

SECTOR IN-DEPTH

13 March 2023



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Default Trends – Global

Annual default study: Corporate default rate will rise in 2023 and peak in early 2024

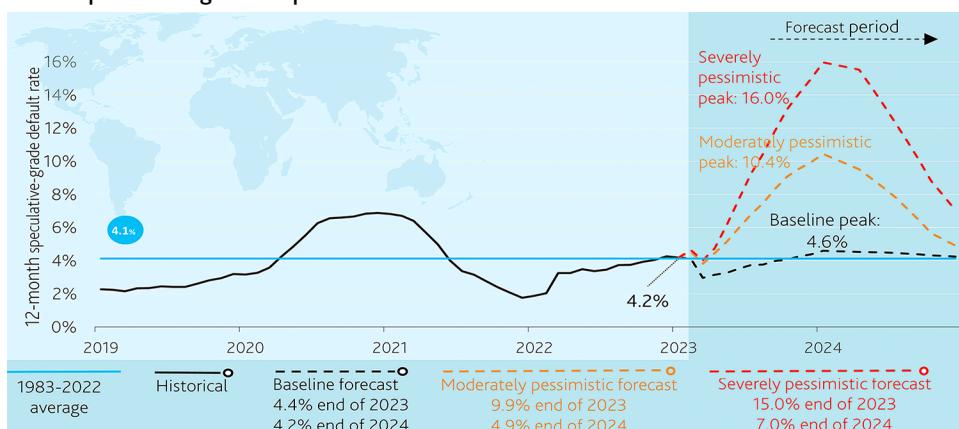
Summary

The global default rate for speculative-grade financial and nonfinancial companies rose to 4.3% for the trailing 12 months ended in December 2022, more than double the 1.8% rate a year earlier and exceeding the long-term average of 4.1%. The Russia-Ukraine war and China's property sector downturn drove much of the increase.

Under our baseline scenario, Moody's Credit Transition Model¹ (CTM) forecasts that the default rate will fall in Q1 2023 as the wave of Russian defaults that occurred in 2022 move out of the trailing 12-month window one year after the withdrawal of their ratings.² After that, the default rate will likely rise to 4.4% at year-end 2023, as some major economies enter mild recessions and effects of tighter financial conditions crystallize.³ We expect the default rate to peak at 4.6% in early 2024 before dropping back to 4.2% later in the year. Our 2024 default rate forecast incorporates our assumption that the global economic recovery will be tepid and the US Federal Reserve will start cutting its benchmark rate in the first quarter Q1 2024, although monetary policy will remain restrictive throughout the year.

Exhibit 1

Global speculative-grade corporate default rate will rise in 2023 and ease in 2024



Source: Moody's Investors Service

This report was republished on 31 March 2023 with corrected data in Exhibit 34.

Key highlights of our analysis include:

- » **Default count almost tripled in 2022.** The number of Moody's-rated corporate issuers that defaulted in 2022 rose to 156, from 55 in 2021. However, last year's default count did not reach 2020's tally of 217, with many of the 2020 defaults spurred by challenging economic conditions brought on by the COVID-19 pandemic. Default volume climbed to \$146 billion in 2022, up from \$55 billion in 2021 but down from \$236 billion in 2020.
- » **Default count increase driven by Russian issuer and China property developer defaults.** The Russia-Ukraine war and the property downturn in China drove much of the default activity. The default count would have been 91 excluding defaults in Russia, with these defaults reflecting specific risks that are rare globally. Among non-Russian defaults, construction and building had the most by sector with 24, reflecting defaults of China property developers. Banking followed with 10 defaults (eight from Ukraine) while healthcare and pharmaceuticals had six, and retail had five.
- » **Default rate will continue to rise in 2023 but at a slower pace under our baseline scenario.** The global default rate was 4.3% at the end of 2022, more than double the 1.8% rate a year earlier and above the long-term average of 4.1%. We expect the rate to climb to 4.4% in 2023. The pace upward will be slower in 2023 because the wave of Russian defaults in 2022 will not show up again and we expect fewer new defaults among China property developers. The default rate will likely edge lower by the end of 2024.
- » **We have also developed more pessimistic default scenarios and a more optimistic scenario, given the high degree of economic uncertainty.** The global default rate will exceed our baseline expectations if economic and financial conditions turn out worse than our baseline assumptions. Under our moderately pessimistic scenario, the rate would rise to 9.9% in 2023, similar to the 9.7% peak after the burst of the dot-com bubble. Under our severely pessimistic scenario, the rate would jump to 15.0%, a level higher than the peak of 13.5% during the global financial crisis. The rate would fall to 4.0% under our optimistic scenario if major economies do not contract and financial markets stabilize as a result of inflation decelerating faster than expected.
- » **Default risk will be highest in durable consumer goods.** Under our baseline forecast, we project there will be 126 total corporate defaults across sectors in 2023, or 10.5 per month.⁴ We expect durable consumer goods to be the most troubled sector measured by default rate (at 7.7%), while healthcare and pharmaceuticals will be the riskiest sector measured by default count, with 12.
- » **Credit quality deteriorated in 2022, particularly among Russian issuers and Chinese property developers.** Rating downgrades outpaced upgrades last year as indicated by rating drift, which fell to -8.4% of a rating notch in 2022 from +6.2% in 2021. Rating downgrades were most severe in Russia as we lowered the ratings of all issuers in the country to Caa2 or below following the downgrade of the Government of Russia on March 6. Outside of Russia, rating drift remained negative though at a less severe rate of -1.8%. Excluding Russian issuers, construction and building had the lowest drift, followed closely by durable consumer goods.
- » **Measured by trading prices, the bank loan recovery rate edged higher in 2022 while the bond recovery rate fell.** The issuer-weighted average recovery rate for first-lien bank loans was 69.8% in 2022, up from 66.4% in 2021 and above the long-term average of 65.7% since 1983. In contrast, the average recovery rate for senior unsecured bonds fell substantially to 31.1% in 2022 from 48.7% in 2021. This compares to the long-term average of 37.7%. Low recovery rates for defaulters in the China property sector and in Russia drove the relatively low recovery rate in 2022. Excluding these two groups of defaulters, the senior unsecured bond recovery rate would have been 51.0%, exceeding the level in 2021.
- » **The average default position (AP) fell to 74.3% in 2022 from 91.5% in 2021, primarily because of defaults of Russian issuers.** The AP measures to what degree companies that ultimately defaulted had lower ratings than did issuers that did not default. Since 1983, the average one-year AP has been 91.2%. The decline last year largely reflects the credit effects of the Russia-Ukraine war, the ensuing capital controls, and sanctions that led to defaults of some high-rated issuers in Russia. Excluding Russian issuers, the 2022 AP would have been much higher at 86.0%.

For inquiries on the underlying data, please contact ClientServices@moodys.com.

About this report

This report is our 36th annual default study, in which we provide data on defaults, losses and rating transitions for corporate bond, loan and deposit issuers over the past year and for the historical period since 1920. This study covers financial institutions, nonfinancial companies and regulated utilities that have long-term debt ratings.

The study is 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 almost 30,000 companies that had long-term rated bonds, loans and/or deposits between 1920 and 2022.

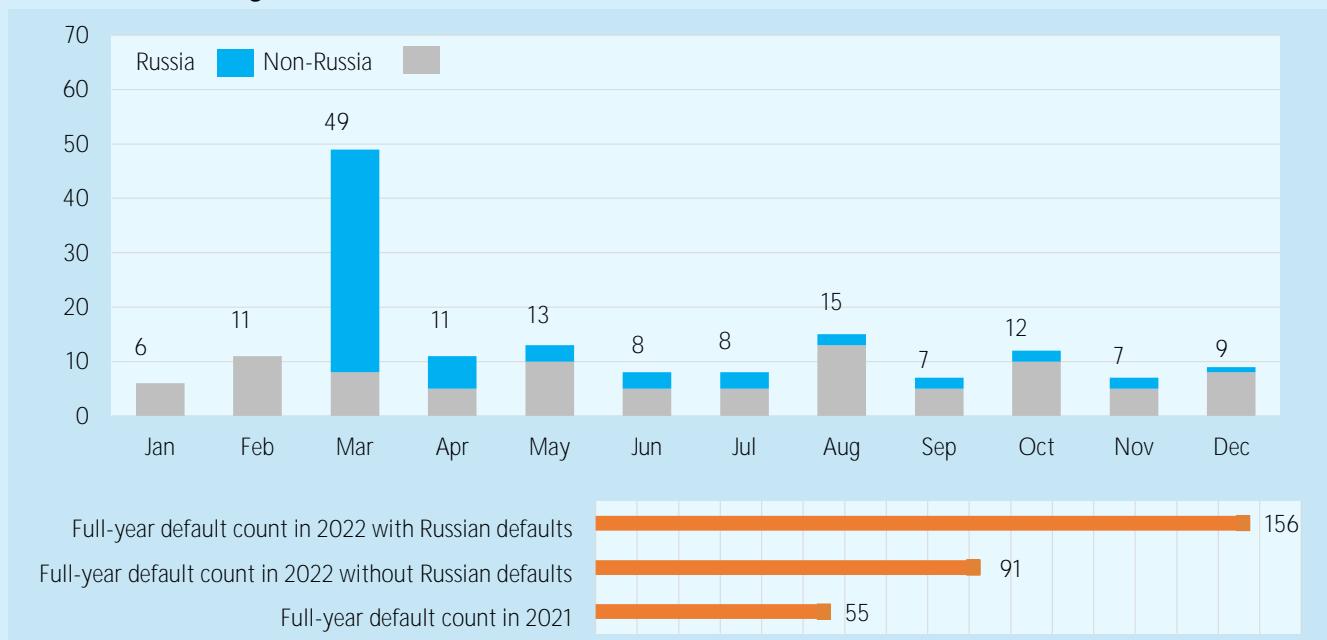
Notes about this year's report

In 2022, Russia's invasion of Ukraine and subsequent international sanctions triggered a wave of defaults in Russia, which reflected specific risks that are rare globally. As a result, last year's default metrics present different patterns than what typical credit risks would have otherwise suggested. For example, the 2022 default count would not have risen as substantially if we excluded Russian defaults (see Exhibit 2). Similarly, default rates, credit loss rates and rating downgrade rates would also have been lower if we excluded Russian defaults, while the average recovery rate for senior unsecured bonds would have been higher. For 2023, our global speculative-grade default rate forecasts would have been on a rising path throughout the year if we excluded Russian defaults.

To help investors better understand default-related trends in 2022, we are providing key information on default, recovery and rating actions both including and excluding Russian issuers.

Exhibit 2

Russian defaults had a significant effect on default count in 2022



Source: Moody's Investors Service

Russia-Ukraine war and China property crisis drove up corporate defaults in 2022

The year 2022 was challenging for high-yield bond and leveraged loan issuers. Continued COVID-19 disruptions, followed by the global energy shock and food price hikes triggered by the Russia-Ukraine war, led to persistently high inflation. As a result, major central banks tightened monetary policy at a pace not seen in decades, leading to higher input costs, tighter financial conditions and increased borrowing costs for corporate issuers. The Russia-Ukraine war and the sanctions against Russia also triggered capital controls on foreign-currency bank deposits in both countries and prevented many Russian issuers from making foreign-currency debt payments. Furthermore, the China property sector continued to suffer from sluggish sales and tight funding conditions, especially in the offshore market. These macro and market dynamics led to a rise in corporate defaults, particularly in Russia, China and Ukraine.

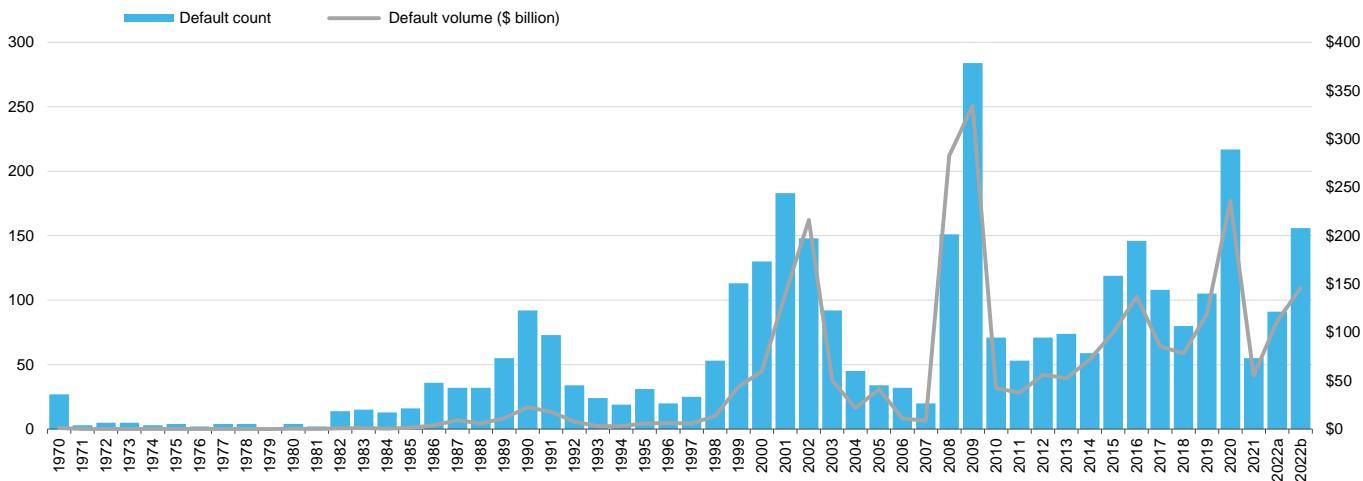
Default count almost tripled

A total of 156 rated corporate issuers defaulted in 2022, nearly triple the year-earlier tally of 55. Last year's default count was the second highest since the global financial crisis. The highest post-crisis level was in 2020, when 217 issuers defaulted amid the challenging economic conditions resulting from COVID-19.

Measured by volume, roughly \$146 billion of debt went into default in 2022, comprising \$112 billion in bonds and \$34 billion in loans. Default volume was higher than 2021's \$55 billion but lower than 2020's \$236 billion. Of the 2022 defaults, 65 were from Russia, affecting more than \$34 billion of debt. Excluding Russian defaults, the default count would have totaled 91 and default volume would have been \$112 billion.

Exhibit 3 shows the annual default count and defaulted debt volume since 1970.

Exhibit 3
Default count nearly tripled in 2022 when including Russian defaults



Russian defaults in 2022 are excluded from 2022a; they are included in 2022b.

Source: Moody's Investors Service

Of the 156 defaults in 2022, one-quarter of them affected at least \$1 billion of debt each. The largest default was by US-based pharmaceuticals company Endo International plc and its subsidiaries (collectively Endo), which filed for Chapter 11 with \$7.9 billion of debt. The bankruptcy filing came after Endo's earnings declined on the loss of exclusivity of the medication Vasostrict, the company's top-selling product, which contributed roughly 30% of Endo's earnings in 2021. Endo has also faced continued pricing pressure in its generics business and from lawsuits related to the opioid crisis. The second-largest default in 2022 was Sinclair Broadcast Group's US-based sports marketing company, Diamond Sports Group, which completed a distressed exchange involving about \$6.3 billion in debt.

Across regions, Europe had the most defaults, at 89, representing more than half of the year's defaults. Without Russian defaults, the region's default count would have been much lower at 24.

North America followed with 38 defaults while Asia Pacific accounted for 24. The remaining five defaults were from Latin America and Africa. In terms of dollar volume, North America had about \$50 billion debt in default, the most across regions. Asia-Pacific and Europe followed closely, with about \$49 billion and \$46 billion, respectively. European default volume would have been lower at \$12 billion if we exclude Russian defaults.

Measured by default type, missed debt payments triggered 87 (or 56%) of last year's defaults. Another 55 (or 35%) were distressed exchanges. There were only 14 instances where bankruptcy was listed as the initial default type. Excluding Russian defaults, distressed exchanges would have been the most prominent type of default.

Default rate rose in 2022 but remained below the pre-pandemic level

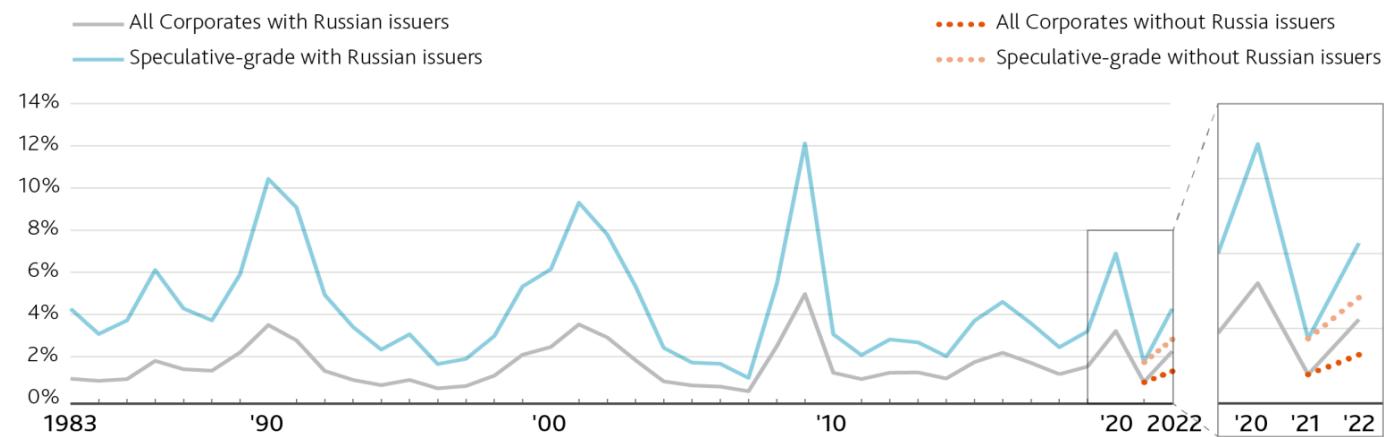
As a result of rising defaults, the issuer-weighted annual default rate for all Moody's-rated corporate issuers increased to 2.3% at the end of 2022, which is above the 0.8% rate in 2021 but lower than the 3.2% rate in 2020 (see Exhibit 4). Among speculative-grade issuers, the default rate showed a similar trend, rising to 4.3% at the end of 2022 from 1.8% in 2021, but down from 6.9% in 2020. The 2022 year-end figures are higher than the 1.7% average one-year default rate since 1983 for all rated corporate issuers and the 4.1% average for speculative-grade issuers.

Measured on a dollar-volume basis, the speculative-grade bond default rate jumped to 1.6% in 2022 from 0.3% in 2021 and the comparable rate for all rated issuers rose to 0.4% from 0.1%.⁵ The dollar-weighted default rates in 2020 were 6.3% for speculative-grade issuers and 1.0% for all rated issuers.

Excluding Russian defaults, the issuer-weighted speculative-grade default rate would have been lower in 2022 at 2.8%. Similarly, the dollar-weighted speculative-grade bond default rate would have been 1.0%.

Exhibit 4

Default rate rebounded in 2022 but was low comparing with the 2020 level*



* Issuer-weighted.

Source: Moody's Investors Service

Banking had the most defaults followed by construction and building

Banking had the most defaults by sector in 2022. The sector had 45 defaults, including 35 in Russia and eight in Ukraine. These defaults resulted from restrictions on foreign-currency deposit withdrawals in accordance with the corresponding central bank's capital controls. The other two banks that defaulted were Polish-based Getin Noble Bank SA and Angola-based Banco Economico SA, which both conducted distressed exchanges.

The construction and building sector was the second largest contributor of defaults, with 26. All but two of these defaults were from China where financially weak property developers continued to have difficulty refinancing their US dollar debts amid limited access to the offshore market.

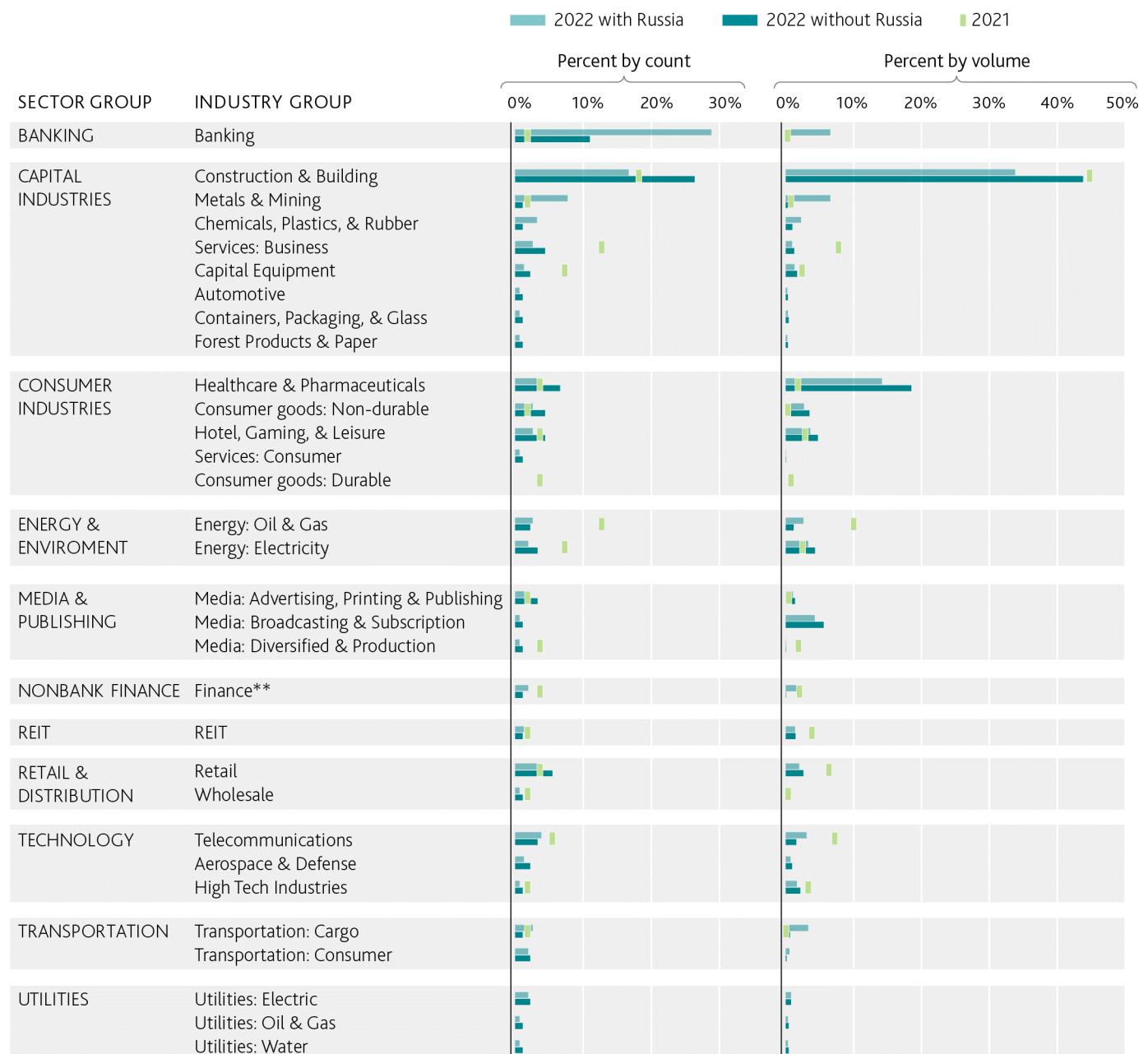
Excluding Russian defaults, construction and building would have been the largest contributor with 24 defaults, followed by banking (10),⁶ healthcare and pharmaceuticals (6) and retail (5).

When measured by dollar volume, construction and building stood at the top of the list even if Russian defaults were included. The sector accounted for slightly more than a third of the default total. The next highest sector by dollar volume was healthcare and pharmaceuticals, with a 14% share of defaults. Healthcare has been a defensive sector historically, but credit stress has built up in the sector amid the weakening macroeconomic environment, labor issues and pressure from private and public payers to reduce costs. The catalysts for healthcare and pharmaceutical defaults in 2022 were elevated financial leverage, high levels of floating-rate debt, persistent inflation and the slowdown in economic growth.

Exhibit 5 shows the distribution of defaults by industry in 2021 and 2022.

Exhibit 5

Construction and building had the highest default volume and second highest default count*



*We omitted those industries that had no defaults in 2021 and 2022.

