CREDIT RISK REPORT
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# EDF Report May 2020 for North American Corporate Firms

North American corporates experienced very steep credit quality decline following the global COVID-19 pandemic. By the end of May 2020, the median EDF™ (Expected Default Frequency) value of North American corporate firms was 2.02%, retreating slightly from a high of 2.31% at the end of March 2020.

The elevated credit risk during the first half of 2020 is mostly attributable to substantially increased market leverage, stemming from a severe drop in equity markets following the pandemic outbreak.

We observe a similar magnitude of increasing credit risk in both bond spread and credit default swap (CDS) spread. All of these credit metrics have seen pullbacks to different extents following their recent highs in March 2020.

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## 1. Overview

North American corporates experienced a very steep credit quality decline during the first half of 2020, following the global outbreak of COVID-19. By the end of May 2020, the median EDF value of North American corporate firms was 2.02%, close to double the level same time last year. However, the current May level is slightly lower compared to the 2.31% observed at the end of March 2020, which marked the first time the median EDF value has doubled year-over-year since September 2008. The decline is attributed to the partially recovered equity market, while balancing out the fact that volatility remains heightened. The median EDF credit measure increased by 96% year to date.

We also observe a similar magnitude of declining risk in the credit markets following the high in March, with both bond spread and CDS spread retracting from recent five-year highs. Yet again, the gap between the spreads from high-yield and investment grade remains large compared to recent history.

Observed corporate defaults of non-financial public firms still remain low compared with historical standards, but higher than what have seen during the previous year. The onset of the COVID-19 outbreak was sudden and still relatively recent. It will take time for impacts to trickle down and become default events. However, we have started to see a handful of COVID-19–related defaults in the United States.

A number of risky industry/sectors' EDF levels increased significantly during the last 12 months. Specifically, oil- and consumer-related industries made up the top of the list when ranking industries by liabilities-weighted EDF measures. These sectors were also among the industries that experienced the largest increase in risk during the prior year.

This report first shows overall credit trends, reflected through realized default counts, the EDF credit measure and its drivers, and credit spreads for North American non-financial firms. Subsequently, we analyze the riskiest industry sectors using a variety of metrics. We also report credit migration patterns using EDF metrics.

During the last financial crisis, we published periodic EDF reports that many clients found helpful. This report follows our previous report for North American and European corporates about the COVID-19 impact on EDF credit risk measures. These reports are available at www.moodysanalytics.com.

## 2. Credit Measure Trends

This section shows EDF credit measure movement and key drivers for North American non-financial companies between January 2000 and May 2020. We report these trends in conjunction with realized default counts and credit spreads.

### 2.1 Realized Defaults

Figure 1 shows quarterly default counts for North American corporates, classified by whether the firm is rated at the time of default. Figure 2 presents the quarterly number of defaults, highlighting bankruptcy defaults. Default occurrences reaffirm that the most recent benign credit environment continued at least until the end of 2019. So far, we have seen only a handful of defaults in the sample during the first half of 2020. However, given that the onset of the pandemic has been sudden, and it is still relatively recent, we expect to see a significant increase in defaults during the second half of 2020, if the credit environment continues to deteriorate. Figures 1 and 2 detail default counts by rating status and default type, respectively. Figure 3 reports monthly default counts occurring the previous year, during which period the default counts remained low. The 12-month default count rolling average currently stands at 4.92, up from 4.67 one year ago. As a benchmark, during the past 10 years, the average monthly default count is around 11.

### 2.2 EDF Credit Measures and Drivers

Figure 4 reports quartiles of the EDF credit measure and its drivers, including the underlying asset volatility and market leverage, from January 2000 through May 2020. Recently, we have seen a substantial rise in EDF values as a result of significant market leverage increases. During the past 12 months, the median EDF value rose dramatically, from 1.04% to 2.02%, about a factor of two. Median leverage increased from 23.46% to 26.77%, due to the equity market sell-off. Median asset volatility increased from 38.05% to 40.90%.

