

RESEARCH

30 MARCH, 2020

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COVID-19 Impact on Middle-Market and Large Firm Credit Risk

Abstract

COVID-19 has become, and will likely continue to be, a major driver of credit risk. In this paper, we examine the impact of the coronavirus and the concurrent shock in oil prices on middle-market and large firms to identify which sectors have the greatest credit deterioration. Using Moody's Analytics probability of default models, we see credit deterioration across firms of all sizes and industries.

Construction, Transportation, and Services sectors have seen the largest increase in default risk, and industries already showing signs of weakness pre-shock continue to outpace other sectors in terms of absolute default risk. These include Services and Communication middle-market firms, as well as Consumer Products, Auto, and Trade large firms. Average size-weighted expected loss across industries increases by close to 80%.

The as-of date for this analysis is March 24, 2020. In addition, this study does not consider potential government aid.

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Executive summary

The purpose of this exercise is to identify which sectors can expect to sustain the greatest impact from COVID-19-related credit stressors. We performed this analysis by running firms' financial statements through default risk models and comparing the following three risk measures:

1. **Pre-COVID-19 point-in-time (PIT) probability of default (PD).** This measure reflects the lower-risk credit cycle conditions just before the coronavirus pandemic (end of January market information and end of December unemployment information).
2. **COVID-19 PIT PD.** This point-in-time probability of default risk measure includes the economic stress caused by the coronavirus pandemic and oil price shocks per the as-of date for this analysis.
3. **Through-the-cycle (TTC) PD.** This measure captures the risk level associated with firms' financial ratios without any consideration of prevailing credit cycle conditions.

We compare these three measures to evaluate how COVID-19 has changed point-in-time probability of default measures from pre-COVID-19 levels (Pre-COVID-19 vs COVID-19 PD) and to what extent COVID-19 point-in-time probability of default measures exceed through-the-cycle probability of default measures (TTC PD vs COVID-19 PD). We perform this analysis at an industry level and at the risk-band level within industries.

This paper identifies which industries COVID-19 affects most and with what magnitude. We do not stress financials for individual firms because we expect that market reactions captured by the PIT PD reflect potential future changes in financials.

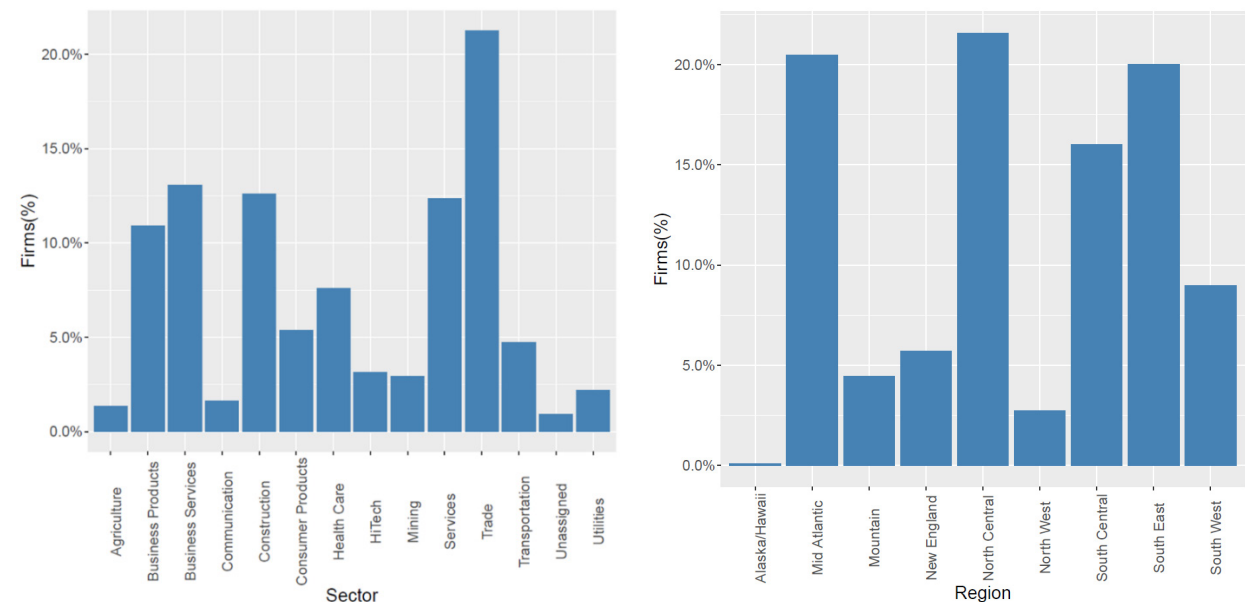
Data

For this study, we selected all of the US firms with financial statements available in the last three years from our database. Moody's Analytics built the database through cooperation with more than 20 banks.

