.64% | 0.12% | 0.04% | 0.01% | 5.73% | 0.08% |
| Baa | 0.03% | 0.23% | 4.20% | 82.90% | 4.55% | 0.72% | 0.13% | 0.02% | 6.96% | 0.25% |
| Ba | 0.01% | 0.07% | 0.49% | 6.15% | 74.05% | 6.85% | 0.67% | 0.09% | 10.49% | 1.14% |
| B | 0.00% | 0.04% | 0.16% | 0.61% | 5.56% | 71.76% | 6.19% | 0.46% | 12.00% | 3.21% |
| Caa | 0.00% | 0.01% | 0.03% | 0.11% | 0.51% | 6.71% | 67.72% | 2.95% | 13.90% | 8.06% |
| Ca-C | 0.00% | 0.02% | 0.10% | 0.04% | 0.57% | 2.82% | 8.19% | 47.69% | 18.45% | 22.13% |

Exhibit 26

Average One-Year Letter Rating Migration Rates, 1970-2017

| From/To | Aaa | Aa | A | Baa | Ba | B | Caa | Ca-C | WR | Default |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| Aaa | 87.71% | 7.94% | 0.58% | 0.07% | 0.02% | 0.00% | 0.00% | 0.00% | 3.67% | 0.00% |
| Aa | 0.82% | 85.15% | 8.51% | 0.42% | 0.06% | 0.03% | 0.02% | 0.00% | 4.95% | 0.02% |
| A | 0.05% | 2.46% | 86.78% | 5.37% | 0.48% | 0.11% | 0.04% | 0.00% | 4.64% | 0.05% |
| Baa | 0.03% | 0.14% | 4.12% | 85.72% | 3.79% | 0.69% | 0.15% | 0.02% | 5.17% | 0.17% |
| Ba | 0.01% | 0.04% | 0.42% | 6.12% | 76.32% | 7.17% | 0.71% | 0.11% | 8.22% | 0.88% |
| B | 0.01% | 0.03% | 0.14% | 0.45% | 4.78% | 73.49% | 6.62% | 0.52% | 10.70% | 3.27% |
| Caa | 0.00% | 0.01% | 0.02% | 0.08% | 0.34% | 6.51% | 67.87% | 2.85% | 14.35% | 7.96% |
| Ca-C | 0.00% | 0.00% | 0.05% | 0.00% | 0.56% | 2.29% | 8.94% | 39.39% | 22.12% | 26.66% |

Exhibit 27

Average Five-Year Letter Rating Migration Rates, 1970-2017*

| From/To | Aaa | Aa | A | Baa | Ba | B | Caa | Ca-C | WR | Default |
|---------|--------|--------|--------|--------|--------|--------|--------|-------|--------|---------|
| Aaa | 53.36% | 23.51% | 4.99% | 0.64% | 0.31% | 0.03% | 0.05% | 0.00% | 17.04% | 0.07% |
| Aa | 2.20% | 45.70% | 23.68% | 4.00% | 0.81% | 0.26% | 0.12% | 0.03% | 22.94% | 0.26% |
| A | 0.19% | 7.33% | 51.37% | 14.64% | 2.47% | 0.80% | 0.16% | 0.02% | 22.35% | 0.67% |
| Baa | 0.16% | 1.04% | 12.32% | 49.33% | 7.96% | 2.55% | 0.59% | 0.09% | 24.50% | 1.46% |
| Ba | 0.03% | 0.19% | 2.60% | 14.20% | 27.81% | 11.51% | 1.99% | 0.13% | 34.74% | 6.80% |
| B | 0.02% | 0.07% | 0.46% | 2.39% | 7.37% | 22.25% | 6.30% | 0.63% | 43.92% | 16.59% |
| Caa | 0.00% | 0.00% | 0.13% | 0.70% | 1.78% | 8.27% | 13.27% | 0.97% | 48.81% | 26.07% |
| Ca-C | 0.00% | 0.00% | 0.03% | 0.80% | 1.80% | 4.74% | 2.87% | 3.26% | 51.07% | 35.44% |

*Last cohort formed on 1/1/2013.

Exhibit 28

2017 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 | 100.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Aa1 | 0.00% | 78.79% | 21.21% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Aa2 | 0.00% | 0.00% | 79.00% | 15.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 6.00% | 0.00% |
| Aa3 | 0.00% | 0.00% | 0.00% | 58.54% | 35.98% | 0.00% | 0.61% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 4.88% | 0.00% |
| A1 | 0.00% | 0.00% | 0.00% | 4.42% | 82.32% | 8.56% | 0.55% | 0.28% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 3.87% | 0.00% |
| A2 | 0.00% | 0.00% | 0.00% | 0.26% | 6.77% | 81.25% | 5.47% | 0.26% | 0.52% | 0.26% | 0.00% | 0.78% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.26% | 0.00% | 4.17% | 0.00% |
| A3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 7.59% | 78.99% | 6.81% | 1.56% | 0.19% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 4.86% | 0.00% |
| Baa1 | 0.00% | 0.00% | 0.00% | 0.18% | 0.00% | 0.36% | 8.05% | 84.08% | 2.86% | 0.36% | 0.00% | 0.00% | 0.18% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 3.94% | 0.00% |
| Baa2 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.32% | 8.28% | 78.90% | 6.33% | 0.32% | 0.00% | 0.16% | 0.00% | 0.00% | 0.16% | 0.00% | 0.00% | 0.00% | 0.00% | 5.52% | 0.00% |
| Baa3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.76% | 10.06% | 78.37% | 2.85% | 0.57% | 0.00% | 0.57% | 0.19% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 6.64% | 0.00% |
| Ba1 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.69% | 11.81% | 73.26% | 5.21% | 2.78% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 6.25% | 0.00% |
| Ba2 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.40% | 6.77% | 6.77% | 72.11% | 4.78% | 1.59% | 0.80% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 6.37% | 0.40% |
| Ba3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.68% | 0.00% | 4.79% | 8.22% | 68.49% | 6.51% | 2.40% | 0.34% | 0.00% | 0.34% | 0.00% | 0.00% | 7.88% | 0.34% |
| B1 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.31% | 0.00% | 0.31% | 1.23% | 14.77% | 56.92% | 7.69% | 2.77% | 1.23% | 0.31% | 0.00% | 0.00% | 14.46% | 0.00% |
| B2 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.36% | 0.72% | 2.51% | 11.83% | 55.20% | 10.39% | 1.79% | 1.43% | 1.08% | 0.00% | 14.34% | 0.36% |
| B3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.25% | 0.74% | 1.48% | 3.46% | 12.84% | 56.05% | 7.65% | 1.48% | 0.25% | 0.00% | 15.31% | 0.49% |
| Caa1 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.16% | 0.65% | 7.42% | 61.61% | 9.03% | 1.61% | 0.16% | 18.39% | 0.97% |
| Caa2 | 0.00% | 0.00% | 0.21% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.21% | 0.42% | 1.48% | 9.51% | 59.20% | 5.50% | 2.11% | 17.12% | 4.23% |
| Caa3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.48% | 0.00% | 0.48% | 1.43% | 3.33% | 5.71% | 47.14% | 13.81% | 16.67% | 10.95% |
| Ca-C | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.81% | 1.63% | 4.88% | 13.01% | 35.77% | 16.26% | 27.64% |

Exhibit 29

Average One-Year Alphanumeric Rating Migration Rates, 1983-2017

| 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 | 86.84% | 5.42% | 2.38% | 0.56% | 0.28% | 0.15% | 0.02% | 0.06% | 0.00% | 0.02% | 0.01% | 0.01% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 4.24% | 0.00% |
| Aa1 | 1.73% | 76.01% | 8.21% | 6.10% | 1.50% | 0.94% | 0.19% | 0.13% | 0.08% | 0.01% | 0.04% | 0.00% | 0.01% | 0.04% | 0.03% | 0.01% | 0.02% | 0.02% | 0.00% | 0.00% | 4.95% | 0.00% |
| Aa2 | 1.06% | 4.35% | 73.12% | 10.25% | 3.59% | 1.68% | 0.40% | 0.09% | 0.16% | 0.07% | 0.03% | 0.02% | 0.00% | 0.03% | 0.01% | 0.02% | 0.00% | 0.02% | 0.00% | 0.00% | 5.10% | 0.00% |
| Aa3 | 0.16% | 1.05% | 4.19% | 75.23% | 8.58% | 3.66% | 0.85% | 0.24% | 0.25% | 0.13% | 0.03% | 0.03% | 0.01% | 0.01% | 0.00% | 0.00% | 0.00% | 0.01% | 0.00% | 0.00% | 5.52% | 0.04% |
| A1 | 0.05% | 0.10% | 1.01% | 5.12% | 75.70% | 7.78% | 2.88% | 0.67% | 0.48% | 0.22% | 0.19% | 0.13% | 0.05% | 0.06% | 0.01% | 0.01% | 0.02% | 0.01% | 0.01% | 0.00% | 5.44% | 0.07% |
| A2 | 0.05% | 0.03% | 0.21% | 1.06% | 5.78% | 76.04% | 7.46% | 2.67% | 1.04% | 0.39% | 0.18% | 0.14% | 0.17% | 0.06% | 0.03% | 0.01% | 0.02% | 0.02% | 0.01% | 0.00% | 4.58% | 0.05% |
| A3 | 0.05% | 0.05% | 0.10% | 0.31% | 1.58% | 6.33% | 74.78% | 6.95% | 2.81% | 0.92% | 0.38% | 0.16% | 0.13% | 0.11% | 0.04% | 0.02% | 0.03% | 0.01% | 0.00% | 0.02% | 5.18% | 0.05% |
| Baa1 | 0.03% | 0.03% | 0.08% | 0.12% | 0.21% | 1.68% | 6.75% | 74.56% | 7.17% | 2.44% | 0.65% | 0.36% | 0.24% | 0.28% | 0.06% | 0.04% | 0.06% | 0.03% | 0.01% | 0.02% | 5.07% | 0.13% |
| Baa2 | 0.04% | 0.04% | 0.02% | 0.06% | 0.18% | 0.59% | 2.05% | 6.52% | 75.08% | 6.60% | 1.41% | 0.66% | 0.47% | 0.34% | 0.20% | 0.09% | 0.11% | 0.01% | 0.02% | 0.01% | 5.31% | 0.17% |
| Baa3 | 0.03% | 0.01% | 0.02% | 0.04% | 0.08% | 0.18% | 0.50% | 1.93% | 8.59% | 72.69% | 4.89% | 2.17% | 1.04% | 0.74% | 0.30% | 0.25% | 0.16% | 0.07% | 0.06% | 0.04% | 5.97% | 0.25% |
| Ba1 | 0.02% | 0.00% | 0.02% | 0.02% | 0.16% | 0.13% | 0.22% | 0.76% | 2.58% | 9.97% | 65.34% | 5.09% | 4.27% | 1.62% | 0.64% | 0.54% | 0.13% | 0.21% | 0.03% | 0.11% | 7.71% | 0.44% |
| Ba2 | 0.00% | 0.00% | 0.02% | 0.03% | 0.09% | 0.12% | 0.17% | 0.39% | 0.72% | 3.81% | 7.91% | 63.59% | 6.82% | 3.79% | 1.34% | 0.95% | 0.32% | 0.22% | 0.09% | 0.13% | 8.78% | 0.71% |
| Ba3 | 0.00% | 0.01% | 0.01% | 0.01% | 0.07% | 0.18% | 0.18% | 0.10% | 0.47% | 0.81% | 2.85% | 6.63% | 63.98% | 7.39% | 3.24% | 1.89% | 0.63% | 0.42% | 0.10% | 0.13% | 9.54% | 1.36% |
| B1 | 0.01% | 0.01% | 0.02% | 0.01% | 0.05% | 0.03% | 0.08% | 0.10% | 0.22% | 0.32% | 0.73% | 2.88% | 6.44% | 63.64% | 6.17% | 4.45% | 1.35% | 0.73% | 0.22% | 0.26% | 10.32% | 1.97% |
| B2 | 0.00% | 0.01% | 0.00% | 0.01% | 0.02% | 0.02% | 0.10% | 0.13% | 0.14% | 0.27% | 0.21% | 0.68% | 2.06% | 7.26% | 61.90% | 7.94% | 3.66% | 1.79% | 0.43% | 0.49% | 9.94% | 2.95% |
| B3 | 0.01% | 0.00% | 0.02% | 0.00% | 0.03% | 0.03% | 0.06% | 0.03% | 0.04% | 0.11% | 0.13% | 0.22% | 0.63% | 2.27% | 6.27% | 60.20% | 7.51% | 3.36% | 1.16% | 0.84% | 12.19% | 4.87% |
| Caa1 | 0.00% | 0.01% | 0.00% | 0.00% | 0.00% | 0.01% | 0.00% | 0.02% | 0.00% | 0.03% | 0.06% | 0.12% | 0.22% | 0.40% | 1.35% | 7.68% | 59.37% | 8.19% | 2.77% | 1.39% | 13.85% | 4.51% |
| Caa2 | 0.00% | 0.00% | 0.01% | 0.00% | 0.02% | 0.01% | 0.00% | 0.00% | 0.06% | 0.10% | 0.05% | 0.06% | 0.18% | 0.38% | 0.84% | 2.37% | 7.92% | 53.92% | 6.05% | 3.01% | 15.43% | 9.59% |
| Caa3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.07% | 0.04% | 0.05% | 0.22% | 0.18% | 1.01% | 3.29% | 8.16% | 44.86% | 9.43% | 13.99% | 18.70% |
| Ca-C | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.02% | 0.03% | 0.00% | 0.00% | 0.00% | 0.26% | 0.15% | 0.16% | 0.16% | 0.23% | 1.85% | 2.01% | 3.28% | 3.80% | 38.70% | 22.49% | 26.86% |

Exhibit 30

Annual Issuer-Weighted Corporate Default Rates By Letter Rating, 1920-2017

| Year | Aaa | Aa | A | Baa | Ba | B | Caa-C | IG | SG | All |
|------|-------|-------|-------|-------|--------|--------|--------|-------|--------|-------|
| 1920 | 0.00% | 0.00% | 0.32% | 0.94% | 2.15% | 4.38% | 0.00% | 0.43% | 3.01% | 1.23% |
| 1921 | 0.00% | 0.19% | 0.35% | 0.65% | 0.44% | 2.68% | 13.33% | 0.39% | 2.15% | 1.07% |
| 1922 | 0.00% | 0.18% | 0.17% | 1.10% | 1.08% | 1.71% | 7.63% | 0.51% | 1.76% | 1.01% |
| 1923 | 0.00% | 0.00% | 0.00% | 0.62% | 0.93% | 2.27% | 5.93% | 0.24% | 1.70% | 0.80% |
| 1924 | 0.00% | 0.37% | 0.00% | 0.13% | 2.06% | 2.70% | 12.84% | 0.14% | 2.85% | 1.15% |
| 1925 | 0.00% | 0.00% | 0.14% | 0.71% | 1.74% | 2.59% | 14.40% | 0.32% | 2.56% | 1.17% |
| 1926 | 0.00% | 0.40% | 0.15% | 0.11% | 1.39% | 2.90% | 3.70% | 0.19% | 1.91% | 0.77% |
| 1927 | 0.00% | 0.00% | 0.21% | 0.00% | 1.30% | 1.98% | 12.84% | 0.07% | 1.83% | 0.74% |
| 1928 | 0.00% | 0.00% | 0.00% | 0.00% | 0.16% | 1.32% | 10.48% | 0.00% | 0.88% | 0.36% |
| 1929 | 0.00% | 0.29% | 0.00% | 0.45% | 0.82% | 0.92% | 9.73% | 0.24% | 1.40% | 0.72% |
| 1930 | 0.00% | 0.00% | 0.00% | 0.40% | 0.92% | 3.16% | 7.72% | 0.15% | 2.20% | 1.04% |
| 1931 | 0.00% | 0.00% | 0.27% | 1.08% | 3.00% | 9.52% | 31.67% | 0.50% | 7.90% | 3.81% |
| 1932 | 0.00% | 0.67% | 1.10% | 0.93% | 6.10% | 13.98% | 24.06% | 0.86% | 10.99% | 5.50% |
| 1933 | 0.00% | 0.00% | 0.26% | 1.77% | 11.55% | 16.15% | 25.92% | 0.79% | 15.71% | 8.49% |
| 1934 | 0.00% | 0.62% | 0.31% | 0.86% | 2.53% | 4.22% | 16.50% | 0.59% | 5.90% | 3.40% |
| 1935 | 0.00% | 0.00% | 1.43% | 1.92% | 5.13% | 4.27% | 13.02% | 1.29% | 6.25% | 3.93% |
| 1936 | 0.00% | 0.85% | 0.54% | 0.33% | 1.23% | 2.38% | 7.80% | 0.48% | 2.72% | 1.63% |
| 1937 | 0.00% | 0.00% | 0.51% | 1.04% | 1.00% | 2.67% | 9.07% | 0.62% | 2.75% | 1.72% |
| 1938 | 0.00% | 0.85% | 1.64% | 1.99% | 0.99% | 1.47% | 12.81% | 1.55% | 2.60% | 2.11% |
| 1939 | 0.00% | 0.00% | 0.00% | 0.99% | 0.62% | 1.74% | 6.07% | 0.41% | 1.77% | 1.22% |
| 1940 | 0.00% | 0.00% | 0.00% | 1.37% | 0.43% | 3.31% | 11.83% | 0.59% | 3.56% | 2.47% |
| 1941 | 0.00% | 0.00% | 0.00% | 0.00% | 0.97% | 0.81% | 5.07% | 0.00% | 1.71% | 1.09% |
| 1942 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.79% | 2.00% | 0.00% | 0.74% | 0.46% |
| 1943 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.36% | 0.00% | 0.00% | 0.62% | 0.37% |
| 1944 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.50% | 2.55% | 0.00% | 0.67% | 0.39% |
| 1945 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 3.57% | 0.00% | 0.56% | 0.31% |
| 1946 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 1947 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.72% | 2.78% | 0.00% | 0.64% | 0.32% |
| 1948 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 1949 | 0.00% | 0.00% | 0.00% | 0.00% | 1.36% | 1.03% | 8.57% | 0.00% | 1.93% | 0.84% |
| 1950 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 1951 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 4.76% | 0.00% | 0.43% | 0.18% |
| 1952 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 1953 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 1954 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 7.14% | 0.00% | 0.47% | 0.17% |
| 1955 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.61% | 0.00% | 0.00% | 0.52% | 0.17% |
| 1956 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 1957 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.27% | 0.00% | 0.00% | 0.45% | 0.14% |
| 1958 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 1959 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 1960 | 0.00% | 0.00% | 0.00% | 0.00% | 1.25% | 0.00% | 0.00% | 0.00% | 0.75% | 0.25% |
| 1961 | 0.00% | 0.00% | 0.00% | 0.00% | 0.60% | 0.00% | 8.70% | 0.00% | 1.07% | 0.35% |
| 1962 | 0.00% | 0.00% | 0.00% | 0.00% | 1.75% | 1.47% | 0.00% | 0.00% | 1.52% | 0.47% |
| 1963 | 0.00% | 0.00% | 0.00% | 0.00% | 1.16% | 1.47% | 0.00% | 0.00% | 1.15% | 0.35% |
| 1964 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 1965 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 1966 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 2.44% | 0.00% | 0.00% | 0.44% | 0.12% |
| 1967 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 1968 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 5.00% | 0.00% | 0.37% | 0.11% |
| 1969 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 1970 | 0.00% | 0.00% | 0.00% | 0.54% | 4.24% | 19.44% | 50.00% | 0.27% | 8.68% | 2.63% |
| 1971 | 0.00% | 0.00% | 0.00% | 0.00% | 0.89% | 0.00% | 12.50% | 0.00% | 1.16% | 0.29% |
| 1972 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 6.90% | 37.50% | 0.00% | 1.92% | 0.45% |
| 1973 | 0.00% | 0.00% | 0.00% | 0.46% | 0.00% | 3.85% | 37.50% | 0.23% | 1.28% | 0.46% |
| 1974 | 0.00% | 0.00% | 0.00% | 0.00% | 0.51% | 7.16% | 0.00% | 0.00% | 1.33% | 0.28% |
| 1975 | 0.00% | 0.00% | 0.00% | 0.00% | 1.03% | 6.16% | 0.00% | 0.00% | 1.74% | 0.36% |
| 1976 | 0.00% | 0.00% | 0.00% | 0.00% | 1.00% | 0.00% | 0.00% | 0.00% | 0.87% | 0.18% |
| 1977 | 0.00% | 0.00% | 0.00% | 0.29% | 0.54% | 3.23% | 33.33% | 0.11% | 1.36% | 0.35% |

| | | | | | | | | | | |
|--------|-------|-------|-------|-------|--------|--------|--------|-------|--------|-------|
| 1978 | 0.00% | 0.00% | 0.00% | 0.00% | 1.12% | 5.41% | 0.00% | 0.00% | 1.82% | 0.35% |
| 1979 | 0.00% | 0.00% | 0.00% | 0.00% | 0.51% | 0.00% | 0.00% | 0.00% | 0.43% | 0.09% |
| 1980 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 5.00% | 33.33% | 0.00% | 1.63% | 0.34% |
| 1981 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 4.40% | 0.00% | 0.00% | 0.70% | 0.16% |
| 1982 | 0.00% | 0.00% | 0.26% | 0.33% | 2.79% | 2.22% | 23.08% | 0.21% | 3.55% | 1.04% |
| 1983 | 0.00% | 0.00% | 0.00% | 0.00% | 1.16% | 2.30% | 42.31% | 0.00% | 4.06% | 0.90% |
| 1984 | 0.00% | 0.00% | 0.00% | 0.62% | 0.52% | 5.34% | 18.18% | 0.18% | 3.13% | 0.87% |
| 1985 | 0.00% | 0.00% | 0.00% | 0.00% | 0.87% | 7.31% | 6.67% | 0.00% | 3.77% | 0.95% |
| 1986 | 0.00% | 0.00% | 0.00% | 0.87% | 2.36% | 10.54% | 17.11% | 0.21% | 6.16% | 1.83% |
| 1987 | 0.00% | 0.00% | 0.00% | 0.00% | 3.03% | 5.44% | 9.82% | 0.00% | 4.31% | 1.42% |
| 1988 | 0.00% | 0.00% | 0.00% | 0.00% | 1.36% | 5.93% | 12.50% | 0.00% | 3.85% | 1.39% |
| 1989 | 0.00% | 0.50% | 0.00% | 0.53% | 2.96% | 7.55% | 20.33% | 0.25% | 5.91% | 2.23% |
| 1990 | 0.00% | 0.00% | 0.00% | 0.26% | 3.77% | 13.74% | 43.91% | 0.06% | 10.54% | 3.57% |
| 1991 | 0.00% | 0.00% | 0.00% | 0.25% | 3.84% | 13.24% | 15.35% | 0.06% | 9.10% | 2.80% |
| 1992 | 0.00% | 0.00% | 0.00% | 0.00% | 0.34% | 7.37% | 16.49% | 0.00% | 4.93% | 1.34% |
| 1993 | 0.00% | 0.00% | 0.00% | 0.00% | 0.62% | 4.38% | 13.53% | 0.00% | 3.40% | 0.90% |
| 1994 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 4.19% | 5.39% | 0.00% | 2.34% | 0.65% |
| 1995 | 0.00% | 0.00% | 0.00% | 0.00% | 0.27% | 4.01% | 10.55% | 0.00% | 3.06% | 0.90% |
| 1996 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.50% | 10.31% | 0.00% | 1.65% | 0.51% |
| 1997 | 0.00% | 0.00% | 0.00% | 0.00% | 0.18% | 2.00% | 9.82% | 0.00% | 1.89% | 0.62% |
| 1998 | 0.00% | 0.00% | 0.00% | 0.11% | 0.90% | 3.88% | 8.34% | 0.03% | 3.03% | 1.14% |
| 1999 | 0.00% | 0.00% | 0.00% | 0.09% | 1.50% | 4.90% | 16.18% | 0.03% | 5.36% | 2.12% |
| 2000 | 0.00% | 0.00% | 0.00% | 0.35% | 1.27% | 5.74% | 17.90% | 0.13% | 6.08% | 2.45% |
| 2001 | 0.00% | 0.00% | 0.16% | 0.18% | 1.16% | 9.24% | 29.96% | 0.12% | 9.63% | 3.68% |
| 2002 | 0.00% | 0.00% | 0.16% | 1.01% | 1.40% | 4.68% | 26.81% | 0.43% | 7.66% | 2.92% |
| 2003 | 0.00% | 0.00% | 0.00% | 0.00% | 0.88% | 2.70% | 20.58% | 0.00% | 5.33% | 1.85% |
| 2004 | 0.00% | 0.00% | 0.00% | 0.00% | 0.38% | 0.80% | 11.82% | 0.00% | 2.42% | 0.83% |
| 2005 | 0.00% | 0.00% | 0.00% | 0.16% | 0.00% | 0.82% | 7.32% | 0.06% | 1.72% | 0.65% |
| 2006 | 0.00% | 0.00% | 0.00% | 0.00% | 0.19% | 1.07% | 5.91% | 0.00% | 1.67% | 0.59% |
| 2007 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 4.95% | 0.00% | 0.95% | 0.35% |
| 2008 | 0.00% | 0.51% | 0.40% | 1.02% | 2.34% | 3.99% | 10.69% | 0.63% | 5.43% | 2.51% |
| 2009 | 0.00% | 0.00% | 0.24% | 0.93% | 1.76% | 7.21% | 26.07% | 0.43% | 12.11% | 5.01% |
| 2010 | 0.00% | 0.00% | 0.17% | 0.07% | 0.00% | 0.38% | 8.54% | 0.10% | 3.01% | 1.23% |
| 2011 | 0.00% | 0.19% | 0.00% | 0.35% | 0.16% | 0.34% | 5.87% | 0.19% | 1.98% | 0.91% |
| 2012 | 0.00% | 0.00% | 0.00% | 0.07% | 0.14% | 0.54% | 7.77% | 0.03% | 2.76% | 1.23% |
| 2013 | 0.00% | 0.00% | 0.09% | 0.12% | 0.58% | 0.91% | 6.22% | 0.10% | 2.63% | 1.23% |
| 2014 | 0.00% | 0.00% | 0.09% | 0.06% | 0.14% | 0.50% | 4.58% | 0.06% | 1.94% | 0.94% |
| 2015 | 0.00% | 0.00% | 0.00% | 0.00% | 0.29% | 2.25% | 6.81% | 0.00% | 3.67% | 1.75% |
| 2016 | 0.00% | 0.00% | 0.00% | 0.00% | 0.13% | 1.54% | 9.02% | 0.00% | 4.45% | 2.14% |
| 2017 | 0.00% | 0.00% | 0.00% | 0.00% | 0.25% | 0.32% | 6.43% | 0.00% | 2.91% | 1.41% |
| Mean | 0.00% | 0.06% | 0.09% | 0.27% | 1.02% | 3.17% | 10.50% | 0.15% | 2.81% | 1.16% |
| Median | 0.00% | 0.00% | 0.00% | 0.00% | 0.53% | 1.99% | 7.74% | 0.00% | 1.90% | 0.82% |
| St Dev | 0.00% | 0.17% | 0.26% | 0.45% | 1.60% | 3.81% | 11.22% | 0.27% | 2.96% | 1.36% |
| Min | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Max | 0.00% | 0.85% | 1.64% | 1.99% | 11.55% | 19.44% | 50.00% | 1.55% | 15.71% | 8.49% |