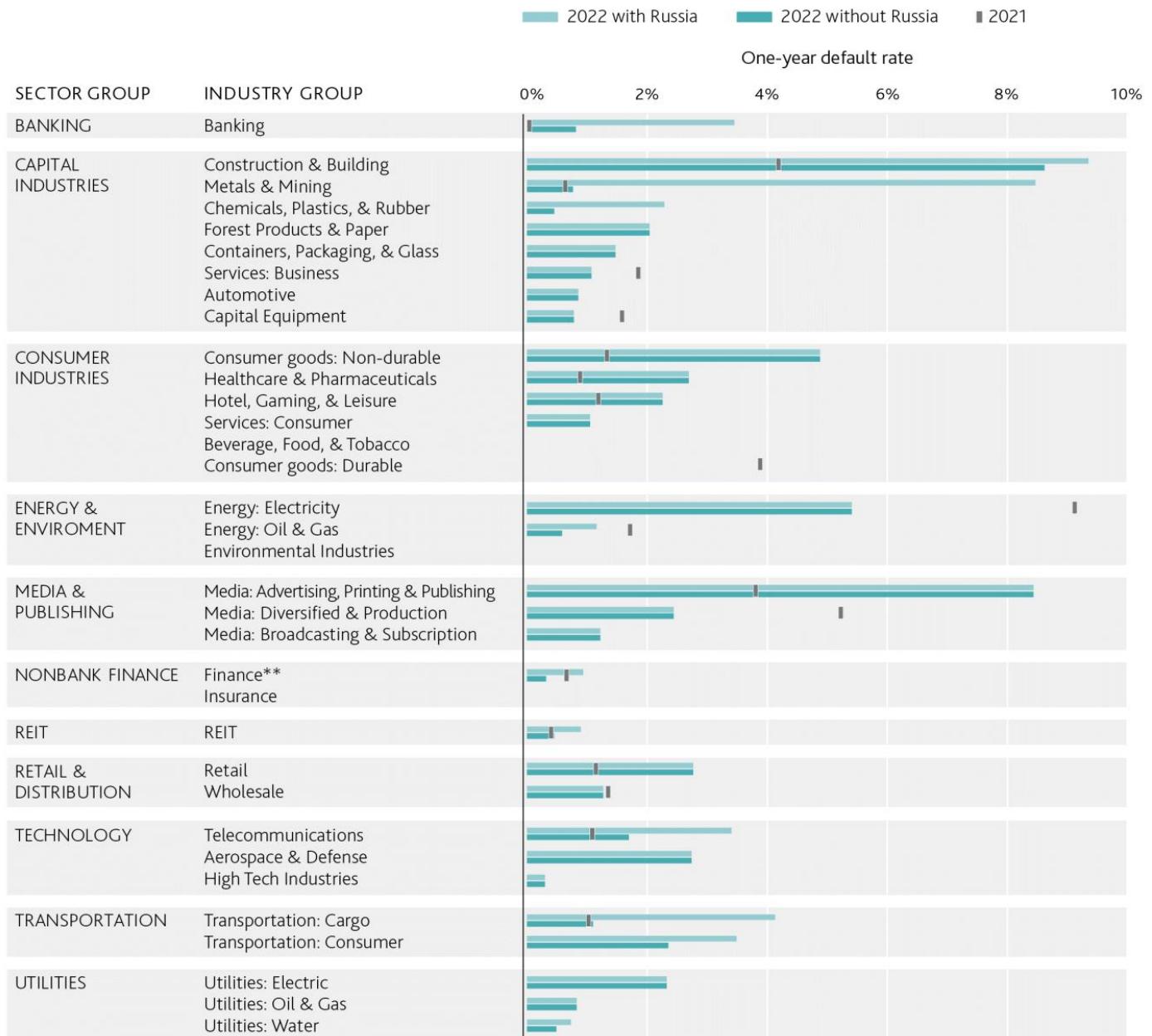
** Non-bank and non-insurance financial companies.

Source: Moody's Investors Service

Although construction and building had the second highest number of defaults, its default rate of 9.4% was the highest across sectors. On the other hand, the default rate for the banking sector was lower due to a larger denominator (see Exhibit 6).

Exhibit 6

Construction and building had the highest one-year default rate in 2022*



*Issuer-weighted and includes investment-grade and speculative-grade issuers.

** Non-bank and non-insurance financial companies.

Companies in the sovereign and public finance sector are government-related financial and nonfinancial corporate issuers. Companies in the finance sector refer to non-bank and non-insurance financial issuers.

Source: Moody's Investors Service

Loan recovery rates rose modestly while bond recovery rate fell

In this section, we discuss recovery rates measured by two methods: one measured by trading price for defaulted debt, and the other measured by the actual value that creditors realize at the resolution of a default event, i.e., ultimate recovery rates.

Exhibit 7 shows the trading price implied recovery rates over the past two years, as well as their long-term averages since 1983. On average, recovery rates have generally correlated with the priority of claim in the capital structure for almost four decades, with a higher priority of claim enjoying a higher average rate of recovery.⁷ For example, recovery rates on first-lien bank loans average 65.7% on an issuer-weighted basis and 63.2% on a dollar-volume basis, the highest recovery rates across security classes. This makes sense given first-lien bank loans' secured nature and seniority in the capital structure.

The exhibit further shows that the issuer-weighted average first-lien loan recovery rate was 69.8% in 2022, up from 66.4% in 2021. The 2022 first-lien loan recovery rate was high by historical standards, with the comparable rate averaging 65.7% since 1983. On the bond side, the recovery rate for senior unsecured bonds averaged 31.1% in 2022, much lower than the 48.7% rate in 2021. This compares to the long-term average of 37.7%. Low recovery rates from defaults in the China property sector (25.3%) and in Russia (15.5%) drove the relatively low recovery rate in 2022. Excluding defaults by these issuers, the global rate would have been noticeably higher at 51.0%, which is above last year's 48.7%. While the average recovery rate was lower for Russian defaulters than for defaulted China property developers, the negative impact that Russian defaulters had on the overall senior unsecured bond recovery rate was slightly smaller than that of China property developers because there were noticeably fewer recovery observations for Russian defaults.⁸ Excluding Russian defaults, the senior unsecured bond recovery rate would have averaged 35.1% in 2022.

Measured by dollar volume, the first-lien loan recovery rate averaged 61.4% in 2022, down from 75.6% in 2021. For senior unsecured bonds, the volume-weighted average recovery rate was 22.4% in 2022, down from 32.7% in 2021. Some of the average recovery rates in 2022 are based on small samples (see observation counts in Exhibit 8).

Exhibit 7

Average corporate debt recovery rates measured by trading prices*

Priority Position	Issuer-weighted recoveries				Dollar-weighted recoveries			
	2022 with Russian defaults	2022 without Russian defaults	2021	1983-2022	2022 with Russian defaults	2022 without Russian defaults	2021	1983-2022
1st Lien Bank Loan	69.8%	69.8%	66.4%	65.7%	61.4%	61.4%	75.6%	63.2%
2nd Lien Bank Loan	54.7%	54.7%	34.1%	33.3%	52.2%	52.2%	31.8%	29.9%
Sr. Unsecured Bank Loan	n.a.	n.a.	n.a.	46.3%	n.a.	n.a.	n.a.	43.9%
1st Lien Bond	60.5%	60.5%	65.9%	55.0%	54.0%	54.0%	70.5%	55.5%
2nd Lien Bond	64.7%	64.7%	98.1%	44.2%	30.2%	30.2%	98.1%	39.4%
Sr. Unsecured Bond	31.1%	35.1%	48.7%	37.7%	22.4%	23.7%	32.7%	33.6%
Sr. Subordinated Bond	n.a.	n.a.	17.0%	31.0%	n.a.	n.a.	17.0%	26.6%
Subordinated Bond	18.2%	24.8%	n.a.	32.0%	10.6%	22.7%	n.a.	27.8%
Jr. Subordinated Bond	n.a.	n.a.	n.a.	22.3%	n.a.	n.a.	n.a.	13.5%

* We use market prices (bids) to proxy recoveries in this exhibit.

Source: Moody's Investors Service

Exhibit 8

Recovery observation counts and dollar volume

Priority Position	Issuer counts				Dollar volume (in \$ billions)			
	2022 with Russian defaults	2022 without Russian defaults	2021	1983-2022	2022 with Russian defaults	2022 without Russian defaults	2021	1983-2022
1st Lien Bank Loan	32	32	14	669	26	26	9	425
2nd Lien Bank Loan	7	7	9	126	1	1	2	26
Sr. Unsecured Bank Loan	0	0	0	71	0	0	0	39
1st Lien Bond	17	17	8	428	20	20	4	204
2nd Lien Bond	2	2	1	108	1	1	0	57
Sr. Unsecured Bond	69	55	33	1283	74	64	30	982
Sr. Subordinated Bond	0	0	1	516	0	0	0	118
Subordinated Bond	3	2	0	419	1	0	0	84
Jr. Subordinated Bond	0	0	0	27	0	0	0	4

Source: Moody's Investors Service

Ultimate recoveries rose for 2022 default resolutions, except for unsecured creditors

Another measure of recovery rates is ultimate recoveries, or the value that creditors realize at the resolution of a default event. Using bankruptcy as an example, the ultimate recovery is the present value of the cash or securities that creditors receive when the debt issuer exits bankruptcy, which typically occurs one to two years following the initial default date. Exhibit 9 shows data on ultimate recovery rates for North American nonfinancial companies included in Moody's Ultimate Recovery Database (URD).²

Unlike during the pandemic-driven downturn in 2020, the North American default environment was relatively subdued in the last two years. For the limited number of North American companies that resolved their defaults in 2022, the ultimate recoveries were either on par with or somewhat above the long-term historical averages for most debt classes, as the exhibit shows. For example, there were five bankruptcies and one distressed exchange that resolved in 2022 and that we were able to analyze based on publicly available information. Their family-level recovery averaged around 63%, which was high compared with the historical average.

Exhibit 9

Average debt recovery rates measured by ultimate recoveries, 1987-2022

Debt type	Emergence Year			Default Year		
	2022	2021	1987-2022	2022	2021	1987-2022
Revolvers*	90.7%	94.2%	86.3%	87.7%	96.7%	86.3%
Term Loans**	75.4%	60.8%	71.7%	64.3%	58.5%	71.7%
Senior Secured Bonds	77.9%	55.5%	61.2%	73.3%	46.4%	61.2%
Senior Unsecured Bonds	27.5%	44.3%	47.1%	n/a	39.4%	47.1%
Subordinated Bonds	n/a	2.5%	27.8%	n/a	2.5%	27.8%

The Moody's Ultimate Recovery Database primarily covers default resolutions of US nonfinancial companies. Emergence year column refers to recovery rates of companies that resolved their defaults in that year regardless of when they defaulted. Default year column refers to recovery rates of companies that both defaulted and resolved their defaults in that same year.

* Includes cash revolvers and borrowing base facilities.

** Includes all types of term loans: first-, second-lien and unsecured.

Source: Moody's Ultimate Recovery Database

At the debt level, the average recovery rate on defaults that resolved in 2022 was roughly 91% for four revolvers and 75% for 13 term loans, both higher than the historical standard. For the bonds, senior secured bonds also fared better than the long-term average, at nearly 78%. In contrast, senior unsecured bonds, one of the most represented debt classes in 2022 default resolutions, had a recovery rate of 28%, lower than the historical average of 47%. The bankruptcies of Mallinckrodt and Intelsat Jackson drove the low average recovery rates of senior unsecured bonds. Both companies filed for bankruptcy protection in 2020 and exited in 2022. The senior unsecured bonds of Mallinckrodt were mostly equitized, while those of Intelsat Jackson were valued as almost worthless. In all, recovery rates of companies exiting bankruptcy in 2022 remained above average for most debt instruments except for senior unsecured bonds.

If we look at recoveries of companies that entered and exited default in 2022, there were only four US defaults that we were able to analyze based on the publicly available settlement data. Three of them were bankruptcies, while one was a distressed exchange. The three bankruptcies were all prepackaged, with an average family recovery rate of 69%, significantly higher than the long-term average of 54%.

The three companies that filed for bankruptcy in 2022 were Carestream Health, Output Services, and TPC Group, with TPC having the lowest family-level recovery (64.3%) of the three. Nevertheless, that recovery significantly exceeded the historical long-term average of 50% for bankrupt companies that filed between 1987 and 2022. While TPC's asset-based loans and first-lien notes realized full recoveries upon the exit from bankruptcy, the second-lien notes, which represented around 75% of the \$1.24 billion pre-petition funded debt, received a combination of cash, some takeback secured notes, new common shares and warrants. This resulted in a discounted ultimate recovery of roughly 52% for this creditors' class. TPC's reorganization plan also discharged most of the remaining (unsecured) third-party liabilities by establishing a \$30 million unsecured creditors' trust. The liabilities stemmed from litigation arising from the explosion at the company's Port Neches facility in 2019.

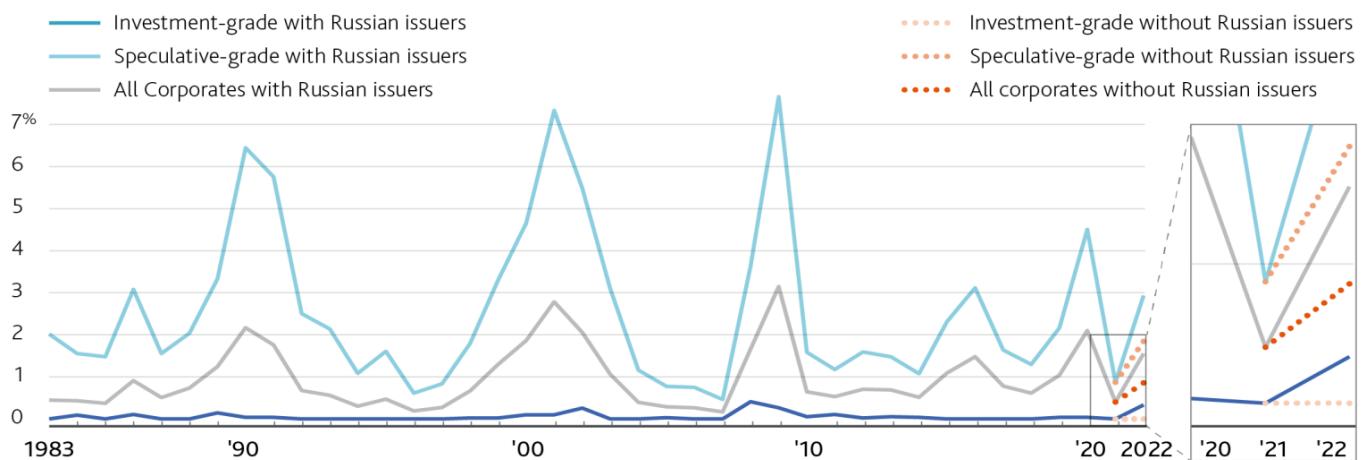
In 2022, the share of US distressed exchanges executed by debt issuers owned by private equity (PE) companies continued to increase. The total share of distressed exchanges stood at around 70% of all corporate defaults. Of these, PE-owned companies accounted for 68% of the distressed exchanges. The overwhelming majority of the distressed exchanges were loan-only issuers defaulting on their secured loans. This contrasts with historical trends in which junior bonds were subject to a distressed exchange, and senior secured bank debt was rarely part of the restructurings. Considering that most distressed debt issuers have loan-only structures and private equity backers, we expect more out-of-court debt restructurings in this space in 2023, where some senior secured loans may not be made whole.

Credit losses rose in 2022, resulting from higher default rate and loss-given-default

Exhibit 10 shows annual average credit loss rates from 1983 through 2022 for all rated corporate issuers. These rates are a function of both the probability of default and loss given default (LGD), or 1-recovery rates. The exhibit indicates that the average credit loss rate among all rated issuers rose to 1.6% in 2022 from 0.4% in 2021. Excluding Russian issuers, the 2022 rate would have been 0.9%. Historically, the average annual credit loss rate for all Moody's-rated corporate issuers has been 1.0% since 1983.

Exhibit 10

Annual credit loss rates increased in 2022



Source: Moody's Investors Service

Credit quality deteriorated in 2022

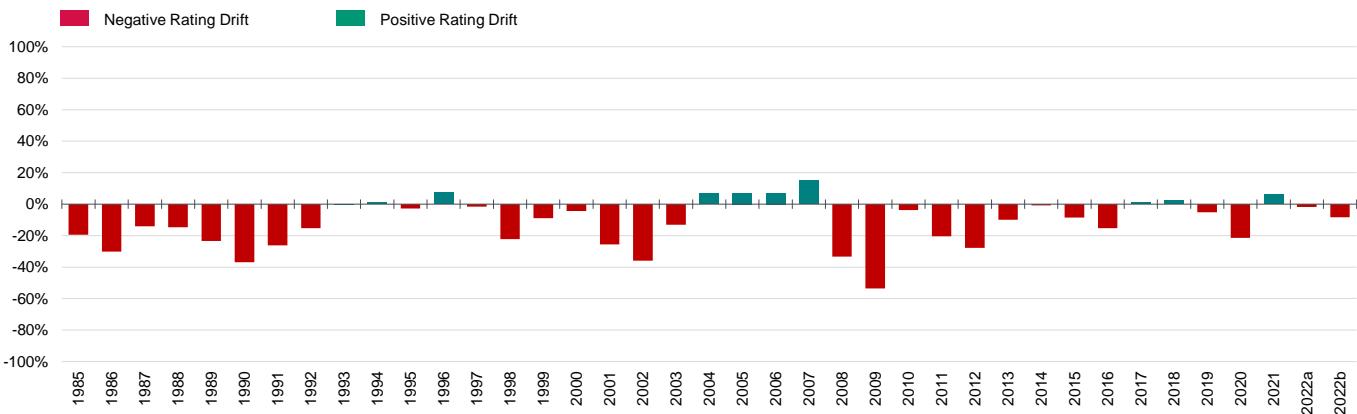
Rating downgrades outpaced upgrades in most sectors

The aggregate credit quality of Moody's-rated issuers deteriorated last year amid the backdrop of macroeconomic headwinds and geopolitical issues. This is reflected in rating drift, which is calculated by the average upgraded notches per issuer minus the average downgraded notches per issuer. By definition, a positive drift indicates overall improvement in credit quality, while a negative drift signals deterioration. In 2022, rating drift fell into the negative zone to -8.4% of a notch, from a positive 6.2% in 2021 (see Exhibit 11).

Exhibit 11

Downgrades of Russian issuers drove down rating drift in 2022*

Percent of one notch



*Rating drift is measured by the average upgraded notches per issuer minus the average downgraded notches per issuer.

Russian issuers are excluded from the rating drift of 2022a but included in 2022b.

Source: Moody's Investors Service

The negative rating drift in 2022 indicates there were more rating downgrades than upgrades. Downgrades were the most severe in Russia, as we lowered the ratings of all issuers in the country to Caa2 or below following the downgrade of the Government of Russia on March 6, 2022. This resulted in multi-notch downgrades to a considerable number of Russian issuers. Outside of Russia, rating drift remained negative, although at a less severe rate of -1.8%.

Across sectors, construction and building had the most negative drift among non-Russian issuers at -34.5% (see Exhibit 12). China property developers accounted for most of the downgrades in this sector. Durable consumer goods followed closely with -34.4%, as the geopolitical instability induced by the Russia-Ukraine conflict and worsening economic outlook led to weaker consumer sentiment, which reduced demand for durable goods in particular.

Exhibit 12

Most sectors had negative drift in 2022
(% of rating notch)



* Non-bank and non-insurance financial companies.

Source: Moody's Investors Service

Investment-grade issuers remained more resilient to macro challenges

Historically, ratings of investment-grade issuers have generally been more stable than those of speculative-grade issuers. This remained the case in 2022 as shown in Exhibit 13, which presents the one-year rating transition matrix. Each cell of the matrix shows the percentage of issuers that held a given row's rating at the beginning of 2022 and have since migrated to a rating or state (including rating withdrawal and default) indicated in the column heading at the end of 2022.¹⁰

The exhibit shows that the numbers in the diagonal are greater for investment-grade rating categories than are those in the speculative-grade universe. Lower triangular elements reflect net upgrades and upper triangular elements reflect net downgrades.

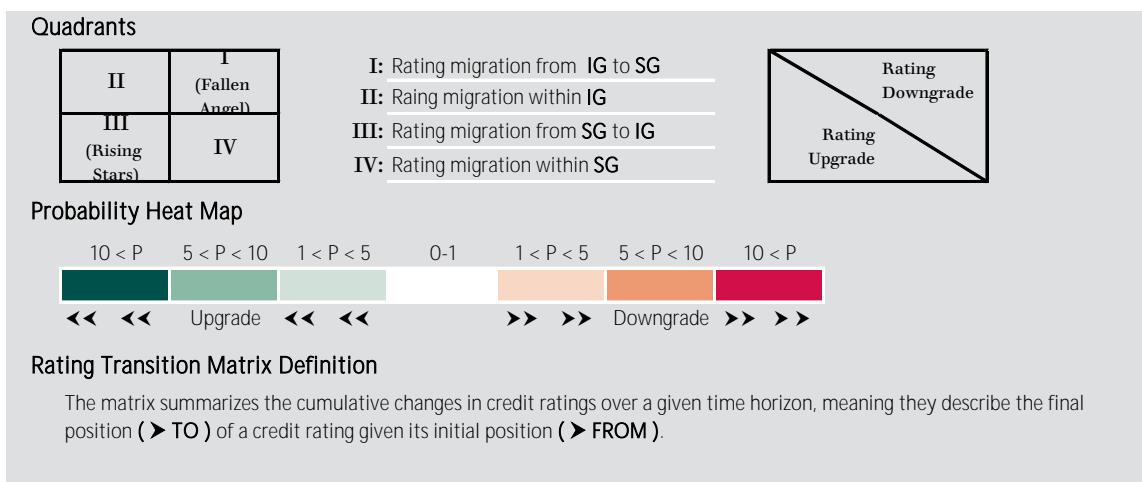
Generally speaking, the farther one moves away from the diagonal, the smaller the transition rates. This reflects a relatively low probability of issuers experiencing large rating actions during the course of a year.

For investors who are interested in the crossover risk between investment-grade and speculative-grade ratings, the fallen angel rate climbed to 1.2% in 2022, triple the year-earlier level of 0.4% but still below the long-term average of 2.0%. In contrast, the rising star rate fell to 0.9% in 2022 from 1.4% in 2021, compared with the long-term average of 2.4%. The higher fallen angel rate in 2022 stemmed primarily from the inclusion of Russian issuers, without which the rate would have been only 0.6%.

Exhibit 13

Ratings continued to be more stable among investment-grade issuers in 2022

With Russian issuers



\rightarrow TO: Final rating position at the end of year (December 31, 2022)

		Investment Grade (IG)										Speculative Grade (SG)											
		Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3	Ca-C	WR	DEF
Investment Grade (IG)	Aaa	96.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0
	Aa1	0.0	93.3	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0
	Aa2	0.0	4.5	91.1	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0
	Aa3	0.0	0.0	4.1	92.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0
	A1	0.0	0.0	0.0	0.5	91.5	2.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0
	A2	0.0	0.0	0.2	0.0	6.8	89.8	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0
	A3	0.0	0.0	0.0	0.0	0.0	3.7	88.5	2.5	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.0
	Baa1	0.0	0.0	0.0	0.0	0.4	0.0	5.2	84.3	3.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0
	Baa2	0.0	0.0	0.0	0.0	0.0	0.1	0.6	7.9	83.3	1.3	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	1.0
	Baa3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	80.1	1.3	0.9	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	7.2	1.9
Speculative Grade (SG)	Ba1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	7.2	67.2	6.4	0.4	1.7	0.0	0.0	0.4	0.0	0.0	0.0	10.6	4.7
	Ba2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	8.9	70.6	2.8	2.4	0.4	0.0	0.0	0.8	0.0	0.0	7.3	4.0
	Ba3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	11.7	70.0	3.4	2.4	0.3	0.3	0.3	0.0	0.0	0.0	5.5	3.4
	B1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	10.8	67.6	3.8	3.5	1.0	0.3	0.0	0.0	0.0	9.2	3.2
	B2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	6.0	63.3	13.1	1.1	1.5	0.4	0.0	0.0	8.6	4.9
	B3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	3.0	8.1	59.4	8.4	1.7	1.0	1.0	0.0	10.1	5.9
	Caa1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.5	8.0	64.8	8.2	2.3	0.7	11.9	2.3
	Caa2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.3	4.6	70.4	7.5	2.3	0.7	11.4	1.5
	Caa3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	2.1	9.7	9.7	55.9	12.3	11.8	6.7
	Ca-C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.1	2.2	7.9	48.3	0.0	15.7	23.6

▲ FROM: Initial rating position in the beginning of year (January 1, 2022)

Without Russian Issuers

► TO: Final rating position at the end of year (December 31, 2022)

	Investment Grade (IG)										Speculative Grade (SG)										WR	DEF	
	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3	Ca-C			
Investment Grade (IG)	Aaa	96.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	
	Aa1	0.0	93.3	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	
	Aa2	0.0	4.5	91.1	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	
	Aa3	0.0	0.0	4.1	92.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	
	A1	0.0	0.0	0.0	0.5	91.5	2.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	
	A2	0.0	0.0	0.2	0.0	6.8	89.8	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	
	A3	0.0	0.0	0.0	0.0	0.0	3.7	88.5	2.5	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.0	
	Baa1	0.0	0.0	0.0	0.0	0.4	0.0	5.2	84.3	3.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	
	Baa2	0.0	0.0	0.0	0.0	0.0	0.1	0.6	8.1	85.0	1.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	0.0	
	Baa3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2	82.3	1.3	1.0	0.4	0.2	0.0	0.0	0.0	0.0	0.0	6.7	0.0	
Speculative Grade (SG)	Ba1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	7.6	70.9	6.7	0.4	1.8	0.0	0.0	0.4	0.0	0.0	10.8	0.0	
	Ba2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	9.3	73.8	3.0	2.5	0.4	0.0	0.0	0.8	0.0	0.0	7.2	0.0
	Ba3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	12.1	72.0	3.5	2.5	0.4	0.4	0.4	0.0	0.0	5.7	0.7	
	B1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	11.1	69.6	3.9	3.6	1.0	0.3	0.0	0.0	8.5	1.3	
	B2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	6.2	65.3	13.5	1.2	1.5	0.4	0.0	8.9	1.9	
	B3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	3.0	8.2	60.0	8.5	1.7	1.0	1.0	10.0	5.2	
	Caa1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.5	8.0	64.8	8.2	2.3	0.7	11.9	2.3	
	Caa2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.3	4.6	70.5	7.5	2.3	11.4	1.3	
	Caa3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	2.1	9.7	55.9	12.3	11.8	6.7	
	Ca-C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.1	2.2	7.9	48.3	15.7	

Data in percentages.