Figure 1 Quarterly Default Counts by Rating Status

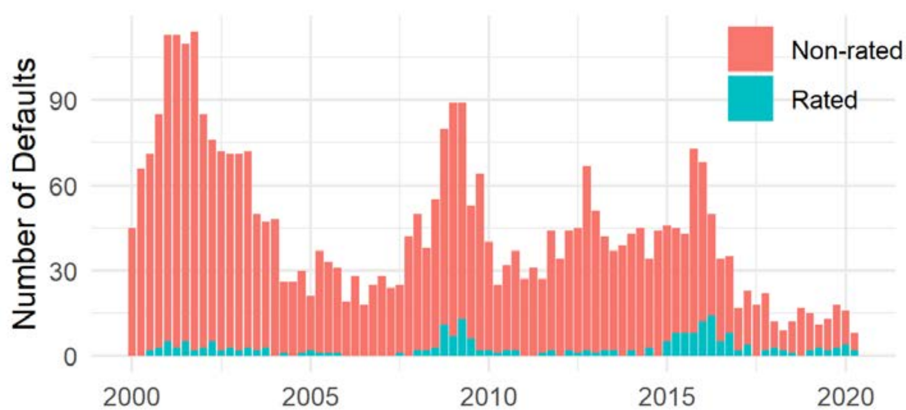


Figure 2 Quarterly Default Counts by Default Type

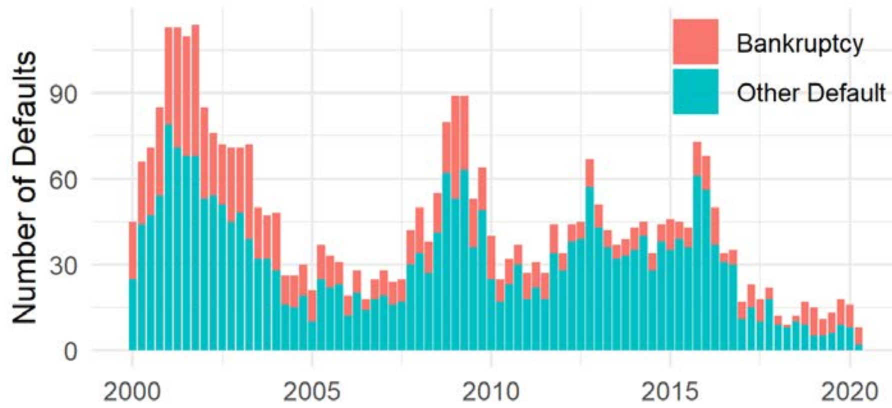



Figure 3 Monthly Default Counts During Past Year

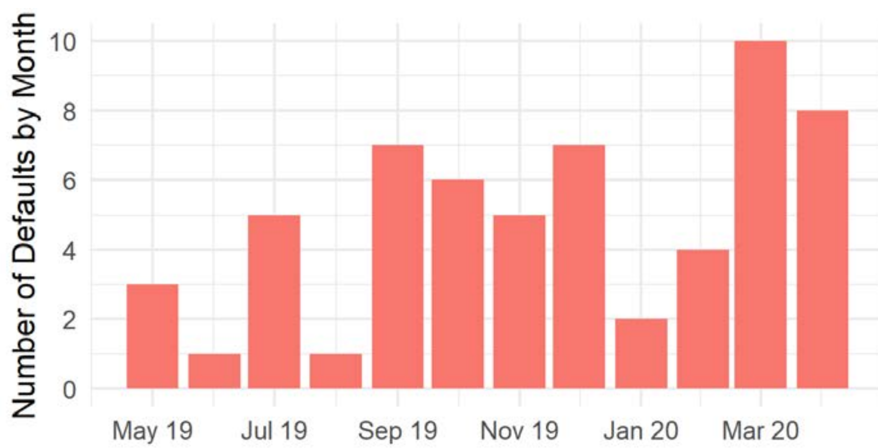
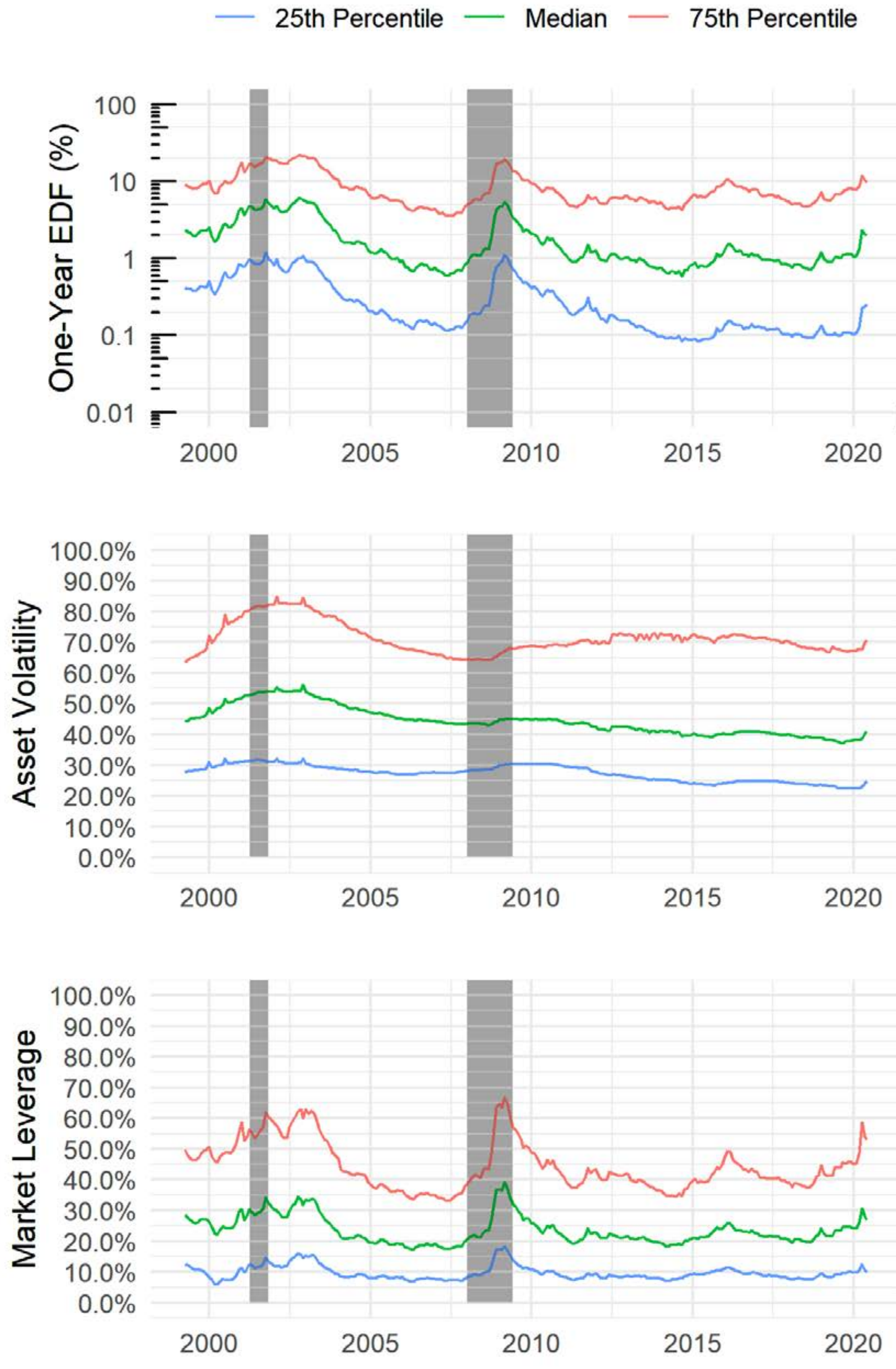