Exhibit 31

Annual Issuer-Weighted Corporate Default Rates By Alphanumeric Rating, 1983-2017

| Year | Aaa | Aa1 | Aa2 | Aa3 | A1 | A2 | A3 | Baa1 | Baa2 | Baa3 | Ba1 | Ba2 | Ba3 | B1 | B2 | B3 | Caa1 | Caa2 | Caa3 | Ca-C | IG | SG | All |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|-------|--------|-------|
| 1983 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 3.08% | 1.01% | 0.00% | 8.52% | | 42.31% | | | 0.00% | 4.06% | 0.90% |
| 1984 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.83% | 0.00% | 1.67% | 0.00% | 6.49% | 0.00% | 3.33% | | 18.18% | | | 0.18% | 3.13% | 0.87% |
| 1985 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.64% | 1.15% | 4.53% | 5.56% | 14.21% | | 6.67% | | | 0.00% | 3.77% | 0.95% |
| 1986 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.81% | 1.94% | 1.23% | 1.10% | 4.00% | 8.66% | 714% | 15.80% | | 1711% | | | 0.21% | 6.16% | 1.83% |
| 1987 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 5.05% | 0.93% | 3.13% | 4.17% | 5.66% | 8.20% | | 10.16% | | 0.00% | 0.00% | 4.31% | 1.42% |
| 1988 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 2.77% | 4.24% | 4.46% | 11.27% | | 10.53% | | 50.00% | 0.00% | 3.85% | 1.39% |
| 1989 | 0.00% | 0.00% | 0.00% | 1.08% | 0.00% | 0.00% | 0.00% | 0.00% | 0.74% | 0.80% | 1.00% | 1.82% | 4.60% | 6.70% | 5.30% | 13.45% | | 21.43% | | 0.00% | 0.25% | 5.91% | 2.23% |
| 1990 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.96% | 1.08% | 5.84% | 3.96% | 6.86% | 16.72% | 25.21% | | 45.16% | | 33.33% | 0.06% | 10.54% | 3.57% |
| 1991 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.70% | 0.00% | 0.00% | 1.05% | 0.00% | 7.22% | 7.46% | 7.16% | 30.14% | | 15.30% | | 16.67% | 0.06% | 9.10% | 2.80% |
| 1992 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.76% | 1.44% | 1.41% | 23.32% | | 18.41% | | 7.69% | 0.00% | 4.93% | 1.34% |
| 1993 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.03% | 0.00% | 0.79% | 2.81% | 1.35% | 12.00% | | 14.43% | | 9.09% | 0.00% | 3.40% | 0.90% |
| 1994 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 2.51% | 2.71% | 9.50% | | 5.10% | | 7.14% | 0.00% | 2.34% | 0.65% |
| 1995 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.68% | 3.68% | 5.74% | 1.97% | | 6.23% | | 23.07% | 0.00% | 3.06% | 0.90% |
| 1996 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.38% | 1.27% | 4.06% | | 11.13% | | 5.88% | 0.00% | 1.65% | 0.51% |
| 1997 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.45% | 0.32% | 0.51% | 7.20% | | 8.68% | | 15.19% | 0.00% | 1.89% | 0.62% |
| 1998 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.29% | 0.00% | 0.00% | 1.16% | 1.54% | 2.69% | 4.43% | 5.28% | 4.55% | 8.06% | 37.50% | 5.26% | 0.03% | 3.03% | 1.14% |
| 1999 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.30% | 0.47% | 0.91% | 3.02% | 3.05% | 3.85% | 8.92% | 10.72% | 26.35% | 14.43% | 18.96% | 0.03% | 5.36% | 2.12% |
| 2000 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.27% | 0.00% | 0.88% | 0.48% | 1.38% | 1.98% | 2.28% | 4.22% | 11.81% | 13.08% | 26.39% | 19.19% | 17.19% | 0.13% | 6.08% | 2.45% |
| 2001 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.41% | 0.00% | 0.28% | 0.25% | 0.00% | 0.00% | 1.00% | 2.54% | 3.27% | 9.63% | 15.60% | 27.23% | 28.32% | 37.89% | 34.63% | 0.12% | 9.63% | 3.68% |
| 2002 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.43% | 0.99% | 0.90% | 1.18% | 2.07% | 1.14% | 0.99% | 2.55% | 5.08% | 6.61% | 18.18% | 21.55% | 31.95% | 39.13% | 0.43% | 7.66% | 2.92% |
| 2003 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.54% | 0.62% | 1.39% | 0.70% | 2.66% | 5.21% | 9.68% | 22.39% | 27.42% | 30.32% | 0.00% | 5.33% | 1.85% |
| 2004 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.98% | 0.00% | 0.56% | 2.20% | 7.81% | 9.17% | 11.91% | 29.13% | 0.00% | 2.42% | 0.83% |
| 2005 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.22% | 0.29% | 0.00% | 0.00% | 0.00% | 0.00% | 0.50% | 2.02% | 4.50% | 6.07% | 23.48% | 13.82% | 0.06% | 1.72% | 0.65% |
| 2006 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.64% | 0.65% | 0.30% | 2.11% | 2.39% | 7.51% | 13.71% | 14.59% | 0.00% | 1.67% | 0.59% |
| 2007 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.85% | 10.52% | 6.91% | 41.39% | 0.00% | 0.95% | 0.35% |
| 2008 | 0.00% | 0.00% | 0.00% | 1.49% | 1.05% | 0.23% | 0.00% | 0.97% | 1.38% | 0.61% | 0.92% | 2.97% | 3.30% | 3.04% | 3.98% | 4.60% | 5.92% | 17.52% | 35.32% | 42.40% | 0.63% | 5.43% | 2.51% |
| 2009 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.69% | 1.02% | 0.87% | 0.91% | 1.43% | 1.21% | 2.58% | 3.37% | 6.89% | 10.00% | 11.61% | 34.77% | 54.00% | 64.84% | 0.43% | 12.11% | 5.01% |
| 2010 | 0.00% | 0.00% | 0.00% | 0.00% | 0.31% | 0.00% | 0.22% | 0.00% | 0.00% | 0.24% | 0.00% | 0.00% | 0.00% | 0.84% | 0.00% | 0.28% | 1.77% | 7.33% | 23.79% | 25.20% | 0.10% | 3.01% | 1.23% |
| 2011 | 0.00% | 0.00% | 0.00% | 0.42% | 0.00% | 0.00% | 0.00% | 0.00% | 0.20% | 0.87% | 0.00% | 0.56% | 0.00% | 0.00% | 0.46% | 0.52% | 1.96% | 7.65% | 15.74% | 20.11% | 0.19% | 1.98% | 0.91% |
| 2012 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.22% | 0.00% | 0.00% | 0.00% | 0.00% | 0.41% | 0.00% | 0.76% | 0.75% | 2.73% | 9.07% | 17.26% | 44.89% | 0.03% | 2.76% | 1.23% |
| 2013 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.22% | 0.00% | 0.16% | 0.19% | 0.00% | 0.00% | 1.57% | 0.70% | 1.26% | 0.84% | 2.27% | 6.46% | 10.50% | 57.97% | 0.10% | 2.63% | 1.23% |
| 2014 | 0.00% | 0.00% | 0.00% | 0.00% | 0.40% | 0.00% | 0.00% | 0.00% | 0.00% | 0.18% | 0.00% | 0.00% | 0.35% | 0.34% | 1.09% | 0.23% | 1.99% | 4.18% | 11.24% | 25.55% | 0.06% | 1.94% | 0.94% |
| 2015 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.90% | 0.00% | 0.00% | 0.69% | 2.99% | 2.78% | 4.31% | 5.28% | 15.14% | 34.13% | 0.00% | 3.67% | 1.75% |
| 2016 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.39% | 1.00% | 1.01% | 2.34% | 3.84% | 5.63% | 18.11% | 47.19% | 0.00% | 4.45% | 2.14% |
| 2017 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.41% | 0.35% | 0.00% | 0.39% | 0.55% | 1.08% | 4.71% | 12.19% | 30.80% | 0.00% | 2.91% | 1.41% |
| Mean | 0.00% | 0.00% | 0.00% | 0.09% | 0.05% | 0.02% | 0.04% | 0.13% | 0.17% | 0.32% | 0.49% | 0.70% | 1.56% | 2.47% | 3.29% | 7.74% | | 14.85% | | | 0.09% | 4.37% | 1.59% |
| Median | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.98% | 2.28% | 2.66% | 5.28% | | 10.52% | | | 0.03% | 3.67% | 1.23% |
| St Dev | 0.00% | 0.00% | 0.00% | 0.31% | 0.19% | 0.08% | 0.14% | 0.30% | 0.34% | 0.53% | 0.96% | 1.16% | 1.69% | 2.43% | 3.50% | 7.51% | | 10.65% | | | 0.15% | 2.69% | 1.04% |
| Min | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.08% | 4.18% | 6.91% | 0.00% | 0.00% | 0.95% | 0.35% |

| | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|-------|--------|-------|
| Max | 0.00% | 0.00% | 0.00% | 1.49% | 1.05% | 0.41% | 0.69% | 1.02% | 1.38% | 1.94% | 5.05% | 5.84% | 7.22% | 8.66% | 16.72% | 30.14% | 27.23% | 45.16% | 54.00% | 64.84% | 0.63% | 12.11% | 5.01% |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|-------|--------|-------|

Exhibit 32

Average Cumulative Issuer-Weighted Global Default Rates By Letter Rating, 1920-2017

| Rating | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Aaa | 0.00% | 0.01% | 0.03% | 0.07% | 0.14% | 0.21% | 0.30% | 0.43% | 0.56% | 0.71% | 0.84% | 0.95% | 1.06% | 1.09% | 1.12% | 1.18% | 1.24% | 1.29% | 1.35% | 1.39% |
| Aa | 0.06% | 0.18% | 0.28% | 0.43% | 0.66% | 0.93% | 1.20% | 1.45% | 1.69% | 1.96% | 2.26% | 2.59% | 2.92% | 3.24% | 3.47% | 3.66% | 3.83% | 4.03% | 4.27% | 4.48% |
| A | 0.08% | 0.25% | 0.51% | 0.81% | 1.12% | 1.47% | 1.83% | 2.19% | 2.58% | 2.99% | 3.40% | 3.81% | 4.18% | 4.55% | 4.99% | 5.37% | 5.68% | 5.98% | 6.27% | 6.56% |
| Baa | 0.26% | 0.72% | 1.26% | 1.86% | 2.48% | 3.10% | 3.70% | 4.31% | 4.96% | 5.59% | 6.24% | 6.89% | 7.55% | 8.14% | 8.68% | 9.25% | 9.81% | 10.32% | 10.81% | 11.30% |
| Ba | 1.21% | 2.87% | 4.71% | 6.64% | 8.50% | 10.27% | 11.88% | 13.44% | 14.95% | 16.54% | 17.92% | 19.30% | 20.62% | 21.80% | 22.93% | 24.02% | 25.09% | 26.12% | 27.05% | 27.90% |
| B | 3.42% | 7.78% | 12.15% | 16.12% | 19.67% | 22.79% | 25.61% | 28.01% | 30.16% | 32.01% | 33.67% | 35.16% | 36.60% | 38.07% | 39.46% | 40.84% | 42.11% | 43.14% | 43.92% | 44.49% |
| Caa-C | 10.11% | 17.72% | 23.85% | 28.87% | 32.89% | 36.06% | 38.80% | 41.29% | 43.68% | 45.73% | 47.75% | 49.56% | 51.12% | 52.68% | 54.33% | 55.94% | 57.42% | 58.82% | 60.21% | 61.68% |
| IG | 0.14% | 0.40% | 0.72% | 1.08% | 1.48% | 1.88% | 2.29% | 2.70% | 3.13% | 3.56% | 4.01% | 4.46% | 4.89% | 5.30% | 5.69% | 6.06% | 6.39% | 6.71% | 7.03% | 7.34% |
| SG | 3.71% | 7.44% | 10.93% | 14.06% | 16.82% | 19.22% | 21.36% | 23.27% | 25.04% | 26.71% | 28.19% | 29.60% | 30.93% | 32.20% | 33.41% | 34.58% | 35.71% | 36.73% | 37.62% | 38.42% |
| All | 1.50% | 3.01% | 4.42% | 5.68% | 6.80% | 7.78% | 8.66% | 9.45% | 10.21% | 10.94% | 11.62% | 12.28% | 12.90% | 13.48% | 14.03% | 14.56% | 15.04% | 15.49% | 15.91% | 16.30% |

Exhibit 33

Average Cumulative Issuer-Weighted Global Default Rates By Letter Rating, 1970-2017

| Rating | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Aaa | 0.00% | 0.01% | 0.01% | 0.03% | 0.08% | 0.14% | 0.19% | 0.25% | 0.31% | 0.38% | 0.45% | 0.52% | 0.60% | 0.64% | 0.68% | 0.73% | 0.78% | 0.80% | 0.80% | 0.80% |
| Aa | 0.02% | 0.06% | 0.11% | 0.19% | 0.29% | 0.40% | 0.52% | 0.63% | 0.71% | 0.79% | 0.89% | 1.02% | 1.17% | 1.29% | 1.39% | 1.49% | 1.62% | 1.78% | 2.02% | 2.26% |
| A | 0.05% | 0.16% | 0.33% | 0.52% | 0.74% | 0.99% | 1.26% | 1.54% | 1.85% | 2.15% | 2.45% | 2.74% | 3.04% | 3.36% | 3.72% | 4.08% | 4.44% | 4.82% | 5.17% | 5.53% |
| Baa | 0.17% | 0.44% | 0.77% | 1.16% | 1.55% | 1.95% | 2.35% | 2.77% | 3.24% | 3.75% | 4.30% | 4.88% | 5.48% | 6.07% | 6.65% | 7.29% | 7.94% | 8.56% | 9.13% | 9.65% |
| Ba | 0.92% | 2.52% | 4.38% | 6.36% | 8.20% | 9.90% | 11.39% | 12.85% | 14.34% | 15.88% | 17.33% | 18.81% | 20.19% | 21.53% | 22.93% | 24.31% | 25.54% | 26.64% | 27.80% | 28.71% |
| B | 3.45% | 8.15% | 12.96% | 17.32% | 21.31% | 24.92% | 28.17% | 30.92% | 33.42% | 35.51% | 37.25% | 38.76% | 40.18% | 41.71% | 43.16% | 44.52% | 45.77% | 46.87% | 47.79% | 48.71% |
| Caa-C | 10.22% | 18.04% | 24.64% | 30.17% | 34.67% | 38.09% | 41.12% | 44.04% | 46.76% | 48.90% | 50.57% | 51.34% | 51.75% | 51.84% | 52.04% | 52.43% | 52.53% | 52.53% | 52.53% | 52.53% |
| IG | 0.09% | 0.24% | 0.43% | 0.66% | 0.90% | 1.17% | 1.43% | 1.71% | 2.00% | 2.31% | 2.62% | 2.95% | 3.29% | 3.62% | 3.96% | 4.32% | 4.68% | 5.04% | 5.39% | 5.72% |
| SG | 4.07% | 8.23% | 12.17% | 15.67% | 18.72% | 21.35% | 23.65% | 25.68% | 27.58% | 29.29% | 30.79% | 32.17% | 33.43% | 34.69% | 35.95% | 37.17% | 38.26% | 39.23% | 40.18% | 40.98% |
| All | 1.53% | 3.06% | 4.45% | 5.66% | 6.68% | 7.56% | 8.32% | 8.99% | 9.63% | 10.22% | 10.76% | 11.28% | 11.78% | 12.26% | 12.75% | 13.23% | 13.69% | 14.13% | 14.54% | 14.93% |

Exhibit 34

Average Cumulative Issuer-Weighted Global Default Rates By Letter Rating, 1983-2017

| Rating | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Aaa | 0.00% | 0.01% | 0.01% | 0.04% | 0.07% | 0.10% | 0.13% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% |
| Aa | 0.02% | 0.06% | 0.12% | 0.20% | 0.31% | 0.40% | 0.50% | 0.58% | 0.66% | 0.74% | 0.85% | 0.99% | 1.13% | 1.23% | 1.33% | 1.43% | 1.54% | 1.72% | 1.97% | 2.19% |
| A | 0.06% | 0.17% | 0.36% | 0.56% | 0.80% | 1.07% | 1.35% | 1.63% | 1.92% | 2.20% | 2.48% | 2.74% | 3.03% | 3.36% | 3.75% | 4.15% | 4.54% | 4.96% | 5.30% | 5.64% |
| Baa | 0.18% | 0.46% | 0.78% | 1.15% | 1.53% | 1.93% | 2.30% | 2.67% | 3.05% | 3.46% | 3.93% | 4.43% | 4.97% | 5.48% | 5.99% | 6.57% | 7.19% | 7.77% | 8.31% | 8.69% |
| Ba | 0.91% | 2.57% | 4.57% | 6.66% | 8.50% | 10.15% | 11.63% | 13.01% | 14.36% | 15.70% | 16.87% | 18.05% | 19.14% | 20.27% | 21.49% | 22.62% | 23.60% | 24.57% | 25.67% | 26.39% |
| B | 3.44% | 8.18% | 13.02% | 17.38% | 21.40% | 25.04% | 28.31% | 31.06% | 33.49% | 35.50% | 37.15% | 38.61% | 39.99% | 41.50% | 42.87% | 44.14% | 45.44% | 46.67% | 47.69% | 48.74% |
| Caa-C | 10.14% | 17.93% | 24.55% | 30.12% | 34.61% | 37.99% | 40.99% | 43.87% | 46.64% | 48.91% | 50.70% | 51.54% | 51.98% | 52.07% | 52.29% | 52.71% | 52.83% | 52.83% | 52.83% | 52.83% |
| IG | 0.09% | 0.25% | 0.45% | 0.67% | 0.92% | 1.18% | 1.43% | 1.68% | 1.93% | 2.19% | 2.46% | 2.74% | 3.05% | 3.35% | 3.67% | 4.01% | 4.35% | 4.71% | 5.05% | 5.33% |
| SG | 4.19% | 8.51% | 12.64% | 16.29% | 19.44% | 22.16% | 24.53% | 26.60% | 28.47% | 30.10% | 31.46% | 32.67% | 33.79% | 34.94% | 36.08% | 37.15% | 38.12% | 39.05% | 40.00% | 40.75% |
| All | 1.64% | 3.29% | 4.80% | 6.09% | 7.18% | 8.10% | 8.88% | 9.56% | 10.17% | 10.72% | 11.21% | 11.66% | 12.11% | 12.56% | 13.01% | 13.46% | 13.89% | 14.32% | 14.73% | 15.06% |