Source: Moody's Investors Service

Macro and credit headwinds will drive up the default rate modestly but the increase may not last long**We expect the speculative-grade default rate to continue rising in 2023 but to ease in 2024**

Under our baseline scenario, we expect the global speculative-grade default rate to fall to 3.0% at the end of the first quarter of 2023 from the year-end 2022 rate of 4.3%, as the big wave of Russian defaults leaves the trailing 12-month window one year after Russian issuers' ratings were withdrawn. The global default rate will then rise during the rest of 2023 to 4.4% in December.

The pace upward will be slower in 2023 than in 2022 because the wave of Russian defaults that occurred in 2022 will not show up again and because the number of new China property sector defaults will likely decline. Many financially weak developers in China have already defaulted amid the liquidity squeeze of the past 12-18 months; thus, most of the remaining companies in the sector have comparatively healthier financial positions. In addition, the China property sector will benefit from an expected economic recovery after Chinese authorities lifted stringent COVID restrictions and following recent government measures to improve funding accessibility for selected developers. We expect the default rate to peak at 4.6% in January 2024, followed by a gradual decline to 4.2% by the end of December 2024, as Exhibit 14 shows.

Exhibit 14

Speculative-grade default rate will rise in 2023 under our baseline scenario, but will not surpass prior recessionary highs



Russian issuers only affect the default rate forecast for one cohort, which is formed on Mar 1st 2022. For that cohort, the global speculative-grade default rate is 4.1% with Russian issuers and 2.8% without Russian issuers. For cohorts formed on or after April 1 2022, Russian issuers are no longer rated, therefore the forecasts with and without Russian issuers are identical.
Source: Moody's Investors Service

Rising interest rates, tightening credit markets, lingering inflation, and the expectation of shallow recessions in a few major economies underpin our 2023 default rate projections. To counter persistently high inflation, major central banks tightened monetary policies aggressively in 2022, resulting in higher interest rates and tighter financing conditions. We expect financial conditions to remain restrictive in 2023, making it difficult for low-rated companies to roll over debt. In addition, higher borrowing costs will pressure debt-service capacities for heavily indebted companies, especially those that rely on floating-rate loans and do not sufficiently hedge their interest-rate risk.

Elevated inflation has also led to rising input costs and impaired earnings for issuers that have not been able to pass along price increases to their customers. Lower earnings will weaken leverage and interest coverage ratios, heightening default risk for companies with limited financial flexibility.

We expect G-20 global economic growth to continue decelerating this year and several major economies to contract in the second half of 2023. This includes the US economy, which we predict will grow modestly in the first half of the year then contract mildly in the second half, as economic drag from higher lending rates and tighter bank lending on residential and business investment, labor markets, and consumer spending accumulates over the next few months. Similarly, we forecast that economic growth will contract in Germany, Italy and France in the second half of the year, and that there will be a full-year contraction in the UK. These contractions will hurt corporate earnings, leading to more rating downgrades and defaults.

Weaker credit quality is also fueling the increased default risk, as reflected in the growing share of low-rated issuers in the speculative-grade universe and the increase in rating downgrades in 2022, particularly during the fourth quarter.¹¹

Despite the above-mentioned macro and credit stresses, the risk of widespread defaults in 2023 remains low because fundamentals are fairly healthy for corporate issuers and their near-term maturities are manageable following refinancing activity in 2020–21.

In 2024, we expect G-20 global economic growth to pick up only modestly. We also expect inflation to slowly recede and the Fed to start cutting interest rates in the first quarter of 2024, although monetary policy will remain restrictive through the end of the year. If these assumptions are realized, they should boost consumer and business demand, supporting corporate earnings and reducing default risk.

From a technical standpoint, our default rate forecasts are derived from rating factors such as rating mix, changes in ratings and watch/outlook assignments, as well as from assumed future paths of high-yield bond spreads and changes in unemployment rates. In our

baseline scenario, we expect the high-yield spread to widen in both the US and Europe. Specifically, we assume the US high-yield spread will widen from 410 basis points (bps) currently to 501 bps in the fourth quarter of 2023, which would be near the historical average and well below levels during prior economic downturns. In Europe, we assume the high-yield spread will widen from the current level of about 400 bps to 544 bp. In 2024, our baseline assumption is that the high-yield spread will stabilize in the range of 520-530 bps in the US and 550-560 in Europe.

In terms of changes in the unemployment rate, another macro input in our default forecasting model, we expect a bigger increase in the US than in Europe in 2023. Specifically, we assume the US unemployment rate will rise from the current rate of 3.4% to 5% in the fourth quarter of 2023, while the European rate will rise from 6.6% to 7.1%. In 2024, we assume the US unemployment rate to edge lower to 4.8% in the fourth quarter while the European rate will stabilize at 7.1%.

The default rate will exceed our baseline forecast if risks crystallize

The default rate will exceed our baseline forecasts if certain economic and financial risks crystallize. For example, there is still a great deal of uncertainty around how quickly US headline inflation will decrease after decelerating from the recent peak of 9.1%. Meanwhile, the US labor market remains resilient. It is possible that the Fed may have to impose more aggressive interest rate hikes than expected to bring down and hold inflation to its 2% target. This could trigger a significant pullback in aggregate demand from consumers and businesses and lead to further liquidity tightening, adding to the risk of a deeper and longer recession.

Developments in the Russia-Ukraine war could also trigger a higher default rate than under our baseline forecast. If the war intensifies, the global economy will worsen and inflation problems will amplify. This could also cause a renewed energy shock in Europe, resulting in severely negative economic outcomes. In fact, this was a concern in 2022 but a severe shock did not materialize thanks to an unseasonably warm winter.

Other risks include the potential for China's economic recovery to disappoint following the lifting of COVID restrictions, with negative spillovers to global growth and credit conditions. Furthermore, the potential escalation of tensions between the US and China would likely slow China's economic recovery and delay the supply-chain recovery. Also, a major resurgence of COVID-19 could cause widespread economic disruption again.

Amid these uncertainties, we have developed a few scenarios that are more pessimistic than our baseline scenario and one scenario that is more optimistic. Since more risks are skewed toward the upside, we present default rate forecasts under various pessimistic scenarios in Exhibit 15. In this exhibit, we apply the same rating histories and current ratings in all scenarios so that the only factors driving the different forecasts are economic assumptions. As the exhibit shows, the global default rate could climb above our baseline expectations if economic and financial conditions turn out worse than our baseline assumptions.

Under our moderately pessimistic (downside 10%) scenario, the global default rate would rise to 9.9% in 2023, which is similar to the 9.7% peak after the burst of the dot-com bubble. Under our severely pessimistic scenario (the downside 4% scenario), the rate would jump to 15.0%, which would be higher than the peak of 13.5% during the global financial crisis.

In the event that inflation decelerates faster than expected and major economies avoid economic contractions in 2023, the optimistic scenario would unfold. Under this scenario, the global default rate would fall to 4.0% by the end of 2023, just below the long-term average of 4.1%. This optimistic scenario assumes that funding environment will remain tight in 2023 and high-yield spreads will widen during the rest of this year at a pace slower than in the baseline scenario. Specifically, we assume the US high-yield spread would range from 451 bps to 495 bps and the European high-yield spread would range from 490 bps to 520 bps. On the other hand, we assume the unemployment rate would stabilize in both regions. These macro assumptions, together with a weaker rating mix than a year ago, would prevent the global default rate from falling significantly, even though the big wave of Russian defaults in 2022 will not recur in 2023 and new defaults among China property developers will likely decline.

Exhibit 15

Default rate forecasts under alternative scenarios

Scenario		Baseline	The downside 25% scenario	The downside 10% scenario	The downside 4% scenario
Scenario description	Probability that the economy will perform better	50%	75%	90%	96%
	Probability that the economy will perform worse	50%	25%	10%	4%
Assumptions for 2023	US Unemployment*	5.0%	6.4%	7.7%	8.4%
	US HY Spread*	501 bps	690 bps	735 bps	868 bps
Speculative-grade default rate	2022 Actual	4.2%	4.2%	4.2%	4.2%
	2023 Forecast	4.4%	6.1%	9.9%	15.0%

* Average in Q4 2023.

Sources: Bloomberg, Moody's Analytics and Moody's Investors Service

Durable consumer goods will have the highest default rate under our forecasts

Our baseline speculative-grade default rate forecast of 4.4% by the end of 2023 translates into 126 defaults during the year (or 10.5 per month). In terms of timing, we think more defaults will likely occur in the second half of the year when the negative impact of monetary tightening materializes. In addition, a significant portion of defaults in nonfinancial corporates is now via distressed exchanges, in which the timing of defaults is often linked to the maturity wall and refinancing activity. As the second half of the year begins, the 2025 maturities, which are bigger than those in 2023 and 2024, will start to come into focus. Those companies that have not been able to address their refinancing needs will have to face up to the fact that they are not able to afford to refinance their capital structure and will need to enter some form of restructuring, including a distressed exchange.

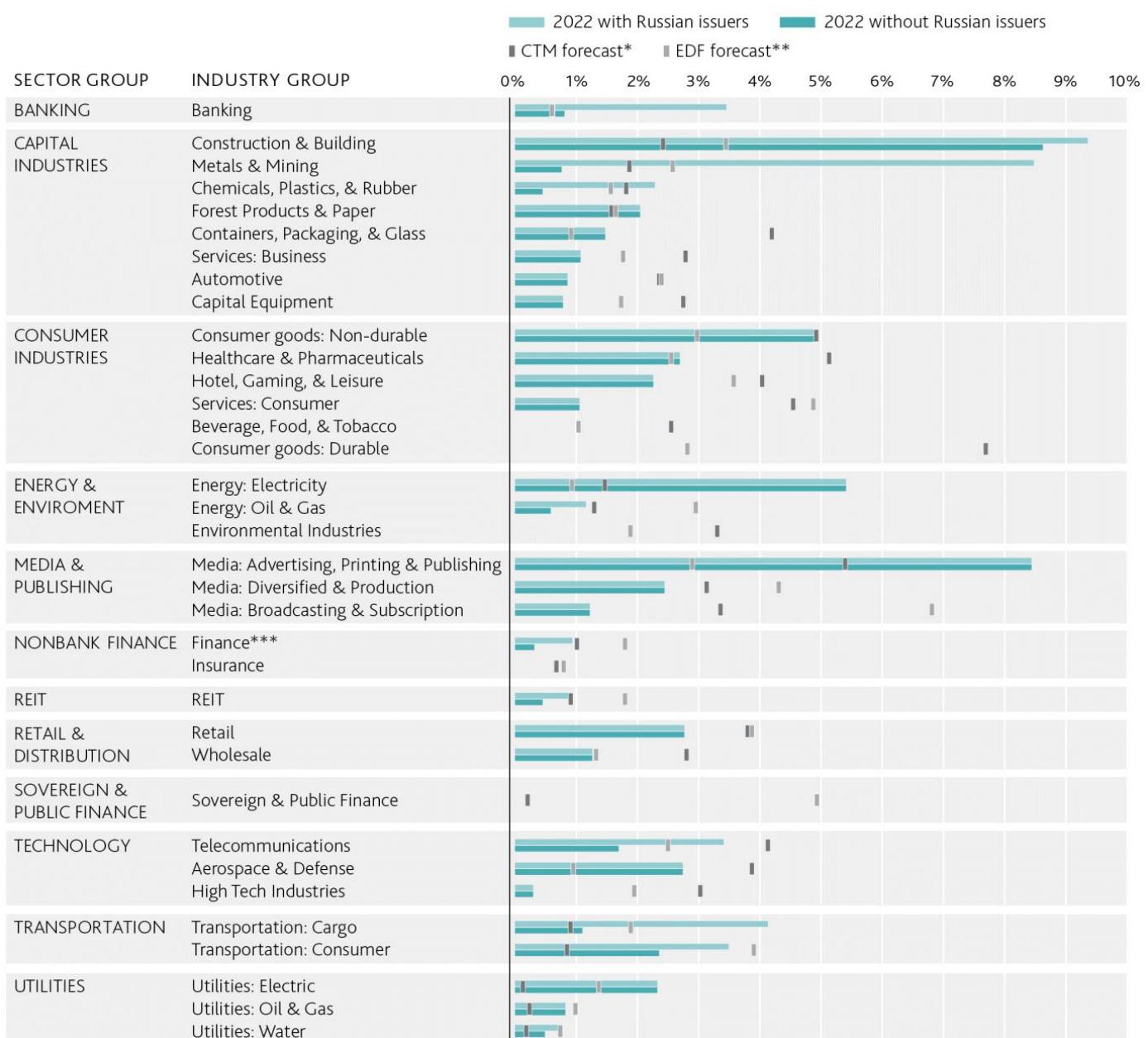
Across sectors, we forecast that durable consumer goods will have the highest default rate, at 7.7%. Issuers rated single B or below dominate this sector. These issuers are less resilient to economic shocks, inflation and financial market risks. Demand has already weakened for certain consumer durables and we expect demand for consumer durable goods to remain weak in 2023, putting earnings pressure on companies in this sector.

When measured by default count, healthcare and pharmaceuticals is forecast to have 12 defaults, the most across sectors, because of the relatively larger number of low-rated companies in the sector. Healthcare and pharmaceuticals has suffered from rising labor costs and shortages since the pandemic. Last year, the ratings of 25 healthcare companies were downgraded to B3 CFR negative or lower in North America, representing a material deterioration in the sector's credit quality.¹² Many healthcare companies rated B3 negative or lower have high financial leverage, high levels of floating-rate debt and weak operating performance. With interest rates rising, they now have to contend with higher financing costs amid a backdrop of persistent inflation and slowing economic growth that will pressure earnings well into 2023. Finding lenders willing to refinance will become increasingly difficult as the market retrenches, leading to rising defaults.

Exhibit 16 shows one-year default rate forecasts by industry, using the same economic assumption for all industries. The industry default rate forecasts include both investment-grade and speculative-grade companies. The factors driving the different forecast default rates include rating histories, current ratings and watch/outlook status of the companies in these industries.

Exhibit 16

Moody's CTM forecasts that consumer durable goods will have the highest default rate in 2023



*CTM forecast is based on Moody's CTM.

**EDF forecast is based on Moody's KMV Model.

Source: Moody's Investors Service

The exhibit also shows the default rate forecast implied by Expected Default Frequency (EDF).¹³ The EDF-implied default rate forecast includes rated and unrated issuers. EDF 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 companies default. In particular, the EDF model assumes that default is highly likely to occur when the market value of a company's assets is insufficient to cover its liabilities at some future date – in other words, when it is insolvent. EDF-implied ratings may indicate different default outlooks compared with those from Moody's CTM. For example, EDF-implied ratings suggest that media: broadcasting and subscription will have the highest default rate. This indication reflects the volatility in the equity market, which

may not be fully captured in rating actions. In addition, the EDF-implied default rate may also be higher in some sectors because that portfolio includes some unrated issuers that may have relatively weak credit quality.

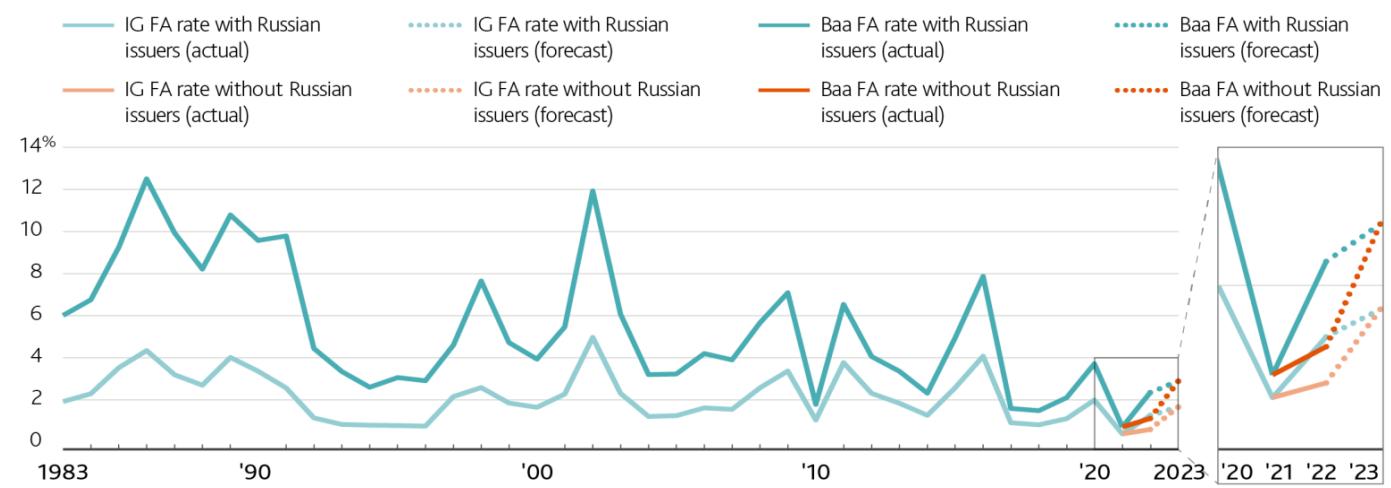
Weak macro and credit headwinds will likely send fallen angel rate higher in 2023

In this section, we use Moody's CTM to predict fallen angel rates based on the same macro assumptions as in our baseline scenario for the default rate forecast. Our model predicts fallen angel rates for Baa-rated companies will rise to 2.9% in 2023 from 2.3% in 2022. Similarly, the fallen angel rate for the entire investment-grade universe will climb to 1.6% from 1.2% under our forecasts (see Exhibit 17). Excluding Russian issuers, the rising slope in the 2023 fallen angel rates will be steeper for both Baa-rated companies and the entire investment-grade universe.

These forecasts, if realized, will remain low by historical standards. Our assumptions of slower economic growth and tighter financial conditions in 2023 than in 2022 are the main drivers of the rising forecasts.

Exhibit 17

Fallen angel (FA) rate will likely rise in 2023 but remain low by historical standards



Source: Moody's Investors Service

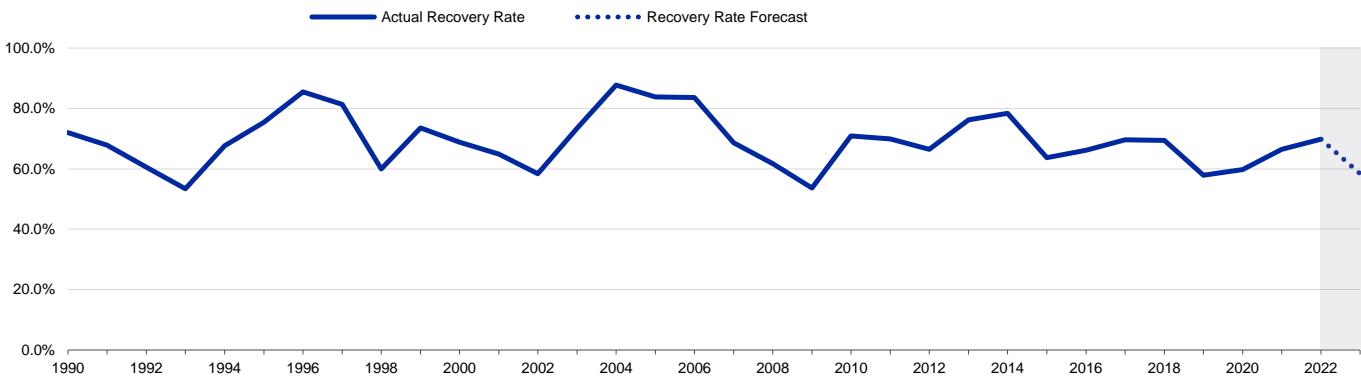
Default risk will rise for loan issuers in 2023

While both bond and loan issuers face similar macro headwinds, loan issuers will suffer more from rising interest rates because most loans carry floating rates. In addition, banks have tightened their lending standards in anticipation of a recession, making it more difficult for loan issuers to refinance, which will raise the risk of default, especially for financially weak issuers. Furthermore, the credit quality of leveraged loan issuers weakened in 2022. Last but not least, a considerable number of leveraged loan issuers are owned by private equity firms, which are more likely to execute distressed exchanges, even before low-rated issuers run out of liquidity or are due to refinance.

Our loss given default assessments (LGDA) at the beginning of this year point to higher losses (i.e., lower recoveries) for senior secured loans. Specifically, we expect the average recovery rates of first-lien senior secured bank loans to be 58.4% across all sectors globally in the event they all default in 2023 (see Exhibit 18). This is lower than the long-term average recovery rate of 65.7% measured by trading prices. The relatively low recovery expectation reflects weaker credit quality and structural deterioration, the latter results from the increase of loan-only structures in recent years. In the worst cases, some first-lien bank loans are becoming bond-like and act as a buffer for asset-based loans, the latter of which are the most senior in the capital structure.

Another concern is the presence of "cov-lite" loans, which have expanded significantly and now constitute the vast majority of institutional leveraged loans. Less-restrictive credit documentation provides borrowers with a greater set of options, which may allow them to delay or avoid a default. However, that also increases the risk of further erosion for first-lien bank lenders because certain cov-lite deals provide greater allowances for collateral transfers to unrestricted subsidiaries or other priming transactions while restricting lender oversight and control.

Exhibit 18

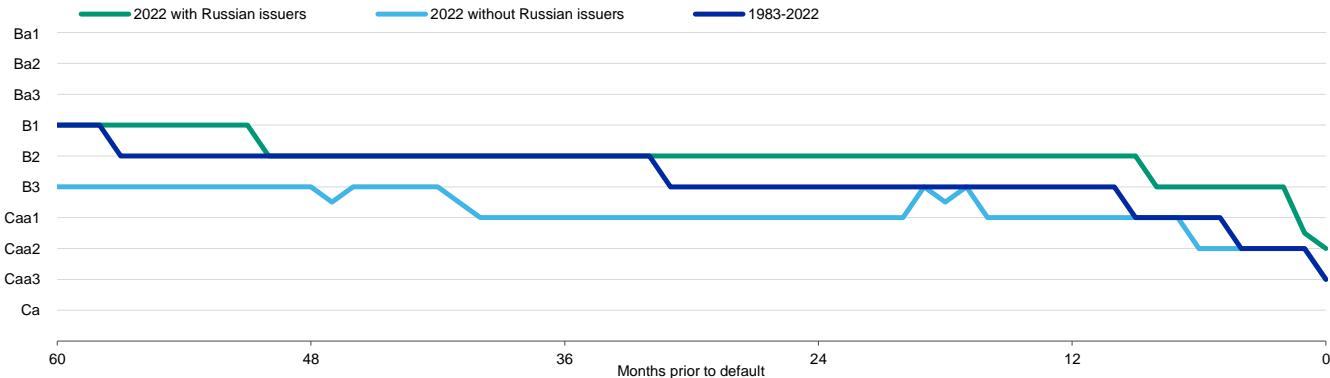
LGDAs suggest first-lien loan recovery rate will fall in 2023

Source: Moody's Investors Service

Rating accuracy

Our ratings have historically proven to be effective predictors of default, as Exhibit 19 shows. The exhibit plots the median ratings of more than 3,000 corporate issuers that defaulted from 1983 to 2022. The exhibit demonstrates that, historically, rated issuers have been downgraded to B1 as early as five years before default. The median rating was B3 one year before default since 1983. Among last year's defaulters, the median rating one year before default was B2 including Russian defaulters, and Caa1 excluding Russian defaulters.