Figure 4 Trends of One-Year EDF Credit Measures and Drivers



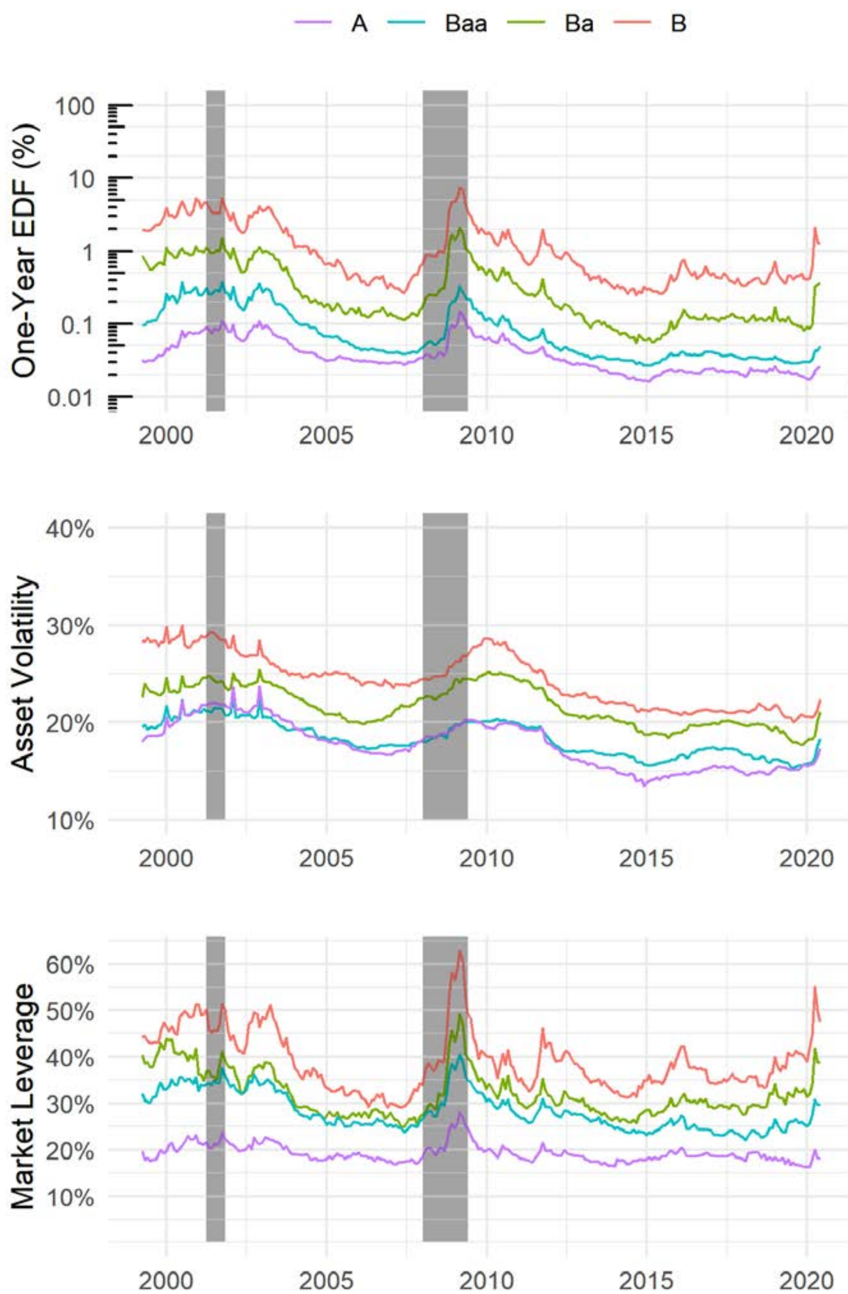
### 2.3 EDF Credit Measures and Drivers: Rated Firms