Exhibit 35

Average Cumulative Issuer-Weighted Global Default Rates By Alphanumeric Rating, 1983-2017

| Rating | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Aaa | 0.00% | 0.01% | 0.01% | 0.04% | 0.07% | 0.10% | 0.13% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% | 0.14% |
| Aa1 | 0.00% | 0.00% | 0.00% | 0.05% | 0.10% | 0.14% | 0.15% | 0.15% | 0.17% | 0.23% | 0.29% | 0.37% | 0.52% | 0.69% | 0.88% | 1.02% | 1.13% | 1.27% | 1.40% | 1.40% |
| Aa2 | 0.00% | 0.01% | 0.11% | 0.24% | 0.35% | 0.43% | 0.52% | 0.62% | 0.75% | 0.90% | 1.03% | 1.17% | 1.30% | 1.36% | 1.43% | 1.56% | 1.79% | 2.05% | 2.30% | 2.55% |
| Aa3 | 0.05% | 0.12% | 0.17% | 0.25% | 0.37% | 0.49% | 0.64% | 0.76% | 0.82% | 0.88% | 0.99% | 1.15% | 1.29% | 1.39% | 1.47% | 1.53% | 1.58% | 1.72% | 2.01% | 2.30% |
| A1 | 0.07% | 0.21% | 0.42% | 0.63% | 0.83% | 1.06% | 1.26% | 1.44% | 1.59% | 1.77% | 1.96% | 2.15% | 2.37% | 2.64% | 2.91% | 3.17% | 3.44% | 3.68% | 3.81% | 3.94% |
| A2 | 0.05% | 0.14% | 0.30% | 0.51% | 0.75% | 1.09% | 1.43% | 1.79% | 2.16% | 2.53% | 2.89% | 3.21% | 3.52% | 3.89% | 4.31% | 4.78% | 5.34% | 5.89% | 6.31% | 6.70% |
| A3 | 0.06% | 0.17% | 0.38% | 0.56% | 0.83% | 1.06% | 1.33% | 1.64% | 1.98% | 2.26% | 2.51% | 2.77% | 3.10% | 3.47% | 3.96% | 4.40% | 4.71% | 5.18% | 5.68% | 6.20% |
| Baa1 | 0.13% | 0.35% | 0.61% | 0.88% | 1.13% | 1.37% | 1.60% | 1.77% | 1.95% | 2.19% | 2.51% | 2.94% | 3.40% | 3.80% | 4.30% | 4.91% | 5.50% | 5.93% | 6.15% | 6.30% |
| Baa2 | 0.17% | 0.43% | 0.72% | 1.10% | 1.44% | 1.81% | 2.19% | 2.55% | 2.97% | 3.44% | 4.01% | 4.59% | 5.19% | 5.73% | 6.22% | 6.64% | 7.04% | 7.53% | 8.14% | 8.61% |
| Baa3 | 0.25% | 0.62% | 1.03% | 1.52% | 2.11% | 2.72% | 3.25% | 3.89% | 4.48% | 5.05% | 5.57% | 6.04% | 6.62% | 7.25% | 7.78% | 8.57% | 9.52% | 10.41% | 11.33% | 11.91% |
| Ba1 | 0.45% | 1.50% | 2.76% | 4.00% | 5.31% | 6.54% | 7.52% | 8.31% | 9.08% | 9.91% | 10.78% | 11.65% | 12.41% | 13.05% | 13.96% | 14.86% | 15.50% | 16.38% | 17.81% | 19.03% |
| Ba2 | 0.74% | 1.92% | 3.36% | 4.85% | 6.16% | 7.24% | 8.25% | 9.39% | 10.71% | 12.09% | 13.16% | 14.19% | 14.90% | 15.74% | 16.81% | 17.48% | 18.17% | 18.70% | 19.40% | 19.50% |
| Ba3 | 1.43% | 4.00% | 7.06% | 10.40% | 13.17% | 15.72% | 18.10% | 20.32% | 22.32% | 24.19% | 25.81% | 27.49% | 29.40% | 31.47% | 33.29% | 35.30% | 37.11% | 38.73% | 39.87% | 40.47% |
| B1 | 2.09% | 5.59% | 9.44% | 13.07% | 16.73% | 20.10% | 23.46% | 26.44% | 29.11% | 31.22% | 33.04% | 34.54% | 36.27% | 38.24% | 39.77% | 40.97% | 42.16% | 43.43% | 44.76% | 46.10% |
| B2 | 3.11% | 7.90% | 12.68% | 17.12% | 20.87% | 24.29% | 27.29% | 29.70% | 32.02% | 34.07% | 35.71% | 37.50% | 38.85% | 40.19% | 41.84% | 43.67% | 45.31% | 46.55% | 47.15% | 48.04% |
| B3 | 5.15% | 11.18% | 17.23% | 22.40% | 27.23% | 31.64% | 35.22% | 38.20% | 40.52% | 42.36% | 43.80% | 44.64% | 45.39% | 46.20% | 46.64% | 46.95% | 47.93% | 49.17% | 50.27% | 50.62% |
| Caa | 8.35% | 15.99% | 22.60% | 28.24% | 32.87% | 36.44% | 39.55% | 42.63% | 45.70% | 48.35% | 50.36% | 51.12% | 51.50% | 51.63% | 51.93% | 52.51% | 52.67% | 52.67% | 52.67% | 52.67% |
| Ca-C | 30.44% | 40.31% | 47.28% | 52.11% | 54.98% | 56.27% | 58.09% | 59.19% | 59.57% | 59.57% | 60.16% | 61.08% | 61.65% | 61.65% | 61.65% | 61.65% | 61.65% | 61.65% | 61.65% | 61.65% |
| IG | 0.09% | 0.25% | 0.45% | 0.67% | 0.92% | 1.18% | 1.43% | 1.68% | 1.93% | 2.19% | 2.46% | 2.74% | 3.05% | 3.35% | 3.67% | 4.01% | 4.35% | 4.71% | 5.05% | 5.33% |
| SG | 4.19% | 8.51% | 12.64% | 16.29% | 19.44% | 22.16% | 24.53% | 26.60% | 28.47% | 30.10% | 31.46% | 32.67% | 33.79% | 34.94% | 36.08% | 37.15% | 38.12% | 39.05% | 40.00% | 40.75% |
| All | 1.64% | 3.29% | 4.80% | 6.09% | 7.18% | 8.10% | 8.88% | 9.56% | 10.17% | 10.72% | 11.21% | 11.66% | 12.11% | 12.56% | 13.01% | 13.46% | 13.89% | 14.32% | 14.73% | 15.06% |

Exhibit 36

Average Cumulative Issuer-Weighted Global Default Rates By Alphanumeric Rating, 1998-2017

| Rating | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Aaa | 0.00% | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% |
| Aa1 | 0.00% | 0.00% | 0.00% | 0.00% | 0.03% | 0.09% | 0.09% | 0.09% | 0.14% | 0.24% |
| Aa2 | 0.00% | 0.01% | 0.14% | 0.29% | 0.38% | 0.48% | 0.59% | 0.71% | 0.89% | 1.05% |
| Aa3 | 0.05% | 0.13% | 0.18% | 0.25% | 0.39% | 0.54% | 0.80% | 1.00% | 1.10% | 1.20% |
| A1 | 0.11% | 0.25% | 0.43% | 0.64% | 0.89% | 1.18% | 1.47% | 1.73% | 1.97% | 2.23% |
| A2 | 0.07% | 0.20% | 0.39% | 0.58% | 0.85% | 1.26% | 1.64% | 2.08% | 2.60% | 3.23% |
| A3 | 0.07% | 0.19% | 0.42% | 0.63% | 0.95% | 1.14% | 1.41% | 1.75% | 2.19% | 2.62% |
| Baa1 | 0.15% | 0.39% | 0.64% | 0.91% | 1.10% | 1.31% | 1.50% | 1.69% | 1.87% | 2.17% |
| Baa2 | 0.19% | 0.43% | 0.69% | 0.97% | 1.20% | 1.48% | 1.71% | 1.90% | 2.23% | 2.57% |
| Baa3 | 0.25% | 0.60% | 0.96% | 1.35% | 1.81% | 2.19% | 2.59% | 3.18% | 3.70% | 4.33% |
| Ba1 | 0.31% | 1.20% | 2.15% | 3.01% | 4.15% | 5.15% | 6.04% | 6.78% | 7.67% | 8.62% |
| Ba2 | 0.68% | 1.60% | 2.84% | 4.12% | 5.24% | 6.10% | 6.83% | 8.02% | 9.39% | 10.96% |
| Ba3 | 0.96% | 2.67% | 4.65% | 6.85% | 8.42% | 9.97% | 11.62% | 13.52% | 15.27% | 16.72% |
| B1 | 1.33% | 4.06% | 7.10% | 10.13% | 12.86% | 15.34% | 17.89% | 20.27% | 22.59% | 24.72% |
| B2 | 2.79% | 7.28% | 11.95% | 16.47% | 19.93% | 23.02% | 25.74% | 28.09% | 30.42% | 32.40% |
| B3 | 3.84% | 9.31% | 15.25% | 20.17% | 24.60% | 28.57% | 31.72% | 34.37% | 36.85% | 38.80% |
| Caa1 | 4.78% | 11.14% | 17.18% | 22.42% | 26.88% | 30.42% | 33.32% | 36.02% | 39.11% | 42.13% |
| Caa2 | 9.46% | 17.86% | 25.19% | 31.72% | 36.83% | 40.94% | 44.63% | 48.38% | 51.99% | 52.76% |
| Caa3 | 19.70% | 31.91% | 40.07% | 45.14% | 49.15% | 51.73% | 55.22% | 58.36% | 59.16% | 59.16% |
| Ca-C | 32.87% | 43.91% | 51.64% | 56.52% | 59.58% | 61.00% | 62.94% | 64.12% | 64.52% | 64.52% |
| IG | 0.12% | 0.28% | 0.49% | 0.70% | 0.94% | 1.18% | 1.43% | 1.71% | 2.01% | 2.35% |
| SG | 4.16% | 8.42% | 12.46% | 15.93% | 18.76% | 21.12% | 23.20% | 25.11% | 26.97% | 28.58% |
| All | 1.76% | 3.49% | 5.07% | 6.38% | 7.42% | 8.28% | 9.03% | 9.72% | 10.40% | 11.03% |

Exhibit 37

Average Cumulative Issuer-Weighted Global Default Rates By Broad Industry Group, 1970-2017

| Industry Group | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Aerospace & Defense | 0.85% | 1.77% | 2.59% | 3.20% | 3.74% | 4.09% | 4.33% | 4.53% | 4.63% | 4.64% |
| Automotive | 2.33% | 4.73% | 7.05% | 9.21% | 11.28% | 13.17% | 14.95% | 16.68% | 18.27% | 19.42% |
| Banking | 0.51% | 1.01% | 1.49% | 1.96% | 2.39% | 2.79% | 3.14% | 3.47% | 3.82% | 4.17% |
| Beverage, Food, & Tobacco | 1.17% | 2.32% | 3.45% | 4.39% | 5.13% | 5.80% | 6.34% | 6.77% | 7.22% | 7.54% |
| Capital Equipment | 1.61% | 3.34% | 5.02% | 6.51% | 7.78% | 8.76% | 9.62% | 10.40% | 11.14% | 11.84% |
| Chemicals, Plastics, & Rubber | 1.09% | 2.28% | 3.40% | 4.46% | 5.42% | 6.17% | 6.72% | 7.15% | 7.60% | 8.10% |
| Construction & Building | 2.59% | 5.36% | 8.00% | 10.51% | 12.75% | 14.84% | 16.66% | 18.45% | 20.10% | 21.50% |
| Consumer goods: Durable | 2.37% | 5.20% | 8.19% | 10.97% | 13.84% | 16.22% | 17.98% | 19.66% | 21.56% | 23.29% |
| Consumer goods: Non-durable | 3.77% | 7.88% | 11.72% | 14.79% | 17.24% | 19.36% | 21.33% | 22.99% | 24.24% | 25.18% |
| Containers, Packaging, & Glass | 2.30% | 4.87% | 7.15% | 9.26% | 11.14% | 12.78% | 14.16% | 15.57% | 16.78% | 17.88% |
| Energy: Electricity | 2.60% | 5.32% | 7.78% | 9.70% | 11.55% | 13.29% | 15.00% | 16.53% | 18.09% | 19.82% |
| Energy: Oil & Gas | 2.38% | 4.51% | 6.37% | 7.91% | 9.19% | 10.22% | 11.11% | 11.88% | 12.61% | 13.26% |
| Environmental Industries | 3.66% | 6.98% | 9.57% | 11.70% | 13.27% | 14.58% | 15.72% | 16.99% | 18.42% | 20.00% |
| FIRE: Finance | 0.86% | 1.73% | 2.54% | 3.11% | 3.64% | 4.14% | 4.64% | 5.14% | 5.68% | 6.27% |
| FIRE: Insurance | 0.36% | 0.76% | 1.17% | 1.61% | 2.07% | 2.52% | 2.96% | 3.39% | 3.85% | 4.31% |
| FIRE: Real Estate | 0.94% | 1.94% | 2.86% | 3.73% | 4.34% | 4.84% | 5.25% | 5.55% | 5.84% | 6.18% |
| Forest Products & Paper | 2.94% | 5.71% | 8.37% | 10.75% | 12.74% | 14.53% | 16.12% | 17.47% | 18.41% | 19.20% |
| Healthcare & Pharmaceuticals | 1.34% | 2.74% | 4.00% | 5.17% | 6.17% | 7.14% | 8.05% | 8.74% | 9.45% | 9.94% |
| High Tech Industries | 1.77% | 3.67% | 5.39% | 6.96% | 8.23% | 9.38% | 10.58% | 11.85% | 13.10% | 14.32% |
| Hotel, Gaming, & Leisure | 4.20% | 8.36% | 11.99% | 15.25% | 18.02% | 20.31% | 22.24% | 24.10% | 25.97% | 27.92% |
| Media: Advertising, Printing & Publishing | 5.96% | 11.83% | 17.11% | 21.65% | 25.99% | 29.73% | 32.51% | 34.46% | 36.27% | 38.28% |
| Media: Broadcasting & Subscription | 3.54% | 7.32% | 11.22% | 14.59% | 17.75% | 20.59% | 22.95% | 25.02% | 26.84% | 28.54% |
| Media: Diversified & Production | 2.41% | 4.80% | 6.86% | 8.21% | 9.17% | 10.02% | 10.40% | 10.66% | 10.95% | 11.27% |
| Metals & Mining | 3.10% | 6.21% | 9.08% | 11.59% | 13.59% | 15.40% | 17.09% | 18.56% | 19.99% | 21.44% |
| Retail | 2.82% | 5.69% | 8.57% | 11.16% | 13.39% | 15.32% | 16.96% | 18.45% | 19.93% | 21.30% |
| Services: Business | 2.08% | 4.20% | 6.16% | 7.82% | 9.38% | 10.89% | 12.26% | 13.41% | 14.47% | 15.43% |
| Services: Consumer | 2.15% | 4.24% | 5.89% | 7.46% | 8.91% | 10.37% | 11.91% | 13.50% | 14.97% | 16.37% |
| Sovereign & Public Finance | 0.51% | 1.02% | 1.45% | 1.78% | 1.98% | 2.10% | 2.14% | 2.14% | 2.14% | 2.14% |
| Telecommunications | 2.23% | 4.37% | 6.27% | 7.75% | 8.84% | 9.59% | 10.16% | 10.52% | 10.76% | 10.92% |
| Transportation: Cargo | 1.99% | 3.63% | 4.99% | 6.07% | 6.90% | 7.62% | 8.21% | 8.73% | 9.20% | 9.71% |
| Transportation: Consumer | 2.91% | 5.63% | 8.35% | 11.00% | 13.31% | 15.20% | 17.03% | 18.93% | 20.90% | 22.81% |
| Utilities: Electric | 0.13% | 0.25% | 0.36% | 0.47% | 0.57% | 0.67% | 0.76% | 0.85% | 0.95% | 1.05% |
| Utilities: Oil & Gas | 0.15% | 0.27% | 0.40% | 0.54% | 0.66% | 0.78% | 0.88% | 0.93% | 0.98% | 1.03% |
| Utilities: Water | 0.12% | 0.26% | 0.32% | 0.32% | 0.32% | 0.32% | 0.32% | 0.32% | 0.32% | 0.32% |
| Wholesale | 3.44% | 7.36% | 10.87% | 13.43% | 15.33% | 17.02% | 17.95% | 18.71% | 19.47% | 20.33% |

Exhibit 38

Annual Default Rates By Broad Industry Group, 1970-2017*

first half 1/2

| Year | Aerospace & Defense | Automotive | Banking | Beverage, Food, & Tobacco | Capital Equipment | Chemicals, Plastics, & Rubber | Construc- tion & Building | Consumer goods: Durable | Consumer goods: Non- durable | Containers, Energy: Packaging, Electricity & Glass | Energy: Oil & Gas | Environ- mental Industries | FIRE: Finance | FIRE: Insurance | FIRE: Real Estate | Forest Products & Paper |
|------|------------------------|------------|---------|---------------------------------|----------------------|-------------------------------------|---------------------------------|-------------------------------|---------------------------------------|--|----------------------|----------------------------------|---------------|-----------------|----------------------|-------------------------------|
| 1970 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 25.00 | 0.00 | 0.00 |
| 1971 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1972 | 0.00 | 0.00 | 0.00 | 0.00 | 1.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1973 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1974 | 0.00 | 0.00 | 0.00 | 0.00 | 1.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1975 | 0.00 | 3.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1976 | 0.00 | 0.00 | 0.00 | 0.00 | 1.04 | 0.00 | 0.00 | 0.00 | 2.63 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1977 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1978 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.70 | 0.00 | 0.00 | 1.32 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1979 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1980 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 33.33 | 0.00 | 0.00 | 0.00 |
| 1981 | 0.00 | 0.00 | 0.00 | 0.00 | 1.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1982 | 0.00 | 2.86 | 0.00 | 0.00 | 0.00 | 0.00 | 3.33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.98 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1983 | 0.00 | 8.11 | 0.00 | 1.47 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.44 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1984 | 0.00 | 2.94 | 0.00 | 1.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1985 | 0.00 | 0.00 | 0.00 | 0.00 | 1.84 | 2.04 | 0.00 | 0.00 | 1.82 | 0.00 | 0.00 | 3.43 | 0.00 | 3.45 | 0.00 | 0.00 |
| 1986 | 2.86 | 0.00 | 0.00 | 1.20 | 0.00 | 1.85 | 1.79 | 5.88 | 0.00 | 0.00 | 0.00 | 8.37 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1987 | 0.00 | 1.82 | 0.28 | 0.00 | 2.47 | 0.00 | 4.64 | 0.00 | 0.00 | 0.00 | 0.00 | 5.54 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1988 | 2.33 | 0.00 | 1.45 | 0.00 | 0.00 | 1.64 | 2.82 | 4.35 | 3.73 | 0.00 | 4.55 | 2.13 | 0.00 | 1.52 | 0.00 | 0.00 |
| 1989 | 0.00 | 7.55 | 1.49 | 2.25 | 0.00 | 0.00 | 8.85 | 0.00 | 3.85 | 5.56 | 0.00 | 0.00 | 3.59 | 1.35 | 8.33 | 0.00 |
| 1990 | 0.00 | 3.89 | 1.84 | 5.61 | 2.61 | 0.00 | 16.93 | 4.76 | 10.03 | 0.00 | 8.00 | 1.47 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1991 | 2.17 | 4.19 | 1.40 | 0.00 | 4.54 | 0.00 | 7.55 | 5.88 | 6.09 | 5.56 | 4.17 | 3.08 | 0.00 | 1.23 | 0.00 | 3.33 |

*In percent.

first half 2/2

| Year | Aerospace & Defense | Automotive | Banking | Beverage, Food, & Tobacco | Capital Equipment | Chemicals, Plastics, & Rubber | Construc- tion & Building | Consumer goods: Durable | Consumer goods: Non- durable | Containers, Packaging, & Glass | Energy: Electricity | Energy: Oil & Gas | Environ- mental Industries | FIRE: Finance | FIRE: Insurance | FIRE: Real Estate | Forest Products & Paper |
|------|------------------------|------------|---------|---------------------------------|----------------------|-------------------------------------|---------------------------------|-------------------------------|---------------------------------------|--------------------------------------|------------------------|----------------------|----------------------------------|---------------|-----------------|----------------------|-------------------------------|
| 1992 | 0.00 | 0.00 | 0.32 | 1.22 | 2.99 | 0.00 | 0.00 | 0.00 | 5.98 | 5.26 | 0.00 | 0.80 | 0.00 | 0.00 | 0.00 | 4.76 | 0.00 |
| 1993 | 2.22 | 0.00 | 0.30 | 1.14 | 4.88 | 0.00 | 1.69 | 0.00 | 2.00 | 0.00 | 0.00 | 2.27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1994 | 0.00 | 0.00 | 0.00 | 1.06 | 0.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.57 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.78 |
| 1995 | 0.00 | 0.00 | 0.00 | 1.94 | 0.83 | 0.00 | 5.07 | 0.00 | 7.51 | 0.00 | 0.00 | 0.64 | 0.00 | 0.00 | 0.82 | 5.71 | 2.22 |
| 1996 | 0.00 | 0.00 | 0.00 | 0.83 | 0.72 | 0.00 | 1.06 | 0.00 | 4.31 | 3.23 | 0.00 | 0.57 | 5.26 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1997 | 0.00 | 1.33 | 0.00 | 0.78 | 0.00 | 0.00 | 1.12 | 0.00 | 6.43 | 2.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.63 | 0.00 | 0.00 |
| 1998 | 0.00 | 1.06 | 0.30 | 0.70 | 0.00 | 2.44 | 0.00 | 0.00 | 4.42 | 0.00 | 0.00 | 1.29 | 5.88 | 0.69 | 0.00 | 2.66 | 1.33 |
| 1999 | 0.00 | 0.89 | 0.14 | 1.86 | 1.40 | 1.52 | 6.44 | 10.60 | 4.33 | 0.00 | 0.00 | 6.20 | 4.55 | 1.89 | 0.00 | 0.71 | 2.44 |
| 2000 | 1.59 | 4.83 | 0.00 | 2.88 | 4.21 | 1.48 | 1.98 | 3.45 | 14.34 | 8.28 | 0.00 | 0.40 | 16.67 | 0.62 | 1.48 | 0.00 | 4.46 |
| 2001 | 4.67 | 5.04 | 0.07 | 2.27 | 5.18 | 5.85 | 3.84 | 3.45 | 15.50 | 8.42 | 1.69 | 1.18 | 11.76 | 1.82 | 0.00 | 2.26 | 16.84 |
| 2002 | 0.00 | 1.63 | 0.39 | 1.63 | 2.05 | 0.00 | 5.04 | 3.13 | 6.01 | 5.26 | 10.20 | 2.33 | 14.29 | 0.00 | 0.45 | 0.83 | 2.76 |
| 2003 | 0.00 | 2.43 | 0.08 | 1.67 | 2.53 | 4.55 | 2.41 | 0.00 | 2.74 | 0.00 | 11.85 | 0.00 | 0.00 | 0.62 | 0.81 | 0.00 | 1.33 |
| 2004 | 0.00 | 2.35 | 0.00 | 1.66 | 0.97 | 0.00 | 2.27 | 2.70 | 4.49 | 1.56 | 0.00 | 0.35 | 0.00 | 0.00 | 0.39 | 0.00 | 1.43 |
| 2005 | 0.00 | 4.89 | 0.07 | 0.00 | 0.96 | 0.00 | 0.00 | 4.08 | 1.59 | 3.23 | 3.85 | 0.36 | 0.00 | 0.65 | 0.00 | 0.00 | 1.61 |
| 2006 | 0.00 | 4.49 | 0.00 | 1.12 | 1.52 | 0.00 | 2.05 | 1.89 | 3.04 | 1.67 | 0.00 | 0.00 | 0.00 | 0.00 | 0.71 | 0.00 | 0.00 |
| 2007 | 0.00 | 1.54 | 0.00 | 1.05 | 0.50 | 0.00 | 1.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.30 |
| 2008 | 1.54 | 4.06 | 3.03 | 1.57 | 2.77 | 2.02 | 5.27 | 2.00 | 6.28 | 8.71 | 0.00 | 1.63 | 5.56 | 4.14 | 0.00 | 2.29 | 7.12 |
| 2009 | 4.52 | 17.83 | 0.93 | 4.28 | 10.15 | 7.89 | 14.72 | 23.45 | 6.73 | 9.33 | 1.96 | 1.98 | 0.00 | 4.98 | 0.33 | 6.31 | 17.37 |
| 2010 | 0.00 | 1.04 | 0.41 | 0.56 | 3.63 | 0.00 | 1.76 | 0.00 | 3.81 | 1.64 | 6.12 | 0.98 | 10.53 | 1.95 | 0.39 | 0.85 | 2.04 |
| 2011 | 0.00 | 0.92 | 0.54 | 0.00 | 1.95 | 0.00 | 2.27 | 0.00 | 0.00 | 3.51 | 2.00 | 0.98 | 0.00 | 0.58 | 0.38 | 0.78 | 1.85 |
| 2012 | 1.28 | 0.00 | 0.49 | 1.60 | 2.33 | 1.46 | 0.00 | 0.00 | 0.00 | 1.56 | 5.45 | 1.19 | 4.55 | 1.72 | 0.38 | 0.00 | 4.01 |
| 2013 | 1.25 | 0.85 | 1.21 | 1.59 | 0.60 | 0.68 | 2.45 | 0.00 | 2.08 | 1.56 | 1.82 | 1.61 | 4.76 | 0.00 | 0.39 | 0.66 | 0.00 |
| 2014 | 1.27 | 0.00 | 0.59 | 0.00 | 0.00 | 0.60 | 0.52 | 2.17 | 0.00 | 0.00 | 7.14 | 0.49 | 0.00 | 0.52 | 0.00 | 0.00 | 2.00 |
| 2015 | 2.57 | 0.00 | 1.55 | 1.93 | 0.00 | 0.00 | 2.23 | 2.00 | 4.64 | 0.00 | 0.00 | 7.06 | 4.35 | 0.51 | 0.75 | 0.53 | 4.17 |
| 2016 | 1.25 | 0.77 | 0.15 | 0.50 | 0.86 | 1.69 | 1.33 | 2.33 | 1.45 | 0.00 | 1.89 | 14.24 | 8.17 | 1.85 | 0.00 | 1.01 | 4.17 |
| 2017 | 2.63 | 0.00 | 0.38 | 0.00 | 0.43 | 1.02 | 0.44 | 0.00 | 0.00 | 0.00 | 5.36 | 6.09 | 5.56 | 0.50 | 0.00 | 0.49 | 8.99 |