Exhibit 19

Median ratings before default, 2022 vs. long-term average

Source: Moody's Investors Service

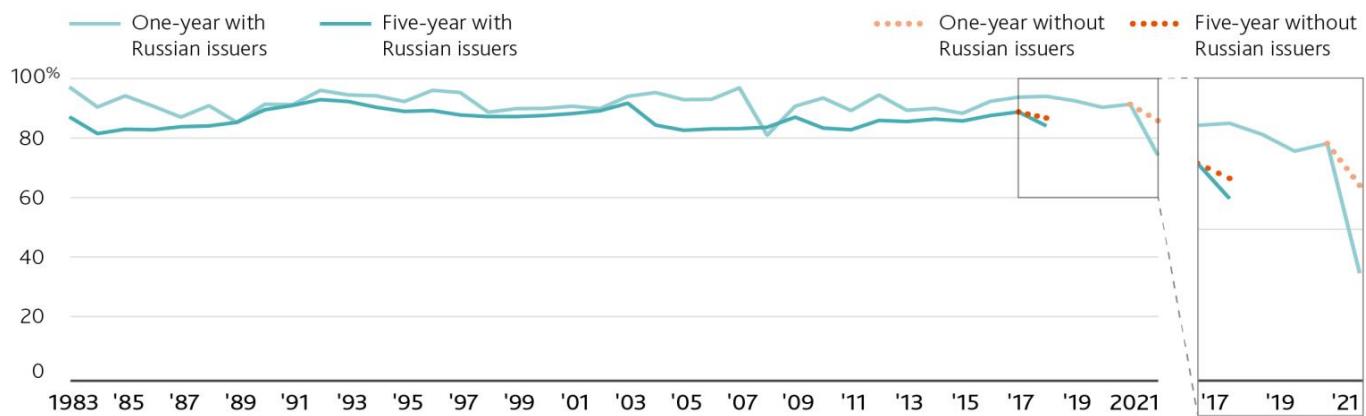
The evolution of median ratings demonstrates that our corporate ratings correlate with subsequent default experience. To further demonstrate the ability of ratings to separate issuers with low credit risk from those with high credit risk, we use the Average Default Position (AP) of defaults to evaluate ordinal accuracy of our ratings (see Exhibit 20).

AP measures the average position of defaulters, with position defined as the percentage of issuers with higher or equal ratings. A greater AP indicates a more discriminatory rating system because there are more issuers rated higher than the defaulters, or that defaulters are generally found in lower rating categories. The AP of defaults was consistently high during the 1983-2022 period, with an average of 91.2% for the one-year horizon and 86.6% for the five-year horizon. These percentages indicate that our ratings have been effective in predicting defaults over both the short and long term.

In 2022, the one-year AP fell to 74.3% from 91.5% in 2021. The Russia-Ukraine war was a key driver of the drop in AP as the war led to capital controls and sanctions, causing many Russian companies to default including high-rated ones, which negatively affected AP. To a less extent, Chinese property defaulters also contributed to the decline in the 2022 AP. The latest one-year AP would have been 86.0% if we exclude Russian issuers and would have been 89.9% if we also exclude defaults in the China property sector.

Exhibit 20

One- and five-year AP by cohort year, 1983-2022



AP measures how well ratings rank-ordered default risk over the measured horizon.

Source: Moody's Investors Service

Methodology and data sources

Moody's definition of default

Our definition of default is applicable only to debt or debtlike obligations (for example, 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 is a technical paper that explains how we calculate default rates, transition rates and rating performance metrics in detail.

Changes in this year's report

We occasionally discover historical defaults, leading to minor revisions of the historical data. As always, the data contained in our most recently published default study supersedes the data in previous reports.

Data sources

We base the results of this study on our 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, our data covers the credit experiences of nearly 30,000 corporate issuers that sold long-term public debt at some time between 1920 and 2022. As of January 1, 2022, close to 7,000 corporate issuers held a Moody's long-term bond, loan, deposit or corporate family rating.

Our database of corporate defaults covers more than 5,000 long-term bond and loan defaults by rated and nonrated issuers.

Additional data sources, such as Bloomberg's Fixed Income Index data, supplemented our proprietary data in the construction of the aggregate dollar volume-weighted default rates. Defaulted bond pricing data was derived from Bloomberg, Thomson Reuters, IDC and TRACE. Most of these market quotes represent an actual bid on the debt instrument, although no trade may have occurred at that price. Over the 1983-2022 period, the data set includes post-default prices for more than 6,000 defaulted instruments issued by over 2,000 defaulting corporations. We make the 1970-2022 credit rating, default and recovery rate data used in this study available through the Default and Recovery Database.

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 19 was derived by mapping our ratings to a linear scale, then taking the median values of the numerically mapped ratings. Exhibit 28 shows average senior unsecured recovery rates by letter rating and year before 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 36.1% two-year B recovery rate reported in Exhibit 28 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.

Exhibits 38 through 42 show issuer-weighted historical average default rates by rating category over various investment horizons. These data were generated by averaging the multiyear 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 20.5% average rate between 1983 and 2022 (see Exhibit 40). 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 46 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 bonds, so larger defaults receive relatively more weight. Average default rates based on bond 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 likely to be the same regardless of differences in the nominal sizes of the exposures.

Exhibit 47 shows the cumulative issuer-weighted historical default rates of cohorts formed between the years 1970 and 2022 (January 1 of each year). These data are a subset of the data used to calculate the issuer-weighted averages shown in Exhibits 38 through 40 (which, again, are based on cohorts formed at monthly time intervals). The default rates in Exhibit 47 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 21

Moody's-rated 2022 corporate defaults*

Company	Domicile	Default month	Broad default type	Bond (\$mil)	Loan (\$mil)	in Jan 2022 cohort?
Absolut Bank (PAO)	Russia	2022.03	Payment default	0	0	yes
ACProducts Holdings, Inc.	United States	2022.06	Distressed exchange	200	0	yes
Agua y Saneamientos Argentinos S.A.	Argentina	2022.12	Distressed exchange	478	0	yes
Alfa-Bank	Russia	2022.03	Payment default	1,200	0	yes
All Day AcquisitionCo LLC	United States	2022.05	Distressed exchange	0	63	yes
ALROSA PJSC	Russia	2022.04	Payment default	1,000	0	yes
Altera Infrastructure L.P.	United Kingdom	2022.08	Bankruptcy	975	26	yes
AO RAIFFEISENBANK	Russia	2022.03	Payment default	0	0	yes
Banco Economico, S.A.	Angola	2022.08	Distressed exchange	0	0	yes
Bank Otkritie Financial Corporation PJSC	Russia	2022.03	Payment default	0	0	yes
Bank Saint-Petersburg PJSC	Russia	2022.03	Payment default	0	0	yes
Bank Solidarnost	Russia	2022.03	Payment default	0	0	yes
Bank Uralsib	Russia	2022.03	Payment default	0	0	yes
Bank Vostok PJSC	Ukraine	2022.02	Payment default	0	0	yes
Bank VTB, PJSC	Russia	2022.03	Payment default	1,435	0	yes
Bank ZENIT PJSC	Russia	2022.03	Payment default	0	0	yes
Bausch Health Companies Inc.	Canada	2022.09	Distressed exchange	5,594	0	yes
Bed Bath & Beyond Inc.	United States	2022.11	Distressed exchange	154	0	yes
Borets International Ltd	Russia	2022.03	Payment default	506	0	yes
Bright Bidco B.V.	Netherlands	2022.08	Bankruptcy	0	1,683	yes
BW NHHC Holdco, Inc.	United States	2022.12	Distressed exchange	0	861	yes
Carestream Health, Inc.	United States	2022.08	Bankruptcy	0	953	yes
Casper Debtco B.V.	Netherlands	2022.10	Distressed exchange	0	249	yes
CB Kuban Credit Ltd	Russia	2022.03	Payment default	0	0	yes
Celtic Resources Holdings DAC	Russia	2022.04	Payment default	400	0	yes
Center-Invest Bank	Russia	2022.03	Payment default	0	0	yes
CIFI Holdings (Group) Co. Ltd.	China	2022.11	Payment default	4,458	0	yes
Commercial Bank Agropromcredit (LLC)	Russia	2022.03	Payment default	0	0	yes
Commercial Bank AK BARS, PJSC	Russia	2022.03	Payment default	600	0	yes
Credit Bank of Moscow	Russia	2022.03	Payment default	2,086	0	yes
Credit Europe Bank (Russia) Ltd.	Russia	2022.03	Payment default	0	0	yes
Crown UK Holdco Limited	United Kingdom	2022.09	Bankruptcy	0	4,675	yes
DaFa Properties Group Limited	China	2022.01	Distressed exchange	741	0	yes
Dexin China Holdings Company Limited	China	2022.12	Payment default	348	0	yes
Diamond Sports Group, LLC	United States	2022.03	Distressed exchange	3,038	3,222	yes
Diebold Nixdorf, Inc.	United States	2022.12	Distressed exchange	1,394	1,021	yes
DME Limited (Moscow Domodedovo Airport)	Russia	2022.08	Payment default	658	0	yes
Dunn Paper Holdings, Inc.	United States	2022.04	Payment default	0	348	yes
Empresa Distribuidora y Com. Norte S.A.	Argentina	2022.05	Distressed exchange	76	0	yes
Endo International plc	United States	2022.08	Bankruptcy	3,880	1,975	yes
Envision Healthcare Corporation	United States	2022.04	Distressed exchange	87	5,297	yes
EuroChem Group AG	Russia	2022.03	Payment default	700	0	yes
EVRAZ plc	Russia	2022.09	Payment default	1,450	0	yes
Exela Intermediate LLC	United States	2022.03	Distressed exchange	70	100	yes
Eximbank of Russia	Russia	2022.03	Payment default	0	0	yes
Fly Leasing Limited	Ireland	2022.10	Distressed exchange	50	0	yes
Fusion Connect, Inc.	United States	2022.01	Distressed exchange	0	256	yes

Source: Moody's Investors Service

Company	Domicile	Default month	Broad default type	Bond (\$mil)	Loan (\$mil)	in Jan 2022 cohort?
Gazprom, PJSC	Russia	2022.09	Payment default	2,000	0	yes
Gazprombank	Russia	2022.03	Payment default	0	0	yes
General Shopping e Outlets do Brasil S.A.	Brazil	2022.02	Distressed exchange	18	0	yes
GEO Group, Inc.	United States	2022.08	Distressed exchange	574	1,055	yes
Getin Noble Bank S.A.	Poland	2022.10	Distressed exchange	144	0	yes
Global Ports Investments Plc	Russia	2022.12	Distressed exchange	198	0	yes
Golden Wheel Tiandi Holdings Company Limited	China	2022.01	Payment default	267	0	yes
Greenland Holding Group Company Limited	China	2022.06	Distressed exchange	488	0	yes
Greenland Holding Group Company Limited	China	2022.11	Distressed exchange	3,182	0	no
GTLK Europe DAC	Russia	2022.04	Payment default	2,650	0	yes
Guangzhou Fineland Real Estate Development	China	2022.08	Payment default	340	0	yes
Haya Real Estate, S.A.U.	Spain	2022.06	Distressed exchange	368	0	yes
Helenbergh China Holdings Limited	China	2022.10	Payment default	620	0	yes
IR Bank JSC	Ukraine	2022.02	Payment default	0	0	yes
Isagenix International, LLC	United States	2022.10	Payment default	0	258	yes
Jiangsu Zhongnan Construction Grp Co., Ltd.	China	2022.06	Distressed exchange	473	0	yes
Jiayuan International Group Limited	China	2022.08	Payment default	1,405	0	yes
Jingrui Holdings Limited	China	2022.03	Distressed exchange	1,345	0	yes
Jinke Property Group Co., Ltd.	China	2022.05	Distressed exchange	303	0	no
Joint Stock Commercial Bank Avangard	Russia	2022.03	Payment default	0	0	yes
JSC "Raiffeisen Bank"	Ukraine	2022.02	Payment default	0	0	yes
K&N Parent, Inc.	United States	2022.10	Distressed exchange	0	372	yes
L1R HB Finance Limited	United Kingdom	2022.10	Distressed exchange	0	1,020	yes
Landsea Green Management Limited	China	2022.10	Distressed exchange	169	0	yes
LLC PIK-Corporation	Russia	2022.06	Payment default	525	0	yes
Logan Group Company Limited	China	2022.08	Payment default	2,578	0	yes
Magnitogorsk Iron & Steel Works	Russia	2022.07	Payment default	500	0	yes
Maritime Bank	Russia	2022.03	Payment default	0	0	yes
Mashantucket (Western) Pequot Tribe, CT	United States	2022.02	Distressed exchange	0	275	yes
MB Aerospace Holdings II Corp.	United States	2022.04	Distressed exchange	0	50	yes
Metallinvestbank JSCB	Russia	2022.03	Payment default	0	0	yes
Metkombank	Russia	2022.03	Payment default	0	0	yes
Midas Intermediate Holdco II, LLC	United States	2022.05	Payment default	375	803	yes
Missouri TopCo Limited	United Kingdom	2022.10	Distressed exchange	401	0	yes
MLN US Holdco LLC	Canada	2022.10	Distressed exchange	0	755	yes
MMC Norilsk Nickel, PJSC	Russia	2022.10	Payment default	1,500	0	yes
Mobile TeleSystems Public Joint Stock Company	Russia	2022.06	Payment default	500	0	yes
Moran Foods LLC	United States	2022.12	Distressed exchange	0	127	yes
National Power Company Ukrenergo	Ukraine	2022.08	Distressed exchange	825	0	yes
National Reserve Bank	Russia	2022.03	Payment default	0	0	yes
NBD Bank	Russia	2022.03	Payment default	0	0	yes
Neovia Logistics, LP (Old)	United States	2022.11	Distressed exchange	0	696	yes
NK Bank	Russia	2022.03	Payment default	0	0	yes
NLMK	Russia	2022.10	Payment default	296	0	yes
Novikombank JSCB	Russia	2022.03	Payment default	0	0	yes
O1 Properties Limited	Russia	2022.04	Payment default	350	0	yes
Output Services Group, Inc.	United States	2022.08	Bankruptcy	0	833	yes
Owl Finance Limited	United Kingdom	2022.03	Distressed exchange	282	0	yes
Pampa Energia S.A.	Argentina	2022.07	Distressed exchange	407	0	yes
PAO Severstal	Russia	2022.03	Payment default	1,434	0	yes
PAO TMK	Russia	2022.03	Payment default	800	0	yes
Par Pharmaceutical Inc.	United States	2022.08	Bankruptcy	2,015	0	yes
Petersburg Social Commercial Bank	Russia	2022.03	Payment default	0	0	yes

Source: Moody's Investors Service

Company	Domicile	Default month	Broad default type	Bond (\$mil)	Loan (\$mil)	in Jan 2022 cohort?
Phoenix Services International LLC	United States	2022.09	Bankruptcy	0	530	yes
Pivdennyi Bank, JSCB	Ukraine	2022.02	Payment default	0	0	yes
PJSC PhosAgro	Russia	2022.05	Payment default	500	0	yes
PJSC PIK - Specialized Homebuilder	Russia	2022.06	Payment default	0	0	yes
PJSC Polys	Russia	2022.07	Distressed exchange	653	0	yes
PJSC ROSBANK	Russia	2022.03	Payment default	0	0	yes
Postmedia Network Inc.	Canada	2022.04	Distressed exchange	197	0	yes
Powerlong Real Estate Holdings Limited	China	2022.07	Distressed exchange	463	0	yes
Premier Brands Group Holdings LLC	United States	2022.09	Distressed exchange	0	5	yes
Privatbank	Ukraine	2022.02	Payment default	0	0	yes
Promsvyazbank	Russia	2022.03	Payment default	0	0	yes
PSS Industrial Group Corp.	United States	2022.04	Payment default	0	300	yes
Redsun Properties Group Limited	China	2022.08	Payment default	875	0	yes
Revlon Consumer Products Corporation	United States	2022.06	Bankruptcy	427	2,962	yes
RiseSun Real Estate Development Co., Ltd.	China	2022.01	Distressed exchange	780	0	yes
Rite Aid Corporation	United States	2022.12	Distressed exchange	165	0	yes
Ronshine China Holdings Limited	China	2022.07	Payment default	2,327	0	yes
Rosdorbank	Russia	2022.03	Payment default	0	0	yes
Ruby Pipeline, LLC	United States	2022.03	Bankruptcy	475	0	yes
RusHydro, PJSC	Russia	2022.04	Payment default	270	0	yes
Russian Agricultural Bank	Russia	2022.03	Payment default	500	0	yes
Russian Railways Joint Stock Company	Russia	2022.03	Payment default	3,007	0	yes
Russian Regional Development Bank	Russia	2022.03	Payment default	0	0	yes
Safari Beteiligungs GmbH	Germany	2022.05	Distressed exchange	0	0	yes
Safari Holding Verwaltungs GmbH	Germany	2022.05	Distressed exchange	350	0	yes
SAS AB	Sweden	2022.07	Bankruptcy	0	0	yes
SAS Denmark-Norway-Sweden	Sweden	2022.07	Bankruptcy	131	0	yes
Savings Bank of Ukraine	Ukraine	2022.02	Payment default	0	0	yes
Sberbank	Russia	2022.03	Payment default	3,000	0	yes
Schur Flexibles GmbH	Germany	2022.09	Distressed exchange	0	472	yes
Screenvision, LLC	United States	2022.12	Distressed exchange	0	25	yes
Shinsun Holdings (Group) Co., Ltd.	China	2022.01	Distressed exchange	742	0	yes
Sibur Holding, PJSC	Russia	2022.07	Payment default	500	0	yes
SME Bank	Russia	2022.03	Payment default	0	0	no
Sovcombank PJSC	Russia	2022.03	Payment default	600	0	yes
Sovcomflot PAO	Russia	2022.05	Payment default	928	0	yes
State Transport Leasing Company (JSC GTLK)	Russia	2022.04	Payment default	0	0	yes
SUEK JSC	Russia	2022.03	Payment default	500	0	yes
Sunac China Holdings Limited	China	2022.05	Payment default	5,891	0	yes
Talen Energy Marketing, LLC	United States	2022.05	Bankruptcy	0	848	no
Talen Energy Supply, LLC	United States	2022.05	Bankruptcy	3,060	500	yes
TASCOMBANK JSC	Ukraine	2022.02	Payment default	0	0	yes
Times China Holdings Limited	China	2022.12	Payment default	2,550	0	yes
Tinkoff Bank	Russia	2022.03	Payment default	0	0	yes
TPC Group Inc.	United States	2022.03	Payment default	1,083	0	yes

Source: Moody's Investors Service

Company	Domicile	Default month	Broad default type	Bond (\$mil)	Loan (\$mil)	in Jan 2022 cohort?
U.S. Telepacific Corp.	United States	2022.02	Distressed exchange	0	607	yes
UC RUSAL, PJSC	Russia	2022.08	Payment default	500	0	yes
Ukreximbank	Ukraine	2022.02	Payment default	0	0	yes
Uralkali PJSC	Russia	2022.05	Payment default	500	0	yes
VEON Holdings B.V.	Russia	2022.11	Payment default	1,229	0	yes
Vericast Corp.	United States	2022.11	Distressed exchange	0	1,058	yes
VimpelCom PJSC	Russia	2022.11	Payment default	1,000	0	yes
Wesco Aircraft Holdings, Inc.	United States	2022.03	Distressed exchange	995	0	yes
Yuzhou Group Holdings Company Limited	China	2022.01	Distressed exchange	5,874	0	yes
Zhenro Properties Group Limited	China	2022.03	Distressed exchange	3,492	0	yes
Zhongliang Holdings Group Company Limited	China	2022.05	Distressed exchange	939	0	no

* This list includes companies that initially defaulted in 2022 and they must have rated bonds, loans and/or deposits within one year before default. Only issuers included in the January 1 cohort are included in the annual default rates in this report. In addition to the 156 companies listed above, eight issuers that initially defaulted in prior years experienced follow-on defaults in 2022 on \$8,313 million of bonds and \$13 million of loans. We include the amount associated with these follow-on defaults in the 2022 default volume.

Source: Moody's Investors Service

Exhibit 22

Annual Moody's-rated global corporate issuer default counts, 1920-2022*

Year	IG	SG	All Ratings	Year	IG	SG	All Ratings	Year	IG	SG	All Ratings
1920	8	25	33	1955	0	1	1	1990	1	88	89
1921	7	25	32	1956	0	0	0	1991	1	68	69
1922	10	23	33	1957	0	1	1	1992	0	33	33
1923	5	22	27	1958	0	0	0	1993	0	23	23
1924	3	37	40	1959	0	0	0	1994	0	19	19
1925	7	34	41	1960	0	2	2	1995	0	29	29
1926	4	18	22	1961	0	3	3	1996	0	18	18
1927	1	15	16	1962	0	4	4	1997	0	25	25
1928	0	8	8	1963	0	3	3	1998	1	50	51
1929	3	12	15	1964	0	0	0	1999	1	106	107
1930	2	21	23	1965	0	0	0	2000	4	125	129
1931	6	78	84	1966	0	1	1	2001	4	179	183
1932	10	108	118	1967	0	0	0	2002	12	136	148
1933	9	189	198	1968	0	1	1	2003	0	91	91
1934	5	60	65	1969	0	0	0	2004	0	41	41
1935	9	51	60	1970	2	25	27	2005	2	31	33
1936	3	19	22	1971	0	3	3	2006	0	31	31
1937	4	18	22	1972	0	5	5	2007	0	20	20
1938	9	17	26	1973	2	3	5	2008	21	119	140
1939	2	13	15	1974	0	3	3	2009	14	258	272
1940	2	22	24	1975	0	4	4	2010	3	62	65
1941	0	10	10	1976	0	2	2	2011	6	44	50
1942	0	4	4	1977	1	3	4	2012	1	68	69
1943	0	3	3	1978	0	4	4	2013	3	68	71
1944	0	3	3	1979	0	1	1	2014	2	56	58
1945	0	2	2	1980	0	4	4	2015	0	109	109
1946	0	0	0	1981	0	2	2	2016	0	139	139
1947	0	2	2	1982	2	11	13	2017	0	106	106
1948	0	0	0	1983	0	14	14	2018	0	74	74
1949	0	5	5	1984	2	11	13	2019	2	96	98
1950	0	0	0	1985	0	16	16	2020	2	204	206
1951	0	1	1	1986	3	33	36	2021	0	51	51
1952	0	0	0	1987	0	31	31	2022a**	0	87	87
1953	0	0	0	1988	0	32	32	2022b**	17	134	151
1954	0	1	1	1989	4	50	54				

* Only includes companies in January 1 cohort.