Figure 5 presents EDF measures and drivers for firms holding a Senior Estimated Rating assignment by Moody's Investors Service. To ensure each rating group has a sufficiently large number of firms, we analyze only groups rated A through B. In the cross-section, the median EDF values for these rating groups are consistent with the risk order indicated by agency ratings. For EDF value drivers, B-rated firms are riskiest in terms of both business risk (that is, asset volatility) and financial risk (that is, leverage). The EDF value difference between Baa-rated and Ba-rated firms is primarily driven by asset volatilities, while leverage is the main driver for the EDF value difference between Baa-rated and A-rated firms.

Currently, Ba and B-rated firm EDF credit measures are still closing in on the historical highs seen during 2008–2009. These levels show a stark contrast with the much more benign credit environment observed during the past few years. For example, a Ba-rated firm is now almost as risky as a B-rated firm in early 2019. However, despite the recent volatility, the EDF credit measures for investment grade firms are still relatively moderate.

We observed a moderate increase in median asset volatilities across all rating groups, up from historic lows at the second half of 2019. The bottom panel of Figure 5 shows that the market leverage — the ratio of the default point over the market value of assets — presented a sharp increase from their historic lows and a recent pull back. The magnitude of the increase in leverage from the first half of 2020 is almost as steep as the one observed during October and November 2008. The recent pullback in market leverage reflected partial recovery of market capitalization for North American corporates across all rating groups. Yet such heighted level in market leverage still points to the much-deteriorated debt service capacity of North American corporates in recent months.

Figure 5 Trends of One-Year EDF Credit Measures and Drivers: Rated Firms




## 2.4 Credit Spreads

Figure 6 presents the time series of median values for the EDF credit measure, the five-year CDS spread, and the option-adjusted spread (OAS) of investment grade and high-yield North American public firms from January 2014 to May 2020. Median bond option-adjusted spreads are derived from the sample of bonds in coverage by the Moody's Analytics EDF-based bond valuation model. Generally, all three measures have been moving in tandem during the longer history. The recent dramatic change is readily apparent for all three measures, especially for the high-yield space. Table 1 shows the median credit metrics by broad rating group as of end of May 2020 and one year ago. As oil and gas-related firms account for a large portion of high-yield bonds, we see the high-yield space was essentially doubly hit by both the COVID-19 pandemic and the recent oil price shock, causing significant distress to speculative-grade debt.

Similar to the pattern observed for EDF credit measures, both OAS and five-year CDS spreads present a substantially steeper credit risk increase in the high-yield space than in the investment grade space, suggested by the increasingly widening gap between the two broad rating classes, shown as the dashed blue line in Figure 6.