*In percent.

second half 1/2

| Year | Healthcare & Pharmaceuticals | High Tech Industries | Hotel, Gaming, & Leisure | Media: Advertising & Publishing | Media: Broad- casting & Sub- scription | Media: Diversified & Production | Metals & Mining | Retail | Services: Business | Services: Consumer | Sovereign & Public Finance | Telecomm- unications | Transport- ation: Cargo | Transport- ation: Consumer | Utilities: Electric | Utilities: Oil & Gas | Utilities: Water | Wholesale |
|------|---------------------------------|-------------------------|--------------------------------|---------------------------------------|---|---------------------------------------|--------------------|--------|-----------------------|-----------------------|----------------------------------|-------------------------|-------------------------------|----------------------------------|------------------------|-------------------------|---------------------|-----------|
| 1970 | 0.00 | 3.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 18.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1971 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.85 | 4.76 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1972 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.64 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1973 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.45 | 0.00 | 0.00 | 0.00 | 0.00 | 1.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1974 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.48 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1975 | 4.76 | 0.00 | 0.00 | 11.11 | 0.00 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1976 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1977 | 0.00 | 0.00 | 0.00 | 14.29 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1978 | 0.00 | 3.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.85 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1979 | 0.00 | 2.78 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1980 | 0.00 | 2.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1981 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1982 | 0.00 | 3.92 | 0.00 | 14.29 | 0.00 | 0.00 | 2.38 | 5.85 | 0.00 | 0.00 | 0.00 | 1.22 | 1.18 | 5.56 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1983 | 0.00 | 1.72 | 0.00 | 0.00 | 0.00 | 0.00 | 1.89 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 19.05 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1984 | 2.22 | 4.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.26 | 0.00 | 0.00 | 0.00 | 1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1985 | 0.00 | 1.52 | 5.26 | 0.00 | 0.00 | 0.00 | 3.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1986 | 1.43 | 0.00 | 2.38 | 0.00 | 3.85 | 5.26 | 19.78 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.16 | 8.17 | 0.00 | 0.00 | 0.00 | 4.76 |
| 1987 | 3.74 | 1.12 | 6.49 | 5.88 | 0.00 | 0.00 | 0.00 | 1.05 | 9.52 | 12.50 | 0.00 | 0.00 | 1.09 | 0.00 | 0.00 | 1.59 | 0.00 | 4.35 |
| 1988 | 4.73 | 1.69 | 2.04 | 0.00 | 4.26 | 3.70 | 0.00 | 1.90 | 4.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.54 | 0.00 | 0.00 | 0.00 |
| 1989 | 2.53 | 1.78 | 13.81 | 0.00 | 4.35 | 11.71 | 0.00 | 2.52 | 4.17 | 0.00 | 10.53 | 0.98 | 1.14 | 3.57 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1990 | 1.14 | 5.74 | 26.10 | 12.50 | 6.43 | 5.00 | 3.96 | 6.34 | 16.00 | 11.11 | 0.00 | 0.00 | 0.00 | 24.14 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1991 | 4.82 | 2.25 | 2.70 | 0.00 | 4.94 | 4.76 | 2.04 | 11.48 | 0.00 | 0.00 | 0.00 | 0.90 | 2.58 | 30.00 | 0.54 | 1.82 | 0.00 | 0.00 |

*In percent.

second half 2/2

| Year | Healthcare & Pharmaceuticals | High Tech Industries | Hotel, Gaming, & Leisure | Media: Advertising & Printing & Publishing | Media: Broad- casting & Subscription | Media: Diversified & Production | Metals & Mining | Retail | Services: Business | Services: Consumer | Sovereign & Public Finance | Telecomm- unications | Transport- ation: Cargo | Transport- ation: Consumer | Utilities: Electric | Utilities: Oil & Gas | Utilities: Water | Wholesale |
|------|---------------------------------|-------------------------|--------------------------------|---|---|---------------------------------------|--------------------|--------|-----------------------|-----------------------|----------------------------------|-------------------------|-------------------------------|----------------------------------|------------------------|-------------------------|---------------------|-----------|
| 1992 | 1.43 | 3.38 | 5.27 | 0.00 | 10.81 | 10.84 | 6.17 | 2.86 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.58 | 0.00 | 0.00 | 0.00 |
| 1993 | 0.00 | 0.00 | 2.33 | 0.00 | 9.01 | 0.00 | 1.75 | 2.86 | 4.76 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1994 | 1.03 | 3.03 | 5.36 | 0.00 | 2.44 | 0.00 | 0.00 | 2.49 | 3.57 | 0.00 | 0.00 | 0.00 | 1.25 | 2.94 | 0.00 | 0.00 | 0.00 | 3.70 |
| 1995 | 1.00 | 1.87 | 2.65 | 0.00 | 0.00 | 0.00 | 0.00 | 1.45 | 3.85 | 0.00 | 0.00 | 0.00 | 0.00 | 5.64 | 0.00 | 0.00 | 0.00 | 3.57 |
| 1996 | 0.00 | 1.03 | 2.29 | 0.00 | 0.00 | 18.75 | 0.00 | 0.74 | 2.94 | 0.00 | 0.00 | 0.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1997 | 0.86 | 1.79 | 2.06 | 0.00 | 2.30 | 0.00 | 0.00 | 3.56 | 0.00 | 0.00 | 0.00 | 0.54 | 1.20 | 0.00 | 0.00 | 0.00 | 0.00 | 2.70 |
| 1998 | 3.05 | 0.73 | 2.90 | 2.44 | 2.55 | 5.56 | 2.91 | 5.41 | 0.00 | 0.00 | 0.00 | 0.95 | 1.06 | 0.00 | 0.00 | 0.00 | 0.00 | 7.14 |
| 1999 | 5.33 | 2.67 | 6.54 | 3.92 | 3.68 | 0.00 | 4.18 | 1.92 | 4.07 | 7.14 | 4.76 | 2.00 | 7.61 | 0.00 | 0.00 | 1.47 | 0.00 | 5.60 |
| 2000 | 4.75 | 3.15 | 6.15 | 1.56 | 1.55 | 3.45 | 6.87 | 4.83 | 2.53 | 8.82 | 4.65 | 2.70 | 4.04 | 5.45 | 0.00 | 0.00 | 0.00 | 10.06 |
| 2001 | 1.51 | 4.48 | 8.76 | 3.28 | 3.82 | 3.57 | 13.75 | 6.53 | 5.36 | 3.13 | 2.44 | 10.27 | 4.92 | 1.79 | 0.75 | 0.00 | 0.00 | 12.54 |
| 2002 | 0.72 | 2.70 | 1.85 | 3.55 | 13.83 | 8.52 | 7.24 | 2.80 | 2.73 | 3.03 | 0.00 | 14.47 | 4.64 | 8.96 | 0.00 | 1.20 | 3.70 | 8.62 |
| 2003 | 2.93 | 3.44 | 2.97 | 1.72 | 5.33 | 0.00 | 4.33 | 2.89 | 1.37 | 0.00 | 0.00 | 8.33 | 3.82 | 3.60 | 0.34 | 1.23 | 0.00 | 9.33 |
| 2004 | 0.75 | 0.00 | 4.14 | 0.00 | 4.68 | 0.00 | 1.90 | 0.71 | 2.64 | 0.00 | 0.00 | 1.54 | 0.00 | 5.17 | 0.31 | 0.00 | 0.00 | 2.78 |
| 2005 | 0.00 | 0.00 | 0.97 | 0.00 | 1.01 | 0.00 | 0.86 | 1.60 | 0.00 | 0.00 | 0.00 | 0.43 | 0.00 | 8.20 | 0.31 | 0.00 | 0.00 | 2.86 |
| 2006 | 0.00 | 2.58 | 0.84 | 0.00 | 3.03 | 0.00 | 0.00 | 0.74 | 0.00 | 0.00 | 0.00 | 0.00 | 3.60 | 0.00 | 0.00 | 0.00 | 0.00 | 2.50 |
| 2007 | 0.76 | 0.00 | 0.00 | 3.26 | 0.00 | 0.00 | 0.00 | 2.23 | 0.83 | 2.33 | 0.00 | 0.93 | 1.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2008 | 0.79 | 0.00 | 10.07 | 7.60 | 1.93 | 7.41 | 0.77 | 2.85 | 0.68 | 0.00 | 0.00 | 2.44 | 4.91 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2009 | 0.74 | 6.90 | 17.93 | 36.35 | 22.30 | 0.00 | 9.81 | 3.71 | 4.01 | 6.21 | 0.00 | 5.97 | 7.07 | 3.20 | 0.30 | 0.00 | 0.00 | 11.11 |
| 2010 | 1.43 | 1.54 | 4.50 | 15.35 | 2.05 | 0.00 | 0.00 | 4.06 | 1.95 | 0.00 | 0.00 | 1.56 | 1.39 | 0.00 | 0.00 | 0.99 | 0.00 | 2.78 |
| 2011 | 0.00 | 0.00 | 3.52 | 8.94 | 0.00 | 0.00 | 0.00 | 3.23 | 1.37 | 1.61 | 0.00 | 0.00 | 5.73 | 5.66 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2012 | 0.69 | 1.15 | 3.92 | 16.29 | 1.00 | 0.00 | 2.12 | 2.13 | 1.73 | 6.10 | 0.00 | 1.71 | 1.12 | 1.96 | 0.55 | 0.00 | 0.00 | 0.00 |
| 2013 | 1.82 | 0.59 | 2.40 | 20.25 | 0.88 | 0.00 | 1.88 | 1.34 | 2.00 | 0.00 | 0.00 | 1.66 | 2.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2014 | 0.00 | 2.71 | 1.56 | 8.70 | 0.00 | 0.00 | 5.10 | 2.33 | 2.57 | 3.00 | 1.10 | 1.64 | 0.97 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2015 | 0.00 | 0.47 | 2.32 | 2.33 | 0.96 | 4.17 | 6.57 | 2.09 | 2.23 | 4.14 | 0.00 | 0.56 | 0.00 | 0.00 | 0.26 | 0.00 | 0.00 | 1.59 |
| 2016 | 0.62 | 0.81 | 0.73 | 16.19 | 0.00 | 0.00 | 8.89 | 3.65 | 1.13 | 0.00 | 0.00 | 1.60 | 2.01 | 1.59 | 0.25 | 0.00 | 0.00 | 5.85 |
| 2017 | 0.62 | 1.28 | 0.00 | 0.00 | 3.74 | 3.57 | 1.91 | 7.01 | 3.09 | 1.18 | 0.00 | 1.61 | 2.93 | 0.00 | 0.00 | 0.00 | 0.00 | 3.01 |

*In percent.

Exhibit 39

Annual Volume-Weighted Corporate Bond Default Rates By Letter Rating, 1994-2017*

| 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 | 22.755 | 0.000 | 2.125 | 0.433 |
| 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 | 16.148 | 77.821 | 1.758 | 21.556 | 4.819 |
| 2003 | 0.000 | 0.000 | 0.000 | 0.000 | 3.622 | 3.745 | 17.012 | 0.000 | 6.122 | 1.070 |
| 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 | 37.815 | 0.217 | 16.255 | 2.754 |
| 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 | 1.376 | 17.030 | 0.000 | 3.468 | 0.789 |
| 2016 | 0.000 | 0.000 | 0.000 | 0.000 | 0.134 | 0.938 | 19.320 | 0.000 | 3.490 | 0.738 |
| 2017 | 0.000 | 0.000 | 0.000 | 0.000 | 0.158 | 0.058 | 9.043 | 0.000 | 1.537 | 0.302 |
| Mean | 0.000 | 0.039 | 0.252 | 0.259 | 1.118 | 3.147 | 17.717 | 0.188 | 4.723 | 1.023 |
| Median | 0.000 | 0.000 | 0.000 | 0.000 | 0.080 | 1.595 | 11.205 | 0.003 | 2.606 | 0.691 |
| StDev | 0.000 | 0.167 | 0.723 | 0.494 | 2.076 | 4.224 | 17.151 | 0.457 | 5.410 | 1.119 |
| 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 | 16.148 | 77.821 | 1.758 | 21.556 | 4.819 |

*In percent.

Exhibit 40

Average Volume-Weighted Corporate Bond Default Rates By Letter Rating, 1994-2017*

| Rating / Year | 1 | 2 | 3 | 4 | 5 |
|---------------|---------|---------|---------|---------|---------|
| Aaa | 0.0000 | 0.0445 | 0.0445 | 0.0445 | 0.0445 |
| Aa | 0.0305 | 0.0805 | 0.1116 | 0.1510 | 0.2099 |
| A | 0.2358 | 0.4532 | 0.6386 | 0.7773 | 0.9451 |
| Baa | 0.1392 | 0.3056 | 0.4365 | 0.6696 | 0.9955 |
| Ba | 0.6803 | 1.7721 | 2.7759 | 3.7899 | 4.5070 |
| B | 2.6193 | 6.1347 | 9.4670 | 12.3915 | 14.3344 |
| Caa-C | 14.4109 | 23.8051 | 30.5097 | 33.7594 | 35.8235 |
| Inv-Grade | 0.1596 | 0.3249 | 0.4581 | 0.6039 | 0.7939 |
| Spec-Grade | 3.7999 | 7.3017 | 10.2514 | 12.4539 | 13.9262 |
| All Rated | 0.8731 | 1.6904 | 2.3678 | 2.9028 | 3.3295 |

*In percent.

Exhibit 41

Cumulative Issuer-Weighted Default Rates By Annual Cohort, 1970-2017*

| 1/1/70 | | | | | | | | | | | | | | | | | | | | | |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Rating | 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 | 0.027 | 0.027 | 0.027 |
| 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 | 0.000 | 0.014 | 0.014 | 0.014 | 0.029 | 0.029 | 0.029 | 0.029 |
| A | 254 | 0.000 | 0.000 | 0.000 | 0.004 | 0.004 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 | 0.018 | 0.018 | 0.028 | 0.028 |
| Baa | 372 | 0.005 | 0.005 | 0.005 | 0.011 | 0.014 | 0.014 | 0.017 | 0.024 | 0.030 | 0.030 | 0.034 | 0.034 | 0.046 | 0.050 | 0.054 | 0.059 | 0.072 | 0.083 | 0.093 | 0.099 |
| Ba | 238 | 0.042 | 0.051 | 0.056 | 0.060 | 0.070 | 0.081 | 0.086 | 0.092 | 0.105 | 0.105 | 0.105 | 0.120 | 0.146 | 0.155 | 0.155 | 0.176 | 0.211 | 0.236 | 0.236 | 0.251 |
| B | 36 | 0.194 | 0.194 | 0.223 | 0.223 | 0.223 | 0.223 | 0.223 | 0.223 | 0.223 | 0.223 | 0.223 | 0.223 | 0.305 | 0.305 | 0.305 | 0.305 | 0.363 | 0.363 | 0.363 | 0.363 |
| Caa-C | 16 | 0.500 | 0.563 | 0.750 | 0.813 | 0.813 | 0.813 | 0.813 | 0.906 | 0.906 | 0.906 | 0.906 | 0.906 | 0.906 | 0.906 | 0.906 | 0.906 | 0.906 | 0.906 | 0.906 | 0.906 |
| IG | 742 | 0.003 | 0.003 | 0.003 | 0.007 | 0.008 | 0.010 | 0.011 | 0.014 | 0.018 | 0.018 | 0.021 | 0.021 | 0.026 | 0.030 | 0.032 | 0.033 | 0.043 | 0.049 | 0.057 | 0.059 |
| SG | 290 | 0.087 | 0.098 | 0.116 | 0.124 | 0.132 | 0.140 | 0.145 | 0.154 | 0.165 | 0.165 | 0.165 | 0.177 | 0.210 | 0.217 | 0.217 | 0.233 | 0.270 | 0.289 | 0.289 | 0.301 |
| All | 1032 | 0.026 | 0.029 | 0.034 | 0.040 | 0.043 | 0.046 | 0.048 | 0.053 | 0.058 | 0.058 | 0.060 | 0.063 | 0.074 | 0.078 | 0.079 | 0.084 | 0.098 | 0.106 | 0.113 | 0.116 |
| 1/1/71 | | | | | | | | | | | | | | | | | | | | | |
| Rating | 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 | 0.027 | 0.027 | 0.027 | 0.027 |
| 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 | 0.018 |
| A | 282 | 0.000 | 0.000 | 0.004 | 0.004 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.011 | 0.011 | 0.015 | 0.020 | 0.020 | 0.020 | 0.024 | 0.024 | 0.033 | 0.033 | 0.033 |
| Baa | 398 | 0.000 | 0.000 | 0.005 | 0.008 | 0.011 | 0.014 | 0.020 | 0.026 | 0.026 | 0.029 | 0.029 | 0.041 | 0.045 | 0.049 | 0.053 | 0.066 | 0.076 | 0.085 | 0.091 | 0.102 |
| Ba | 228 | 0.009 | 0.013 | 0.018 | 0.028 | 0.038 | 0.044 | 0.050 | 0.062 | 0.062 | 0.062 | 0.078 | 0.103 | 0.112 | 0.112 | 0.133 | 0.179 | 0.205 | 0.205 | 0.220 | 0.220 |
| B | 27 | 0.000 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.159 | 0.159 | 0.159 | 0.159 | 0.235 | 0.235 | 0.235 | 0.235 | 0.235 |
| Caa-C | 8 | 0.125 | 0.500 | 0.625 | 0.625 | 0.625 | 0.625 | 0.813 | 0.813 | 0.813 | 0.813 | 0.813 | 0.813 | 0.813 | 0.813 | 0.813 | 0.813 | 0.813 | 0.813 | 0.813 | 0.813 |
| IG | 794 | 0.000 | 0.000 | 0.004 | 0.005 | 0.008 | 0.009 | 0.012 | 0.015 | 0.015 | 0.018 | 0.018 | 0.025 | 0.028 | 0.030 | 0.031 | 0.039 | 0.044 | 0.052 | 0.054 | 0.060 |
| SG | 263 | 0.012 | 0.031 | 0.039 | 0.048 | 0.057 | 0.062 | 0.072 | 0.083 | 0.083 | 0.083 | 0.096 | 0.132 | 0.139 | 0.139 | 0.157 | 0.205 | 0.226 | 0.226 | 0.238 | 0.238 |
| All | 1057 | 0.003 | 0.008 | 0.013 | 0.016 | 0.020 | 0.022 | 0.026 | 0.031 | 0.031 | 0.034 | 0.036 | 0.048 | 0.052 | 0.053 | 0.058 | 0.071 | 0.079 | 0.086 | 0.089 | 0.094 |
| 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 | 0.000 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 |
| 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 | 0.000 | 0.017 | 0.017 |
| A | 303 | 0.000 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.007 | 0.011 | 0.011 | 0.011 | 0.015 | 0.015 | 0.023 | 0.023 | 0.028 | 0.033 |
| Baa | 431 | 0.000 | 0.005 | 0.007 | 0.012 | 0.015 | 0.021 | 0.026 | 0.026 | 0.033 | 0.033 | 0.040 | 0.043 | 0.051 | 0.055 | 0.067 | 0.076 | 0.085 | 0.095 | 0.111 | 0.138 |
| Ba | 224 | 0.000 | 0.005 | 0.015 | 0.025 | 0.030 | 0.036 | 0.048 | 0.048 | 0.048 | 0.063 | 0.095 | 0.103 | 0.103 | 0.132 | 0.175 | 0.199 | 0.199 | 0.212 | 0.226 | 0.287 |
| B | 29 | 0.069 | 0.069 | 0.069 | 0.069 | 0.069 | 0.069 | 0.069 | 0.069 | 0.069 | 0.069 | 0.178 | 0.178 | 0.178 | 0.178 | 0.253 | 0.253 | 0.253 | 0.253 | 0.253 | 0.253 |
| Caa-C | 8 | 0.375 | 0.500 | 0.500 | 0.500 | 0.500 | 0.667 | 0.667 | 0.667 | 0.667 | 0.667 | 0.667 | 0.667 | 0.667 | 0.667 | 0.667 | 0.667 | 0.667 | 0.667 | 0.667 | 0.667 |
| IG | 853 | 0.000 | 0.004 | 0.005 | 0.007 | 0.009 | 0.011 | 0.014 | 0.014 | 0.017 | 0.017 | 0.021 | 0.024 | 0.028 | 0.029 | 0.036 | 0.041 | 0.048 | 0.052 | 0.062 | 0.074 |
| SG | 261 | 0.019 | 0.027 | 0.036 | 0.045 | 0.049 | 0.059 | 0.070 | 0.070 | 0.070 | 0.082 | 0.122 | 0.130 | 0.130 | 0.154 | 0.199 | 0.219 | 0.219 | 0.230 | 0.243 | 0.297 |
| All | 1114 | 0.005 | 0.009 | 0.012 | 0.016 | 0.018 | 0.022 | 0.026 | 0.026 | 0.029 | 0.031 | 0.042 | 0.046 | 0.049 | 0.054 | 0.067 | 0.074 | 0.080 | 0.085 | 0.095 | 0.112 |
| 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 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 |
| 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 | 0.016 | 0.016 | 0.016 |
| A | 309 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.004 | 0.007 | 0.007 | 0.007 | 0.011 | 0.011 | 0.020 | 0.020 | 0.024 | 0.029 | 0.033 |
| Baa | 441 | 0.005 | 0.007 | 0.012 | 0.014 | 0.019 | 0.025 | 0.025 | 0.031 | 0.031 | 0.037 | 0.044 | 0.051 | 0.059 | 0.070 | 0.078 | 0.087 | 0.097 | 0.117 | 0.138 | 0.138 |
| Ba | 205 | 0.000 | 0.010 | 0.021 | 0.026 | 0.032 | 0.045 | 0.045 | 0.045 | 0.060 | 0.100 | 0.109 | 0.109 | 0.128 | 0.170 | 0.205 | 0.205 | 0.218 | 0.232 | 0.305 | 0.320 |