** 2022a excludes Russian defaults while 2022b includes Russian defaults

Source: Moody's Investors Service

Exhibit 23

Annual rated global corporate bond and loan default volumes, 1970-2022* (in \$ million)

Investment-grade			Speculative-grade			All Ratings		
Year	Bond	Loan	Bond	Loan	Total	Bond	Loan	Total
1970	154	0	756	0	756	910	0	910
1971	0	0	132	0	132	132	0	132
1972	0	0	215	0	215	215	0	215
1973	17	0	94	0	94	112	0	112
1974	0	0	69	0	69	69	0	69
1975	0	0	176	0	176	176	0	176
1976	0	0	34	0	34	34	0	34
1977	68	0	179	0	179	247	0	247
1978	0	0	112	0	112	112	0	112
1979	0	0	18	0	18	18	0	18
1980	0	0	302	0	302	302	0	302
1981	0	0	47	0	47	47	0	47
1982	243	0	515	0	515	758	0	758
1983	0	0	1,187	0	1,187	1,187	0	1,187
1984	215	0	386	0	386	601	0	601
1985	0	0	1,354	0	1,354	1,354	0	1,354
1986	138	0	4,004	0	4,004	4,142	0	4,142
1987	0	0	8,941	277	9,217	8,941	277	9,217
1988	0	0	5,642	361	6,003	5,642	361	6,003
1989	1,506	0	9,657	0	9,657	11,162	0	11,162
1990	0	0	20,429	1,831	22,260	20,429	1,831	22,260
1991	1,348	0	15,546	678	16,224	16,894	678	17,572
1992	0	0	6,667	956	7,623	6,667	956	7,623
1993	0	0	2,617	487	3,103	2,617	487	3,103
1994	0	0	2,713	299	3,013	2,713	299	3,013
1995	0	0	5,401	372	5,773	5,401	372	5,773
1996	0	0	4,106	1,435	5,541	4,106	1,435	5,541
1997	0	0	5,024	948	5,972	5,024	948	5,972
1998	399	0	9,469	3,299	12,768	9,868	3,299	13,167
1999	461	1,225	1,686	26,217	40,270	26,678	15,279	41,956
2000	4,115	3,950	8,065	25,516	26,206	51,721	29,631	30,156
2001	21,195	5,363	26,558	78,505	34,103	112,609	99,701	39,466
2002	46,350	13,158	59,508	115,724	41,121	156,845	162,075	54,279
2003	0	870	870	38,667	10,308	48,976	38,667	11,178
2004	0	0	16,409	4,712	21,122	16,409	4,712	21,122
2005	2,155	2,825	4,980	27,629	8,745	36,374	29,784	11,570
2006	0	0	7,940	2,630	10,570	7,940	2,630	10,570
2007	0	0	6,614	1,983	8,597	6,614	1,983	8,597
2008	182,073	10,380	192,452	51,362	32,451	83,814	233,435	42,831
2009	35,704	21,931	57,634	149,189	122,495	271,683	184,892	144,425
2010	4,047	0	4,047	22,256	14,042	36,298	26,303	14,042
2011	6,561	1,411	7,972	22,696	4,906	27,602	29,257	6,317
2012	323	0	323	35,001	18,289	53,290	35,324	18,289
2013	2,408	0	2,408	28,949	13,805	42,754	31,358	13,805
2014	939	0	939	40,392	30,370	70,762	41,331	30,370
2015	0	0	0	75,639	19,794	95,433	75,639	19,794
2016	0	0	0	90,823	43,648	134,472	90,823	43,648
2017	0	0	0	57,688	27,397	85,085	57,688	27,397
2018	0	0	0	49,468	25,892	75,360	49,468	25,892
2019	17,573	3,855	21,428	55,414	32,653	88,067	72,988	36,508
2020	756	1,766	2,522	127,004	99,360	226,364	127,760	101,126
2021	0	0	0	37,054	11,918	48,971	37,054	11,918
2022a**	0	0	0	72,830	33,443	106,273	72,830	33,443
2022b**	17,522	0	17,522	89,782	33,443	123,226	107,305	33,443
								140,748

* Only include companies in Jan 1 cohort.

** 2022a excludes Russian defaults while 2022b includes Russian defaults.

Source: Moody's Investors Service

Exhibit 24

Annual issuer default counts and volume by geographical region, 1986-2022*

Year	Default count					Default Volume (in \$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	36	\$0	\$0	\$0	\$0	\$4,142
1987	0	0	0	0	32	\$0	\$0	\$0	\$0	\$9,297
1988	0	0	0	0	32	\$0	\$0	\$0	\$0	\$6,003
1989	0	4	0	0	51	\$0	\$969	\$0	\$0	\$10,253
1990	0	1	1	0	90	\$0	\$200	\$516	\$0	\$22,097
1991	0	0	2	0	71	\$0	\$0	\$1,228	\$0	\$16,753
1992	0	0	0	0	34	\$0	\$0	\$0	\$0	\$7,673
1993	0	0	0	0	24	\$0	\$0	\$0	\$0	\$3,104
1994	0	0	1	0	18	\$0	\$0	\$774	\$0	\$2,238
1995	0	0	0	1	30	\$0	\$0	\$0	\$100	\$5,774
1996	0	0	0	1	19	\$0	\$0	\$0	\$207	\$5,930
1997	0	2	0	2	21	\$0	\$614	\$0	\$310	\$5,048
1998	0	4	5	0	44	\$0	\$1,444	\$707	\$0	\$11,241
1999	0	8	9	8	88	\$0	\$4,458	\$3,950	\$2,018	\$33,299
2000	0	4	4	4	118	\$0	\$4,453	\$866	\$455	\$54,080
2001	0	11	15	7	150	\$0	\$10,088	\$10,540	\$2,034	\$116,505
2002	2	2	25	17	102	\$150	\$1,842	\$47,555	\$10,370	\$156,437
2003	0	3	7	12	70	\$0	\$625	\$2,927	\$4,933	\$41,485
2004	1	0	5	1	38	\$183	\$0	\$2,311	\$1,093	\$18,304
2005	0	0	1	1	32	\$0	\$0	\$207	\$100	\$41,152
2006	0	0	7	2	23	\$0	\$0	\$1,601	\$167	\$9,295
2007	0	0	4	0	16	\$0	\$0	\$2,230	\$0	\$6,367
2008	0	3	52	3	93	\$0	\$625	\$53,374	\$705	\$227,926
2009	1	16	31	11	225	\$650	\$6,989	\$28,413	\$3,031	\$295,225
2010	0	3	10	4	54	\$0	\$6,913	\$9,713	\$487	\$25,384
2011	0	0	16	1	36	\$0	\$0	\$10,102	\$358	\$27,149
2012	1	1	13	5	51	\$48	\$1,805	\$17,441	\$3,077	\$33,780
2013	0	2	26	10	36	\$0	\$546	\$24,263	\$4,880	\$23,091
2014	1	5	16	5	32	\$350	\$4,000	\$9,974	\$4,539	\$53,092
2015	1	9	30	10	69	\$456	\$4,114	\$16,106	\$4,314	\$75,157
2016	2	2	20	12	110	\$945	\$1,806	\$16,248	\$26,135	\$91,785
2017	1	7	30	3	67	\$553	\$2,336	\$20,684	\$19,478	\$42,504
2018	0	5	13	5	57	\$0	\$4,161	\$7,950	\$8,559	\$57,417
2019	3	5	13	3	81	\$0	\$2,549	\$7,418	\$7,800	\$101,008
2020	3	17	40	13	144	\$2,845	\$13,053	\$41,597	\$9,350	\$168,972
2021	0	15	10	6	24	\$0	\$26,869	\$4,397	\$4,103	\$19,959
2022a**	1	24	24	4	38	\$0	\$48,976	\$11,651	\$979	\$49,939
2022b**	1	24	89	4	38	\$0	\$48,976	\$46,126	\$979	\$49,939

* Includes defaults outside of January 1 cohort.

** 2022a excludes Russian defaults while 2022b includes Russian defaults.

Source: Moody's Investors Service

Exhibit 25

2022 defaulted corporate bond and loan recoveries*

Company	Broad default type	Loan		Bond			
		1st Lien	2nd Lien	1st Lien	2nd Lien	Sr. Unsec.	Sub
ACProducts Holdings, Inc.	distressed exchange					64.0%	
Agua y Saneamientos Argentinos S.A.	distressed exchange					72.2%	
All Day AcquisitionCo LLC	distressed exchange	98.3%					
ALROSA PJSC	payment default					8.0%	
Altera Infrastructure L.P.	bankruptcy					5.3%	
Bausch Health Companies Inc.	distressed exchange					42.5%	
Bed Bath & Beyond Inc.	distressed exchange					15.4%	
Borets International Ltd	payment default					31.0%	
Bright Bidco B.V.	bankruptcy	34.9%					
BW NHHC Holdco, Inc.	distressed exchange	65.7%	57.2%				
Carestream Health, Inc.	bankruptcy	93.5%	80.0%				
Casper Debtco B.V.	distressed exchange	69.5%					
Celtic Resources Holdings DAC	payment default					15.0%	
China Aoyuan Group Limited	payment default					20.1%	
CIFI Holdings (Group) Co. Ltd.	payment default					22.2%	
CREDITO REAL, S.A.B. DE C.V., SOFOM, E.R.	payment default					6.5%	
Crown UK Holdco Limited	bankruptcy	39.5%					
DaFa Properties Group Limited	distressed exchange					55.4%	
Datang Group Holdings Ltd.	distressed exchange					33.8%	
Dexin China Holdings Company Limited	payment default					18.1%	
Diamond Sports Group, LLC	distressed exchange	37.9%		41.1%			
Diebold Nixdorf, Inc.	distressed exchange	74.7%		67.8%		53.8%	
Dr. Peng Telecom & Media Group Co., Ltd.	payment default					75.0%	
DTEK ENERGY B.V.	distressed exchange			24.0%			
DTEK ENERGY B.V.	distressed exchange			20.9%			
Dunn Paper Holdings, Inc.	payment default	85.0%	83.0%				
Empresa Distribuidora y Com. Norte S.A.	distressed exchange					97.1%	
Endo International plc	bankruptcy	86.5%		84.1%	16.2%	5.4%	
Envision Healthcare Corporation	distressed exchange	62.4%				41.5%	
EuroChem Group AG	payment default					40.0%	
Exela Intermediate LLC	distressed exchange			30.5%			
Fantasia Holdings Group Co., Limited	payment default					13.8%	
Fly Leasing Limited	distressed exchange					77.0%	
Fusion Connect, Inc.	distressed exchange	27.5%					
General Shopping Brasil S.A.	distressed exchange					80.0%	
GEO Group, Inc.	distressed exchange	97.5%				90.2%	
Getin Noble Bank S.A.	distressed exchange					37.8%	
Golden Wheel Tiandi Holdings Company Limited	payment default					39.3%	
Greenland Holding Group Company Limited	distressed exchange					46.2%	
Greenland Holding Group Company Limited	distressed exchange					20.0%	
GTLK Europe DAC	payment default					16.5%	
Guangzhou Fineland Real Estate Development	payment default					17.5%	
Haya Real Estate, S.A.U.	distressed exchange			70.4%			
Helenbergh China Holdings Limited	payment default					34.5%	
Isagenix International, LLC	payment default	39.2%					
Jiangsu Zhongnan Construction Grp Co., Ltd.	distressed exchange					33.5%	
Jiayuan International Group Limited	payment default					9.4%	

Source: Moody's Investors Service

Company	Broad default type	Loan		Bond			
		1st Lien	2nd Lien	1st Lien	2nd Lien	Sr. Unsec.	Sub
Jingrui Holdings Limited	distressed exchange					14.9%	
K&N Parent, Inc.	distressed exchange	78.0%	50.0%				
Kaisa Group Holdings Ltd	payment default					13.2%	
L1R HB Finance Limited	distressed exchange	75.1%					
Landsea Green Management Limited	distressed exchange					61.4%	
Leading Holdings Group Ltd	distressed exchange					64.4%	
Logan Group Company Limited	payment default					18.5%	
Mashantucket (Western) Pequot Tribe, CT	distressed exchange	97.8%					
MB Aerospace Holdings II Corp.	distressed exchange	86.8%					
MHP SE	distressed exchange					38.9%	
Midas Intermediate Holdco II, LLC	payment default	92.3%				100.0%	
Missouri TopCo Limited	distressed exchange			92.5%			
MLN US Holdco LLC	distressed exchange	62.5%	41.1%				
Modern Land (China) Co., Limited	payment default					17.5%	
Moran Foods LLC	distressed exchange			61.0%			
National Power Company Ukrenergo	distressed exchange					16.3%	
Neovia Logistics, LP	distressed exchange	90.3%					
O1 Properties Limited	payment default					4.3%	
Output Services Group, Inc.	bankruptcy	69.7%					
Owl Finance Limited	distressed exchange			61.0%			
Pampa Energia S.A.	distressed exchange					95.7%	
PAO Severstal	payment default					12.9%	
PAO TMK	payment default					5.0%	
Par Pharmaceutical Inc.	bankruptcy			83.5%			
Phoenix Services International LLC	bankruptcy	21.9%					
PJSC PhosAgro	payment default					26.5%	
Postmedia Network Inc.	distressed exchange				113.2%		
Powerlong Real Estate Holdings Limited	distressed exchange					16.4%	
Premier Brands Group Holdings LLC	distressed exchange	82.3%					
PSS Industrial Group Corp.	payment default	47.6%					
R&F Properties (HK) Company Limited	distressed exchange			50.8%			
R&F Properties (HK) Company Limited	distressed exchange			20.9%			
Redsun Properties Group Limited	payment default					10.7%	
Revlon Consumer Products Corporation	bankruptcy	61.6%				6.3%	
RiseSun Real Estate Development Co., Ltd.	distressed exchange					34.1%	
Rite Aid Corporation	distressed exchange			74.5%			
Ronshine China Holdings Limited	payment default					7.0%	
Ruby Pipeline, LLC	bankruptcy					88.8%	
Russian Agricultural Bank	payment default						5.0%
Russian Railways Joint Stock Company	payment default						11.2%
Safari Holding Verwaltungs GmbH	distressed exchange			91.3%			
SAS Denmark-Norway-Sweden	bankruptcy						11.7%
Schur Flexibles GmbH	distressed exchange	45.7%					
Shimao Group Holdings Limited	payment default						12.9%

Source: Moody's Investors Service

Company	Broad default type	Loan		Bond			
		1st Lien	2nd Lien	1st Lien	2nd Lien	Sr. Unsec.	Sub
Shinsun Holdings (Group) Co., Ltd.	distressed exchange					25.0%	
Sinic Holdings (Group) Company Limited	payment default					6.0%	
Sovcomflot PAO	payment default					13.0%	
SUEK JSC	payment default					10.0%	
Sunac China Holdings Limited	payment default					16.4%	
Sungard AS New Holdings III, LLC	bankruptcy	68.8%	10.5%				
Talen Energy Marketing, LLC	bankruptcy	105.7%					
Talen Energy Supply, LLC	bankruptcy	94.4%		97.4%		65.1%	
Times China Holdings Limited	payment default					21.6%	
TPC Group Inc.	payment default			38.9%			
U.S. Telepacific Corp.	distressed exchange	70.1%					
UNIFIN Financiera, S.A.B. de C.V.	payment default					9.2%	
Uralkali PJSC	payment default					19.5%	
Vericast Corp.	distressed exchange	70.9%					
VimpelCom PJSC	payment default					3.9%	
Wesco Aircraft Holdings, Inc.	distressed exchange			79.5%			
Xinyuan Real Estate Co., Ltd.	distressed exchange					20.9%	
Yango Group Co., Ltd	distressed exchange					10.8%	
Yuzhou Group Holdings Company Limited	distressed exchange					12.3%	
Zhenro Properties Group Limited	distressed exchange					7.9%	
Zhongliang Holdings Group Company Limited	distressed exchange					28.4%	

*Based on trading prices

Source: Moody's Investors Service

Exhibit 26

Annual defaulted corporate bond and loan recoveries*

Year	Loan	Bond					
		1st Lien	Sr. Unsec.	Sr. Sub.	Sub.	Jr. Sub.	All Bonds
1983		40.0%	52.7%	43.5%	41.1%		44.5%
1984			49.4%	67.9%	44.3%		45.5%
1985		83.6%	60.2%	29.6%	39.7%	48.5%	43.6%
1986		59.2%	49.5%	46.8%	41.4%		47.2%
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%	50.2%	36.6%	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	59.9%	46.8%	39.5%	45.0%	18.2%	62.0%	38.3%
1999	73.6%	39.1%	38.0%	26.9%	35.6%		34.3%
2000	68.8%	40.1%	24.2%	20.8%	31.9%	15.5%	25.4%
2001	64.9%	33.6%	21.2%	19.8%	15.9%	47.0%	21.7%
2002	58.4%	50.8%	29.6%	21.4%	23.4%		29.9%
2003	73.4%	63.0%	41.9%	37.8%	12.3%		40.8%
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%	86.1%	53.7%	56.2%			57.4%
2008	61.7%	52.5%	33.5%	23.3%	29.5%		34.1%
2009	53.6%	37.3%	36.7%	23.1%	45.3%	8.5%	33.9%
2010	70.9%	57.6%	48.2%	37.5%	33.7%		51.1%
2011	69.9%	70.5%	43.6%	42.8%	31.9%		46.7%
2012	66.4%	57.6%	43.3%	29.9%	40.3%		44.5%
2013	76.2%	68.8%	45.1%	20.7%	26.4%		46.2%
2014	78.4%	73.6%	47.0%	39.1%	38.8%		48.5%
2015	63.7%	54.8%	37.6%	36.6%	58.5%	14.0%	41.2%
2016	66.2%	49.6%	32.2%	36.7%	24.5%	0.6%	37.2%
2017	69.6%	65.4%	54.3%	38.0%	42.6%	17.5%	56.1%
2018	69.4%	58.8%	47.2%	45.6%			51.4%
2019	57.9%	60.3%	32.3%	64.7%	40.0%		41.2%
2020	59.8%	52.5%	34.6%	14.1%			38.4%
2021	66.4%	65.9%	48.7%	17.0%			52.1%
2022a**	69.8%	60.5%	35.1%		24.8%		40.4%
2022b**	69.8%	60.5%	31.1%		18.2%		36.1%

* Measured by trading prices.

** 2022a excludes Russian defaults while 2022b includes Russian defaults.

Source: Moody's Investors Service

Exhibit 27

Average defaulted corporated bond and loan recoveries by industry, 1983-2022*

Industry groups	1st Lien	Recoveries				Observation Counts				
		Bond				Loan				
		1st Lien	Sr. Unsec.	Sr. Sub.	Sub.	1st Lien	1st Lien	Sr. Unsec.	Sr. Sub.	Sub.
Aerospace & Defense	63.8%	79.5%	49.3%	23.3%	40.8%	5	1	10	9	7
Automotive	68.9%	57.9%	47.6%	23.9%	49.5%	38	4	37	28	5
Banking		7.0%	41.2%	20.0%	31.1%	0	1	58	7	67
Beverage, Food, & Tobacco	80.2%	55.5%	40.6%	27.5%	34.0%	19	16	32	19	10
Capital Equipment	63.3%	64.0%	31.3%	34.2%	39.6%	30	10	28	30	15
Chemicals, Plastics, & Rubber	67.6%	47.4%	29.3%	23.6%	63.6%	11	18	26	12	2
Construction & Building	57.8%	68.1%	36.7%	25.3%	28.5%	27	8	100	24	20
Consumer goods: Durable	63.3%	44.2%	34.0%	28.9%	29.4%	10	5	12	15	10
Consumer goods: Non-durable	62.9%	41.0%	32.7%	33.2%	38.6%	38	7	30	37	11
Containers, Packaging, & Glass	71.3%	63.2%	52.1%	36.5%	42.0%	6	9	12	11	3
Energy: Electricity	82.3%	82.0%	58.8%	78.9%	22.3%	7	14	28	2	4
Energy: Oil & Gas	68.1%	56.3%	36.8%	38.0%	39.1%	66	45	176	28	36
Environmental Industries	61.0%	13.0%	29.7%	27.1%	13.6%	8	1	7	6	3
Finance**	70.5%	47.6%	44.0%	36.8%	28.9%	10	5	40	11	15
Forest Products & Paper	74.8%	50.6%	37.3%	20.5%	1.5%	10	15	36	9	3
Healthcare & Pharmaceuticals	68.4%	80.6%	40.8%	33.0%	35.3%	34	6	29	30	30
High Tech Industries	60.1%	53.9%	35.5%	26.1%	23.2%	20	14	26	22	38
Hotel, Gaming, & Leisure	71.3%	56.0%	36.6%	31.4%	26.0%	38	44	44	36	17
Insurance	86.2%	96.3%	37.9%	46.0%	43.2%	2	1	10	4	6
Media: Advertising, Printing & Publishing	56.7%	49.7%	28.4%	22.0%	50.9%	36	20	20	23	4
Media: Broadcasting & Subscription	64.7%	40.1%	41.9%	39.1%	29.1%	20	13	50	29	13
Media: Diversified & Production	71.9%	14.0%	41.3%	32.9%	45.1%	5	2	7	3	3
Metals & Mining	58.7%	40.5%	34.9%	32.1%	45.8%	18	38	76	10	11
REIT	67.8%	44.0%	43.6%	13.0%	27.0%	6	2	17	3	7
Retail	61.5%	59.8%	36.1%	34.4%	22.2%	69	36	82	46	27
Services: Business	69.0%	70.1%	47.3%	28.9%	41.5%	46	23	29	11	6
Services: Consumer	64.1%	35.2%	53.9%	49.1%		13	2	7	5	0
Sovereign & Public Finance		31.4%	50.8%			0	3	7	0	0
Telecommunications	59.8%	56.4%	25.3%	31.0%	31.6%	38	20	141	20	17
Transportation: Cargo	67.9%	51.6%	41.9%	35.4%	32.5%	19	19	36	12	5
Transportation: Consumer	84.0%	53.2%	33.8%	43.6%	28.6%	4	10	31	3	14
Utilities: Electric	100.8%	60.6%	55.3%		27.1%	1	11	19	0	2
Utilities: Oil & Gas		85.0%	72.6%		57.5%	0	1	3	0	1
Utilities: Water			82.1%			0	0	2	0	0
Wholesale	65.7%	53.8%	37.9%	14.1%	37.0%	15	4	15	9	5

* Measured by trading prices.

** Non-bank and non-insurance financial companies

Source: Moody's Investors Service

Exhibit 28

Average senior unsecured bond recovery rates by year before default, 1983-2022*

Rating\Year	1	2	3	4	5
Aaa**		3.3%	3.3%	61.9%	69.6%
Aa	37.2%	39.0%	38.1%	44.0%	43.2%
A	35.1%	45.3%	46.9%	46.3%	45.7%
Baa	38.4%	40.8%	41.6%	42.0%	42.1%
Ba	40.9%	40.6%	40.1%	40.0%	39.8%
B	36.4%	36.1%	36.7%	37.4%	38.0%
Caa-C	38.5%	38.7%	38.6%	38.5%	38.5%
IG	37.7%	41.6%	42.9%	43.4%	43.4%
SG	38.0%	37.9%	38.0%	38.2%	38.4%
All	38.0%	38.0%	38.3%	38.6%	38.9%

* 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%.