Figure 6 Medians of Credit Measures: Investment Grade vs. High-Yield

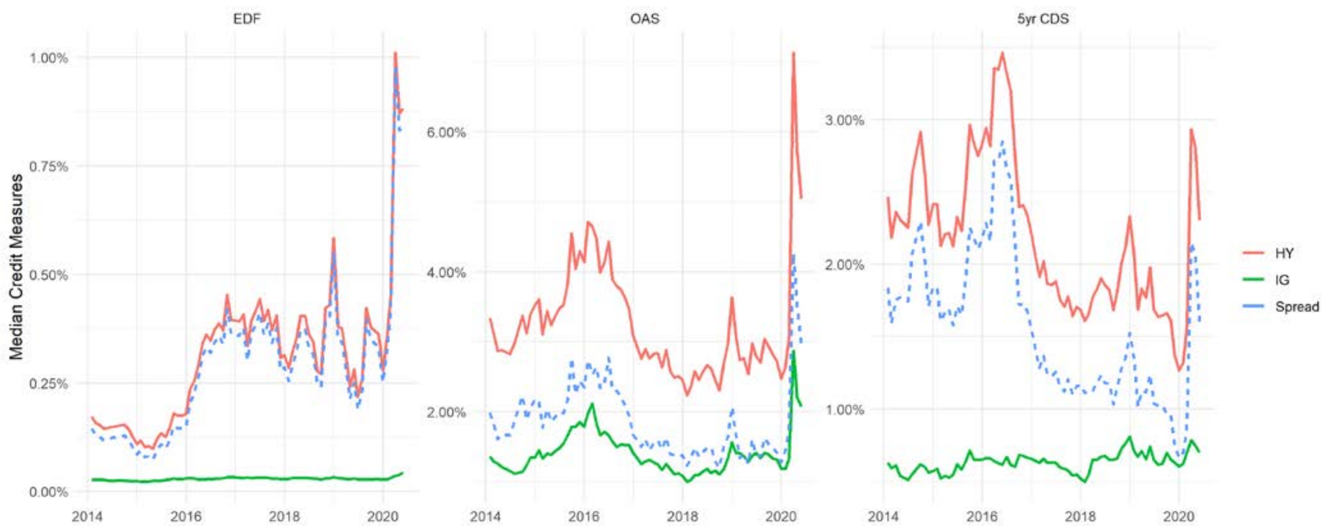
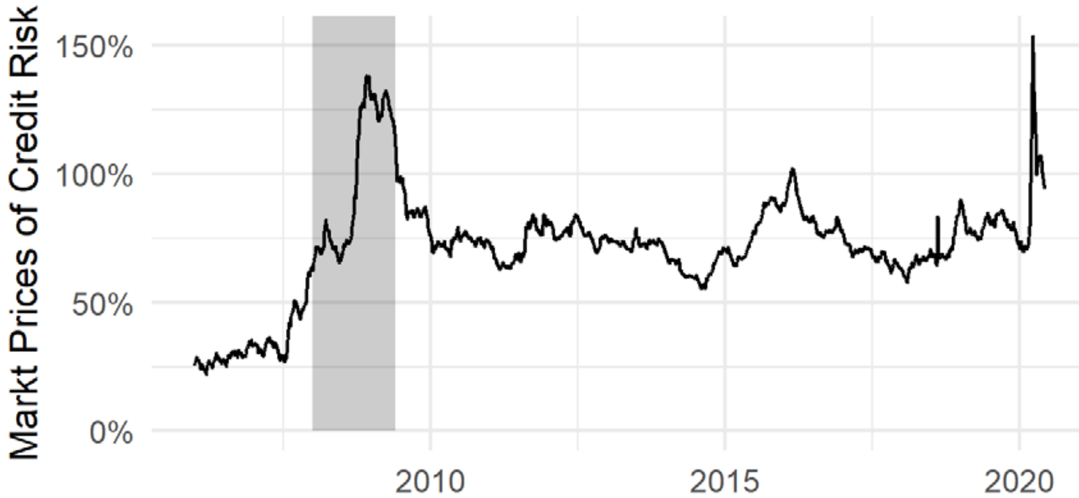



Table 1 Median Credit Measures as of May 29, 2020 and May 31, 2020

| 2019-05-31 | | | | 2020-05-29 | | | |
|---|---|---|---|---|---|---|---|
| **Rating** | **EDF** | **5yr CDS** | **OAS** | **Rating** | **EDF** | **5yr CDS** | **OAS** |
| Aa | 0.02% | 0.35% | 0.70% | Aa | 0.01% | 0.31% | 0.78% |
| A | 0.02% | 0.51% | 0.97% | A | 0.03% | 0.49% | 1.28% |
| Baa | 0.04% | 0.87% | 1.57% | Baa | 0.06% | 0.84% | 2.41% |
| Ba | 0.14% | 1.54% | 2.56% | Ba | 0.50% | 1.87% | 4.37% |
| B | 0.82% | 2.70% | 3.61% | B | 2.96% | 3.91% | 6.54% |
| <B | 13.75% | 10.33% | 7.23% | <B | 9.42% | 8.71% | 10.09% |

As the current elevated level of credit spreads potentially reflects both the anticipated increase in default risk and investors' increased risk aversion, we analyze the market Sharpe ratios, estimated using Moody's Analytics EDF-based bond valuation model, shown in Figure 7. It is apparent that the estimated market price of credit risk has risen drastically during the last month, surpassing levels seen during the last financial crisis.