| | | | | | | | | | | | | | | | | | | | | |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| B | 27 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.038 | 0.152 | 0.152 | 0.152 | 0.152 | 0.229 | 0.229 | 0.229 | 0.229 | 0.229 | 0.229 |
| Caa-C | 6 | 0.375 | 0.375 | 0.375 | 0.375 | 0.583 | 0.583 | 0.583 | 0.583 | 0.583 | 0.583 | 0.583 | 0.583 | 0.583 | 0.583 | 0.583 | 0.583 | 0.583 | 0.583 | 0.583 |
| IG | 872 | 0.002 | 0.003 | 0.006 | 0.007 | 0.010 | 0.012 | 0.012 | 0.015 | 0.015 | 0.019 | 0.024 | 0.027 | 0.030 | 0.036 | 0.041 | 0.048 | 0.052 | 0.063 | 0.073 |
| SG | 238 | 0.013 | 0.022 | 0.031 | 0.036 | 0.046 | 0.057 | 0.057 | 0.057 | 0.070 | 0.117 | 0.125 | 0.125 | 0.141 | 0.186 | 0.216 | 0.216 | 0.227 | 0.240 | 0.305 |
| All | 1110 | 0.005 | 0.007 | 0.011 | 0.013 | 0.017 | 0.021 | 0.021 | 0.024 | 0.026 | 0.038 | 0.043 | 0.045 | 0.050 | 0.063 | 0.071 | 0.077 | 0.082 | 0.093 | 0.110 |
| 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 |
| 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 | 0.000 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 |
| Aa | 89 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 | 0.027 | 0.027 | 0.027 |
| A | 307 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.004 | 0.007 | 0.007 | 0.007 | 0.011 | 0.011 | 0.019 | 0.019 | 0.024 | 0.028 | 0.033 |
| Baa | 431 | 0.000 | 0.005 | 0.007 | 0.012 | 0.018 | 0.018 | 0.024 | 0.024 | 0.030 | 0.037 | 0.044 | 0.052 | 0.056 | 0.064 | 0.073 | 0.082 | 0.097 | 0.118 | 0.118 |
| Ba | 197 | 0.005 | 0.016 | 0.022 | 0.028 | 0.041 | 0.041 | 0.041 | 0.049 | 0.089 | 0.098 | 0.098 | 0.117 | 0.179 | 0.214 | 0.214 | 0.227 | 0.255 | 0.328 | 0.343 |
| B | 29 | 0.072 | 0.072 | 0.072 | 0.072 | 0.072 | 0.072 | 0.072 | 0.118 | 0.222 | 0.222 | 0.222 | 0.222 | 0.300 | 0.300 | 0.300 | 0.300 | 0.300 | 0.300 | 0.300 |
| Caa-C | 3 | 0.000 | 0.000 | 0.000 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 |
| IG | 871 | 0.000 | 0.002 | 0.004 | 0.006 | 0.009 | 0.009 | 0.011 | 0.011 | 0.017 | 0.021 | 0.024 | 0.027 | 0.031 | 0.036 | 0.042 | 0.046 | 0.055 | 0.065 | 0.067 |
| SG | 229 | 0.013 | 0.023 | 0.028 | 0.038 | 0.049 | 0.049 | 0.049 | 0.062 | 0.110 | 0.118 | 0.118 | 0.134 | 0.197 | 0.226 | 0.226 | 0.238 | 0.263 | 0.330 | 0.344 |
| All | 1100 | 0.003 | 0.007 | 0.008 | 0.012 | 0.017 | 0.017 | 0.019 | 0.021 | 0.034 | 0.039 | 0.041 | 0.047 | 0.059 | 0.067 | 0.073 | 0.078 | 0.089 | 0.105 | 0.109 |
| 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 |
| 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 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 |
| Aa | 103 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.022 | 0.022 | 0.035 | 0.035 | 0.035 | 0.035 |
| A | 321 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.004 | 0.004 | 0.004 | 0.004 | 0.007 | 0.007 | 0.015 | 0.015 | 0.019 | 0.028 | 0.032 | 0.037 |
| Baa | 412 | 0.000 | 0.000 | 0.003 | 0.008 | 0.008 | 0.014 | 0.014 | 0.024 | 0.031 | 0.039 | 0.046 | 0.050 | 0.058 | 0.063 | 0.072 | 0.092 | 0.113 | 0.113 | 0.113 |
| Ba | 200 | 0.010 | 0.021 | 0.033 | 0.039 | 0.039 | 0.039 | 0.046 | 0.084 | 0.093 | 0.093 | 0.111 | 0.170 | 0.203 | 0.215 | 0.227 | 0.241 | 0.296 | 0.311 | 0.327 |
| B | 33 | 0.062 | 0.062 | 0.062 | 0.095 | 0.095 | 0.095 | 0.134 | 0.221 | 0.221 | 0.221 | 0.221 | 0.286 | 0.286 | 0.286 | 0.286 | 0.388 | 0.490 | 0.490 | 0.490 |
| Caa-C | 3 | 0.000 | 0.000 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 |
| IG | 888 | 0.000 | 0.000 | 0.001 | 0.004 | 0.004 | 0.006 | 0.006 | 0.012 | 0.016 | 0.019 | 0.022 | 0.025 | 0.029 | 0.036 | 0.039 | 0.050 | 0.061 | 0.062 | 0.064 |
| SG | 236 | 0.017 | 0.027 | 0.041 | 0.051 | 0.051 | 0.051 | 0.063 | 0.108 | 0.115 | 0.115 | 0.130 | 0.189 | 0.217 | 0.227 | 0.237 | 0.260 | 0.320 | 0.333 | 0.348 |
| All | 1124 | 0.004 | 0.005 | 0.009 | 0.013 | 0.013 | 0.015 | 0.017 | 0.030 | 0.035 | 0.037 | 0.042 | 0.053 | 0.061 | 0.068 | 0.072 | 0.085 | 0.102 | 0.105 | 0.108 |
| 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 |
| Aaa | 66 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 |
| Aa | 112 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 | 0.021 | 0.021 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 |
| A | 367 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.006 | 0.006 | 0.006 | 0.013 | 0.013 | 0.023 | 0.023 | 0.031 | 0.042 | 0.042 | 0.047 | 0.052 |
| Baa | 371 | 0.000 | 0.003 | 0.006 | 0.006 | 0.009 | 0.009 | 0.023 | 0.031 | 0.039 | 0.046 | 0.051 | 0.060 | 0.060 | 0.070 | 0.091 | 0.108 | 0.114 | 0.114 | 0.114 |
| Ba | 206 | 0.010 | 0.020 | 0.032 | 0.032 | 0.038 | 0.044 | 0.072 | 0.080 | 0.080 | 0.096 | 0.149 | 0.178 | 0.188 | 0.200 | 0.212 | 0.273 | 0.286 | 0.300 | 0.300 |
| B | 27 | 0.000 | 0.000 | 0.040 | 0.040 | 0.040 | 0.088 | 0.195 | 0.195 | 0.195 | 0.195 | 0.285 | 0.285 | 0.285 | 0.285 | 0.428 | 0.571 | 0.571 | 0.571 | 0.571 |
| Caa-C | 3 | 0.000 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 |
| IG | 916 | 0.000 | 0.001 | 0.002 | 0.002 | 0.003 | 0.003 | 0.010 | 0.015 | 0.018 | 0.021 | 0.025 | 0.029 | 0.036 | 0.039 | 0.050 | 0.061 | 0.062 | 0.064 | 0.066 |
| SG | 236 | 0.009 | 0.022 | 0.037 | 0.037 | 0.042 | 0.054 | 0.090 | 0.096 | 0.096 | 0.111 | 0.165 | 0.192 | 0.201 | 0.211 | 0.232 | 0.300 | 0.311 | 0.325 | 0.325 |
| All | 1152 | 0.002 | 0.005 | 0.009 | 0.009 | 0.011 | 0.013 | 0.025 | 0.030 | 0.033 | 0.037 | 0.049 | 0.057 | 0.063 | 0.067 | 0.080 | 0.098 | 0.101 | 0.104 | 0.106 |
| 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 |
| Aaa | 67 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 |
| Aa | 119 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.019 | 0.019 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 |

| | | | | | | | | | | | | | | | | | | | | | |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| A | 388 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.006 | 0.006 | 0.006 | 0.012 | 0.012 | 0.028 | 0.028 | 0.039 | 0.050 | 0.050 | 0.054 | 0.054 | 0.059 | 0.059 |
| Baa | 355 | 0.003 | 0.006 | 0.006 | 0.006 | 0.006 | 0.021 | 0.028 | 0.036 | 0.044 | 0.048 | 0.057 | 0.057 | 0.068 | 0.084 | 0.101 | 0.107 | 0.107 | 0.107 | 0.107 | 0.107 |
| Ba | 195 | 0.005 | 0.017 | 0.017 | 0.023 | 0.029 | 0.057 | 0.065 | 0.065 | 0.081 | 0.134 | 0.163 | 0.173 | 0.184 | 0.196 | 0.258 | 0.271 | 0.285 | 0.285 | 0.285 | 0.285 |
| B | 31 | 0.032 | 0.066 | 0.066 | 0.106 | 0.149 | 0.249 | 0.249 | 0.249 | 0.249 | 0.332 | 0.332 | 0.332 | 0.332 | 0.466 | 0.599 | 0.599 | 0.599 | 0.599 | 0.599 | 0.599 |
| Caa-C | 3 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | | | | | | |
| IG | 929 | 0.001 | 0.002 | 0.002 | 0.002 | 0.002 | 0.008 | 0.014 | 0.016 | 0.019 | 0.023 | 0.027 | 0.036 | 0.039 | 0.051 | 0.061 | 0.062 | 0.064 | 0.064 | 0.066 | 0.066 |
| SG | 229 | 0.014 | 0.028 | 0.028 | 0.038 | 0.050 | 0.086 | 0.092 | 0.092 | 0.106 | 0.161 | 0.186 | 0.195 | 0.205 | 0.226 | 0.293 | 0.305 | 0.319 | 0.319 | 0.319 | 0.319 |
| All | 1158 | 0.004 | 0.007 | 0.007 | 0.009 | 0.011 | 0.022 | 0.028 | 0.030 | 0.035 | 0.046 | 0.054 | 0.063 | 0.067 | 0.079 | 0.096 | 0.099 | 0.102 | 0.102 | 0.104 | 0.104 |

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 | 0.000 | 0.016 | 0.016 | 0.016 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 | 0.032 |
| Aa | 131 | 0.000 | 0.000 | 0.000 | 0.000 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 |
| A | 380 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.006 | 0.006 | 0.006 | 0.012 | 0.012 | 0.026 | 0.026 | 0.040 | 0.047 | 0.047 | 0.052 | 0.052 | 0.056 | 0.056 | 0.056 |
| Baa | 341 | 0.000 | 0.000 | 0.000 | 0.000 | 0.014 | 0.018 | 0.025 | 0.029 | 0.033 | 0.047 | 0.051 | 0.061 | 0.077 | 0.099 | 0.104 | 0.104 | 0.104 | 0.104 | 0.104 | 0.104 |
| Ba | 187 | 0.011 | 0.011 | 0.011 | 0.018 | 0.046 | 0.061 | 0.061 | 0.093 | 0.154 | 0.174 | 0.184 | 0.196 | 0.219 | 0.281 | 0.294 | 0.323 | 0.323 | 0.323 | 0.323 | 0.323 |
| B | 37 | 0.054 | 0.054 | 0.117 | 0.150 | 0.224 | 0.224 | 0.269 | 0.269 | 0.326 | 0.387 | 0.387 | 0.387 | 0.474 | 0.606 | 0.606 | 0.606 | 0.606 | 0.606 | 0.606 | 0.606 |
| Caa-C | 3 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | | | | | | | |
| IG | 923 | 0.000 | 0.000 | 0.000 | 0.000 | 0.006 | 0.010 | 0.012 | 0.014 | 0.018 | 0.023 | 0.032 | 0.035 | 0.048 | 0.057 | 0.059 | 0.061 | 0.061 | 0.063 | 0.063 | 0.063 |
| SG | 227 | 0.018 | 0.018 | 0.028 | 0.039 | 0.074 | 0.086 | 0.093 | 0.120 | 0.187 | 0.212 | 0.220 | 0.229 | 0.260 | 0.326 | 0.338 | 0.364 | 0.364 | 0.364 | 0.364 | 0.364 |
| All | 1150 | 0.004 | 0.004 | 0.005 | 0.007 | 0.018 | 0.024 | 0.027 | 0.032 | 0.046 | 0.054 | 0.063 | 0.067 | 0.082 | 0.098 | 0.101 | 0.106 | 0.106 | 0.108 | 0.108 | 0.108 |

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 | 0.015 | 0.015 | 0.015 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 |
| Aa | 132 | 0.000 | 0.000 | 0.000 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 |
| A | 376 | 0.000 | 0.000 | 0.000 | 0.000 | 0.006 | 0.006 | 0.006 | 0.012 | 0.012 | 0.025 | 0.025 | 0.036 | 0.043 | 0.043 | 0.047 | 0.047 | 0.052 | 0.052 | 0.052 | 0.052 |
| Baa | 336 | 0.000 | 0.003 | 0.003 | 0.017 | 0.021 | 0.024 | 0.028 | 0.028 | 0.041 | 0.045 | 0.055 | 0.081 | 0.103 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 |
| Ba | 207 | 0.005 | 0.005 | 0.011 | 0.035 | 0.061 | 0.095 | 0.123 | 0.189 | 0.206 | 0.214 | 0.223 | 0.254 | 0.317 | 0.328 | 0.352 | 0.352 | 0.352 | 0.352 | 0.352 | 0.352 |
| B | 34 | 0.000 | 0.065 | 0.098 | 0.170 | 0.170 | 0.216 | 0.265 | 0.390 | 0.457 | 0.457 | 0.457 | 0.566 | 0.566 | | | | | | | |
| Caa-C | 3 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | | | | | | | | |
| IG | 919 | 0.000 | 0.001 | 0.001 | 0.007 | 0.011 | 0.012 | 0.013 | 0.016 | 0.021 | 0.030 | 0.033 | 0.047 | 0.056 | 0.058 | 0.060 | 0.060 | 0.062 | 0.062 | 0.062 | 0.062 |
| SG | 244 | 0.004 | 0.013 | 0.023 | 0.054 | 0.075 | 0.111 | 0.141 | 0.218 | 0.240 | 0.247 | 0.255 | 0.292 | 0.350 | 0.360 | 0.383 | 0.383 | 0.383 | 0.383 | 0.383 | 0.383 |
| All | 1163 | 0.001 | 0.004 | 0.005 | 0.016 | 0.023 | 0.030 | 0.037 | 0.052 | 0.060 | 0.068 | 0.072 | 0.089 | 0.105 | 0.108 | 0.112 | 0.112 | 0.114 | 0.114 | 0.114 | 0.114 |

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 | 0.000 | 0.013 | 0.013 | 0.013 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 |
| Aa | 130 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 |
| A | 381 | 0.000 | 0.000 | 0.003 | 0.008 | 0.008 | 0.008 | 0.017 | 0.020 | 0.030 | 0.030 | 0.041 | 0.048 | 0.048 | 0.052 | 0.052 | 0.056 | 0.056 | 0.056 | 0.056 | 0.067 |
| Baa | 336 | 0.000 | 0.000 | 0.010 | 0.014 | 0.017 | 0.025 | 0.025 | 0.033 | 0.041 | 0.055 | 0.080 | 0.105 | 0.115 | 0.115 | 0.115 | 0.115 | 0.115 | 0.115 | 0.115 | 0.115 |
| Ba | 207 | 0.000 | 0.005 | 0.039 | 0.051 | 0.089 | 0.121 | 0.182 | 0.205 | 0.213 | 0.239 | 0.268 | 0.330 | 0.353 | 0.377 | 0.377 | 0.377 | 0.377 | 0.392 | 0.392 | 0.392 |
| B | 41 | 0.050 | 0.076 | 0.157 | 0.215 | 0.279 | 0.316 | 0.448 | 0.494 | 0.494 | 0.494 | 0.614 | 0.691 | 0.691 | 0.691 | 0.691 | 0.691 | 0.691 | 0.691 | 0.691 | 0.691 |
| Caa-C | 6 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.556 | 0.556 | 0.556 | 0.556 | 0.556 | | | | | | | | | |
| IG | 934 | 0.000 | 0.000 | 0.005 | 0.008 | 0.009 | 0.012 | 0.016 | 0.022 | 0.030 | 0.035 | 0.048 | 0.059 | 0.062 | 0.064 | 0.064 | 0.065 | 0.065 | 0.065 | 0.065 | 0.070 |
| SG | 254 | 0.016 | 0.025 | 0.066 | 0.085 | 0.126 | 0.158 | 0.232 | 0.257 | 0.263 | 0.285 | 0.325 | 0.387 | 0.407 | 0.429 | 0.429 | 0.429 | 0.429 | 0.442 | 0.442 | 0.442 |
| All | 1188 | 0.003 | 0.005 | 0.017 | 0.024 | 0.033 | 0.041 | 0.057 | 0.067 | 0.075 | 0.082 | 0.099 | 0.117 | 0.123 | 0.127 | 0.127 | 0.128 | 0.128 | 0.130 | 0.130 | 0.134 |

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 | 0.012 | 0.012 | 0.012 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 |
| Aa | 135 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.008 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.037 |
| A | 386 | 0.000 | 0.003 | 0.003 | 0.003 | 0.003 | 0.012 | 0.015 | 0.021 | 0.021 | 0.032 | 0.039 | 0.039 | 0.043 | 0.043 | 0.047 | 0.047 | 0.047 | 0.047 | 0.057 | 0.063 |
| Baa | 339 | 0.000 | 0.006 | 0.020 | 0.027 | 0.034 | 0.034 | 0.038 | 0.046 | 0.059 | 0.083 | 0.102 | 0.112 | 0.112 | 0.112 | 0.112 | 0.112 | 0.112 | 0.112 | 0.119 | 0.127 |
| Ba | 241 | 0.000 | 0.037 | 0.051 | 0.082 | 0.119 | 0.186 | 0.211 | 0.217 | 0.247 | 0.288 | 0.352 | 0.372 | 0.394 | 0.394 | 0.394 | 0.394 | 0.409 | 0.423 | 0.423 | 0.423 |
| B | 46 | 0.044 | 0.114 | 0.163 | 0.243 | 0.272 | 0.412 | 0.412 | 0.412 | 0.412 | 0.515 | 0.576 | 0.576 | 0.576 | 0.576 | 0.576 | 0.576 | 0.576 | 0.576 | 0.576 | 0.576 |
| Caa-C | 7 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.167 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 | 0.333 |
| IG | 951 | 0.000 | 0.003 | 0.008 | 0.010 | 0.013 | 0.016 | 0.021 | 0.029 | 0.033 | 0.046 | 0.055 | 0.058 | 0.060 | 0.060 | 0.062 | 0.062 | 0.062 | 0.062 | 0.068 | 0.075 |
| SG | 294 | 0.007 | 0.048 | 0.068 | 0.105 | 0.140 | 0.219 | 0.245 | 0.250 | 0.275 | 0.322 | 0.383 | 0.401 | 0.420 | 0.420 | 0.420 | 0.420 | 0.431 | 0.444 | 0.444 | 0.444 |
| All | 1245 | 0.002 | 0.014 | 0.021 | 0.031 | 0.041 | 0.060 | 0.069 | 0.077 | 0.085 | 0.103 | 0.120 | 0.125 | 0.130 | 0.130 | 0.131 | 0.131 | 0.133 | 0.134 | 0.140 | 0.145 |

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 | 0.000 | 0.012 | 0.012 | 0.012 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 |
| Aa | 147 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.008 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.045 | 0.045 |
| A | 395 | 0.003 | 0.003 | 0.003 | 0.003 | 0.011 | 0.011 | 0.017 | 0.017 | 0.031 | 0.038 | 0.038 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.047 | 0.052 | 0.083 |
| Baa | 326 | 0.003 | 0.003 | 0.014 | 0.021 | 0.025 | 0.033 | 0.042 | 0.055 | 0.079 | 0.098 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 | 0.108 | 0.123 | 0.131 | 0.131 |
| Ba | 254 | 0.028 | 0.054 | 0.081 | 0.118 | 0.186 | 0.208 | 0.214 | 0.241 | 0.285 | 0.326 | 0.345 | 0.365 | 0.365 | 0.365 | 0.365 | 0.379 | 0.394 | 0.394 | 0.394 | 0.427 |
| B | 45 | 0.022 | 0.091 | 0.141 | 0.168 | 0.292 | 0.292 | 0.292 | 0.292 | 0.346 | 0.532 | 0.532 | 0.532 | 0.532 | 0.532 | 0.532 | 0.532 | 0.532 | 0.532 | 0.532 | 0.532 |
| Caa-C | 13 | 0.231 | 0.462 | 0.462 | 0.462 | 0.551 | 0.641 | 0.641 | 0.641 | 0.641 | 0.641 | 0.641 | 0.641 | 0.641 | 0.641 | 0.641 | 0.641 | 0.641 | 0.641 | 0.641 | 0.641 |
| IG | 962 | 0.002 | 0.002 | 0.006 | 0.008 | 0.013 | 0.018 | 0.025 | 0.030 | 0.044 | 0.052 | 0.055 | 0.057 | 0.057 | 0.059 | 0.059 | 0.059 | 0.059 | 0.065 | 0.071 | 0.084 |
| SG | 312 | 0.036 | 0.077 | 0.106 | 0.140 | 0.217 | 0.239 | 0.244 | 0.266 | 0.309 | 0.363 | 0.380 | 0.397 | 0.397 | 0.397 | 0.397 | 0.408 | 0.420 | 0.420 | 0.420 | 0.447 |
| All | 1274 | 0.010 | 0.020 | 0.030 | 0.039 | 0.061 | 0.069 | 0.077 | 0.084 | 0.103 | 0.120 | 0.125 | 0.129 | 0.129 | 0.130 | 0.130 | 0.132 | 0.133 | 0.139 | 0.144 | 0.159 |

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 | 0.023 | 0.023 | 0.023 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 |
| Aa | 234 | 0.000 | 0.000 | 0.000 | 0.000 | 0.005 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 | 0.033 | 0.042 |
| A | 475 | 0.000 | 0.000 | 0.000 | 0.002 | 0.002 | 0.010 | 0.010 | 0.023 | 0.035 | 0.040 | 0.044 | 0.044 | 0.044 | 0.044 | 0.044 | 0.044 | 0.044 | 0.048 | 0.060 | 0.065 |
| Baa | 324 | 0.000 | 0.010 | 0.013 | 0.028 | 0.032 | 0.036 | 0.046 | 0.070 | 0.090 | 0.090 | 0.090 | 0.090 | 0.090 | 0.090 | 0.090 | 0.090 | 0.105 | 0.121 | 0.138 | 0.173 |
| Ba | 178 | 0.012 | 0.024 | 0.044 | 0.103 | 0.120 | 0.156 | 0.199 | 0.234 | 0.269 | 0.269 | 0.286 | 0.286 | 0.286 | 0.286 | 0.286 | 0.310 | 0.335 | 0.362 | 0.415 | 0.442 |
| B | 135 | 0.023 | 0.071 | 0.138 | 0.243 | 0.272 | 0.281 | 0.304 | 0.376 | 0.486 | 0.533 | 0.558 | 0.558 | 0.558 | 0.558 | 0.595 | 0.595 | 0.595 | 0.595 | 0.595 | 0.595 |
| Caa-C | 20 | 0.423 | 0.538 | 0.596 | 0.596 | 0.731 | 0.731 | 0.731 | 0.731 | 0.731 | 0.731 | 0.731 | 0.731 | 0.731 | 0.731 | 0.731 | 0.731 | 0.731 | 0.731 | 0.731 | 0.731 |
| IG | 1132 | 0.000 | 0.003 | 0.004 | 0.009 | 0.013 | 0.020 | 0.023 | 0.036 | 0.045 | 0.048 | 0.049 | 0.049 | 0.051 | 0.051 | 0.051 | 0.051 | 0.054 | 0.060 | 0.071 | 0.082 |
| SG | 333 | 0.041 | 0.074 | 0.116 | 0.191 | 0.220 | 0.242 | 0.274 | 0.322 | 0.381 | 0.397 | 0.415 | 0.415 | 0.415 | 0.415 | 0.427 | 0.441 | 0.455 | 0.471 | 0.502 | 0.518 |
| All | 1465 | 0.009 | 0.018 | 0.028 | 0.047 | 0.057 | 0.067 | 0.074 | 0.093 | 0.110 | 0.114 | 0.118 | 0.118 | 0.119 | 0.119 | 0.120 | 0.122 | 0.126 | 0.133 | 0.145 | 0.157 |