Middle-market data

The middle-market sample includes 30,000 US private firms. The chart on the left in Exhibit 1 presents the distribution of firms, which span all the industry sectors in the model. The Unassigned sector is for firms that either do not have an industry identifier or are in an industry that does not map to the model's middle-market sectors. The chart on the right shows the firms' geographic location. The Mid-Atlantic, North Central, South Central, and South East regions each contribute more than 15% to the sample, while the Mountain, New England, and North West regions contribute fewer, but still adequate, borrowers to the sample.

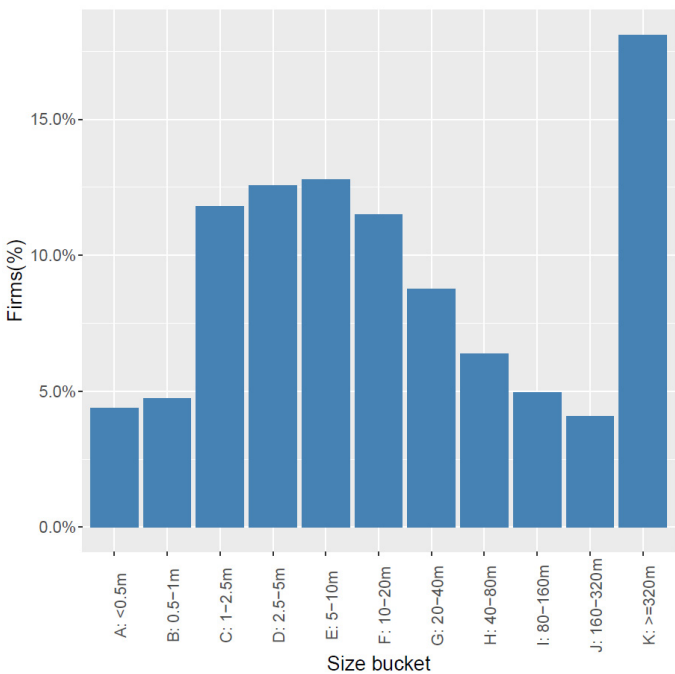
Exhibit 1: Industry and geographic distribution for middle-market firms in the COVID-19 exercise sample



Source: Moody's Analytics Data Alliance

Exhibit 2 shows the distribution of firms by total asset size. Over half of the firms in the sample have total assets between \$1 million and \$40 million. Approximately 16% of the sample has total assets greater than \$320 million.

Exhibit 2: Distribution by total assets for middle-market firms in the COVID-19 exercise sample