Source: Moody's Investors Service

Exhibit 29

Annual credit loss rates by letter rating, 1983-2022*

Year	Aaa	Aa	A	Baa	Ba	B	Caa-C	IG	SG	All
1983	0.0%	0.0%	0.0%	0.0%	0.5%	1.0%	21.3%	0.0%	2.0%	0.5%
1984	0.0%	0.0%	0.0%	0.3%	0.3%	2.6%	9.2%	0.1%	1.6%	0.4%
1985	0.0%	0.0%	0.0%	0.0%	0.3%	2.8%	2.5%	0.0%	1.5%	0.4%
1986	0.0%	0.0%	0.0%	0.4%	1.2%	5.2%	8.2%	0.1%	3.1%	0.9%
1987	0.0%	0.0%	0.0%	0.0%	1.1%	1.9%	3.6%	0.0%	1.6%	0.5%
1988	0.0%	0.0%	0.0%	0.0%	0.7%	3.1%	6.8%	0.0%	2.0%	0.7%
1989	0.0%	0.3%	0.0%	0.3%	1.7%	4.2%	11.5%	0.1%	3.3%	1.2%
1990	0.0%	0.0%	0.0%	0.2%	2.2%	8.5%	27.9%	0.0%	6.4%	2.2%
1991	0.0%	0.0%	0.0%	0.2%	2.4%	8.3%	10.1%	0.0%	5.8%	1.8%
1992	0.0%	0.0%	0.0%	0.0%	0.2%	3.9%	8.0%	0.0%	2.5%	0.7%
1993	0.0%	0.0%	0.0%	0.0%	0.4%	2.7%	8.8%	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%	2.0%	6.1%	0.0%	1.6%	0.5%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	3.7%	0.0%	0.6%	0.2%
1997	0.0%	0.0%	0.0%	0.0%	0.1%	0.9%	4.0%	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%	3.1%	9.4%	0.0%	3.3%	1.3%
2000	0.0%	0.0%	0.0%	0.3%	1.1%	4.3%	13.7%	0.1%	4.7%	1.9%
2001	0.0%	0.0%	0.1%	0.1%	0.9%	6.8%	22.6%	0.1%	7.3%	2.8%
2002	0.0%	0.0%	0.1%	0.6%	1.2%	3.2%	18.8%	0.3%	5.5%	2.1%
2003	0.0%	0.0%	0.0%	0.0%	0.5%	1.6%	11.8%	0.0%	3.1%	1.1%
2004	0.0%	0.0%	0.0%	0.0%	0.2%	0.4%	5.5%	0.0%	1.2%	0.4%
2005	0.0%	0.0%	0.0%	0.1%	0.0%	0.4%	3.2%	0.0%	0.8%	0.3%
2006	0.0%	0.0%	0.0%	0.0%	0.1%	0.5%	2.6%	0.0%	0.7%	0.3%
2007	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%	0.5%	0.2%
2008	0.0%	0.3%	0.3%	0.7%	1.6%	2.7%	7.2%	0.4%	3.6%	1.7%
2009	0.0%	0.0%	0.1%	0.6%	1.1%	4.3%	16.8%	0.3%	7.7%	3.1%
2010	0.0%	0.0%	0.1%	0.0%	0.0%	0.2%	4.5%	0.0%	1.6%	0.6%
2011	0.0%	0.1%	0.0%	0.2%	0.1%	0.2%	3.5%	0.1%	1.2%	0.5%
2012	0.0%	0.0%	0.0%	0.0%	0.1%	0.3%	4.5%	0.0%	1.6%	0.7%
2013	0.0%	0.0%	0.0%	0.1%	0.3%	0.6%	3.4%	0.1%	1.5%	0.7%
2014	0.0%	0.0%	0.0%	0.0%	0.1%	0.3%	2.5%	0.0%	1.1%	0.5%
2015	0.0%	0.0%	0.0%	0.0%	0.2%	1.5%	4.1%	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%	0.2%	0.2%	3.5%	0.0%	1.6%	0.8%
2018	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	2.7%	0.0%	1.3%	0.6%
2019	0.0%	0.0%	0.0%	0.1%	0.0%	0.8%	4.4%	0.0%	2.2%	1.0%
2020	0.0%	0.0%	0.0%	0.1%	0.1%	2.6%	8.4%	0.0%	4.5%	2.1%
2021	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	1.5%	0.0%	0.9%	0.4%
2022a**	0.0%	0.0%	0.0%	0.0%	0.2%	2.1%	2.5%	0.0%	1.8%	0.9%
2022b**	0.0%	0.0%	0.0%	0.6%	2.9%	3.4%	2.7%	0.3%	2.9%	1.6%

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

** 2022a excludes Russian defaults while 2022b includes Russian defaults.

Source: Moody's Investors Service

Exhibit 30

2022 one-year letter rating migration rates

With Russian issuers

From\To	Aaa	Aa	A	Baa	Ba	B	Caa	Ca_C	WR	Def
Aaa	96.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	0.0%
Aa	0.0%	97.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%
A	0.0%	0.2%	95.1%	1.2%	0.0%	0.0%	0.0%	0.0%	3.5%	0.0%
Baa	0.0%	0.0%	2.3%	89.8%	0.9%	0.1%	0.0%	0.0%	6.1%	0.9%
Ba	0.0%	0.0%	0.0%	3.5%	80.5%	3.8%	0.6%	0.0%	7.6%	4.0%
B	0.0%	0.0%	0.0%	0.0%	4.6%	75.1%	5.8%	0.4%	9.4%	4.8%
Caa	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	78.4%	3.2%	11.6%	2.4%
Ca_C	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	11.2%	48.3%	15.7%	23.6%

Without Russian issuers

From\To	Aaa	Aa	A	Baa	Ba	B	Caa	Ca_C	WR	Def
Aaa	96.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	0.0%
Aa	0.0%	97.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%
A	0.0%	0.2%	95.1%	1.2%	0.0%	0.0%	0.0%	0.0%	3.5%	0.0%
Baa	0.0%	0.0%	2.3%	91.1%	0.9%	0.1%	0.0%	0.0%	5.6%	0.0%
Ba	0.0%	0.0%	0.0%	3.6%	83.8%	3.9%	0.7%	0.0%	7.7%	0.3%
B	0.0%	0.0%	0.0%	0.0%	4.7%	76.7%	5.9%	0.4%	9.2%	3.1%
Caa	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	78.4%	3.2%	11.6%	2.3%
Ca_C	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	11.2%	48.3%	15.7%	23.6%

Source: Moody's Investors Service

Exhibit 31

Average one-year letter rating migration rates, 1920-2022*

From\To	Aaa	Aa	A	Baa	Ba	B	Caa	Ca_C	WR	Def
Aaa	87.1%	7.5%	0.8%	0.2%	0.0%	0.0%	0.0%	0.0%	4.4%	0.0%
Aa	1.0%	84.5%	7.6%	0.7%	0.1%	0.0%	0.0%	0.0%	6.0%	0.1%
A	0.1%	2.6%	85.8%	5.2%	0.6%	0.1%	0.0%	0.0%	5.5%	0.1%
Baa	0.0%	0.2%	3.9%	84.1%	4.1%	0.6%	0.1%	0.0%	6.7%	0.2%
Ba	0.0%	0.1%	0.4%	6.0%	74.6%	6.6%	0.7%	0.1%	10.4%	1.1%
B	0.0%	0.0%	0.1%	0.6%	5.5%	72.2%	6.3%	0.4%	11.8%	3.0%
Caa	0.0%	0.0%	0.0%	0.1%	0.4%	6.0%	69.9%	2.8%	14.0%	6.8%
Ca_C	0.0%	0.0%	0.1%	0.1%	0.4%	2.5%	9.6%	45.2%	17.2%	25.0%

* Include Russian issuers

Source: Moody's Investors Service

Exhibit 32

Average one-year letter rating migration rates, 1970-2022*

From\To	Aaa	Aa	A	Baa	Ba	B	Caa	Ca_C	WR	Def
Aaa	88.0%	7.6%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%
Aa	0.8%	85.7%	8.2%	0.4%	0.1%	0.0%	0.0%	0.0%	4.8%	0.0%
A	0.0%	2.4%	87.5%	4.9%	0.4%	0.1%	0.0%	0.0%	4.5%	0.0%
Baa	0.0%	0.1%	3.7%	86.8%	3.3%	0.6%	0.1%	0.0%	5.2%	0.2%
Ba	0.0%	0.0%	0.4%	5.9%	76.8%	6.8%	0.7%	0.1%	8.4%	0.9%
B	0.0%	0.0%	0.1%	0.4%	4.8%	73.8%	6.7%	0.5%	10.7%	3.0%
Caa	0.0%	0.0%	0.0%	0.1%	0.2%	5.8%	70.3%	2.7%	14.2%	6.6%
Ca_C	0.0%	0.0%	0.0%	0.1%	0.3%	2.0%	10.5%	38.6%	19.4%	29.1%

* Include Russian issuers

Source: Moody's Investors Service

Exhibit 33

Average five-year letter rating migration rates, 1970-2022*

From\To	Aaa	Aa	A	Baa	Ba	B	Caa	Ca_C	WR	Def
Aaa	54.7%	22.1%	4.7%	0.6%	0.3%	0.0%	0.0%	0.0%	17.5%	0.1%
Aa	2.0%	46.8%	23.7%	3.7%	0.7%	0.2%	0.1%	0.0%	22.4%	0.2%
A	0.2%	7.3%	53.2%	14.1%	2.2%	0.7%	0.1%	0.0%	21.7%	0.6%
Baa	0.1%	0.8%	11.4%	51.9%	7.6%	2.3%	0.5%	0.1%	24.0%	1.2%
Ba	0.0%	0.2%	2.2%	14.5%	28.6%	11.3%	2.0%	0.1%	35.0%	6.1%
B	0.0%	0.1%	0.4%	2.2%	7.7%	23.4%	6.6%	0.6%	44.0%	15.1%
Caa	0.0%	0.0%	0.1%	0.4%	1.4%	7.3%	15.8%	1.2%	51.6%	22.2%
Ca_C	0.0%	0.0%	0.3%	0.6%	1.4%	3.8%	3.0%	2.5%	44.7%	43.6%

* Include Russian issuers

Source: Moody's Investors Service

Exhibit 35

Average one-year alphanumeric rating migration rates, 1983-2022*

From\To	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3	Ca_C	WR	Def
Aaa	87.2%	5.2%	2.2%	0.5%	0.3%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.3%	0.0%
Aa1	1.6%	77.0%	7.9%	5.6%	1.4%	1.0%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.1%	0.0%
Aa2	1.0%	4.2%	74.8%	9.7%	3.2%	1.5%	0.4%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	0.0%
Aa3	0.1%	1.0%	4.0%	76.0%	8.7%	3.3%	0.8%	0.2%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	0.0%
A1	0.0%	0.1%	1.0%	5.0%	77.2%	7.3%	2.5%	0.6%	0.4%	0.2%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.2%	0.1%
A2	0.1%	0.0%	0.2%	0.9%	5.7%	77.3%	7.1%	2.4%	0.9%	0.3%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%
A3	0.0%	0.0%	0.1%	0.3%	1.4%	6.1%	76.7%	6.6%	2.4%	0.8%	0.3%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.9%	0.0%
Baa1	0.0%	0.0%	0.1%	0.1%	0.2%	1.4%	6.2%	77.3%	6.4%	2.0%	0.5%	0.3%	0.2%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	4.9%	0.1%
Baa2	0.0%	0.0%	0.0%	0.1%	0.2%	0.5%	1.7%	6.5%	76.9%	6.0%	1.2%	0.5%	0.4%	0.3%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	5.2%	0.2%
Baa3	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.4%	1.6%	8.7%	73.9%	4.5%	1.9%	0.9%	0.7%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	6.1%	0.3%
Ba1	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.6%	2.3%	10.0%	65.6%	5.6%	3.9%	1.5%	0.6%	0.5%	0.1%	0.2%	0.0%	0.1%	8.1%	0.5%
Ba2	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.3%	0.6%	3.6%	8.1%	64.7%	6.2%	3.7%	1.3%	0.8%	0.3%	0.2%	0.1%	0.1%	0.1%	8.8%	0.7%
Ba3	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.4%	0.8%	2.7%	7.0%	64.8%	6.9%	3.0%	1.8%	0.7%	0.4%	0.1%	0.1%	0.1%	9.6%	1.3%
B1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.4%	0.6%	2.7%	6.9%	63.7%	6.3%	4.4%	1.3%	0.7%	0.2%	0.2%	10.3%	1.8%
B2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.2%	0.2%	0.6%	2.1%	7.4%	62.4%	8.0%	3.5%	1.8%	0.4%	0.5%	9.7%	2.8%
B3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.8%	2.5%	6.3%	60.7%	7.5%	3.3%	1.0%	0.8%	12.2%	4.3%
Caa1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.6%	1.3%	7.5%	59.2%	9.4%	2.8%	1.2%	13.9%	3.8%	
Caa2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.3%	0.7%	1.9%	6.5%	59.8%	6.3%	2.7%	14.7%	6.8%	
Caa3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.9%	2.9%	9.9%	46.5%	8.8%	14.3%	16.3%	
Ca_C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.4%	1.5%	1.7%	3.2%	5.8%	38.1%	19.6%	29.2%

* Include Russian issuer

Source: Moody's Investors Service

Exhibit 36

Annual issuer-weighted corporate default rates by letter rating, 1920-2022

Year	Aaa	Aa	A	Baa	Ba	B	Caa-C	IG	SG	All
1920	0.0%	0.0%	0.3%	0.9%	2.2%	4.4%	0.0%	0.4%	3.0%	1.2%
1921	0.0%	0.2%	0.4%	0.6%	0.4%	2.7%	13.3%	0.4%	2.2%	1.1%
1922	0.0%	0.2%	0.2%	1.1%	1.1%	1.7%	7.6%	0.5%	1.8%	1.0%
1923	0.0%	0.0%	0.0%	0.6%	0.9%	2.3%	5.9%	0.2%	1.7%	0.8%
1924	0.0%	0.4%	0.0%	0.1%	2.1%	2.7%	12.8%	0.1%	2.9%	1.2%
1925	0.0%	0.0%	0.1%	0.7%	1.7%	2.6%	14.4%	0.3%	2.6%	1.2%
1926	0.0%	0.4%	0.1%	0.1%	1.4%	2.9%	3.7%	0.2%	1.9%	0.8%
1927	0.0%	0.0%	0.2%	0.0%	1.3%	2.0%	12.8%	0.1%	1.8%	0.7%
1928	0.0%	0.0%	0.0%	0.0%	0.2%	1.3%	10.5%	0.0%	0.9%	0.4%
1929	0.0%	0.3%	0.0%	0.4%	0.8%	0.9%	9.7%	0.2%	1.4%	0.7%
1930	0.0%	0.0%	0.0%	0.4%	0.9%	3.2%	7.7%	0.2%	2.2%	1.0%
1931	0.0%	0.0%	0.3%	1.1%	3.0%	9.5%	31.7%	0.5%	7.9%	3.8%
1932	0.0%	0.7%	1.1%	0.9%	6.1%	14.0%	24.1%	0.9%	11.0%	5.5%
1933	0.0%	0.0%	0.3%	1.8%	11.7%	16.1%	25.9%	0.8%	15.8%	8.5%
1934	0.0%	0.6%	0.3%	0.9%	2.5%	4.2%	16.5%	0.6%	5.9%	3.4%
1935	0.0%	0.0%	1.4%	1.9%	5.1%	4.3%	13.0%	1.3%	6.2%	3.9%
1936	0.0%	0.8%	0.5%	0.3%	1.2%	2.4%	7.8%	0.5%	2.7%	1.6%
1937	0.0%	0.0%	0.5%	1.0%	1.0%	2.7%	9.1%	0.6%	2.7%	1.7%
1938	0.0%	0.9%	1.6%	2.0%	1.0%	1.5%	12.8%	1.6%	2.6%	2.1%
1939	0.0%	0.0%	0.0%	1.0%	0.6%	1.7%	6.1%	0.4%	1.8%	1.2%
1940	0.0%	0.0%	0.0%	1.4%	0.4%	3.3%	11.8%	0.6%	3.6%	2.5%
1941	0.0%	0.0%	0.0%	0.0%	1.0%	0.8%	5.1%	0.0%	1.7%	1.1%
1942	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	2.0%	0.0%	0.7%	0.5%
1943	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.6%	0.4%
1944	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	2.6%	0.0%	0.7%	0.4%
1945	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	0.6%	0.3%
1946	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1947	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	2.8%	0.0%	0.6%	0.3%
1948	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1949	0.0%	0.0%	0.0%	0.0%	1.4%	1.0%	8.6%	0.0%	1.9%	0.8%
1950	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1951	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	0.0%	0.4%	0.2%
1952	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1953	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1954	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.1%	0.0%	0.5%	0.2%
1955	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%	0.5%	0.2%
1956	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1957	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.4%	0.1%
1958	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1959	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1960	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.7%	0.2%
1961	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	8.7%	0.0%	1.1%	0.4%
1962	0.0%	0.0%	0.0%	0.0%	1.7%	1.5%	0.0%	0.0%	1.5%	0.5%
1963	0.0%	0.0%	0.0%	0.0%	1.2%	1.5%	0.0%	0.0%	1.2%	0.4%
1964	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1965	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1966	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	0.0%	0.0%	0.4%	0.1%
1967	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1968	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.4%	0.1%
1969	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1970	0.0%	0.0%	0.0%	0.5%	4.2%	19.4%	50.0%	0.3%	8.7%	2.6%
1971	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	12.5%	0.0%	1.2%	0.3%
1972	0.0%	0.0%	0.0%	0.0%	0.0%	6.9%	37.5%	0.0%	1.9%	0.5%
1973	0.0%	0.0%	0.0%	0.5%	0.0%	3.8%	37.5%	0.2%	1.3%	0.5%

Year	Aaa	Aa	A	Baa	Ba	B	Caa-C	IG	SG	All
1974	0.0%	0.0%	0.0%	0.0%	0.5%	7.2%	0.0%	0.0%	1.3%	0.3%
1975	0.0%	0.0%	0.0%	0.0%	1.0%	6.2%	0.0%	0.0%	1.7%	0.4%
1976	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.9%	0.2%
1977	0.0%	0.0%	0.0%	0.3%	0.5%	3.2%	33.3%	0.1%	1.4%	0.4%
1978	0.0%	0.0%	0.0%	0.0%	1.1%	5.4%	0.0%	0.0%	1.8%	0.4%
1979	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.4%	0.1%
1980	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	33.3%	0.0%	1.6%	0.3%
1981	0.0%	0.0%	0.0%	0.0%	0.0%	4.4%	0.0%	0.0%	0.7%	0.2%
1982	0.0%	0.0%	0.3%	0.3%	2.8%	2.2%	21.4%	0.2%	3.5%	1.0%
1983	0.0%	0.0%	0.0%	0.0%	1.2%	2.2%	45.1%	0.0%	4.3%	1.0%
1984	0.0%	0.0%	0.0%	0.6%	0.5%	5.2%	18.2%	0.2%	3.1%	0.9%
1985	0.0%	0.0%	0.0%	0.0%	0.9%	7.1%	6.3%	0.0%	3.7%	0.9%
1986	0.0%	0.0%	0.0%	0.8%	2.4%	10.3%	16.2%	0.2%	6.1%	1.8%
1987	0.0%	0.0%	0.0%	0.0%	3.0%	5.3%	9.8%	0.0%	4.3%	1.4%
1988	0.0%	0.0%	0.0%	0.0%	1.4%	5.6%	12.5%	0.0%	3.7%	1.3%
1989	0.0%	0.5%	0.0%	0.5%	3.0%	7.5%	20.4%	0.3%	5.9%	2.2%
1990	0.0%	0.0%	0.0%	0.3%	3.5%	13.7%	45.1%	0.1%	10.4%	3.5%
1991	0.0%	0.0%	0.0%	0.2%	3.8%	13.1%	16.0%	0.1%	9.1%	2.8%
1992	0.0%	0.0%	0.0%	0.0%	0.3%	7.6%	15.7%	0.0%	4.9%	1.3%
1993	0.0%	0.0%	0.0%	0.0%	0.6%	4.3%	14.0%	0.0%	3.4%	0.9%
1994	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%	5.3%	0.0%	2.3%	0.6%
1995	0.0%	0.0%	0.0%	0.0%	0.3%	3.8%	11.5%	0.0%	3.1%	0.9%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	10.0%	0.0%	1.7%	0.5%
1997	0.0%	0.0%	0.0%	0.0%	0.2%	2.0%	9.2%	0.0%	1.9%	0.6%
1998	0.0%	0.0%	0.0%	0.1%	0.8%	3.8%	8.3%	0.0%	3.0%	1.1%
1999	0.0%	0.0%	0.0%	0.1%	1.4%	5.0%	15.2%	0.0%	5.3%	2.1%
2000	0.0%	0.0%	0.0%	0.3%	1.4%	5.6%	18.0%	0.1%	6.2%	2.5%
2001	0.0%	0.0%	0.2%	0.2%	1.2%	8.7%	28.7%	0.1%	9.3%	3.5%
2002	0.0%	0.0%	0.2%	0.8%	1.8%	4.5%	26.7%	0.4%	7.8%	2.9%
2003	0.0%	0.0%	0.0%	0.0%	0.9%	2.7%	20.3%	0.0%	5.3%	1.8%
2004	0.0%	0.0%	0.0%	0.0%	0.4%	0.8%	11.4%	0.0%	2.4%	0.8%
2005	0.0%	0.0%	0.0%	0.2%	0.0%	0.8%	7.2%	0.1%	1.7%	0.6%
2006	0.0%	0.0%	0.0%	0.0%	0.2%	1.1%	5.8%	0.0%	1.7%	0.6%
2007	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	4.9%	0.0%	1.0%	0.4%
2008	0.0%	0.5%	0.4%	1.0%	2.3%	4.0%	10.9%	0.6%	5.5%	2.5%
2009	0.0%	0.0%	0.2%	0.9%	1.8%	6.9%	26.5%	0.4%	12.1%	5.0%
2010	0.0%	0.0%	0.2%	0.1%	0.0%	0.4%	8.7%	0.1%	3.1%	1.2%
2011	0.0%	0.2%	0.0%	0.4%	0.2%	0.3%	6.2%	0.2%	2.1%	0.9%
2012	0.0%	0.0%	0.0%	0.1%	0.1%	0.5%	8.0%	0.0%	2.8%	1.2%
2013	0.0%	0.0%	0.1%	0.1%	0.6%	1.0%	6.3%	0.1%	2.7%	1.2%
2014	0.0%	0.0%	0.1%	0.1%	0.1%	0.5%	4.8%	0.1%	2.0%	1.0%
2015	0.0%	0.0%	0.0%	0.0%	0.3%	2.4%	6.6%	0.0%	3.7%	1.8%
2016	0.0%	0.0%	0.0%	0.0%	0.1%	1.6%	9.1%	0.0%	4.6%	2.2%
2017	0.0%	0.0%	0.0%	0.0%	0.5%	0.4%	7.6%	0.0%	3.6%	1.7%
2018	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	5.2%	0.0%	2.5%	1.2%
2019	0.0%	0.0%	0.0%	0.1%	0.0%	1.2%	6.5%	0.1%	3.2%	1.5%
2020	0.0%	0.0%	0.0%	0.1%	0.1%	4.0%	12.8%	0.1%	6.9%	3.2%
2021	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	3.0%	0.0%	1.8%	0.8%
2022a*	0.0%	0.0%	0.0%	0.0%	0.3%	3.3%	3.8%	0.0%	2.8%	1.3%
2022b*	0.0%	0.0%	0.0%	0.9%	4.2%	5.0%	3.9%	0.5%	4.3%	2.3%
Mean**	0.0%	0.1%	0.1%	0.3%	1.0%	3.1%	10.3%	0.1%	2.9%	1.2%
Median**	0.0%	0.0%	0.0%	0.0%	0.5%	2.0%	7.6%	0.0%	1.9%	0.8%
Std Dev**	0.0%	0.2%	0.3%	0.4%	1.6%	3.7%	11.1%	0.3%	2.9%	1.3%
Min**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Max**	0.0%	0.9%	1.6%	2.0%	11.7%	19.4%	50.0%	1.6%	15.8%	8.5%

* 2022a excludes Russian defaults while 2022b includes Russian defaults.