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 | 0.013 | 0.013 | 0.013 | 0.027 | 0.027 | 0.027 | 0.027 | 0.027 | 0.027 | 0.027 | 0.027 | 0.027 | 0.027 | 0.027 | 0.027 | 0.027 | 0.027 |
| Aa | 250 | 0.000 | 0.000 | 0.000 | 0.009 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.031 | 0.038 | 0.038 |
| A | 496 | 0.000 | 0.002 | 0.004 | 0.007 | 0.016 | 0.016 | 0.031 | 0.042 | 0.047 | 0.047 | 0.047 | 0.047 | 0.047 | 0.047 | 0.047 | 0.047 | 0.051 | 0.062 | 0.066 | 0.071 |
| Baa | 331 | 0.006 | 0.006 | 0.010 | 0.014 | 0.018 | 0.027 | 0.036 | 0.051 | 0.051 | 0.057 | 0.057 | 0.057 | 0.057 | 0.064 | 0.064 | 0.072 | 0.089 | 0.116 | 0.143 | 0.143 |
| Ba | 195 | 0.005 | 0.022 | 0.091 | 0.117 | 0.152 | 0.184 | 0.244 | 0.297 | 0.308 | 0.319 | 0.319 | 0.319 | 0.319 | 0.319 | 0.319 | 0.358 | 0.378 | 0.398 | 0.438 | 0.438 |
| B | 154 | 0.053 | 0.123 | 0.217 | 0.247 | 0.280 | 0.337 | 0.418 | 0.478 | 0.497 | 0.537 | 0.537 | 0.537 | 0.537 | 0.537 | 0.573 | 0.573 | 0.573 | 0.573 | 0.573 | 0.573 |
| Caa-C | 11 | 0.182 | 0.299 | 0.299 | 0.474 | 0.474 | 0.474 | 0.474 | 0.474 | 0.474 | 0.474 | 0.474 | 0.474 | 0.474 | 0.474 | 0.474 | 0.474 | 0.474 | 0.474 | 0.474 | 0.474 |
| IG | 1162 | 0.002 | 0.003 | 0.005 | 0.009 | 0.017 | 0.019 | 0.029 | 0.037 | 0.040 | 0.041 | 0.041 | 0.043 | 0.043 | 0.044 | 0.044 | 0.046 | 0.051 | 0.064 | 0.073 | 0.075 |

| | | | | | | | | | | | | | | | | | | | | | |
|---------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| SG | 360 | 0.031 | 0.073 | 0.151 | 0.182 | 0.215 | 0.257 | 0.324 | 0.377 | 0.390 | 0.411 | 0.411 | 0.411 | 0.411 | 0.411 | 0.422 | 0.446 | 0.459 | 0.472 | 0.498 | 0.498 |
| All | 1522 | 0.009 | 0.019 | 0.039 | 0.049 | 0.062 | 0.072 | 0.093 | 0.109 | 0.113 | 0.118 | 0.118 | 0.119 | 0.119 | 0.120 | 0.122 | 0.126 | 0.132 | 0.144 | 0.156 | 0.157 |
| 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 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 |
| Aa | 303 | 0.000 | 0.000 | 0.000 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 | 0.020 | 0.027 | 0.027 | 0.027 |
| A | 557 | 0.000 | 0.002 | 0.012 | 0.023 | 0.023 | 0.040 | 0.050 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | 0.056 | 0.063 | 0.067 | 0.071 | 0.071 |
| Baa | 336 | 0.000 | 0.010 | 0.014 | 0.018 | 0.026 | 0.031 | 0.046 | 0.051 | 0.057 | 0.057 | 0.057 | 0.057 | 0.064 | 0.064 | 0.089 | 0.108 | 0.136 | 0.165 | 0.165 | 0.165 |
| Ba | 236 | 0.009 | 0.059 | 0.087 | 0.121 | 0.172 | 0.233 | 0.291 | 0.307 | 0.316 | 0.316 | 0.316 | 0.316 | 0.316 | 0.316 | 0.332 | 0.349 | 0.383 | 0.417 | 0.417 | 0.417 |
| B | 182 | 0.073 | 0.160 | 0.210 | 0.243 | 0.300 | 0.383 | 0.438 | 0.455 | 0.495 | 0.495 | 0.520 | 0.520 | 0.520 | 0.555 | 0.555 | 0.555 | 0.555 | 0.555 | 0.555 | 0.555 |
| Caa-C | 15 | 0.067 | 0.133 | 0.220 | 0.318 | 0.318 | 0.318 | 0.318 | 0.318 | 0.318 | 0.318 | 0.591 | 0.591 | 0.591 | 0.591 | 0.591 | 0.591 | 0.591 | 0.591 | 0.591 | 0.591 |
| IG | 1287 | 0.000 | 0.003 | 0.009 | 0.016 | 0.018 | 0.028 | 0.036 | 0.038 | 0.039 | 0.039 | 0.041 | 0.041 | 0.042 | 0.042 | 0.047 | 0.052 | 0.063 | 0.072 | 0.074 | 0.074 |
| SG | 433 | 0.038 | 0.105 | 0.143 | 0.179 | 0.231 | 0.299 | 0.353 | 0.368 | 0.385 | 0.385 | 0.407 | 0.407 | 0.407 | 0.416 | 0.426 | 0.437 | 0.460 | 0.483 | 0.483 | 0.483 |
| All | 1720 | 0.010 | 0.029 | 0.043 | 0.057 | 0.070 | 0.092 | 0.108 | 0.113 | 0.117 | 0.117 | 0.122 | 0.122 | 0.123 | 0.124 | 0.130 | 0.135 | 0.147 | 0.158 | 0.159 | 0.159 |
| 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 | 0.000 |
| Aa | 352 | 0.000 | 0.000 | 0.006 | 0.006 | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.024 | 0.030 | 0.030 | 0.030 | 0.030 |
| A | 625 | 0.000 | 0.002 | 0.007 | 0.009 | 0.019 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.032 | 0.038 | 0.045 | 0.049 | 0.049 | 0.053 |
| Baa | 364 | 0.009 | 0.012 | 0.025 | 0.037 | 0.052 | 0.065 | 0.074 | 0.079 | 0.084 | 0.084 | 0.084 | 0.090 | 0.090 | 0.105 | 0.112 | 0.128 | 0.144 | 0.144 | 0.144 | 0.144 |
| Ba | 314 | 0.024 | 0.069 | 0.094 | 0.136 | 0.203 | 0.264 | 0.284 | 0.306 | 0.314 | 0.314 | 0.314 | 0.324 | 0.324 | 0.324 | 0.339 | 0.397 | 0.427 | 0.427 | 0.427 | 0.443 |
| B | 223 | 0.105 | 0.149 | 0.190 | 0.240 | 0.318 | 0.391 | 0.438 | 0.465 | 0.465 | 0.487 | 0.487 | 0.487 | 0.511 | 0.569 | 0.599 | 0.599 | 0.599 | 0.599 | 0.599 | 0.599 |
| Caa-C | 19 | 0.171 | 0.235 | 0.311 | 0.311 | 0.311 | 0.311 | 0.311 | 0.311 | 0.311 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 | 0.770 |
| IG | 1477 | 0.002 | 0.004 | 0.011 | 0.014 | 0.023 | 0.029 | 0.031 | 0.032 | 0.033 | 0.034 | 0.034 | 0.035 | 0.035 | 0.038 | 0.042 | 0.050 | 0.057 | 0.059 | 0.059 | 0.061 |
| SG | 556 | 0.062 | 0.107 | 0.140 | 0.185 | 0.254 | 0.318 | 0.347 | 0.370 | 0.375 | 0.392 | 0.392 | 0.399 | 0.406 | 0.423 | 0.441 | 0.479 | 0.498 | 0.498 | 0.498 | 0.509 |
| All | 2033 | 0.018 | 0.031 | 0.045 | 0.058 | 0.081 | 0.098 | 0.105 | 0.110 | 0.112 | 0.115 | 0.115 | 0.118 | 0.119 | 0.123 | 0.129 | 0.140 | 0.149 | 0.151 | 0.151 | 0.154 |
| 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 | 0.000 |
| Aa | 365 | 0.000 | 0.000 | 0.000 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.013 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 |
| A | 594 | 0.000 | 0.000 | 0.002 | 0.011 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 | 0.021 | 0.027 | 0.034 | 0.042 | 0.042 | 0.046 | 0.050 |
| Baa | 402 | 0.000 | 0.009 | 0.018 | 0.034 | 0.048 | 0.063 | 0.075 | 0.075 | 0.075 | 0.075 | 0.081 | 0.087 | 0.099 | 0.105 | 0.119 | 0.126 | 0.126 | 0.126 | 0.126 | 0.126 |
| Ba | 422 | 0.030 | 0.050 | 0.087 | 0.159 | 0.239 | 0.265 | 0.290 | 0.307 | 0.313 | 0.320 | 0.336 | 0.336 | 0.336 | 0.347 | 0.382 | 0.441 | 0.441 | 0.441 | 0.455 | 0.470 |
| B | 303 | 0.054 | 0.119 | 0.194 | 0.295 | 0.381 | 0.431 | 0.449 | 0.449 | 0.461 | 0.461 | 0.461 | 0.476 | 0.511 | 0.565 | 0.584 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 |
| Caa-C | 33 | 0.098 | 0.168 | 0.168 | 0.501 | 0.501 | 0.501 | 0.501 | 0.501 | 0.750 | 0.750 | 0.750 | 0.750 | 0.750 | 0.750 | 0.750 | 0.750 | 0.750 | 0.750 | 0.750 | 0.750 |
| IG | 1517 | 0.000 | 0.002 | 0.005 | 0.014 | 0.019 | 0.023 | 0.026 | 0.026 | 0.027 | 0.027 | 0.028 | 0.029 | 0.032 | 0.034 | 0.041 | 0.047 | 0.050 | 0.050 | 0.052 | 0.053 |
| SG | 758 | 0.043 | 0.083 | 0.135 | 0.224 | 0.304 | 0.338 | 0.359 | 0.370 | 0.385 | 0.390 | 0.399 | 0.404 | 0.417 | 0.443 | 0.470 | 0.513 | 0.513 | 0.513 | 0.522 | 0.531 |
| All | 2275 | 0.014 | 0.029 | 0.046 | 0.078 | 0.103 | 0.114 | 0.121 | 0.123 | 0.127 | 0.128 | 0.131 | 0.133 | 0.137 | 0.143 | 0.153 | 0.165 | 0.167 | 0.167 | 0.170 | 0.172 |
| 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 | 0.000 |
| Aa | 401 | 0.000 | 0.005 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.016 | 0.021 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 |
| A | 605 | 0.000 | 0.002 | 0.009 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.021 | 0.024 | 0.032 | 0.032 | 0.036 | 0.040 | 0.040 |
| Baa | 380 | 0.000 | 0.003 | 0.012 | 0.025 | 0.042 | 0.057 | 0.057 | 0.057 | 0.057 | 0.062 | 0.062 | 0.068 | 0.074 | 0.093 | 0.112 | 0.112 | 0.112 | 0.112 | 0.112 | 0.112 |
| Ba | 463 | 0.014 | 0.065 | 0.120 | 0.201 | 0.225 | 0.249 | 0.259 | 0.264 | 0.275 | 0.288 | 0.296 | 0.303 | 0.312 | 0.358 | 0.416 | 0.416 | 0.416 | 0.429 | 0.443 | 0.476 |

| | | | | | | | | | | | | | | | | | | | | | |
|---------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| B | 385 | 0.059 | 0.130 | 0.262 | 0.348 | 0.393 | 0.423 | 0.438 | 0.463 | 0.463 | 0.474 | 0.520 | 0.548 | 0.592 | 0.608 | 0.625 | 0.625 | 0.625 | 0.625 | 0.625 | 0.625 |
| Caa-C | 40 | 0.125 | 0.157 | 0.445 | 0.445 | 0.445 | 0.445 | 0.445 | 0.723 | 0.723 | 0.723 | 0.723 | 0.723 | 0.723 | 0.723 | 0.723 | 0.723 | 0.723 | 0.723 | 0.723 | 0.723 |
| IG | 1540 | 0.000 | 0.003 | 0.009 | 0.014 | 0.018 | 0.021 | 0.021 | 0.022 | 0.022 | 0.023 | 0.023 | 0.024 | 0.027 | 0.035 | 0.041 | 0.044 | 0.044 | 0.046 | 0.047 | 0.047 |
| SG | 888 | 0.039 | 0.097 | 0.190 | 0.271 | 0.303 | 0.329 | 0.340 | 0.358 | 0.365 | 0.376 | 0.398 | 0.412 | 0.433 | 0.466 | 0.508 | 0.508 | 0.508 | 0.515 | 0.524 | 0.543 |
| All | 2428 | 0.014 | 0.036 | 0.069 | 0.098 | 0.109 | 0.119 | 0.121 | 0.126 | 0.128 | 0.131 | 0.136 | 0.139 | 0.145 | 0.157 | 0.169 | 0.172 | 0.172 | 0.174 | 0.177 | 0.179 |
| 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 | 0.000 |
| Aa | 412 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.013 | 0.017 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.033 |
| A | 642 | 0.000 | 0.003 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.017 | 0.020 | 0.024 | 0.024 | 0.028 | 0.031 | 0.031 | 0.044 |
| Baa | 398 | 0.005 | 0.016 | 0.022 | 0.040 | 0.047 | 0.047 | 0.047 | 0.047 | 0.052 | 0.052 | 0.057 | 0.062 | 0.084 | 0.101 | 0.107 | 0.107 | 0.107 | 0.107 | 0.107 | 0.115 |
| Ba | 437 | 0.030 | 0.098 | 0.178 | 0.201 | 0.227 | 0.231 | 0.236 | 0.247 | 0.260 | 0.281 | 0.289 | 0.305 | 0.347 | 0.410 | 0.410 | 0.410 | 0.410 | 0.422 | 0.448 | 0.463 |
| B | 423 | 0.075 | 0.211 | 0.295 | 0.346 | 0.379 | 0.402 | 0.436 | 0.443 | 0.468 | 0.496 | 0.519 | 0.557 | 0.557 | 0.588 | 0.588 | 0.588 | 0.611 | 0.611 | 0.611 | 0.662 |
| Caa-C | 49 | 0.203 | 0.490 | 0.554 | 0.554 | 0.554 | 0.554 | 0.554 | 0.554 | 0.554 | 0.554 | 0.554 | 0.554 | 0.777 | 0.777 | 0.777 | 0.777 | 0.777 | 0.777 | 0.777 | 0.777 |
| IG | 1623 | 0.003 | 0.006 | 0.010 | 0.014 | 0.016 | 0.016 | 0.017 | 0.017 | 0.018 | 0.018 | 0.019 | 0.021 | 0.030 | 0.037 | 0.039 | 0.039 | 0.041 | 0.042 | 0.042 | 0.052 |
| SG | 909 | 0.059 | 0.164 | 0.245 | 0.280 | 0.308 | 0.320 | 0.337 | 0.346 | 0.363 | 0.387 | 0.400 | 0.424 | 0.453 | 0.502 | 0.502 | 0.502 | 0.509 | 0.516 | 0.532 | 0.559 |
| All | 2532 | 0.022 | 0.060 | 0.088 | 0.101 | 0.109 | 0.112 | 0.117 | 0.119 | 0.124 | 0.128 | 0.132 | 0.138 | 0.151 | 0.164 | 0.166 | 0.166 | 0.168 | 0.171 | 0.173 | 0.185 |
| 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 | 0.000 |
| Aa | 462 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.006 | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 | 0.020 | 0.036 |
| A | 668 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 0.006 | 0.008 | 0.012 | 0.012 | 0.015 | 0.015 | 0.015 | 0.027 | 0.043 |
| Baa | 390 | 0.003 | 0.008 | 0.011 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.020 | 0.025 | 0.053 | 0.081 | 0.087 | 0.087 | 0.087 | 0.087 | 0.094 | 0.094 | 0.102 | 0.128 |
| Ba | 422 | 0.038 | 0.122 | 0.147 | 0.175 | 0.179 | 0.189 | 0.194 | 0.206 | 0.227 | 0.234 | 0.257 | 0.313 | 0.355 | 0.355 | 0.355 | 0.355 | 0.367 | 0.392 | 0.405 | 0.419 |
| B | 447 | 0.137 | 0.232 | 0.300 | 0.332 | 0.355 | 0.383 | 0.397 | 0.427 | 0.452 | 0.474 | 0.513 | 0.513 | 0.546 | 0.546 | 0.546 | 0.569 | 0.569 | 0.569 | 0.650 | 0.679 |
| Caa-C | 56 | 0.439 | 0.479 | 0.566 | 0.566 | 0.566 | 0.566 | 0.566 | 0.566 | 0.566 | 0.783 | 0.783 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| IG | 1712 | 0.001 | 0.002 | 0.003 | 0.003 | 0.003 | 0.004 | 0.004 | 0.004 | 0.004 | 0.005 | 0.007 | 0.015 | 0.023 | 0.025 | 0.025 | 0.026 | 0.028 | 0.028 | 0.037 | 0.052 |
| SG | 925 | 0.105 | 0.192 | 0.239 | 0.267 | 0.280 | 0.298 | 0.306 | 0.325 | 0.347 | 0.364 | 0.391 | 0.429 | 0.465 | 0.465 | 0.465 | 0.472 | 0.479 | 0.494 | 0.527 | 0.545 |
| All | 2637 | 0.036 | 0.064 | 0.079 | 0.087 | 0.090 | 0.095 | 0.097 | 0.101 | 0.106 | 0.109 | 0.116 | 0.129 | 0.141 | 0.143 | 0.143 | 0.145 | 0.147 | 0.149 | 0.161 | 0.176 |
| 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 | 0.000 |
| Aa | 493 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.006 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.019 | 0.038 | 0.038 |
| A | 656 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 0.005 | 0.008 | 0.011 | 0.011 | 0.014 | 0.014 | 0.014 | 0.026 | 0.041 | 0.045 |
| Baa | 414 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.007 | 0.011 | 0.034 | 0.058 | 0.063 | 0.063 | 0.063 | 0.069 | 0.075 | 0.082 | 0.096 | 0.096 |
| Ba | 357 | 0.038 | 0.051 | 0.070 | 0.075 | 0.080 | 0.085 | 0.097 | 0.119 | 0.127 | 0.152 | 0.204 | 0.241 | 0.241 | 0.253 | 0.253 | 0.266 | 0.266 | 0.281 | 0.298 | 0.298 |
| B | 373 | 0.132 | 0.221 | 0.267 | 0.291 | 0.324 | 0.337 | 0.360 | 0.388 | 0.411 | 0.453 | 0.469 | 0.521 | 0.521 | 0.521 | 0.546 | 0.546 | 0.573 | 0.664 | 0.732 | 0.732 |
| Caa-C | 62 | 0.153 | 0.186 | 0.221 | 0.265 | 0.317 | 0.317 | 0.374 | 0.374 | 0.478 | 0.478 | 0.609 | 0.609 | 0.609 | 0.609 | 0.609 | 0.609 | 0.609 | 0.609 | 0.609 | 0.609 |
| IG | 1742 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.002 | 0.004 | 0.011 | 0.019 | 0.021 | 0.021 | 0.022 | 0.023 | 0.025 | 0.033 | 0.047 | 0.049 |
| SG | 792 | 0.091 | 0.141 | 0.173 | 0.188 | 0.208 | 0.216 | 0.235 | 0.258 | 0.275 | 0.304 | 0.345 | 0.383 | 0.383 | 0.390 | 0.397 | 0.405 | 0.413 | 0.449 | 0.478 | 0.478 |
| All | 2534 | 0.028 | 0.042 | 0.051 | 0.054 | 0.060 | 0.061 | 0.065 | 0.070 | 0.073 | 0.079 | 0.092 | 0.104 | 0.105 | 0.106 | 0.108 | 0.111 | 0.113 | 0.124 | 0.140 | 0.141 |
| 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 | 0.000 |
| Aa | 499 | 0.000 | 0.000 | 0.000 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.015 | 0.019 | 0.019 |

| | | | | | | | | | | | | | | | | | | | | | |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| A | 756 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 0.005 | 0.009 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.029 | 0.049 | 0.056 | 0.064 |
| Baa | 425 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.004 | 0.008 | 0.029 | 0.043 | 0.047 | 0.047 | 0.053 | 0.058 | 0.064 | 0.070 | 0.083 | 0.083 | 0.090 |
| Ba | 339 | 0.003 | 0.011 | 0.011 | 0.016 | 0.016 | 0.028 | 0.049 | 0.063 | 0.079 | 0.130 | 0.174 | 0.174 | 0.186 | 0.198 | 0.212 | 0.212 | 0.245 | 0.262 | 0.262 | 0.262 |
| B | 300 | 0.074 | 0.139 | 0.173 | 0.213 | 0.233 | 0.257 | 0.284 | 0.307 | 0.363 | 0.378 | 0.445 | 0.445 | 0.445 | 0.445 | 0.445 | 0.445 | 0.500 | 0.592 | 0.592 | 0.592 |
| Caa-C | 73 | 0.165 | 0.221 | 0.268 | 0.295 | 0.327 | 0.360 | 0.360 | 0.431 | 0.431 | 0.513 | 0.513 | 0.513 | 0.513 | 0.513 | 0.513 | 0.675 | 0.675 | 0.675 | 0.675 | 0.675 |
| IG | 1845 | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 | 0.001 | 0.001 | 0.002 | 0.003 | 0.010 | 0.014 | 0.016 | 0.016 | 0.018 | 0.019 | 0.020 | 0.028 | 0.041 | 0.045 | 0.049 |
| SG | 712 | 0.049 | 0.086 | 0.104 | 0.125 | 0.136 | 0.154 | 0.176 | 0.197 | 0.225 | 0.264 | 0.311 | 0.311 | 0.317 | 0.324 | 0.333 | 0.341 | 0.378 | 0.420 | 0.420 | 0.420 |
| All | 2557 | 0.013 | 0.023 | 0.027 | 0.032 | 0.034 | 0.038 | 0.042 | 0.046 | 0.052 | 0.063 | 0.074 | 0.076 | 0.077 | 0.079 | 0.081 | 0.083 | 0.094 | 0.110 | 0.114 | 0.117 |

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 | 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 | 0.000 | 0.004 | 0.009 | 0.009 | 0.009 |
| A | 824 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 0.006 | 0.010 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.024 | 0.039 | 0.042 | 0.046 | 0.049 |
| Baa | 478 | 0.000 | 0.000 | 0.002 | 0.002 | 0.005 | 0.008 | 0.015 | 0.021 | 0.039 | 0.050 | 0.057 | 0.057 | 0.062 | 0.066 | 0.071 | 0.087 | 0.108 | 0.113 | 0.125 | 0.131 |
| Ba | 353 | 0.006 | 0.006 | 0.019 | 0.027 | 0.037 | 0.054 | 0.078 | 0.085 | 0.127 | 0.171 | 0.171 | 0.171 | 0.181 | 0.192 | 0.192 | 0.217 | 0.244 | 0.244 | 0.244 | 0.244 |
| B | 289 | 0.044 | 0.084 | 0.140 | 0.156 | 0.182 | 0.204 | 0.239 | 0.319 | 0.352 | 0.388 | 0.400 | 0.400 | 0.400 | 0.418 | 0.438 | 0.484 | 0.566 | 0.566 | 0.566 | 0.566 |
| Caa-C | 75 | 0.135 | 0.193 | 0.239 | 0.266 | 0.266 | 0.266 | 0.327 | 0.327 | 0.402 | 0.402 | 0.402 | 0.487 | 0.487 | 0.487 | 0.487 | 0.487 | 0.487 | 0.487 | 0.487 | 0.487 |
| IG | 1938 | 0.000 | 0.000 | 0.001 | 0.001 | 0.001 | 0.002 | 0.003 | 0.006 | 0.012 | 0.016 | 0.019 | 0.019 | 0.020 | 0.021 | 0.022 | 0.030 | 0.042 | 0.046 | 0.050 | 0.052 |
| SG | 717 | 0.034 | 0.056 | 0.090 | 0.103 | 0.118 | 0.136 | 0.166 | 0.199 | 0.239 | 0.277 | 0.282 | 0.287 | 0.292 | 0.305 | 0.311 | 0.342 | 0.383 | 0.383 | 0.383 | 0.383 |
| All | 2655 | 0.009 | 0.015 | 0.023 | 0.026 | 0.029 | 0.033 | 0.040 | 0.048 | 0.059 | 0.069 | 0.072 | 0.073 | 0.075 | 0.077 | 0.079 | 0.090 | 0.105 | 0.109 | 0.112 | 0.114 |