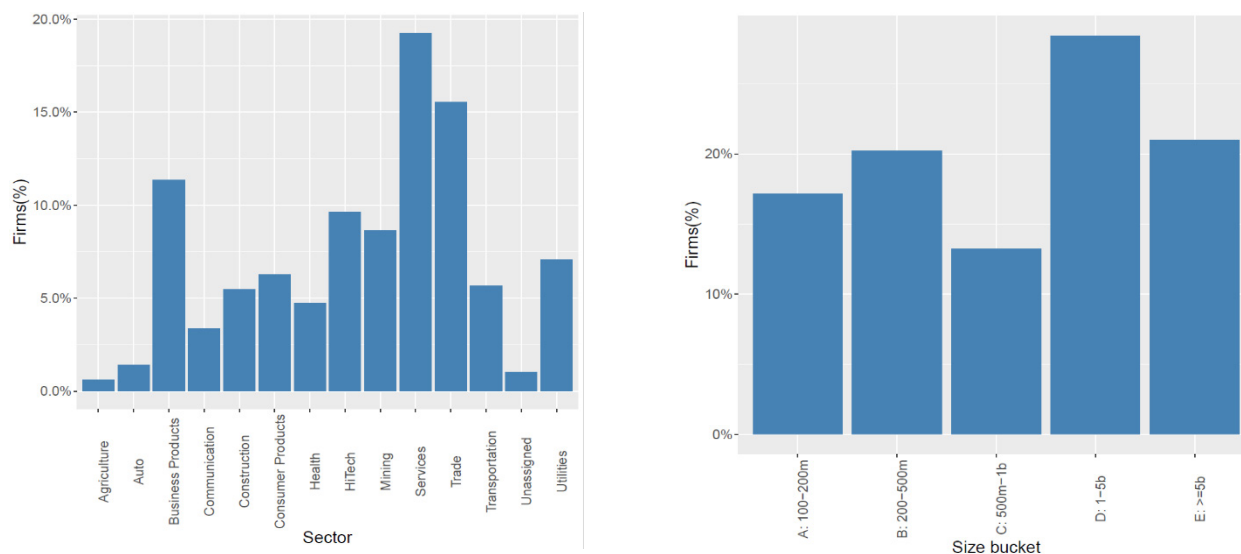


Source: Moody's Analytics Data Alliance

Large firm data

The large firm sample includes 10,000 private and public firms. Over 90% of the firms are in the United States, and the rest of the firms are in Canada. Exhibit 3 shows the distribution of firms by industry on the left and by total asset size on the right. Services, Trade, and Business Products are the most-represented industries in the sample. Total asset size for this sample has a lower boundary of \$100 million.

Exhibit 3: Distribution of large firms in the COVID-19 exercise sample by industry and total assets



Source: Moody's Analytics Data Alliance

Analysis and results

Methodology

We run two sets of analyses in this exercise. The first set focuses on the impact of COVID-19 and the oil price shocks on default risk for middle-market borrowers. The second set of analyses focuses on large firm borrowers. Both models are using financial statements data and associated default observations on historical data samples with defining characteristics similar to those of the data samples used in this exercise. We evaluate firms by their PD measure. Each model produces through-the-cycle default risk measures using only firms' financial statements without any consideration of the prevailing credit cycle conditions. Each model also produces point-in-time default risk measures that account for the credit cycle by translating public equity market signals for large firms. For middle-market firms, the PIT PD also accounts for unemployment rate by state. Both models use a common mapping to translate an PD into an PD-implied rating.¹

We compare these three measures to evaluate how COVID-19 has changed point-in-time probability of default measures from pre-COVID-19 levels and to what extent COVID-19 point-in-time probability of default measures exceed through-the-cycle probability of default measures. We perform this analysis at an industry level and at the risk-band level within industries.

Middle-market analysis

Construction, Services, and Transportation see the greatest increase in risk, while Services and Communication remain the riskiest sectors

Exhibit 4 identifies increased PIT PDs and implied PIT ratings across all industries from the pre-COVID-19 PIT PD to the COVID-19 PIT PD. The pre-COVID-19 PIT is the point-in-time probability of default risk measure that reflects the lower-risk credit cycle conditions just before the coronavirus pandemic. The COVID-19 PIT PD includes the economic stress caused by the coronavirus and oil price shocks. The Construction, Services, and Transportation sectors have the greatest average increase due to COVID-19.

¹ The PD-implied or EDF-implied rating is generally consistent with the default rates of bond ratings as measured by Moody's Investors Service Default Studies.

Healthcare, High Tech, and Agriculture see the smallest average PIT PD movement. All sectors see at least a one-grade downgrade on average. Construction sees the largest rating downgrade for its firms, 1.76 rating grades on average, while on the lowest end High Tech sees a 1.08 rating grade downgrade on average (for example, one rating grade change would be from Baa2 to Baa3).