** Include Russian issuers

Source: Moody's Investors Service

Exhibit 41

Average cumulative issuer-weighted global default rates by alphanumeric rating, 1983-2022*

Rating\Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aaa	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	
Aa1	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.3%	0.4%	0.5%	0.7%	0.8%	0.9%	1.0%	1.1%	1.1%	
Aa2	0.0%	0.0%	0.1%	0.2%	0.3%	0.4%	0.5%	0.6%	0.7%	0.8%	0.9%	1.0%	1.1%	1.2%	1.2%	1.3%	1.5%	1.7%	1.9%	
Aa3	0.0%	0.1%	0.2%	0.2%	0.4%	0.5%	0.6%	0.7%	0.8%	0.9%	1.0%	1.1%	1.2%	1.3%	1.3%	1.4%	1.4%	1.5%	1.7%	
A1	0.1%	0.2%	0.4%	0.5%	0.7%	0.9%	1.1%	1.2%	1.3%	1.5%	1.6%	1.8%	2.0%	2.3%	2.5%	2.7%	3.0%	3.2%	3.3%	
A2	0.0%	0.1%	0.3%	0.5%	0.7%	0.9%	1.2%	1.5%	1.8%	2.2%	2.5%	2.7%	3.0%	3.3%	3.6%	4.0%	4.5%	4.9%	5.2%	
A3	0.1%	0.2%	0.3%	0.5%	0.7%	1.0%	1.2%	1.5%	1.8%	2.0%	2.3%	2.5%	2.8%	3.1%	3.5%	3.8%	4.1%	4.5%	4.8%	
Baa1	0.1%	0.3%	0.4%	0.6%	0.8%	1.1%	1.3%	1.6%	1.9%	2.2%	2.6%	3.1%	3.6%	4.0%	4.5%	5.0%	5.4%	5.6%	5.8%	
Baa2	0.2%	0.4%	0.7%	1.0%	1.3%	1.6%	1.9%	2.3%	2.6%	3.0%	3.5%	3.9%	4.4%	4.8%	5.3%	5.8%	6.3%	6.8%	7.3%	
Baa3	0.3%	0.7%	1.2%	1.7%	2.4%	3.0%	3.5%	4.2%	4.8%	5.4%	5.9%	6.4%	7.1%	7.7%	8.2%	8.8%	9.4%	10.0%	10.4%	
Ba1	0.5%	1.5%	2.7%	3.9%	5.1%	6.4%	7.4%	8.3%	9.0%	9.9%	10.7%	11.6%	12.4%	13.1%	14.1%	14.9%	15.6%	16.3%	17.4%	
Ba2	0.8%	2.1%	3.6%	5.1%	6.6%	8.0%	9.3%	10.5%	11.9%	13.4%	14.7%	16.0%	17.1%	18.3%	19.7%	20.8%	21.6%	22.4%	23.2%	
Ba3	1.3%	3.7%	6.4%	9.4%	12.0%	14.4%	16.8%	19.0%	21.1%	23.3%	25.3%	27.2%	29.0%	30.7%	32.3%	34.0%	35.7%	37.1%	38.1%	
B1	1.9%	5.2%	8.7%	12.2%	15.6%	18.8%	22.0%	24.8%	27.1%	29.1%	30.9%	32.5%	34.3%	36.3%	38.0%	39.8%	41.7%	43.6%	45.4%	
B2	3.0%	7.6%	12.3%	16.6%	20.4%	23.9%	26.9%	29.3%	31.9%	34.4%	36.8%	39.3%	41.3%	43.2%	44.9%	46.7%	48.4%	49.9%	51.2%	
B3	4.6%	10.2%	16.0%	21.1%	25.6%	29.5%	32.9%	36.0%	38.8%	41.0%	42.9%	44.6%	46.5%	48.6%	50.4%	51.5%	52.2%	52.6%	53.3%	
Caa	7.1%	13.8%	19.9%	25.2%	30.0%	34.2%	37.7%	41.0%	44.0%	46.7%	48.9%	50.2%	51.3%	52.0%	52.8%	53.7%	54.2%	54.8%	55.8%	
Ca-C	32.6%	44.6%	53.1%	59.6%	62.5%	63.6%	65.6%	67.1%	68.3%	68.8%	69.6%	70.1%	70.5%	70.5%	70.5%	71.2%	71.8%	71.8%	71.8%	
IG	0.1%	0.2%	0.4%	0.6%	0.9%	1.1%	1.4%	1.6%	1.9%	2.1%	2.4%	2.7%	2.9%	3.2%	3.5%	3.8%	4.1%	4.4%	4.6%	
SG	4.1%	8.4%	12.4%	16.1%	19.3%	22.1%	24.5%	26.7%	28.7%	30.5%	32.1%	33.6%	35.0%	36.4%	37.7%	39.0%	40.1%	41.1%	42.1%	
All	1.7%	3.3%	4.9%	6.2%	7.4%	8.3%	9.2%	9.9%	10.6%	11.2%	11.7%	12.3%	12.8%	13.3%	13.7%	14.2%	14.6%	15.0%	15.4%	
																			15.7%	

* Include Russian issuers

Source: Moody's Investors Service

Exhibit 42

Average cumulative issuer-weighted global default rates by alphanumeric rating, 1998-2022*

Rating\Year	1	2	3	4	5	6	7	8	9	10
Aaa	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Aa1	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.2%
Aa2	0.0%	0.0%	0.1%	0.2%	0.3%	0.4%	0.5%	0.6%	0.7%	0.9%
Aa3	0.0%	0.1%	0.2%	0.2%	0.4%	0.5%	0.7%	0.9%	1.0%	1.1%
A1	0.1%	0.2%	0.3%	0.5%	0.7%	0.9%	1.1%	1.3%	1.5%	1.6%
A2	0.1%	0.2%	0.3%	0.5%	0.7%	1.0%	1.3%	1.6%	2.0%	2.5%
A3	0.1%	0.2%	0.3%	0.5%	0.8%	1.0%	1.2%	1.5%	1.9%	2.2%
Baa1	0.1%	0.3%	0.4%	0.6%	0.7%	1.0%	1.2%	1.5%	1.8%	2.2%
Baa2	0.2%	0.4%	0.7%	0.9%	1.1%	1.3%	1.5%	1.7%	2.1%	2.3%
Baa3	0.3%	0.7%	1.1%	1.7%	2.2%	2.7%	3.1%	3.8%	4.4%	5.0%
Ba1	0.4%	1.3%	2.3%	3.2%	4.3%	5.4%	6.4%	7.2%	8.1%	8.9%
Ba2	0.7%	1.9%	3.2%	4.6%	6.0%	7.3%	8.5%	9.8%	11.2%	12.9%
Ba3	0.9%	2.5%	4.4%	6.5%	8.2%	9.8%	11.6%	13.7%	15.8%	17.9%
B1	1.2%	3.7%	6.5%	9.4%	12.0%	14.4%	16.9%	19.3%	21.3%	23.1%
B2	2.7%	7.1%	11.7%	16.0%	19.7%	22.9%	25.6%	28.0%	30.7%	33.4%
B3	3.5%	8.7%	14.3%	19.2%	23.4%	27.1%	30.1%	33.1%	36.0%	38.4%
Caa1	4.2%	9.7%	15.3%	20.4%	25.1%	29.2%	32.6%	35.5%	38.6%	41.3%
Caa2	6.7%	13.2%	19.2%	24.7%	29.7%	34.1%	38.0%	41.9%	45.1%	47.5%
Caa3	17.4%	29.6%	38.1%	43.8%	48.7%	53.3%	57.3%	60.7%	63.0%	64.6%
Ca-C	34.5%	47.5%	56.6%	63.3%	66.4%	67.5%	69.7%	71.2%	72.3%	72.8%
IG	0.1%	0.3%	0.5%	0.7%	0.9%	1.1%	1.3%	1.6%	1.9%	2.2%
SG	4.1%	8.3%	12.3%	15.8%	18.8%	21.4%	23.7%	25.8%	27.8%	29.7%
All	1.8%	3.5%	5.1%	6.5%	7.6%	8.6%	9.4%	10.2%	10.9%	11.6%

* Include Russian issuers

Source: Moody's Investors Service

Exhibit 43

Average cumulative issuer-weighted global default rates by industry group, 1970-2022*

Industry\Year	1	2	3	4	5	6	7	8	9	10
Aerospace & Defense	0.9%	1.9%	2.8%	3.4%	3.9%	4.2%	4.4%	4.6%	4.7%	4.7%
Automotive	2.2%	4.5%	6.6%	8.6%	10.4%	12.1%	13.7%	15.2%	16.6%	17.6%
Banking	0.6%	1.2%	1.8%	2.4%	2.9%	3.4%	3.9%	4.4%	4.9%	5.4%
Beverage, Food, & Tobacco	1.1%	2.2%	3.3%	4.2%	5.0%	5.7%	6.3%	6.7%	7.1%	7.5%
Capital Equipment	1.6%	3.3%	4.9%	6.4%	7.7%	8.7%	9.5%	10.3%	11.0%	11.6%
Chemicals, Plastics, & Rubber	1.0%	2.1%	3.2%	4.1%	5.1%	5.8%	6.3%	6.8%	7.3%	7.8%
Construction & Building	3.1%	6.3%	9.5%	12.3%	14.8%	17.1%	19.2%	21.2%	23.0%	24.4%
Consumer goods: Durable	2.6%	5.6%	8.9%	12.1%	15.2%	17.8%	19.7%	21.6%	23.5%	25.4%
Consumer goods: Non-durable	3.8%	7.8%	11.6%	14.7%	17.1%	19.2%	21.2%	22.8%	24.1%	25.1%
Containers, Packaging, & Glass	2.2%	4.6%	6.6%	8.5%	10.1%	11.5%	12.8%	14.1%	15.1%	16.1%
Energy: Electricity	3.2%	6.4%	9.4%	11.7%	14.0%	16.3%	18.5%	20.6%	22.7%	25.0%
Energy: Oil & Gas	2.8%	5.4%	7.6%	9.5%	11.1%	12.5%	13.6%	14.7%	15.7%	16.6%
Environmental Industries	3.0%	5.7%	7.8%	9.4%	10.6%	11.6%	12.4%	13.3%	14.3%	15.3%
Finance**	1.1%	2.1%	3.1%	3.9%	4.5%	5.1%	5.5%	6.0%	6.4%	6.9%
Forest Products & Paper	2.3%	4.5%	6.7%	8.8%	10.6%	12.1%	13.4%	14.6%	15.6%	16.4%
Healthcare & Pharmaceuticals	1.5%	3.1%	4.5%	5.7%	6.9%	7.9%	8.9%	9.7%	10.5%	11.1%
High Tech Industries	1.5%	3.1%	4.6%	6.0%	7.1%	8.1%	9.1%	10.1%	11.1%	12.1%
Hotel, Gaming, & Leisure	3.8%	7.6%	11.0%	14.1%	16.8%	19.1%	21.0%	22.9%	24.6%	26.2%
Insurance	0.3%	0.6%	0.9%	1.3%	1.6%	2.0%	2.3%	2.6%	3.0%	3.3%
Media: Advertising, Printing & Publishing	5.8%	11.6%	16.6%	20.7%	24.5%	27.7%	30.3%	32.2%	34.0%	36.0%
Media: Broadcasting & Subscription	3.2%	6.6%	10.1%	13.0%	15.8%	18.2%	20.1%	21.8%	23.3%	24.7%
Media: Diversified & Production	2.3%	4.6%	6.5%	7.7%	8.5%	9.2%	9.5%	9.7%	9.9%	10.2%
Metals & Mining	3.1%	6.2%	9.0%	11.4%	13.4%	15.1%	16.7%	18.2%	19.6%	20.9%
REIT	0.5%	1.0%	1.5%	1.9%	2.2%	2.6%	2.9%	3.1%	3.4%	3.8%
Retail	3.3%	6.6%	9.9%	12.9%	15.5%	17.8%	19.7%	21.4%	22.9%	24.2%
Services: Business	2.3%	4.7%	7.0%	9.1%	11.1%	12.7%	14.2%	15.6%	16.9%	18.2%
Services: Consumer	2.4%	4.9%	7.2%	9.5%	11.6%	13.6%	15.5%	17.2%	18.9%	20.5%
Sovereign & Public Finance	0.4%	0.9%	1.3%	1.6%	1.8%	2.0%	2.1%	2.1%	2.1%	2.1%
Telecommunications	2.2%	4.4%	6.3%	7.8%	9.0%	9.8%	10.5%	11.0%	11.4%	11.7%
Transportation: Cargo	2.1%	3.8%	5.4%	6.7%	7.8%	8.7%	9.4%	10.0%	10.6%	11.3%
Transportation: Consumer	2.7%	5.2%	7.7%	10.1%	12.3%	14.0%	15.6%	17.3%	19.1%	20.8%
Utilities: Electric	0.2%	0.3%	0.4%	0.6%	0.7%	0.8%	0.9%	1.0%	1.2%	1.3%
Utilities: Oil & Gas	0.1%	0.3%	0.4%	0.6%	0.7%	0.8%	1.0%	1.0%	1.1%	1.2%
Utilities: Water	0.2%	0.4%	0.5%	0.7%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%
Wholesale	3.3%	7.1%	10.6%	13.2%	15.3%	16.9%	17.8%	18.5%	19.2%	19.9%

* Include Russian issuers

** Non-bank and non-insurance financial companies

Source: Moody's Investors Service

Exhibit 44

Annual default rates by broad industry group, 1970-2022

	Aerospace & Defense	Automotive	Banking	Beverage, Food, & Tobacco	Capital Equipment	Chemicals, Plastics, & Construction Rubber	Construction & Building	Consumer goods: Durable	Consumer goods: Non-durable	Containers, Packaging, & Glass	Energy: Electricity	Energy: Oil & Gas	Environmental Industries	Finance*	Forest Products & Paper	Healthcare & Pharmaceuticals	High Tech Industries
1970	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%		0.0%			0.0%			0.0%	0.0%	3.7%
1971	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%		0.0%			0.0%			0.0%	0.0%	0.0%
1972	0.0%	0.0%		0.0%	1.1%	0.0%	0.0%	0.0%	0.0%			0.0%			0.0%	0.0%	0.0%
1973	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%			0.0%	0.0%	0.0%
1974	0.0%	0.0%		0.0%	1.1%	0.0%	0.0%	0.0%	0.0%			0.0%			0.0%	0.0%	0.0%
1975	0.0%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%			0.0%	4.8%	0.0%
1976	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	2.6%			0.0%			0.0%	0.0%	0.0%
1977	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%			0.0%			0.0%	0.0%	0.0%
1978	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%			1.3%			0.0%	0.0%	3.1%
1979	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%			0.0%	0.0%	2.8%
1980	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.2%	0.0%	0.0%			0.0%			0.0%	0.0%	2.7%
1981	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%			0.0%			0.0%	0.0%	0.0%
1982	0.0%	2.9%	0.0%	0.0%	0.0%	0.0%	3.3%	0.0%	0.0%			1.0%			0.0%	0.0%	4.0%
1983	0.0%	7.7%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	3.2%		0.0%	0.0%	1.8%
1984	0.0%	2.8%	0.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	4.0%		0.0%	0.0%	4.8%
1985	0.0%	0.0%	0.0%	0.0%	1.7%	2.1%	0.0%	0.0%	1.7%			0.0%	3.4%		0.0%	0.0%	1.5%
1986	2.9%	0.0%	0.0%	1.2%	0.0%	1.9%	1.7%	5.9%	0.0%			0.0%	8.3%		0.0%	0.0%	1.4%
1987	0.0%	1.8%	0.3%	0.0%	2.4%	0.0%	4.4%	0.0%	0.0%			0.0%	5.5%		0.0%	0.0%	3.7%
1988	2.3%	0.0%	1.4%	0.0%	0.0%	1.7%	2.7%	4.3%	3.6%	0.0%		4.8%	2.1%		0.0%	0.0%	3.5%
1989	0.0%	7.4%	1.5%	2.2%	0.0%	0.0%	8.8%	0.0%	3.8%	10.0%	0.0%	0.0%	0.0%	4.7%	0.0%	2.5%	1.8%
1990	0.0%	3.9%	1.8%	5.5%	2.6%	0.0%	16.9%	4.8%	9.9%	0.0%		8.3%	1.5%		0.0%	0.0%	5.7%
1991	2.2%	4.2%	1.4%	0.0%	4.5%	0.0%	7.5%	5.9%	6.1%	0.0%		4.3%	3.1%		0.0%	0.0%	4.9%
1992	0.0%	0.0%	0.3%	1.2%	3.0%	0.0%	0.0%	0.0%	6.0%	7.7%	0.0%	0.8%	0.0%	0.0%	0.0%	1.4%	3.3%
1993	2.2%	0.0%	0.3%	1.1%	4.9%	0.0%	1.7%	0.0%	2.0%	0.0%		0.0%	2.3%		0.0%	0.0%	0.0%
1994	0.0%	0.0%	0.0%	1.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%		4.0%	0.0%		0.0%	0.0%	3.0%
1995	0.0%	0.0%	0.0%	1.9%	0.8%	0.0%	5.1%	0.0%	7.6%	0.0%		0.0%	0.6%		0.0%	2.0%	1.9%
1996	0.0%	0.0%	0.0%	0.8%	0.7%	0.0%	1.1%	0.0%	4.4%	5.6%	0.0%	0.6%	5.0%	0.0%	0.0%	0.0%	1.0%
1997	0.0%	1.4%	0.0%	0.8%	0.0%	0.0%	1.1%	0.0%	6.5%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	1.8%
1998	0.0%	1.1%	0.3%	0.7%	0.0%	1.6%	0.0%	0.0%	4.5%	0.0%		0.0%	1.3%	5.6%	2.0%	1.2%	3.0%
1999	0.0%	0.9%	0.1%	1.8%	1.4%	1.5%	6.4%	10.6%	4.3%	0.0%		0.0%	6.1%	4.3%	1.8%	1.1%	5.3%
2000	1.6%	5.0%	0.0%	2.8%	4.2%	1.5%	2.0%	3.4%	14.3%	4.6%	0.0%	0.4%	15.8%	0.6%	6.9%	4.7%	3.2%

	Aerospace & Defense	Automotive	Banking	Beverage, Food, & Tobacco	Capital Equipment	Chemicals, Plastics, & Rubber	Construction & Building	Consumer goods: Durable	Consumer goods: Non-durable	Containers, Packaging, & Glass	Energy: Electricity	Energy: Oil & Gas	Environmental Industries	Finance*	Forest Products & Paper	Healthcare & Pharmaceuticals	High Tech Industries
2001	4.7%	5.3%	0.1%	2.2%	5.1%	5.7%	4.8%	3.4%	15.5%	11.5%	1.8%	1.2%	11.1%	3.6%	7.5%	1.5%	4.5%
2002	0.0%	1.7%	0.6%	1.6%	2.1%	0.0%	5.1%	3.1%	6.0%	4.9%	8.9%	2.3%	13.3%	0.0%	3.3%	0.7%	2.7%
2003	0.0%	2.6%	0.1%	1.7%	2.5%	4.4%	2.4%	0.0%	2.7%	0.0%	11.8%	0.0%	0.0%	0.6%	1.1%	2.8%	3.5%
2004	0.0%	2.5%	0.0%	1.7%	1.0%	0.0%	2.3%	2.7%	4.5%	2.1%	0.0%	0.3%	0.0%	0.0%	1.2%	0.7%	0.0%
2005	0.0%	5.1%	0.1%	0.0%	0.9%	0.0%	0.0%	4.1%	1.6%	4.4%	3.9%	0.4%	0.0%	0.6%	1.3%	0.0%	0.0%
2006	0.0%	4.8%	0.0%	1.1%	1.5%	0.0%	2.1%	1.9%	3.0%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%
2007	0.0%	1.7%	0.0%	1.1%	0.5%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.8%	0.0%
2008	1.5%	4.3%	3.1%	1.6%	2.7%	1.9%	5.3%	2.0%	6.2%	10.5%	0.0%	1.6%	5.3%	3.9%	6.4%	0.8%	0.0%
2009	4.5%	19.3%	0.9%	4.3%	10.3%	7.4%	14.7%	23.5%	6.6%	9.0%	2.0%	1.9%	0.0%	5.4%	15.4%	0.7%	6.7%
2010	0.0%	1.1%	0.5%	0.6%	3.5%	0.0%	1.8%	0.0%	3.7%	0.0%	6.1%	1.0%	10.0%	2.6%	3.0%	1.4%	1.5%
2011	0.0%	1.0%	0.5%	0.0%	1.9%	0.0%	2.3%	0.0%	0.0%	5.1%	4.0%	1.3%	0.0%	0.6%	1.4%	0.0%	0.0%
2012	1.3%	0.0%	0.6%	1.6%	2.2%	1.4%	0.0%	0.0%	0.0%	2.2%	5.6%	0.9%	4.3%	1.7%	2.9%	0.7%	1.1%
2013	1.2%	0.9%	1.3%	1.6%	0.6%	0.6%	2.5%	0.0%	2.0%	2.1%	1.9%	1.6%	4.5%	0.0%	0.0%	1.8%	0.6%
2014	1.3%	0.0%	0.7%	0.0%	0.0%	0.6%	0.5%	2.2%	0.0%	0.0%	7.3%	0.5%	0.0%	0.5%	1.5%	0.0%	2.6%
2015	2.6%	0.0%	1.6%	2.0%	0.0%	0.0%	2.3%	2.0%	4.6%	0.0%	0.0%	7.1%	4.2%	0.5%	3.1%	0.0%	0.4%
2016	1.3%	0.8%	0.2%	0.5%	0.8%	1.6%	1.4%	2.3%	1.4%	0.0%	2.0%	14.5%	7.9%	2.7%	3.0%	0.6%	0.8%
2017	2.7%	0.0%	0.8%	0.0%	0.8%	1.0%	0.5%	0.0%	0.0%	0.0%	5.6%	6.9%	10.5%	2.4%	9.3%	0.6%	1.2%
2018	0.0%	0.0%	0.1%	1.2%	0.0%	0.0%	4.0%	5.8%	1.4%	0.0%	7.3%	3.1%	0.0%	1.3%	1.7%	1.1%	0.4%
2019	1.4%	0.9%	0.3%	1.1%	2.0%	0.5%	2.1%	3.9%	4.1%	0.0%	0.0%	5.1%	0.0%	0.8%	2.0%	2.6%	0.7%
2020	2.9%	3.4%	0.4%	2.2%	2.5%	1.4%	3.2%	5.9%	7.9%	1.7%	8.0%	13.1%	0.0%	0.0%	0.0%	5.0%	2.5%
2021	0.0%	0.0%	0.1%	0.0%	1.6%	0.0%	4.2%	3.9%	1.4%	0.0%	9.2%	1.8%	0.0%	0.7%	0.0%	0.9%	0.0%
2022a**	2.7%	0.9%	0.8%	0.0%	0.8%	0.5%	8.6%	0.0%	4.9%	1.5%	5.4%	0.6%	0.0%	0.3%	2.0%	2.7%	0.3%
2022b**	2.7%	0.9%	3.5%	0.0%	0.8%	2.3%	9.4%	0.0%	4.9%	1.5%	5.4%	1.2%	0.0%	0.9%	2.0%	2.7%	0.3%

	Hotel, Gaming, & Leisure	Insurance	Media: Advertising, Printing & Publishing	Media: Broadcasting & Subscription	Media: Diversified & Production	Metals & Mining	REIT	Retail	Services: Business	Services: Consumer	Sovereign & Public Finance	Telecommun ications	Transportation: Cargo	Transportation: Consumer	Utilities: Electric	Utilities: Oil & Gas	Utilities: Water	Wholesale
1970			0.0%			0.0%		0.0%			0.0%		18.5%	0.0%	0.0%	0.0%		0.0%
1971			0.0%			0.0%		0.0%			0.0%		1.9%	4.8%	0.0%	0.0%		0.0%
1972						0.0%		0.0%	0.0%		0.0%		3.8%	0.0%	0.0%	0.0%		0.0%
1973						0.0%		3.4%	0.0%		0.0%		2.0%	0.0%	0.0%	0.0%		0.0%
1974						0.0%		3.5%	0.0%		0.0%		0.0%	0.0%	0.0%	0.0%		0.0%
1975						0.0%		1.8%	0.0%		0.0%		0.0%	0.0%	0.0%	0.0%		0.0%
1976						0.0%		0.0%	0.0%		0.0%		0.0%	0.0%	0.0%	0.0%		0.0%
1977						0.0%		0.0%	0.0%		0.0%		2.2%	0.0%	0.0%	0.0%		0.0%
1978						0.0%		1.9%	0.0%		0.0%		0.0%	0.0%	0.0%	0.0%		0.0%
1979			0.0%			0.0%		0.0%	0.0%		0.0%		0.0%	0.0%	0.0%	0.0%		0.0%
1980		0.0%	0.0%			0.0%		0.0%	0.0%		0.0%		0.0%	5.0%	0.0%	0.0%		0.0%
1981	0.0%	0.0%			0.0%	0.0%		0.0%	0.0%		0.0%		1.1%	0.0%	0.0%	0.0%		0.0%
1982	0.0%	0.0%			0.0%	2.4%		5.9%	0.0%		1.2%		1.2%	5.6%	0.0%	0.0%		0.0%
1983	0.0%	0.0%		0.0%	0.0%	1.8%		0.0%	0.0%		0.0%		0.0%	19.0%	0.0%	0.0%	0.0%	0.0%
1984	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	5.6%		0.0%		1.2%	0.0%	0.0%	0.0%	0.0%	0.0%
1985	5.3%	3.4%	0.0%	0.0%	0.0%	3.3%		0.0%	0.0%		0.0%		1.2%	0.0%	0.0%	0.0%	0.0%	0.0%
1986	2.4%	0.0%	0.0%	3.8%	5.0%	18.5%		0.0%	0.0%		0.0%		1.1%	8.2%	0.0%	0.0%	0.0%	4.8%
1987	6.5%	0.0%	5.9%	0.0%	0.0%	0.0%		0.0%	1.0%	8.0%		0.0%	1.1%	0.0%	0.0%	1.6%	0.0%	4.3%
1988	2.0%	1.5%	0.0%	4.3%	3.6%	0.0%		0.0%	1.9%	3.6%		0.0%	0.0%	0.0%	0.5%	0.0%		0.0%
1989	13.8%	1.4%	0.0%	4.4%	11.3%	0.0%		5.9%	2.5%	3.2%	0.0%	10.5%	1.0%	1.1%	3.6%	0.0%	0.0%	0.0%
1990	24.6%	0.0%	11.8%	6.4%	4.5%	3.8%		0.0%	6.3%	11.1%	11.1%	0.0%	0.0%	0.0%	24.1%	0.0%	0.0%	0.0%
1991	2.7%	1.2%	0.0%	4.9%	4.3%	2.0%		0.0%	11.5%	0.0%	0.0%	0.9%	2.5%	30.0%	0.5%	1.8%		0.0%
1992	5.3%	0.0%	0.0%	10.5%	9.8%	5.9%		6.7%	2.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%
1993	2.3%	0.0%	0.0%	8.7%	0.0%	1.7%		0.0%	2.9%	2.8%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1994	5.3%	0.0%	0.0%	2.4%	0.0%	0.0%		0.0%	2.5%	2.4%		0.0%	0.0%	1.3%	2.9%	0.0%	0.0%	0.0%
1995	2.6%	0.8%	0.0%	0.0%	0.0%	0.0%		0.0%	1.4%	2.6%		0.0%	0.0%	0.0%	5.6%	0.0%	0.0%	0.0%
1996	2.3%	0.0%	0.0%	0.0%	17.6%	0.0%		0.0%	0.7%	2.3%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%
1997	2.0%	0.6%	0.0%	2.3%	0.0%	0.0%		0.0%	3.6%	0.0%	0.0%	0.0%	0.5%	1.2%	0.0%	0.0%	0.0%	2.7%
1998	2.8%	0.0%	2.3%	2.5%	5.3%	2.9%		1.0%	5.4%	0.0%	0.0%	0.0%	0.9%	1.1%	0.0%	0.0%	0.0%	7.1%
1999	6.4%	0.0%	3.7%	3.7%	0.0%	4.1%		0.0%	1.9%	4.4%	7.4%	4.7%	2.0%	7.7%	0.0%	0.0%	1.5%	0.0%
2000	6.1%	1.5%	1.5%	1.6%	3.2%	6.8%		0.0%	4.8%	2.0%	10.0%	4.4%	3.0%	4.1%	5.3%	0.0%	0.0%	10.1%