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 | 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 | 0.000 | 0.004 | 0.004 | 0.004 | 0.004 |
| A | 1003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 0.005 | 0.008 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.020 | 0.035 | 0.037 | 0.045 | 0.048 | 0.048 |
| Baa | 539 | 0.000 | 0.002 | 0.002 | 0.004 | 0.007 | 0.019 | 0.024 | 0.037 | 0.045 | 0.051 | 0.051 | 0.055 | 0.058 | 0.062 | 0.079 | 0.101 | 0.106 | 0.115 | 0.120 | 0.120 |
| Ba | 397 | 0.000 | 0.009 | 0.012 | 0.022 | 0.043 | 0.074 | 0.103 | 0.135 | 0.174 | 0.180 | 0.180 | 0.188 | 0.206 | 0.206 | 0.240 | 0.301 | 0.301 | 0.301 | 0.317 | 0.317 |
| B | 381 | 0.042 | 0.091 | 0.126 | 0.143 | 0.172 | 0.219 | 0.273 | 0.331 | 0.379 | 0.414 | 0.433 | 0.433 | 0.445 | 0.458 | 0.489 | 0.522 | 0.522 | 0.522 | 0.522 | 0.522 |
| Caa-C | 84 | 0.054 | 0.104 | 0.144 | 0.144 | 0.144 | 0.237 | 0.237 | 0.322 | 0.322 | 0.322 | 0.435 | 0.435 | 0.435 | 0.435 | 0.435 | 0.435 | 0.435 | 0.435 | 0.435 | 0.435 |
| IG | 2152 | 0.000 | 0.000 | 0.000 | 0.001 | 0.002 | 0.005 | 0.007 | 0.011 | 0.015 | 0.018 | 0.018 | 0.019 | 0.020 | 0.021 | 0.029 | 0.040 | 0.043 | 0.049 | 0.051 | 0.051 |
| SG | 862 | 0.023 | 0.054 | 0.073 | 0.086 | 0.109 | 0.149 | 0.187 | 0.230 | 0.271 | 0.288 | 0.300 | 0.304 | 0.319 | 0.324 | 0.356 | 0.403 | 0.403 | 0.403 | 0.412 | 0.412 |
| All | 3014 | 0.007 | 0.015 | 0.020 | 0.023 | 0.029 | 0.040 | 0.049 | 0.060 | 0.071 | 0.076 | 0.078 | 0.080 | 0.083 | 0.084 | 0.095 | 0.111 | 0.113 | 0.118 | 0.121 | 0.121 |

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 | 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 | 0.000 | 0.004 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |
| A | 1079 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.004 | 0.008 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.020 | 0.030 | 0.033 | 0.040 | 0.042 | 0.042 | 0.045 |
| Baa | 553 | 0.000 | 0.000 | 0.000 | 0.002 | 0.013 | 0.018 | 0.033 | 0.041 | 0.044 | 0.044 | 0.047 | 0.050 | 0.054 | 0.070 | 0.091 | 0.095 | 0.105 | 0.109 | 0.109 | 0.109 |
| Ba | 409 | 0.003 | 0.005 | 0.018 | 0.036 | 0.071 | 0.096 | 0.127 | 0.151 | 0.167 | 0.167 | 0.174 | 0.190 | 0.190 | 0.219 | 0.297 | 0.297 | 0.297 | 0.311 | 0.311 | 0.311 |
| B | 502 | 0.040 | 0.065 | 0.090 | 0.123 | 0.166 | 0.220 | 0.311 | 0.385 | 0.428 | 0.451 | 0.458 | 0.465 | 0.474 | 0.492 | 0.522 | 0.522 | 0.522 | 0.522 | 0.522 | 0.522 |
| Caa-C | 94 | 0.105 | 0.165 | 0.165 | 0.207 | 0.313 | 0.419 | 0.557 | 0.631 | 0.631 | 0.631 | 0.631 | 0.631 | 0.631 | 0.631 | 0.631 | 0.631 | 0.631 | 0.631 | 0.631 | 0.631 |
| IG | 2331 | 0.000 | 0.000 | 0.000 | 0.001 | 0.003 | 0.005 | 0.010 | 0.014 | 0.016 | 0.016 | 0.016 | 0.017 | 0.018 | 0.025 | 0.036 | 0.039 | 0.044 | 0.046 | 0.046 | 0.048 |
| SG | 1005 | 0.031 | 0.049 | 0.066 | 0.094 | 0.136 | 0.178 | 0.240 | 0.289 | 0.317 | 0.329 | 0.336 | 0.347 | 0.351 | 0.375 | 0.425 | 0.425 | 0.425 | 0.432 | 0.432 | 0.432 |
| All | 3336 | 0.009 | 0.014 | 0.019 | 0.026 | 0.038 | 0.049 | 0.066 | 0.080 | 0.087 | 0.089 | 0.091 | 0.094 | 0.095 | 0.105 | 0.121 | 0.124 | 0.128 | 0.131 | 0.131 | 0.132 |

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 | 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 | 0.004 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 |
| A | 1156 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.004 | 0.006 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.016 | 0.028 | 0.030 | 0.036 | 0.038 | 0.038 | 0.041 | 0.041 |
| Baa | 650 | 0.000 | 0.000 | 0.002 | 0.007 | 0.013 | 0.027 | 0.033 | 0.038 | 0.040 | 0.042 | 0.048 | 0.048 | 0.064 | 0.081 | 0.084 | 0.096 | 0.100 | 0.100 | 0.100 | 0.112 |
| Ba | 468 | 0.000 | 0.007 | 0.021 | 0.056 | 0.076 | 0.110 | 0.137 | 0.153 | 0.153 | 0.165 | 0.177 | 0.184 | 0.207 | 0.257 | 0.257 | 0.257 | 0.267 | 0.267 | 0.267 | 0.267 |
| B | 571 | 0.015 | 0.040 | 0.088 | 0.121 | 0.177 | 0.253 | 0.328 | 0.364 | 0.389 | 0.395 | 0.401 | 0.408 | 0.434 | 0.486 | 0.486 | 0.486 | 0.486 | 0.486 | 0.486 | 0.512 |
| Caa-C | 106 | 0.103 | 0.152 | 0.198 | 0.345 | 0.444 | 0.567 | 0.615 | 0.615 | 0.615 | 0.615 | 0.615 | 0.615 | 0.615 | 0.615 | 0.615 | 0.615 | 0.615 | 0.615 | 0.615 | 0.615 |
| IG | 2550 | 0.000 | 0.000 | 0.000 | 0.002 | 0.004 | 0.009 | 0.011 | 0.014 | 0.014 | 0.015 | 0.017 | 0.017 | 0.024 | 0.034 | 0.037 | 0.042 | 0.044 | 0.044 | 0.045 | 0.048 |
| SG | 1145 | 0.017 | 0.036 | 0.069 | 0.110 | 0.151 | 0.208 | 0.258 | 0.283 | 0.295 | 0.303 | 0.312 | 0.319 | 0.342 | 0.390 | 0.390 | 0.390 | 0.396 | 0.396 | 0.396 | 0.408 |
| All | 3695 | 0.005 | 0.011 | 0.020 | 0.032 | 0.044 | 0.061 | 0.075 | 0.083 | 0.086 | 0.088 | 0.091 | 0.092 | 0.101 | 0.118 | 0.120 | 0.124 | 0.127 | 0.127 | 0.128 | 0.132 |

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 | 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 | 0.003 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 |
| A | 1178 | 0.000 | 0.000 | 0.000 | 0.001 | 0.003 | 0.005 | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 | 0.020 | 0.030 | 0.032 | 0.040 | 0.043 | 0.052 | 0.054 | 0.054 | 0.054 |
| Baa | 821 | 0.000 | 0.001 | 0.005 | 0.010 | 0.020 | 0.027 | 0.030 | 0.032 | 0.036 | 0.040 | 0.040 | 0.051 | 0.069 | 0.072 | 0.081 | 0.087 | 0.087 | 0.087 | 0.103 | 0.103 |
| Ba | 590 | 0.002 | 0.014 | 0.051 | 0.082 | 0.107 | 0.140 | 0.155 | 0.155 | 0.164 | 0.173 | 0.178 | 0.194 | 0.229 | 0.229 | 0.229 | 0.236 | 0.236 | 0.236 | 0.259 | 0.259 |
| B | 689 | 0.020 | 0.063 | 0.103 | 0.156 | 0.250 | 0.313 | 0.348 | 0.373 | 0.381 | 0.396 | 0.407 | 0.438 | 0.503 | 0.503 | 0.503 | 0.503 | 0.512 | 0.512 | 0.512 | 0.521 |
| Caa-C | 127 | 0.098 | 0.174 | 0.308 | 0.474 | 0.589 | 0.626 | 0.626 | 0.626 | 0.626 | 0.626 | 0.626 | 0.626 | 0.626 | 0.626 | 0.626 | 0.626 | 0.626 | 0.626 | 0.626 | 0.626 |
| IG | 2818 | 0.000 | 0.000 | 0.002 | 0.003 | 0.007 | 0.010 | 0.013 | 0.014 | 0.015 | 0.016 | 0.016 | 0.023 | 0.033 | 0.036 | 0.041 | 0.044 | 0.048 | 0.049 | 0.053 | 0.053 |
| SG | 1406 | 0.019 | 0.051 | 0.096 | 0.144 | 0.207 | 0.254 | 0.278 | 0.290 | 0.298 | 0.309 | 0.316 | 0.338 | 0.385 | 0.385 | 0.385 | 0.388 | 0.392 | 0.392 | 0.404 | 0.408 |
| All | 4224 | 0.006 | 0.017 | 0.031 | 0.045 | 0.066 | 0.080 | 0.088 | 0.092 | 0.094 | 0.097 | 0.099 | 0.109 | 0.126 | 0.127 | 0.132 | 0.135 | 0.138 | 0.139 | 0.145 | 0.146 |

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 | 20 |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 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 | 0.000 | 0.000 |
| Aa | 735 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.005 | 0.008 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.015 |
| A | 1177 | 0.000 | 0.000 | 0.001 | 0.003 | 0.005 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.019 | 0.030 | 0.031 | 0.037 | 0.042 | 0.052 | 0.054 | 0.054 | 0.054 | 0.054 |
| Baa | 961 | 0.001 | 0.004 | 0.008 | 0.018 | 0.028 | 0.031 | 0.034 | 0.037 | 0.041 | 0.041 | 0.049 | 0.067 | 0.072 | 0.079 | 0.082 | 0.085 | 0.085 | 0.099 | 0.099 | 0.099 |
| Ba | 711 | 0.009 | 0.036 | 0.066 | 0.102 | 0.132 | 0.150 | 0.153 | 0.159 | 0.163 | 0.167 | 0.183 | 0.222 | 0.222 | 0.222 | 0.232 | 0.232 | 0.232 | 0.249 | 0.261 | 0.261 |
| B | 937 | 0.039 | 0.096 | 0.166 | 0.260 | 0.320 | 0.367 | 0.402 | 0.412 | 0.433 | 0.450 | 0.469 | 0.505 | 0.505 | 0.505 | 0.505 | 0.510 | 0.510 | 0.516 | 0.516 | 0.522 |
| Caa-C | 139 | 0.083 | 0.275 | 0.391 | 0.581 | 0.633 | 0.689 | 0.733 | 0.733 | 0.733 | 0.733 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| IG | 2998 | 0.000 | 0.001 | 0.003 | 0.007 | 0.011 | 0.014 | 0.015 | 0.016 | 0.018 | 0.018 | 0.024 | 0.035 | 0.037 | 0.043 | 0.046 | 0.050 | 0.051 | 0.055 | 0.055 | 0.056 |
| SG | 1787 | 0.030 | 0.085 | 0.141 | 0.215 | 0.262 | 0.296 | 0.316 | 0.324 | 0.336 | 0.346 | 0.365 | 0.400 | 0.400 | 0.400 | 0.405 | 0.408 | 0.408 | 0.418 | 0.424 | 0.426 |
| All | 4785 | 0.011 | 0.031 | 0.052 | 0.079 | 0.098 | 0.110 | 0.117 | 0.120 | 0.124 | 0.126 | 0.135 | 0.152 | 0.154 | 0.158 | 0.161 | 0.165 | 0.166 | 0.171 | 0.172 | 0.174 |

1/1/99

| Rating | n(0) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 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 | 0.000 |
| Aa | 731 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.005 | 0.010 | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 | 0.017 |
| A | 1218 | 0.000 | 0.000 | 0.002 | 0.003 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.017 | 0.028 | 0.028 | 0.035 | 0.040 | 0.049 | 0.051 | 0.051 | 0.051 | 0.051 |
| Baa | 1102 | 0.001 | 0.005 | 0.013 | 0.025 | 0.030 | 0.033 | 0.035 | 0.038 | 0.038 | 0.047 | 0.068 | 0.072 | 0.079 | 0.083 | 0.086 | 0.086 | 0.098 | 0.098 | 0.098 |
| Ba | 701 | 0.015 | 0.035 | 0.061 | 0.087 | 0.107 | 0.109 | 0.115 | 0.121 | 0.124 | 0.150 | 0.186 | 0.190 | 0.190 | 0.199 | 0.199 | 0.199 | 0.205 | 0.221 | 0.221 |
| B | 1089 | 0.049 | 0.136 | 0.233 | 0.318 | 0.365 | 0.403 | 0.420 | 0.439 | 0.460 | 0.480 | 0.527 | 0.527 | 0.532 | 0.532 | 0.536 | 0.536 | 0.558 | 0.564 | 0.581 |
| Caa-C | 299 | 0.162 | 0.243 | 0.404 | 0.436 | 0.478 | 0.495 | 0.495 | 0.495 | 0.509 | 0.509 | 0.509 | 0.526 | 0.526 | 0.526 | 0.526 | 0.526 | 0.526 | 0.526 | 0.526 |
| IG | 3163 | 0.000 | 0.002 | 0.005 | 0.010 | 0.013 | 0.015 | 0.016 | 0.017 | 0.017 | 0.023 | 0.035 | 0.038 | 0.043 | 0.047 | 0.051 | 0.052 | 0.056 | 0.056 | 0.057 |

| | | | | | | | | | | | | | | | | | | | | |
|---------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| SG | 2089 | 0.054 | 0.117 | 0.197 | 0.255 | 0.291 | 0.313 | 0.324 | 0.336 | 0.346 | 0.368 | 0.403 | 0.405 | 0.408 | 0.412 | 0.414 | 0.414 | 0.426 | 0.435 | 0.442 |
| All | 5252 | 0.021 | 0.046 | 0.079 | 0.103 | 0.117 | 0.125 | 0.129 | 0.133 | 0.136 | 0.147 | 0.164 | 0.167 | 0.171 | 0.175 | 0.178 | 0.179 | 0.184 | 0.187 | 0.189 |
| 1/1/00 | | | | | | | | | | | | | | | | | | | | |
| Rating | n(0) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | |
| 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 | 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 | 0.000 | 0.005 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.011 |
| A | 1251 | 0.000 | 0.002 | 0.004 | 0.007 | 0.008 | 0.008 | 0.008 | 0.008 | 0.020 | 0.033 | 0.033 | 0.039 | 0.044 | 0.052 | 0.054 | 0.058 | 0.058 | 0.058 | 0.058 |
| Baa | 1184 | 0.003 | 0.008 | 0.019 | 0.025 | 0.028 | 0.031 | 0.034 | 0.034 | 0.038 | 0.060 | 0.064 | 0.069 | 0.075 | 0.077 | 0.077 | 0.083 | 0.083 | 0.083 | 0.083 |
| Ba | 662 | 0.013 | 0.031 | 0.052 | 0.068 | 0.068 | 0.076 | 0.079 | 0.082 | 0.115 | 0.164 | 0.168 | 0.168 | 0.177 | 0.177 | 0.177 | 0.187 | 0.203 | 0.203 | 0.203 |
| B | 1167 | 0.057 | 0.157 | 0.244 | 0.295 | 0.334 | 0.354 | 0.382 | 0.400 | 0.424 | 0.483 | 0.486 | 0.490 | 0.490 | 0.494 | 0.499 | 0.520 | 0.530 | 0.547 | |
| Caa-C | 313 | 0.179 | 0.400 | 0.494 | 0.562 | 0.601 | 0.601 | 0.601 | 0.601 | 0.601 | 0.620 | 0.620 | 0.640 | 0.640 | 0.640 | 0.640 | 0.640 | 0.640 | 0.640 | 0.640 |
| IG | 3278 | 0.001 | 0.004 | 0.008 | 0.012 | 0.013 | 0.015 | 0.015 | 0.015 | 0.022 | 0.034 | 0.036 | 0.041 | 0.045 | 0.049 | 0.050 | 0.054 | 0.054 | 0.054 | 0.054 |
| SG | 2142 | 0.061 | 0.150 | 0.216 | 0.256 | 0.281 | 0.294 | 0.309 | 0.319 | 0.344 | 0.392 | 0.396 | 0.399 | 0.403 | 0.405 | 0.407 | 0.420 | 0.431 | 0.438 | |
| All | 5420 | 0.025 | 0.060 | 0.088 | 0.104 | 0.113 | 0.118 | 0.123 | 0.126 | 0.137 | 0.158 | 0.161 | 0.165 | 0.169 | 0.172 | 0.173 | 0.179 | 0.182 | 0.184 | |
| 1/1/01 | | | | | | | | | | | | | | | | | | | | |
| 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 | 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 | 0.005 | 0.007 | 0.007 | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 | 0.013 | |
| A | 1298 | 0.002 | 0.004 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.020 | 0.032 | 0.033 | 0.039 | 0.042 | 0.049 | 0.052 | 0.057 | 0.057 | 0.057 | 0.057 | |
| Baa | 1157 | 0.002 | 0.014 | 0.020 | 0.025 | 0.028 | 0.031 | 0.031 | 0.034 | 0.054 | 0.056 | 0.061 | 0.070 | 0.072 | 0.072 | 0.076 | 0.078 | 0.078 | 0.078 | |
| Ba | 622 | 0.012 | 0.028 | 0.046 | 0.046 | 0.057 | 0.060 | 0.063 | 0.096 | 0.151 | 0.155 | 0.155 | 0.165 | 0.165 | 0.165 | 0.175 | 0.186 | 0.192 | 0.192 | |
| B | 1110 | 0.092 | 0.189 | 0.245 | 0.284 | 0.304 | 0.334 | 0.352 | 0.381 | 0.458 | 0.462 | 0.466 | 0.466 | 0.471 | 0.476 | 0.499 | 0.517 | 0.537 | 0.537 | |
| Caa-C | 309 | 0.300 | 0.417 | 0.547 | 0.602 | 0.613 | 0.613 | 0.613 | 0.613 | 0.630 | 0.630 | 0.650 | 0.650 | 0.650 | 0.650 | 0.650 | 0.650 | 0.650 | 0.650 | |
| IG | 3326 | 0.001 | 0.007 | 0.010 | 0.011 | 0.012 | 0.013 | 0.013 | 0.020 | 0.031 | 0.033 | 0.038 | 0.042 | 0.047 | 0.048 | 0.051 | 0.052 | 0.053 | 0.053 | |
| SG | 2041 | 0.096 | 0.169 | 0.219 | 0.245 | 0.260 | 0.277 | 0.287 | 0.314 | 0.373 | 0.377 | 0.381 | 0.385 | 0.387 | 0.389 | 0.403 | 0.414 | 0.424 | 0.424 | |
| All | 5367 | 0.037 | 0.067 | 0.086 | 0.095 | 0.100 | 0.105 | 0.108 | 0.119 | 0.142 | 0.144 | 0.148 | 0.152 | 0.156 | 0.158 | 0.163 | 0.166 | 0.169 | 0.169 | |
| 1/1/02 | | | | | | | | | | | | | | | | | | | | |
| Rating | n(0) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | | | |
| 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 | 0.000 |
| Aa | 757 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.005 | 0.007 | 0.007 | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 | 0.013 | 0.013 | |
| A | 1302 | 0.002 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.016 | 0.025 | 0.028 | 0.033 | 0.037 | 0.044 | 0.047 | 0.052 | 0.052 | 0.052 | 0.052 | 0.052 | |
| Baa | 1249 | 0.010 | 0.015 | 0.015 | 0.018 | 0.019 | 0.019 | 0.022 | 0.041 | 0.041 | 0.042 | 0.050 | 0.052 | 0.052 | 0.056 | 0.058 | 0.058 | 0.058 | 0.058 | |
| Ba | 601 | 0.014 | 0.037 | 0.046 | 0.055 | 0.063 | 0.067 | 0.095 | 0.147 | 0.151 | 0.151 | 0.164 | 0.164 | 0.164 | 0.179 | 0.184 | 0.190 | 0.190 | 0.190 | |
| B | 893 | 0.047 | 0.098 | 0.130 | 0.153 | 0.184 | 0.200 | 0.243 | 0.340 | 0.356 | 0.369 | 0.369 | 0.374 | 0.379 | 0.398 | 0.424 | 0.444 | 0.444 | 0.444 | |
| Caa-C | 359 | 0.268 | 0.410 | 0.485 | 0.498 | 0.527 | 0.538 | 0.554 | 0.601 | 0.601 | 0.619 | 0.619 | 0.619 | 0.619 | 0.619 | 0.619 | 0.619 | 0.619 | 0.619 | |
| IG | 3433 | 0.004 | 0.007 | 0.007 | 0.008 | 0.008 | 0.008 | 0.014 | 0.024 | 0.026 | 0.029 | 0.034 | 0.038 | 0.039 | 0.042 | 0.043 | 0.044 | 0.044 | 0.044 | |
| SG | 1853 | 0.077 | 0.132 | 0.160 | 0.177 | 0.198 | 0.208 | 0.240 | 0.309 | 0.318 | 0.326 | 0.332 | 0.334 | 0.336 | 0.350 | 0.362 | 0.372 | 0.372 | 0.372 | |
| All | 5286 | 0.029 | 0.049 | 0.058 | 0.063 | 0.069 | 0.071 | 0.083 | 0.107 | 0.110 | 0.114 | 0.119 | 0.122 | 0.124 | 0.129 | 0.132 | 0.134 | 0.134 | 0.134 | |
| 1/1/03 | | | | | | | | | | | | | | | | | | | | |
| Rating | n(0) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | | | | |
| Aaa | 123 | 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 | 687 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.005 | 0.007 | 0.007 | 0.010 | 0.010 | 0.010 | 0.010 | 0.013 | 0.013 | 0.013 | 0.013 | |
| A | 1290 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.012 | 0.020 | 0.023 | 0.029 | 0.032 | 0.039 | 0.042 | 0.046 | 0.046 | 0.046 | 0.046 | 0.046 | 0.046 | |
| Baa | 1209 | 0.000 | 0.000 | 0.002 | 0.003 | 0.004 | 0.005 | 0.017 | 0.017 | 0.017 | 0.024 | 0.026 | 0.026 | 0.029 | 0.031 | 0.031 | 0.031 | 0.031 | 0.031 | |
| Ba | 591 | 0.009 | 0.013 | 0.019 | 0.024 | 0.027 | 0.055 | 0.106 | 0.114 | 0.114 | 0.127 | 0.127 | 0.127 | 0.136 | 0.146 | 0.151 | 0.151 | 0.151 | 0.151 | |

| | | | | | | | | | | | | | | | | |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| B | 873 | 0.027 | 0.047 | 0.068 | 0.094 | 0.108 | 0.153 | 0.253 | 0.269 | 0.280 | 0.296 | 0.304 | 0.308 | 0.327 | 0.348 | 0.364 |
| Caa-C | 359 | 0.206 | 0.316 | 0.344 | 0.382 | 0.391 | 0.403 | 0.473 | 0.473 | 0.506 | 0.506 | 0.506 | 0.506 | 0.506 | 0.506 | 0.506 |
| IG | 3309 | 0.000 | 0.000 | 0.001 | 0.001 | 0.001 | 0.007 | 0.014 | 0.016 | 0.019 | 0.023 | 0.027 | 0.028 | 0.031 | 0.031 | 0.032 |
| SG | 1823 | 0.053 | 0.082 | 0.098 | 0.117 | 0.126 | 0.159 | 0.234 | 0.245 | 0.253 | 0.266 | 0.269 | 0.271 | 0.284 | 0.297 | 0.306 |
| All | 5132 | 0.018 | 0.028 | 0.033 | 0.039 | 0.041 | 0.054 | 0.078 | 0.082 | 0.086 | 0.091 | 0.095 | 0.097 | 0.102 | 0.105 | 0.107 |