Figure 7 Market Prices of Credit Risk Estimated from Bond Option-Adjusted Spreads and EDF Value Data




## 3. Industry Analysis

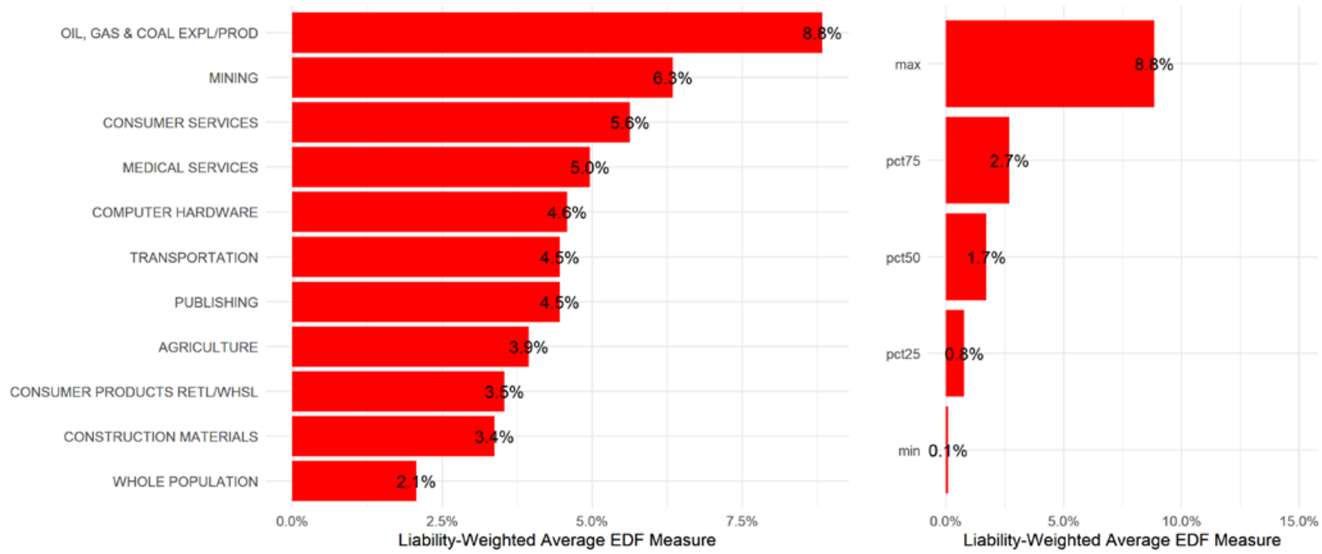
This section applies two measures that capture different aspects of industry risk. The first measure is based on the average EDF value weighted by total liabilities of each company in a given industry. Therefore, this measure is dominated by the risks of firms with large liability amounts. The second measure is the percentage of firms with EDF values greater than the 90th percentile of the entire population of North American non-financial companies. Consequently, this measure tends to be more represented by the risks of smaller companies, more likely riskier in most industries. With both measures, the analysis in this section helps paint a relatively complete picture of industry-level credit risk for North American corporates. To avoid small sample bias, we examine only industries with more than 20 firms as of May 29, 2020.

### 3.1 Riskiest Industries

The entire North American corporate population has a 2.07% liabilities-weighted EDF credit measure, up from 1.42% last year. Figure 8 shows the riskiest industries and the distribution of liabilities-weighted EDF credit measures across all industries. The chart on the left side displays the top-ten riskiest industries and their EDF measures; the chart on the right displays the EDF measure distribution of all industries.