	Hotel, Gaming, & Leisure	Insurance	Media: Advertising, Printing & Publishing	Media: Broadcasting & Subscription	Media: Diversified & Production	Metals & Mining	REIT	Retail	Services: Business	Services: Consumer	Sovereign & Public Finance	Telecommunications	Transportation: Cargo	Transportation: Consumer	Utilities: Electric	Utilities: Oil & Gas	Utilities: Water	Wholesale
2001	8.6%	0.0%	3.1%	3.8%	3.3%	13.8%	0.0%	6.5%	4.3%	3.6%	2.4%	10.2%	4.0%	1.7%	0.7%	0.0%	0.0%	12.5%
2002	1.8%	0.4%	3.4%	14.0%	7.9%	7.4%	0.9%	2.7%	2.2%	3.4%	0.0%	14.2%	4.6%	8.7%	0.0%	1.2%	3.6%	8.6%
2003	2.9%	0.8%	1.6%	5.4%	0.0%	4.5%	0.0%	2.8%	1.1%	0.0%	0.0%	8.2%	3.7%	3.5%	0.3%	1.3%	0.0%	9.3%
2004	4.1%	0.4%	0.0%	4.8%	0.0%	2.0%	0.0%	0.7%	2.3%	0.0%	0.0%	1.5%	0.0%	5.0%	0.3%	0.0%	0.0%	2.8%
2005	1.0%	0.0%	0.0%	1.0%	0.0%	0.9%	0.0%	1.6%	0.0%	0.0%	0.0%	0.4%	0.0%	8.1%	0.3%	0.0%	0.0%	2.9%
2006	0.8%	0.7%	0.0%	3.2%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	3.7%	0.0%	0.0%	0.0%	0.0%	2.5%
2007	0.8%	0.0%	3.1%	0.0%	0.0%	0.0%	0.0%	2.2%	0.8%	2.6%	0.0%	0.9%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%
2008	9.9%	0.0%	7.3%	2.0%	6.9%	0.8%	2.4%	3.6%	0.6%	0.0%	0.0%	2.4%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2009	17.7%	0.3%	34.5%	22.9%	0.0%	10.2%	5.8%	3.7%	3.2%	7.3%	0.0%	6.0%	7.4%	3.2%	0.3%	0.0%	0.0%	10.5%
2010	4.4%	0.4%	13.9%	2.1%	0.0%	0.0%	0.0%	4.1%	1.8%	0.0%	0.0%	1.6%	1.5%	0.0%	0.0%	1.0%	0.0%	2.6%
2011	3.4%	0.4%	8.2%	0.0%	0.0%	0.0%	0.8%	3.3%	1.3%	1.9%	0.0%	0.0%	6.1%	5.4%	0.0%	0.0%	0.0%	0.0%
2012	3.8%	0.4%	14.9%	1.0%	0.0%	2.2%	0.0%	2.1%	1.6%	6.9%	0.0%	1.7%	1.2%	1.9%	0.5%	0.0%	0.0%	0.0%
2013	2.3%	0.4%	18.8%	0.9%	0.0%	2.0%	0.7%	1.3%	2.0%	0.0%	0.0%	1.7%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%
2014	1.5%	0.0%	8.0%	0.0%	0.0%	5.3%	0.0%	2.3%	2.5%	3.4%	1.1%	1.6%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2015	2.2%	0.7%	2.2%	1.0%	3.3%	6.8%	0.0%	2.1%	2.6%	4.8%	0.0%	0.6%	0.0%	0.0%	0.2%	0.0%	0.0%	1.6%
2016	0.7%	0.0%	15.8%	0.0%	0.0%	9.3%	0.0%	3.7%	1.5%	0.0%	0.0%	1.6%	2.1%	1.5%	0.2%	0.0%	0.0%	5.9%
2017	0.0%	0.0%	0.0%	4.1%	2.9%	2.0%	0.0%	7.0%	4.0%	1.4%	0.0%	1.6%	3.1%	0.0%	0.0%	0.0%	0.0%	3.0%
2018	0.0%	0.0%	6.4%	1.0%	0.0%	1.9%	0.0%	7.4%	2.4%	0.0%	0.0%	1.0%	2.0%	0.0%	0.2%	0.0%	0.0%	4.4%
2019	2.1%	0.0%	3.2%	1.1%	2.9%	3.2%	0.0%	5.6%	2.6%	1.5%	1.1%	3.1%	2.9%	0.0%	0.5%	0.0%	0.0%	2.9%
2020	7.5%	0.0%	13.7%	0.0%	3.1%	2.7%	0.9%	12.5%	7.1%	10.0%	0.0%	3.2%	5.1%	4.2%	0.2%	0.0%	0.0%	5.5%
2021	1.2%	0.0%	3.8%	0.0%	5.3%	0.7%	0.4%	1.2%	1.9%	0.0%	0.0%	1.1%	1.1%	0.0%	0.0%	0.0%	0.0%	1.4%
2022a**	2.3%	0.0%	8.4%	1.2%	2.4%	0.8%	0.5%	2.8%	1.1%	1.1%	0.0%	1.7%	1.1%	2.4%	0.5%	0.8%	2.3%	1.3%
2022b**	2.3%	0.0%	8.4%	1.2%	2.4%	8.5%	0.9%	2.8%	1.1%	1.1%	0.0%	3.4%	4.1%	3.5%	0.7%	0.8%	2.3%	1.3%

* Non-bank and non-insurance financial companies

** 2022a excludes Russian defaults while 2022b includes Russian defaults.

Source: Moody's Investors Service

Exhibit 45

Annual volume-weighted corporate bond default rates by letter rating, 1994-2022

Year	Aaa	Aa	A	Baa	Ba	B	Caa-C	IG	SG	All
1994	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	22.8%	0.0%	2.1%	0.4%
1995	0.0%	0.0%	0.0%	0.0%	0.0%	4.3%	12.4%	0.0%	3.1%	0.7%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	18.5%	0.0%	2.3%	0.7%
1997	0.0%	0.0%	0.0%	0.0%	0.1%	3.1%	6.4%	0.0%	1.9%	0.5%
1998	0.0%	0.0%	0.0%	0.0%	0.7%	3.3%	11.3%	0.0%	2.9%	0.9%
1999	0.0%	0.0%	0.0%	0.1%	1.2%	5.5%	21.2%	0.0%	5.9%	1.1%
2000	0.0%	0.0%	0.0%	0.6%	1.9%	5.3%	20.0%	0.1%	5.6%	1.3%
2001	0.0%	0.0%	0.7%	1.0%	1.3%	14.3%	50.3%	0.5%	15.2%	3.0%
2002	0.0%	0.0%	2.7%	2.3%	5.3%	16.1%	78.1%	1.9%	21.6%	4.9%
2003	0.0%	0.0%	0.0%	0.0%	3.6%	3.7%	16.1%	0.0%	5.9%	1.0%
2004	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	9.2%	0.0%	1.9%	0.3%
2005	0.0%	0.0%	0.0%	0.2%	0.0%	0.9%	18.2%	0.1%	3.8%	0.8%
2006	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	4.0%	0.0%	1.1%	0.2%
2007	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	4.6%	0.0%	0.8%	0.2%
2008	0.0%	0.8%	2.4%	1.1%	8.3%	1.1%	11.2%	1.5%	5.8%	2.2%
2009	0.0%	0.0%	0.0%	0.8%	3.4%	6.2%	37.9%	0.2%	16.1%	2.7%
2010	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	6.2%	0.1%	1.7%	0.3%
2011	0.0%	0.1%	0.0%	0.4%	0.0%	0.2%	7.2%	0.1%	1.5%	0.4%
2012	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	11.2%	0.0%	2.1%	0.4%
2013	0.0%	0.0%	0.1%	0.0%	0.0%	0.9%	4.4%	0.0%	1.1%	0.3%
2014	0.0%	0.0%	0.0%	0.0%	0.1%	0.3%	9.3%	0.0%	1.7%	0.4%
2015	0.0%	0.0%	0.0%	0.0%	0.8%	1.4%	17.1%	0.0%	3.5%	0.8%
2016	0.0%	0.0%	0.0%	0.0%	0.1%	0.9%	18.0%	0.0%	3.3%	0.7%
2017	0.0%	0.0%	0.0%	0.0%	0.3%	0.3%	9.8%	0.0%	1.8%	0.4%
2018	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	11.9%	0.0%	1.9%	0.4%
2019	0.0%	0.0%	0.0%	0.4%	0.0%	1.4%	16.4%	0.2%	2.8%	0.7%
2020	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	35.5%	0.0%	6.3%	1.0%
2021	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	0.0%	0.3%	0.1%
2022a*	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	8.1%	0.0%	1.0%	0.2%
2022b*	0.0%	0.0%	0.0%	0.3%	1.0%	0.3%	8.2%	0.1%	1.6%	0.4%
Mean**	0.0%	0.0%	0.2%	0.2%	1.0%	2.8%	17.2%	0.2%	4.3%	0.9%
Median**	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	11.9%	0.0%	2.3%	0.7%
Std Dev**	0.0%	0.2%	0.7%	0.5%	1.9%	3.9%	15.9%	0.4%	5.0%	1.0%
Min**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	0.0%	0.3%	0.1%
Max**	0.0%	0.8%	2.7%	2.3%	8.3%	16.1%	78.1%	1.9%	21.6%	4.9%

* 2022a excludes Russian defaults while 2022b includes Russian defaults.

** Include Russian issuers

Source: Moody's Investors Service

Exhibit 46

Average volume-weighted corporate bond default rates by letter rating, 1994-2022*

Rating\Year	1	2	3	4	5
Aaa	0.0%	0.0%	0.0%	0.0%	0.0%
Aa	0.0%	0.1%	0.1%	0.1%	0.2%
A	0.2%	0.4%	0.5%	0.6%	0.8%
Baa	0.1%	0.2%	0.3%	0.5%	0.7%
Ba	0.5%	1.3%	2.0%	2.8%	3.5%
B	2.1%	5.0%	7.9%	10.4%	12.0%
Caa-C	14.3%	24.2%	31.1%	34.7%	36.8%
IG	0.1%	0.3%	0.4%	0.5%	0.6%
SG	3.3%	6.4%	9.0%	10.9%	12.2%
All	0.7%	1.4%	2.0%	2.5%	2.8%

* Include Russian issuers

Source: Moody's Investors Service

1-1-10

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12	13
Aaa	99	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Aa	592	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
A	1253	0.2%	0.5%	1.0%	1.8%	2.1%	2.3%	2.3%	2.5%	2.5%	2.7%	2.7%	2.7%	2.8%
Baa	1349	0.1%	0.3%	0.4%	0.8%	1.0%	1.0%	1.3%	1.4%	1.9%	2.1%	2.8%	2.8%	3.9%
Ba	597	0.0%	0.0%	0.8%	1.7%	2.2%	4.0%	5.0%	6.4%	7.3%	8.6%	10.2%	10.6%	14.9%
B	819	0.4%	1.8%	3.8%	4.6%	6.8%	11.3%	14.1%	16.2%	17.3%	19.0%	22.6%	23.1%	31.2%
Caa-C	725	8.7%	13.3%	19.0%	23.2%	26.4%	29.4%	34.7%	37.2%	38.6%	41.3%	45.8%	46.4%	47.1%
IG	3293	0.1%	0.3%	0.5%	1.0%	1.2%	1.3%	1.4%	1.6%	1.8%	1.9%	2.2%	2.2%	2.7%
SG	2141	3.1%	5.1%	7.9%	9.8%	11.6%	14.7%	17.4%	19.3%	20.4%	22.1%	25.0%	25.5%	30.0%
All	5434	1.2%	2.1%	3.2%	4.2%	4.9%	5.8%	6.7%	7.4%	7.8%	8.3%	9.3%	9.4%	10.8%

1-1-11

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11	12
Aaa	87	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Aa	553	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
A	1247	0.0%	0.1%	0.7%	0.8%	0.9%	0.9%	1.2%	1.2%	1.3%	1.3%	1.3%	1.4%
Baa	1440	0.4%	0.4%	0.9%	1.2%	1.2%	1.6%	1.7%	2.1%	2.3%	3.1%	3.1%	4.2%
Ba	645	0.2%	1.4%	2.1%	3.0%	4.7%	5.8%	7.0%	8.1%	9.2%	10.7%	11.0%	15.2%
B	962	0.3%	1.9%	3.2%	5.3%	9.8%	13.7%	15.6%	16.8%	18.3%	22.6%	23.7%	31.1%
Caa-C	737	6.2%	13.5%	18.3%	22.2%	26.4%	31.8%	34.4%	36.4%	39.2%	44.9%	45.7%	47.2%
IG	3327	0.2%	0.3%	0.7%	0.9%	0.9%	1.1%	1.2%	1.4%	1.5%	1.9%	1.9%	2.4%
SG	2344	2.1%	5.2%	7.3%	9.4%	12.8%	16.0%	17.8%	19.0%	20.6%	23.9%	24.6%	29.5%
All	5671	0.9%	2.2%	3.2%	4.1%	5.2%	6.3%	7.0%	7.5%	8.0%	9.1%	9.3%	10.9%

1-1-12

Rating	n(0)	1	2	3	4	5	6	7	8	9	10	11
Aaa	85	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Aa	445	0.0%	0.0%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
A	1213	0.0%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.3%	0.3%	0.3%	0.4%
Baa	1481	0.1%	0.4%	0.5%	0.5%	0.8%	0.9%	1.3%	1.5%	2.4%	2.4%	3.4%
Ba	723	0.1%	1.7%	2.2%	3.4%	5.2%	6.6%	7.3%	8.3%	9.5%	9.8%	14.4%
B	995	0.5%	1.7%	4.0%	8.1%	11.7%	14.4%	15.3%	16.9%	21.4%	22.3%	29.0%
Caa-C	828	8.0%	13.3%	17.6%	22.7%	28.3%	31.9%	35.5%	37.7%	44.8%	45.4%	47.7%
IG	3224	0.0%	0.2%	0.3%	0.3%	0.4%	0.5%	0.7%	0.8%	1.2%	1.2%	1.7%
SG	2546	2.8%	5.3%	7.6%	11.0%	14.4%	16.8%	18.2%	19.6%	23.2%	23.8%	28.6%
All	5770	1.2%	2.4%	3.4%	4.6%	5.9%	6.8%	7.3%	7.8%	9.2%	9.3%	11.0%

1-1-13

Rating	n(0)	1	2	3	4	5	6	7	8	9	10
Aaa	62	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Aa	304	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
A	1180	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.4%	0.4%	0.5%
Baa	1671	0.1%	0.2%	0.2%	0.3%	0.4%	0.7%	0.9%	1.5%	1.5%	2.6%
Ba	698	0.6%	1.1%	1.8%	3.4%	5.5%	5.7%	6.7%	8.0%	8.3%	12.3%
B	1053	1.0%	2.6%	7.1%	11.3%	13.2%	14.5%	15.6%	19.7%	20.7%	26.4%
Caa-C	938	6.3%	10.3%	17.2%	23.2%	27.8%	31.9%	34.8%	43.3%	43.8%	47.9%
IG	3217	0.1%	0.2%	0.2%	0.2%	0.3%	0.4%	0.5%	0.9%	0.9%	1.5%
SG	2689	2.7%	4.8%	8.9%	12.8%	15.5%	17.0%	18.5%	22.4%	23.0%	27.6%
All	5906	1.2%	2.2%	3.8%	5.3%	6.3%	6.9%	7.5%	8.9%	9.1%	10.8%

1-1-14

Rating	n(0)	1	2	3	4	5	6	7	8	9
Aaa	58	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Aa	298	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
A	1171	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.3%	0.3%	0.3%
Baa	1735	0.1%	0.1%	0.2%	0.2%	0.5%	0.6%	1.2%	1.2%	2.5%
Ba	720	0.1%	0.5%	1.7%	3.2%	3.4%	4.8%	6.7%	6.9%	10.9%
B	1097	0.5%	3.9%	7.6%	10.3%	12.1%	13.2%	16.9%	18.6%	24.5%
Caa-C	1143	4.8%	11.9%	18.6%	24.7%	29.1%	32.4%	40.7%	41.4%	45.4%
IG	3262	0.1%	0.1%	0.1%	0.1%	0.3%	0.4%	0.8%	0.8%	1.4%
SG	2960	2.0%	6.0%	10.1%	13.5%	15.6%	17.3%	21.6%	22.5%	27.1%
All	6222	1.0%	2.7%	4.5%	5.8%	6.6%	7.3%	9.0%	9.3%	11.1%

1-1-15

Rating	n(0)	1	2	3	4	5	6	7	8
Aaa	57	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Aa	306	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
A	1246	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.2%	0.2%
Baa	1743	0.0%	0.0%	0.0%	0.3%	0.4%	1.2%	1.2%	2.2%
Ba	718	0.3%	1.6%	2.8%	3.0%	3.4%	4.7%	4.7%	9.3%
B	1074	2.4%	6.0%	7.8%	10.0%	12.3%	16.9%	18.8%	25.2%
Caa-C	1369	6.6%	13.1%	19.3%	23.5%	28.4%	37.9%	38.9%	42.4%
IG	3352	0.0%	0.0%	0.0%	0.1%	0.2%	0.7%	0.7%	1.1%
SG	3161	3.7%	7.9%	11.3%	13.6%	16.2%	21.3%	22.3%	27.1%
All	6513	1.8%	3.7%	5.1%	6.1%	7.1%	9.2%	9.5%	11.4%

1-1-16

Rating	n(0)	1	2	3	4	5	6	7
Aaa	53	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Aa	310	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
A	1303	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%
Baa	1729	0.0%	0.0%	0.2%	0.3%	1.0%	1.1%	1.5%
Ba	733	0.1%	0.8%	0.9%	1.5%	3.3%	3.3%	8.5%
B	1014	1.6%	2.9%	4.7%	6.7%	11.9%	13.7%	20.7%
Caa-C	1439	9.1%	15.9%	20.0%	24.7%	34.1%	35.5%	39.2%
IG	3395	0.0%	0.0%	0.1%	0.2%	0.5%	0.6%	0.8%
SG	3186	4.6%	8.1%	10.4%	13.0%	18.6%	19.6%	24.9%
All	6581	2.2%	3.7%	4.8%	5.8%	8.1%	8.5%	10.4%

1-1-17

Rating	n(0)	1	2	3	4	5	6
Aaa	54	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Aa	303	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
A	1277	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%
Baa	1708	0.0%	0.0%	0.1%	0.3%	0.4%	0.7%
Ba	797	0.5%	0.5%	0.5%	1.6%	1.8%	6.9%
B	978	0.4%	1.4%	3.3%	10.6%	12.2%	19.6%
Caa-C	1442	7.6%	13.2%	19.0%	29.2%	30.7%	34.0%
IG	3342	0.0%	0.0%	0.1%	0.2%	0.2%	0.4%
SG	3217	3.6%	6.2%	9.2%	15.6%	16.8%	22.0%
All	6559	1.7%	2.9%	4.2%	6.9%	7.3%	9.3%

1-1-18

Rating	n(0)	1	2	3	4	5
Aaa	56	0.0%	0.0%	0.0%	0.0%	0.0%
Aa	256	0.0%	0.0%	0.0%	0.0%	0.0%
A	1306	0.0%	0.2%	0.2%	0.2%	0.2%
Baa	1757	0.0%	0.0%	0.3%	0.4%	0.8%
Ba	835	0.0%	0.0%	1.1%	1.3%	7.1%
B	973	0.7%	2.1%	8.9%	11.0%	17.3%
Caa-C	1426	5.2%	11.4%	21.6%	23.4%	26.2%
IG	3375	0.0%	0.1%	0.2%	0.3%	0.5%
SG	3234	2.5%	5.5%	12.0%	13.5%	18.3%
All	6609	1.2%	2.6%	5.5%	6.1%	8.1%

1-1-19

Rating	n(0)	1	2	3	4
Aaa	54	0.0%	0.0%	0.0%	0.0%
Aa	291	0.0%	0.0%	0.0%	0.0%
A	1306	0.0%	0.0%	0.0%	0.0%
Baa	1813	0.1%	0.2%	0.3%	1.1%
Ba	802	0.0%	0.7%	1.0%	5.5%
B	987	1.2%	7.4%	9.4%	16.0%
Caa-C	1427	6.5%	17.4%	19.2%	22.3%
IG	3464	0.1%	0.1%	0.2%	0.6%
SG	3216	3.2%	10.0%	11.5%	16.1%
All	6680	1.5%	4.6%	5.3%	7.4%

1-1-20

Rating	n(0)	1	2	3
Aaa	54	0.0%	0.0%	0.0%
Aa	330	0.0%	0.0%	0.0%
A	1310	0.0%	0.0%	0.0%
Baa	1836	0.1%	0.1%	1.0%
Ba	776	0.1%	0.4%	5.7%
B	953	4.0%	5.5%	11.1%
Caa-C	1396	12.8%	15.2%	19.1%
IG	3530	0.1%	0.1%	0.5%
SG	3125	6.9%	8.5%	13.3%
All	6655	3.2%	3.9%	6.2%

1-1-21

Rating	n(0)	1	2
Aaa	50	0.0%	0.0%
Aa	327	0.0%	0.0%
A	1294	0.0%	0.0%
Baa	1862	0.0%	0.9%
Ba	782	0.0%	4.8%
B	898	1.3%	8.1%
Caa-C	1446	3.0%	6.6%
IG	3533	0.0%	0.5%
SG	3126	1.8%	6.6%
All	6659	0.8%	3.2%

1/1/22a*

Rating	n(0)	1
Aaa	50	0.0%
Aa	314	0.0%
A	1325	0.0%
Baa	1901	0.0%
Ba	742	0.3%
B	967	3.3%
Caa-C	1545	3.8%
IG	3590	0.0%
SG	3254	2.8%
All	6844	1.3%

1/1/22b*

Rating	n(0)	1
Aaa	50	0.0%
Aa	314	0.0%
A	1325	0.0%
Baa	1929	0.9%
Ba	773	4.2%
B	988	5.0%
Caa-C	1546	3.9%
IG	3618	0.5%
SG	3307	4.3%
All	6925	2.3%

* 1/1/22a excludes Russian issuers while 1/1/22b includes Russian issuers.

Source: Moody's Investors Service

Endnotes

- [1](#) To learn more about the model, please see [Introducing Moody's Credit Transition Model](#).
 - [2](#) We withdrew the ratings of all Russian issuers by the end of March 2022.
 - [3](#) [Global Macro Outlook 2023-24 \(February 2023 Update\): Global economic risks persist despite recent positive surprises](#), February 28, 2023.
 - [4](#) We predict a lower default count in 2023 than in 2022 despite a higher speculative-grade default rate forecast for 2023. This largely reflects the fact that the 2022 cohort had a number of investment-grade defaults in Russia but we anticipate far fewer investment-grade defaults in 2023, if any. In addition, the denominator is smaller for the 2023 forecast rate because all of the Russian companies' ratings were withdrawn in 2022 and some of the 2022 defaulters did not return to the 2023 cohort as they remained in default.
 - [5](#) Dollar-weighted bond default rates only include defaulted bonds from US and European issuers.
 - [6](#) Eight were from Ukraine.
 - [7](#) Average recovery rates of senior unsecured bonds and other debts can be based on different defaulters because for example some defaulters may have senior unsecured bonds and no other debts.
 - [8](#) See details in Exhibit 25 in the Appendix.
 - [9](#) The analysis on ultimate recovery is provided by Julia Chursin, a corporate finance analyst at Moody's. The data is from Moody's Ultimate Recovery Database, which includes robust detailed recovery information for more than 5,700 loans and bonds from more than 1,200 US corporate nonfinancial defaulters since 1987.
- [10](#) [Glossary of Moody's Ratings Performance Metrics](#) for details on data methodology.
- [11](#) [Moody's B3 Negative and Lower Corporate Ratings List – US: Volatile 2022 fueled List's growth, setting the stage for more defaults in 2023](#), January 2023.
- [12](#) See more details in [Credit stress is rising, setting the stage for more downgrades and defaults](#), December 2022.
- [13](#) For details about the EDF model, see [Public Firm Expected Default Frequency \(EDFTM\) Credit Measures: Methodology, Performance, and Model Extensions](#), June 2012.

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