1/1/04

| Rating | n(0) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Aaa | 143 | 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 | 654 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 0.002 | 0.007 | 0.009 | 0.009 | 0.012 | 0.012 | 0.012 | 0.012 | 0.015 |
| A | 1276 | 0.000 | 0.000 | 0.000 | 0.000 | 0.011 | 0.016 | 0.018 | 0.024 | 0.025 | 0.033 | 0.036 | 0.040 | 0.040 | 0.040 |
| Baa | 1269 | 0.000 | 0.002 | 0.002 | 0.002 | 0.003 | 0.019 | 0.019 | 0.019 | 0.027 | 0.028 | 0.028 | 0.033 | 0.035 | 0.035 |
| Ba | 569 | 0.004 | 0.006 | 0.013 | 0.018 | 0.045 | 0.099 | 0.102 | 0.102 | 0.111 | 0.111 | 0.111 | 0.125 | 0.135 | 0.140 |
| B | 966 | 0.008 | 0.021 | 0.040 | 0.049 | 0.091 | 0.201 | 0.214 | 0.222 | 0.241 | 0.248 | 0.251 | 0.263 | 0.276 | 0.295 |
| Caa-C | 314 | 0.118 | 0.185 | 0.229 | 0.259 | 0.287 | 0.405 | 0.416 | 0.475 | 0.491 | 0.491 | 0.491 | 0.491 | 0.514 | 0.514 |
| IG | 3342 | 0.000 | 0.001 | 0.001 | 0.001 | 0.006 | 0.014 | 0.015 | 0.018 | 0.022 | 0.026 | 0.027 | 0.030 | 0.031 | 0.031 |
| SG | 1849 | 0.024 | 0.041 | 0.060 | 0.070 | 0.105 | 0.195 | 0.204 | 0.214 | 0.228 | 0.231 | 0.233 | 0.245 | 0.257 | 0.268 |
| All | 5191 | 0.008 | 0.014 | 0.020 | 0.023 | 0.036 | 0.065 | 0.068 | 0.073 | 0.079 | 0.083 | 0.084 | 0.089 | 0.092 | 0.095 |

1/1/05

| Rating | n(0) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Aaa | 132 | 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 | 672 | 0.000 | 0.000 | 0.000 | 0.002 | 0.002 | 0.008 | 0.010 | 0.010 | 0.013 | 0.013 | 0.013 | 0.013 | 0.016 |
| A | 1326 | 0.000 | 0.000 | 0.000 | 0.008 | 0.013 | 0.015 | 0.020 | 0.021 | 0.028 | 0.030 | 0.034 | 0.034 | 0.034 |
| Baa | 1291 | 0.002 | 0.002 | 0.002 | 0.007 | 0.021 | 0.021 | 0.021 | 0.028 | 0.031 | 0.031 | 0.035 | 0.036 | 0.036 |
| Ba | 560 | 0.000 | 0.006 | 0.009 | 0.036 | 0.089 | 0.095 | 0.095 | 0.106 | 0.106 | 0.106 | 0.123 | 0.127 | 0.132 |
| B | 1050 | 0.008 | 0.026 | 0.037 | 0.085 | 0.203 | 0.216 | 0.225 | 0.244 | 0.255 | 0.258 | 0.272 | 0.291 | 0.307 |
| Caa-C | 346 | 0.073 | 0.113 | 0.145 | 0.218 | 0.377 | 0.409 | 0.489 | 0.502 | 0.515 | 0.532 | 0.551 | 0.571 | 0.571 |
| IG | 3421 | 0.001 | 0.001 | 0.001 | 0.006 | 0.013 | 0.015 | 0.018 | 0.021 | 0.025 | 0.026 | 0.029 | 0.029 | 0.030 |
| SG | 1956 | 0.017 | 0.036 | 0.047 | 0.092 | 0.194 | 0.207 | 0.220 | 0.235 | 0.242 | 0.245 | 0.261 | 0.273 | 0.282 |
| All | 5377 | 0.006 | 0.012 | 0.016 | 0.033 | 0.067 | 0.072 | 0.078 | 0.084 | 0.089 | 0.090 | 0.096 | 0.099 | 0.102 |

1/1/06

| Rating | n(0) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Aaa | 127 | 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 | 691 | 0.000 | 0.000 | 0.002 | 0.002 | 0.008 | 0.010 | 0.010 | 0.012 | 0.012 | 0.012 | 0.012 | 0.015 |
| A | 1385 | 0.000 | 0.000 | 0.007 | 0.010 | 0.012 | 0.018 | 0.019 | 0.027 | 0.029 | 0.033 | 0.033 | 0.033 |
| Baa | 1280 | 0.000 | 0.000 | 0.006 | 0.016 | 0.016 | 0.016 | 0.022 | 0.024 | 0.024 | 0.027 | 0.028 | 0.028 |
| Ba | 567 | 0.002 | 0.002 | 0.031 | 0.094 | 0.094 | 0.094 | 0.104 | 0.107 | 0.110 | 0.132 | 0.136 | 0.140 |
| B | 1117 | 0.011 | 0.020 | 0.082 | 0.190 | 0.213 | 0.229 | 0.253 | 0.263 | 0.269 | 0.293 | 0.320 | 0.350 |
| Caa-C | 375 | 0.059 | 0.100 | 0.199 | 0.386 | 0.440 | 0.497 | 0.505 | 0.526 | 0.538 | 0.551 | 0.598 | 0.598 |
| IG | 3483 | 0.000 | 0.000 | 0.005 | 0.010 | 0.012 | 0.015 | 0.017 | 0.022 | 0.023 | 0.025 | 0.026 | 0.026 |
| SG | 2059 | 0.017 | 0.029 | 0.086 | 0.192 | 0.212 | 0.228 | 0.245 | 0.253 | 0.258 | 0.280 | 0.298 | 0.313 |
| All | 5542 | 0.006 | 0.010 | 0.032 | 0.069 | 0.076 | 0.082 | 0.089 | 0.094 | 0.096 | 0.103 | 0.108 | 0.112 |

1/1/07

| Rating | n(0) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Aaa | 136 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Aa | 738 | 0.000 | 0.002 | 0.002 | 0.007 | 0.009 | 0.009 | 0.011 | 0.011 | 0.011 | 0.011 | 0.013 |

| | | | | | | | | | | | | |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| A | 1379 | 0.000 | 0.007 | 0.011 | 0.012 | 0.017 | 0.019 | 0.029 | 0.031 | 0.034 | 0.034 | 0.034 |
| Baa | 1281 | 0.000 | 0.007 | 0.017 | 0.017 | 0.017 | 0.023 | 0.025 | 0.025 | 0.028 | 0.029 | 0.031 |
| Ba | 623 | 0.000 | 0.018 | 0.078 | 0.085 | 0.085 | 0.099 | 0.107 | 0.110 | 0.132 | 0.145 | 0.148 |
| B | 1145 | 0.000 | 0.065 | 0.178 | 0.209 | 0.227 | 0.255 | 0.268 | 0.279 | 0.306 | 0.334 | 0.355 |
| Caa-C | 423 | 0.050 | 0.162 | 0.345 | 0.389 | 0.429 | 0.454 | 0.483 | 0.492 | 0.502 | 0.581 | 0.609 |
| IG | 3534 | 0.000 | 0.006 | 0.011 | 0.013 | 0.015 | 0.018 | 0.023 | 0.024 | 0.026 | 0.026 | 0.027 |
| SG | 2191 | 0.009 | 0.069 | 0.179 | 0.205 | 0.220 | 0.242 | 0.255 | 0.262 | 0.285 | 0.310 | 0.323 |
| All | 5725 | 0.003 | 0.028 | 0.070 | 0.080 | 0.086 | 0.095 | 0.102 | 0.104 | 0.112 | 0.119 | 0.123 |

1/1/08

| Rating | n(0) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Aaa | 169 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Aa | 824 | 0.005 | 0.005 | 0.009 | 0.014 | 0.014 | 0.017 | 0.019 | 0.023 | 0.023 | 0.025 |
| A | 1301 | 0.004 | 0.009 | 0.011 | 0.014 | 0.018 | 0.028 | 0.029 | 0.031 | 0.031 | 0.031 |
| Baa | 1244 | 0.010 | 0.018 | 0.018 | 0.018 | 0.022 | 0.023 | 0.023 | 0.023 | 0.025 | 0.026 |
| Ba | 629 | 0.023 | 0.072 | 0.074 | 0.074 | 0.085 | 0.092 | 0.097 | 0.119 | 0.130 | 0.136 |
| B | 1020 | 0.040 | 0.149 | 0.178 | 0.196 | 0.220 | 0.231 | 0.241 | 0.274 | 0.296 | 0.320 |
| Caa-C | 655 | 0.107 | 0.286 | 0.342 | 0.376 | 0.409 | 0.438 | 0.464 | 0.485 | 0.549 | 0.563 |
| IG | 3538 | 0.006 | 0.011 | 0.013 | 0.015 | 0.017 | 0.022 | 0.023 | 0.025 | 0.026 | 0.027 |
| SG | 2304 | 0.054 | 0.166 | 0.195 | 0.211 | 0.233 | 0.246 | 0.257 | 0.283 | 0.306 | 0.320 |
| All | 5842 | 0.025 | 0.072 | 0.083 | 0.090 | 0.099 | 0.107 | 0.111 | 0.119 | 0.126 | 0.130 |

1/1/09

| Rating | n(0) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Aaa | 148 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Aa | 737 | 0.000 | 0.002 | 0.005 | 0.005 | 0.008 | 0.010 | 0.016 | 0.016 | 0.018 |
| A | 1291 | 0.002 | 0.004 | 0.007 | 0.010 | 0.019 | 0.020 | 0.022 | 0.022 | 0.022 |
| Baa | 1233 | 0.009 | 0.009 | 0.012 | 0.014 | 0.015 | 0.016 | 0.016 | 0.019 | 0.020 |
| Ba | 602 | 0.018 | 0.022 | 0.022 | 0.035 | 0.042 | 0.050 | 0.066 | 0.075 | 0.081 |
| B | 861 | 0.072 | 0.084 | 0.098 | 0.117 | 0.126 | 0.139 | 0.185 | 0.207 | 0.232 |
| Caa-C | 757 | 0.261 | 0.334 | 0.367 | 0.407 | 0.436 | 0.459 | 0.476 | 0.535 | 0.550 |
| IG | 3409 | 0.004 | 0.005 | 0.008 | 0.010 | 0.014 | 0.016 | 0.018 | 0.019 | 0.019 |
| SG | 2220 | 0.121 | 0.151 | 0.166 | 0.190 | 0.204 | 0.217 | 0.243 | 0.267 | 0.282 |
| All | 5629 | 0.050 | 0.062 | 0.069 | 0.078 | 0.086 | 0.091 | 0.100 | 0.107 | 0.111 |

1/1/10

| Rating | n(0) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| Aaa | 99 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Aa | 573 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 |
| A | 1232 | 0.002 | 0.005 | 0.008 | 0.016 | 0.019 | 0.024 | 0.024 | 0.024 |
| Baa | 1354 | 0.001 | 0.003 | 0.005 | 0.008 | 0.009 | 0.010 | 0.013 | 0.014 |
| Ba | 586 | 0.000 | 0.000 | 0.006 | 0.015 | 0.020 | 0.038 | 0.046 | 0.052 |
| B | 834 | 0.004 | 0.018 | 0.039 | 0.047 | 0.066 | 0.110 | 0.133 | 0.153 |
| Caa-C | 723 | 0.085 | 0.128 | 0.186 | 0.229 | 0.261 | 0.288 | 0.346 | 0.372 |
| IG | 3258 | 0.001 | 0.003 | 0.005 | 0.009 | 0.011 | 0.013 | 0.014 | 0.015 |
| SG | 2143 | 0.030 | 0.049 | 0.077 | 0.096 | 0.113 | 0.143 | 0.169 | 0.185 |
| All | 5401 | 0.012 | 0.021 | 0.032 | 0.041 | 0.047 | 0.058 | 0.066 | 0.071 |

1/1/11

| Rating | n(0) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--------|------|-------|-------|-------|-------|-------|-------|-------|
| Aaa | 86 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Aa | 542 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.004 |
| A | 1222 | 0.000 | 0.001 | 0.008 | 0.009 | 0.010 | 0.010 | 0.010 |
| Baa | 1447 | 0.004 | 0.004 | 0.008 | 0.011 | 0.012 | 0.015 | 0.016 |
| Ba | 640 | 0.002 | 0.012 | 0.020 | 0.028 | 0.050 | 0.059 | 0.064 |
| B | 968 | 0.003 | 0.021 | 0.034 | 0.053 | 0.097 | 0.133 | 0.153 |
| Caa-C | 744 | 0.059 | 0.128 | 0.176 | 0.214 | 0.252 | 0.310 | 0.336 |
| IG | 3297 | 0.002 | 0.003 | 0.007 | 0.008 | 0.009 | 0.011 | 0.011 |
| SG | 2352 | 0.020 | 0.051 | 0.071 | 0.092 | 0.126 | 0.157 | 0.172 |
| All | 5649 | 0.009 | 0.021 | 0.032 | 0.040 | 0.052 | 0.063 | 0.068 |

1/1/12

| Rating | n(0) | 1 | 2 | 3 | 4 | 5 | 6 |
|--------|------|-------|-------|-------|-------|-------|-------|
| Aaa | 84 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Aa | 437 | 0.000 | 0.000 | 0.002 | 0.002 | 0.002 | 0.002 |
| A | 1191 | 0.000 | 0.001 | 0.001 | 0.001 | 0.001 | 0.002 |
| Baa | 1480 | 0.001 | 0.004 | 0.005 | 0.005 | 0.008 | 0.008 |
| Ba | 721 | 0.001 | 0.015 | 0.020 | 0.034 | 0.050 | 0.058 |
| B | 1000 | 0.005 | 0.017 | 0.037 | 0.077 | 0.111 | 0.139 |
| Caa-C | 839 | 0.078 | 0.130 | 0.173 | 0.226 | 0.284 | 0.310 |
| IG | 3192 | 0.000 | 0.002 | 0.003 | 0.003 | 0.004 | 0.005 |
| SG | 2560 | 0.028 | 0.052 | 0.074 | 0.109 | 0.142 | 0.162 |
| All | 5752 | 0.012 | 0.024 | 0.033 | 0.046 | 0.058 | 0.065 |

1/1/13

| Rating | n(0) | 1 | 2 | 3 | 4 | 5 |
|--------|------|-------|-------|-------|-------|-------|
| Aaa | 60 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Aa | 298 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| A | 1166 | 0.001 | 0.002 | 0.002 | 0.002 | 0.002 |
| Baa | 1663 | 0.001 | 0.002 | 0.002 | 0.003 | 0.003 |
| Ba | 708 | 0.006 | 0.011 | 0.020 | 0.033 | 0.045 |
| B | 1055 | 0.009 | 0.023 | 0.066 | 0.107 | 0.128 |
| Caa-C | 946 | 0.062 | 0.103 | 0.171 | 0.232 | 0.270 |
| IG | 3187 | 0.001 | 0.002 | 0.002 | 0.002 | 0.002 |
| SG | 2709 | 0.026 | 0.046 | 0.087 | 0.125 | 0.147 |
| All | 5896 | 0.012 | 0.021 | 0.038 | 0.053 | 0.061 |

1/1/14

| Rating | n(0) | 1 | 2 | 3 | 4 |
|--------|------|-------|-------|-------|-------|
| Aaa | 55 | 0.000 | 0.000 | 0.000 | 0.000 |
| Aa | 292 | 0.000 | 0.000 | 0.000 | 0.000 |
| A | 1162 | 0.001 | 0.001 | 0.001 | 0.001 |
| Baa | 1725 | 0.001 | 0.001 | 0.002 | 0.002 |
| Ba | 739 | 0.001 | 0.006 | 0.016 | 0.025 |
| B | 1107 | 0.005 | 0.036 | 0.073 | 0.097 |
| Caa-C | 1140 | 0.046 | 0.117 | 0.185 | 0.240 |
| IG | 3234 | 0.001 | 0.001 | 0.001 | 0.001 |

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|----|------|-------|-------|-------|-------|
| SG | 2986 | 0.019 | 0.058 | 0.098 | 0.127 |
|----|------|-------|-------|-------|-------|

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|-----|------|-------|-------|-------|-------|
| All | 6220 | 0.009 | 0.027 | 0.044 | 0.055 |
|-----|------|-------|-------|-------|-------|

1/1/15

| Rating | n(0) | 1 | 2 | 3 |
|--------|------|---|---|---|
|--------|------|---|---|---|

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|-----|----|-------|-------|-------|
| Aaa | 55 | 0.000 | 0.000 | 0.000 |
|-----|----|-------|-------|-------|

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|----|-----|-------|-------|-------|
| Aa | 302 | 0.000 | 0.000 | 0.000 |
|----|-----|-------|-------|-------|

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|---|------|-------|-------|-------|
| A | 1237 | 0.000 | 0.000 | 0.000 |
|---|------|-------|-------|-------|

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|-----|------|-------|-------|-------|
| Baa | 1724 | 0.000 | 0.000 | 0.000 |
|-----|------|-------|-------|-------|

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|----|-----|-------|-------|-------|
| Ba | 747 | 0.003 | 0.015 | 0.021 |
|----|-----|-------|-------|-------|

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|---|------|-------|-------|-------|
| B | 1101 | 0.023 | 0.057 | 0.076 |
|---|------|-------|-------|-------|

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|-------|------|-------|-------|-------|
| Caa-C | 1348 | 0.068 | 0.131 | 0.182 |
|-------|------|-------|-------|-------|

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|----|------|-------|-------|-------|
| IG | 3318 | 0.000 | 0.000 | 0.000 |
|----|------|-------|-------|-------|

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|----|------|-------|-------|-------|
| SG | 3196 | 0.037 | 0.077 | 0.105 |
|----|------|-------|-------|-------|

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|-----|------|-------|-------|-------|
| All | 6514 | 0.018 | 0.036 | 0.048 |
|-----|------|-------|-------|-------|

1/1/16

| Rating | n(0) | 1 | 2 |
|--------|------|---|---|
|--------|------|---|---|

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|-----|----|-------|-------|
| Aaa | 53 | 0.000 | 0.000 |
|-----|----|-------|-------|

| | | | |
|----|-----|-------|-------|
| Aa | 304 | 0.000 | 0.000 |
|----|-----|-------|-------|

| | | | |
|---|------|-------|-------|
| A | 1290 | 0.000 | 0.000 |
|---|------|-------|-------|

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|-----|------|-------|-------|
| Baa | 1713 | 0.000 | 0.000 |
|-----|------|-------|-------|

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|----|-----|-------|-------|
| Ba | 763 | 0.001 | 0.004 |
|----|-----|-------|-------|

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|---|------|-------|-------|
| B | 1043 | 0.015 | 0.026 |
|---|------|-------|-------|

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|-------|------|-------|-------|
| Caa-C | 1414 | 0.090 | 0.149 |
|-------|------|-------|-------|

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|----|------|-------|-------|
| IG | 3360 | 0.000 | 0.000 |
|----|------|-------|-------|

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|----|------|-------|-------|
| SG | 3220 | 0.045 | 0.073 |
|----|------|-------|-------|

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|-----|------|-------|-------|
| All | 6580 | 0.021 | 0.034 |
|-----|------|-------|-------|

1/1/17

| Rating | n(0) | 1 |
|--------|------|---|
|--------|------|---|

| | | |
|-----|----|-------|
| Aaa | 54 | 0.000 |
|-----|----|-------|

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|----|-----|-------|
| Aa | 297 | 0.000 |
|----|-----|-------|

| | | |
|---|------|-------|
| A | 1260 | 0.000 |
|---|------|-------|

| | | |
|-----|------|-------|
| Baa | 1702 | 0.000 |
|-----|------|-------|

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|----|-----|-------|
| Ba | 831 | 0.002 |
|----|-----|-------|

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|---|------|-------|
| B | 1009 | 0.003 |
|---|------|-------|

| | | |
|-------|------|-------|
| Caa-C | 1426 | 0.064 |
|-------|------|-------|

| | | |
|----|------|-------|
| IG | 3313 | 0.000 |
|----|------|-------|

| | | |
|----|------|-------|
| SG | 3266 | 0.029 |
|----|------|-------|

| | | |
|-----|------|-------|
| All | 6579 | 0.014 |
|-----|------|-------|

*In percent.

Moody's related publications

[Annual Default Study: Corporate Default and Recovery Rates, 1920-2016](#)

[Impairment and Loss Rates of Structured Finance Securities: 1993-2016](#)

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

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

Endnotes

- [1](#) 2014 marks the beginning of the latest commodity crisis when commodity prices began to fall substantially.
- [2](#) Combines Oil & Gas and Metals & Mining.
- [3](#) Only 88 were included in the January 1st cohort. See details in Exhibit 15.
- [4](#) 2017 also recorded defaults by the governments of Venezuela, Congo, Belize, and Mozambique, which are outside the scope of this report.
- [5](#) The dollar-weighted bond default rates only include bonds issued by US and European issuers.
- [6](#) Together with Toys 'R' US, Inc., the corporate family's total default amount was \$3.3 billion.
- [7](#) The 9.0% default rate is based on 49 issuers.
- [8](#) The industry default rates in this report refer to Moody's entire rated universe combining investment-grade and speculative-grade companies.
- [9](#) In Exhibit 7, we use market prices (bids) to proxy recoveries.
- [10](#) 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.
- [11](#) Moody's research shows that distressed exchanges generally have higher recovery rates than non-distressed exchange defaults. For details, please see Moody's Special Comment, [A closer look at distressed exchanges, December 2017](#).
- [12](#) For distressed exchanges, we take trading prices at default. For other types of defaults, we take trading prices approximately one month after default.
- [13](#) For details, see Moody's Special Comment [Moody's Ultimate Recovery Database, April 2007](#).
- [14](#) The analysis on ultimate recovery is provided by David Keisman and Julia Chursin. The data is from Moody's Ultimate Recovery Database, which includes robust detailed recovery information for over 5500 loans and bonds from more than 1,100 North American corporate defaulters since 1987.
- [15](#) 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.
- [16](#) The high yield spreads are option-adjusted. The unemployment rate forecast is sourced from Moody's Economy.com.
- [17](#) See Oil and Gas –Global 2018 Outlook, Moody's Outlook Research, December 2017.
- [18](#) The industry default rate forecasts include both investment-grade and speculative-grade issuers.
- [19](#) For details, see Moody's outlook research: Retail, Apparel, Restaurants – US, December 2017.
- [20](#) Note that the EDF-implied default rate forecast includes rated and unrated issuers.
- [21](#) Expected Default Frequency metrics are forward-looking probabilities of default generated by Moody's EDF model, which belongs to a class of credit risk models referred to as structural models. Their basic assumption is that there is a causal, economically motivated reason why firms default. Default is highly likely to occur when the market value of a firm's assets is insufficient to cover its liabilities at some future date – in other words, when it is insolvent. For details, please refer to [Public Firm Expected Default Frequency \(EDF\) Credit Measures: Methodology, Performance, and Model Extensions, Moody's Capital Markets Research, June, 2012](#).
- [22](#) We apply S4 - Protracted Slump scenario in our pessimistic forecast. For more details about the description and assumption under this economic scenario, please refer to the [Standard Stress Scenarios webpage from Moody's Analytics - Economy.com](#).
- [23](#) 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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