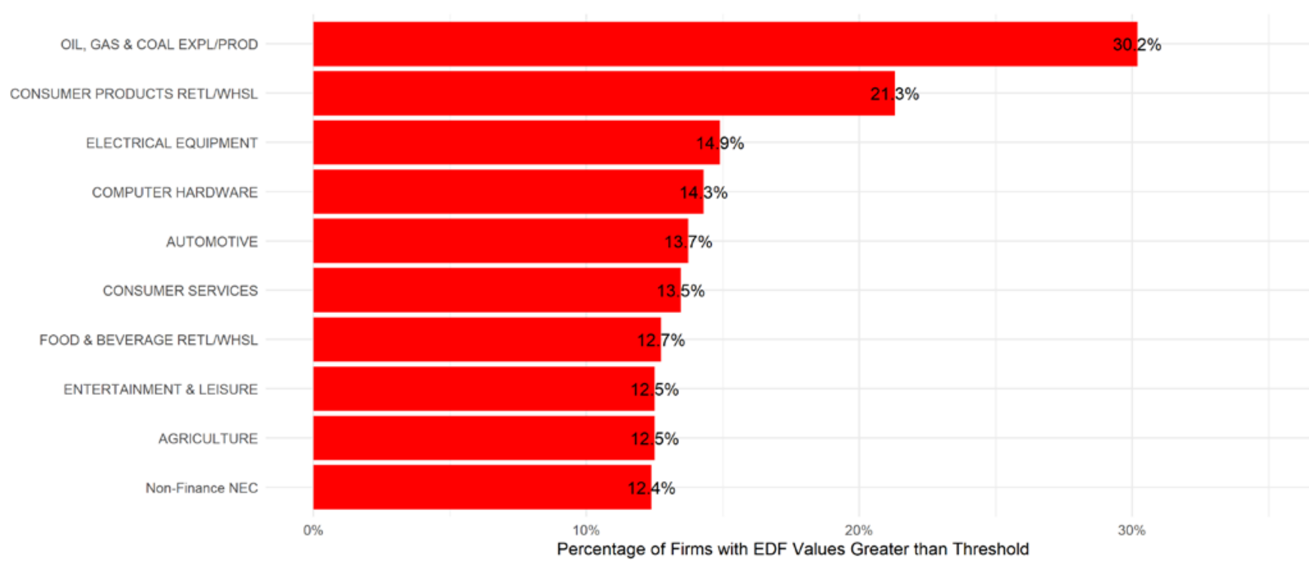
The top-two riskiest industries are Oil & Gas Refining and Mining-related, probably not surprisingly. These industries were hit twice in rapid succession — decreased demand due to the COVID-19 pandemic and a massive equity price drop due to the fall in oil prices. In particular, the liabilities-weighted EDF value for the Oil, Gas & Coal Exploration/Production industry is 8.8%, presenting alarming levels of default risk. Other industries topping the list tend to be non-essentials, including Consumer Services, as well as Consumer Products Retailers and Wholesalers, and Construction-related. All of these industries have above a 3% liabilities-weighted EDF measure. Medical Services, considered a “mission-critical” industry in light of the COVID-19 pandemic, is still relatively risky and ranked fourth. However, the high ranking is not because of a recent increase, but rather more in-line with how risky the industry has been in the past years.

Figure 8 Riskiest Industries by Liability-Weighted Average EDF Credit Measures




Examining an alternative measure of industry risk, we compile the percentage of firms within an industry that have EDF values greater than the 90th percentile of the EDF value distribution for the entire population. At the end of May 2020, for the population of North American non-financial firms, this threshold value was 27.33%. Figure 9 lists the riskiest industries using this measure. The list is largely consistent with the list obtained using the other measure. Again, the Oil, Gas & Coal Exploration/Production industry is ranked as the riskiest, with almost 30% of firms over the threshold. Consumer Products Retail and Wholesale appears on this list, consistent with a substantial drop in demand.

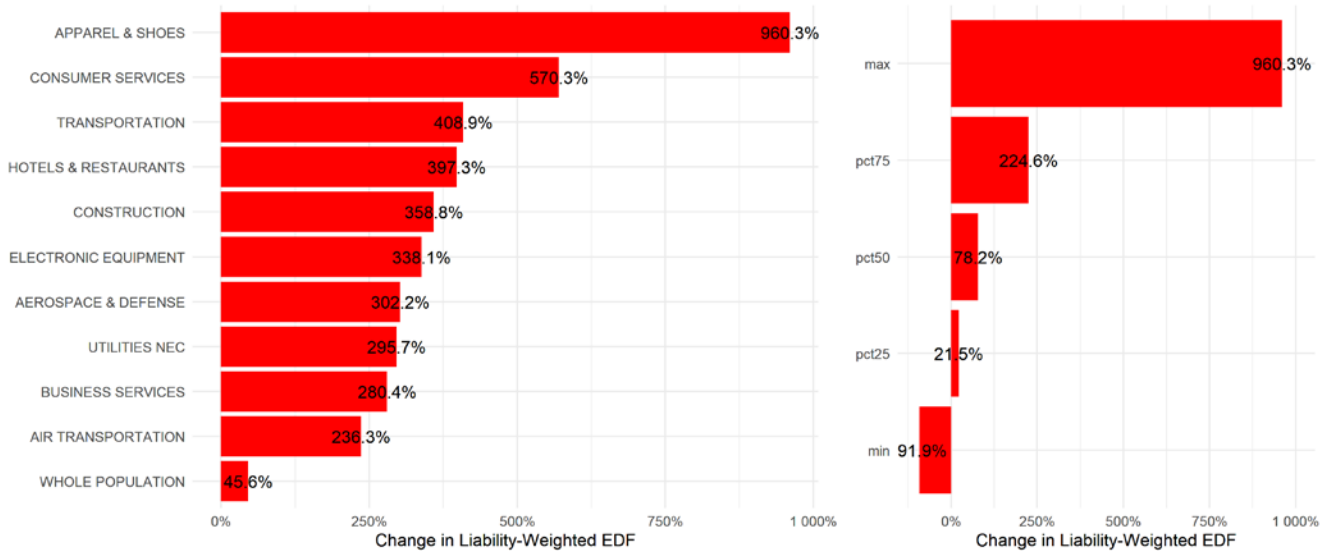
Figure 9 Riskiest Industries by Percentage of Firms with EDF Values Greater than Threshold