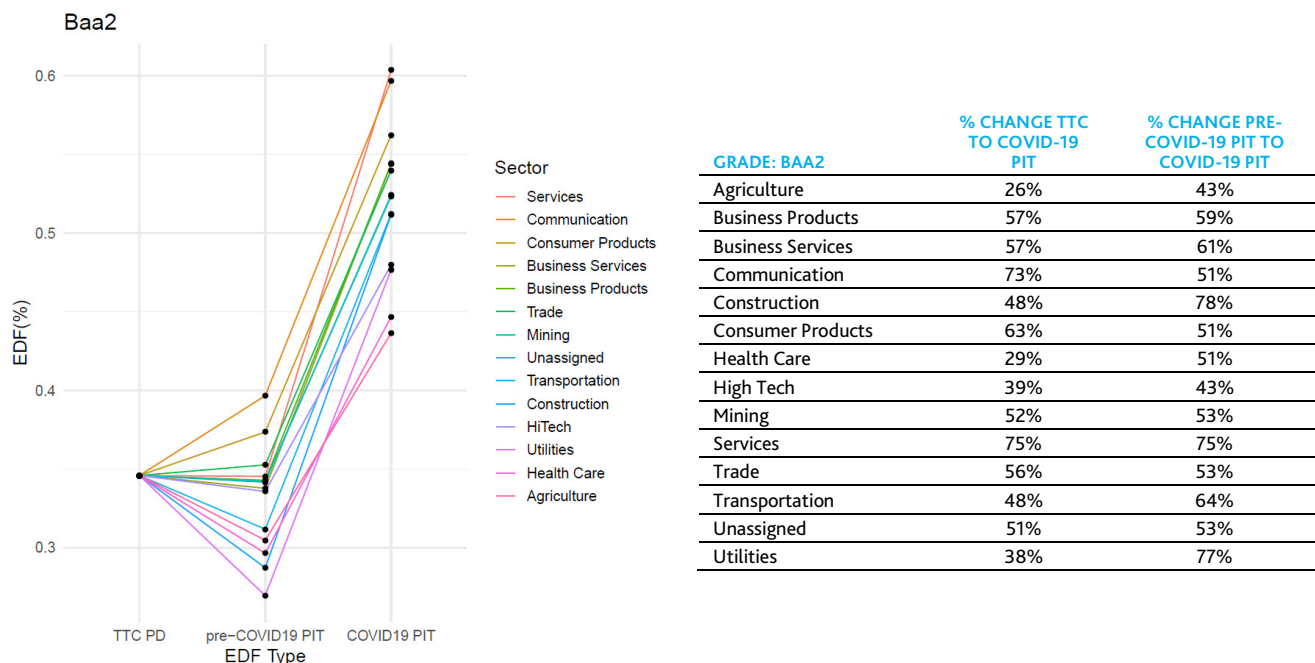
Exhibit 4: Change in implied ratings and PIT PD from the pre-COVID-19 to the COVID-19 for middle-market firms

SECTOR	AVERAGE IMPLIED RATING CHANGE (PRE-COVID-19 TO COVID-19 PIT)	AVERAGE CHANGE IN PIT PD (PRE-COVID-19 TO COVID-19 PIT)
Construction	1.76	117%
Services	1.64	99%
Transportation	1.51	91%
Utilities	1.53	84%
Business Products	1.36	82%
Business Services	1.39	81%
Unassigned	1.29	76%
Trade	1.27	73%
Communication	1.17	71%
Mining	1.25	71%
Consumer Products	1.17	70%
Agriculture	1.15	60%
Health Care	1.20	59%
High Tech	1.08	55%

Exhibit 4 shows how the pandemic drives change in the PIT PD and PIT PD-implied rating on an industry level. We further break down the impact by rating grades. Exhibit 5 is a further breakdown of Exhibit 4. Exhibit 5 takes a firm whose financial ratios imply a TTC PD rating of Baa2 (~0.35% PD) and then applies the pre-COVID-19 credit cycle adjustment and the COVID-19 credit cycle adjustment of each industry to see how COVID-19 affects default probability at different starting risk levels. The pre-COVID-19 PIT PD shows that before the coronavirus, some industries were in a stronger credit cycle than others. Following the onset of COVID-19, all industries suffer an increase of credit risk per the COVID-19 PIT PD, although it maintains nearly the same rank ordering as before. Services and Communication see their default risk increase and remain the riskiest sectors. Utilities jumps from lowest risk to third lowest as the Healthcare and Agriculture sectors' risk increases less.

The table on the right in Exhibit 5 measures the PD movement for each sector from the TTC to the COVID-19 PIT PD. Users can apply this percentage change to their TTC PD to approximate the impact of the coronavirus on their portfolio. Exhibit 5 also measures the PD movement for each sector from the pre-COVID-19 PIT PD to the COVID-19 PIT PD. Users can apply this percentage change to their pre-COVID-19 PIT PD or equivalent point-in-time probability of default measure to approximate the impact of COVID-19 on their portfolio. For example, if you have an agriculture firm that has a risk profile similar to a Baa2 risk rating with a TTC PD of 0.35%, you can multiply that 0.35% TTC PD by (1 + 26%) to get a point-in-time default risk measure of 0.44% that incorporates the coronavirus credit cycle stressors. If you have an agriculture firm that has a pre-COVID-19 PIT PD of 0.31%, you can multiply that 0.31% PIT PD by (1 + 43%) to adjust the point-in-time default risk measure for COVID-19, resulting in a COVID-19 PIT PD of 0.44%. Appendix II: Expected Movements in PIT PD Due to COVID-19 presents tables with percentage change adjustments for each industry and implied-rating grade combination.