## 3.2 Industries with the Largest Credit Risk Increase

The sharp elevation in credit risk is more apparent when we look at year-over-year increases in EDF values within each industry. From May 2019 to May 2020, most industries in the North American corporate space experienced substantial increases in credit risk: the median EDF value for all industries has almost doubled from a year ago. The industries with the largest percentage increases are reported on the chart to the left in Figure 10, where we find industries heavily engaged in travel and leisure (for example, Transportation and Hotels & Restaurants), as well as international trade (Apparel & Shoes, Electronic Equipment, Furniture & Appliances). Among these industries, the median EDF value for Apparel & Shoes increased almost by tenfold in light of the COVID-19 pandemic. The chart on the right side of Figure 10 presents the distribution of changes across all industries, which is skewed, with a median percentage increase of 78%.

Figure 10 Industries with the Largest Increases in Liabilities-Weighted EDF Credit Measures



## 4. Credit Migration

This section analyzes credit quality shift from both the change in agency rating and the change in EDF-implied rating. The agency rating is more latent, reflecting the credit risk ranking of a firm over a long period of time, and is thus, more stable. On the other hand, the EDF-Implied Rating (EIR) is calibrated monthly, and is, therefore, more point-in-time, but also more volatile.

Table 2 shows the mapping between EDF values and the corresponding implied ratings for North American non-financials as of May 2020. EDF values within the lower bound and upper bound are mapped to the corresponding rating class. The resulting EIRs are then compared to their counterparts in May 2019. Figure 11 shows the differences, along with the notch differences in agency ratings.

Table 2 EDF-Implied Rating Mapping for North American Non-financials

| Investment Grade | | | | High-Yield | | | |
|---|---|---|---|---|---|---|---|
| Rating | Median | Lower Bound | Upper Bound | Rating | Median | Lower Bound | Upper Bound |
| Aaa | 0.0100% | 0.0100% | 0.0126% | Ba1 | 0.2546% | 0.1794% | 0.3613% |
| Aa1 | 0.0159% | 0.0126% | 0.0178% | Ba2 | 0.5127% | 0.3613% | 0.6117% |
| Aa2 | 0.0200% | 0.0178% | 0.0216% | Ba3 | 0.7298% | 0.6117% | 0.8707% |
| Aa3 | 0.0232% | 0.0216% | 0.0250% | B1 | 1.0388% | 0.8707% | 1.2393% |
| A1 | 0.0270% | 0.0250% | 0.0291% | B2 | 1.4786% | 1.2393% | 1.9811% |
| A2 | 0.0314% | 0.0291% | 0.0352% | B3 | 2.6544% | 1.9811% | 3.5565% |
| A3 | 0.0395% | 0.0352% | 0.0444% | Caa1 | 4.7652% | 3.5565% | 6.3846% |
| Baa1 | 0.0498% | 0.0444% | 0.0559% | Caa2 | 8.5544% | 6.3846% | 9.9103% |
| Baa2 | 0.0627% | 0.0559% | 0.0891% | Caa3 | 11.4812% | 9.9103% | 15.4093% |
| Baa3 | 0.1264% | 0.0891% | 0.1794% | Ca | 20.6814% | 15.4093% | 32.1569% |

Looking at the histogram of notch differences, even though the agency ratings suggest that the longer-term credit risk for the majority of the firms have changed little, we see a positive skewness for the EIR, suggesting clear, immediate credit deterioration, in line with other credit metrics.

Figure 11 EDF-Implied Rating Change: May 2020 vs. May 2019