Exhibit 5: Change from the TTC PD and pre-COVID-19 PIT PD to the COVID-19 PIT PD by industry for Baa2 middle-market firms



Large firm analysis

Construction shows the greatest increase, while Consumer Products, Auto, and Trade lead the pack in default risk

Large firms behave similarly to middle-market firms in this exercise. Exhibit 6 shows that Construction has the largest movement in PIT PDs and average ratings due to the coronavirus and oil shocks. Transportation, Utilities, and Services are close behind. High Tech and Agriculture have less substantial movement, as does Mining. The difference in the Mining sector's middle-market results and large firm results is due to the sector's already-elevated default risk before the pandemic's onset and the mix of firm types within the Mining sector. Oil and Gas firms make up a smaller portion of the mining sector in the large firm data than in the middle-market data.

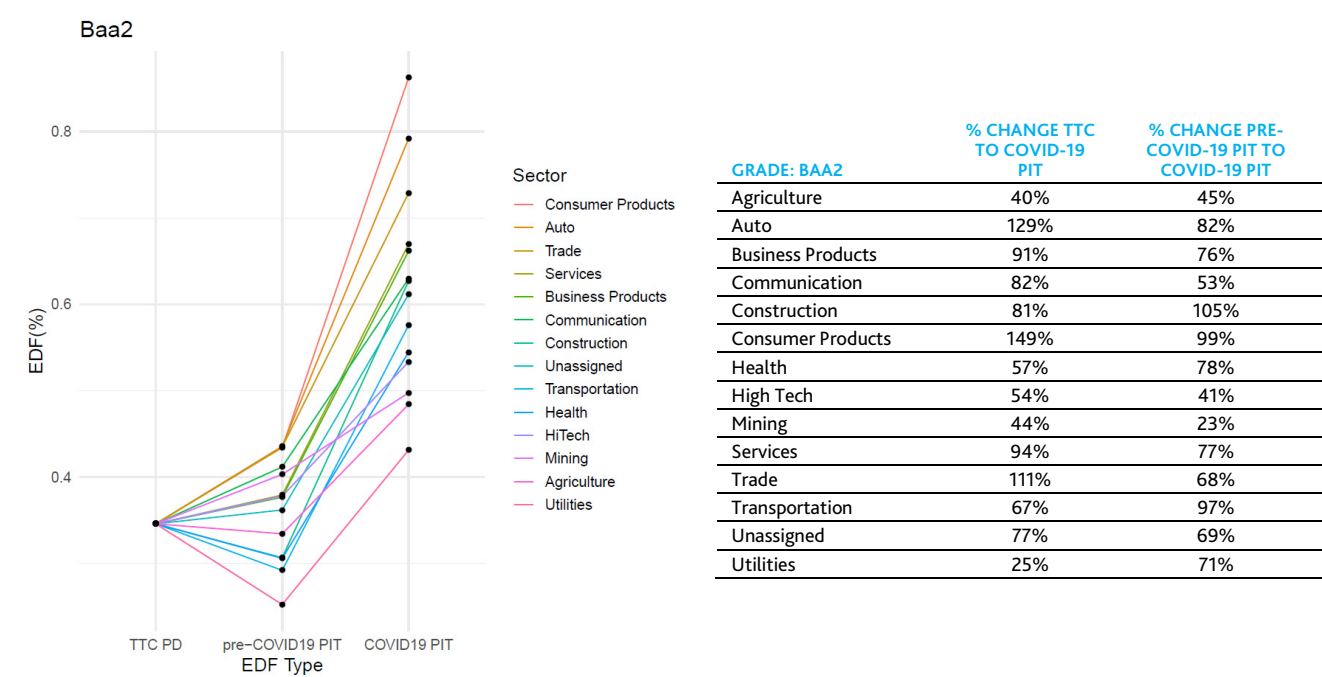
Exhibit 6: Change in implied ratings and PIT PD from the pre-COVID-19 to the COVID-19 large firms

SECTOR	AVERAGE IMPLIED RATING CHANGE (PRE-COVID-19 TO COVID-19 PIT)	AVERAGE CHANGE IN PIT PD (PRE-COVID-19 TO COVID-19 PIT)
Construction	1.49	83%
Transportation	1.45	79%
Utilities	1.52	78%
Services	1.35	77%
Consumer Products	1.33	72%
Business Products	1.39	70%
Health	1.21	68%
Auto	1.23	65%
Trade	1.09	62%
Unassigned	1.27	60%
Communication	0.97	52%
Agriculture	0.88	45%
High Tech	0.76	40%
Mining	0.58	27%

Exhibit 7 charts the default risk progression from the TTC PD and pre-COVID-19 PIT PD to the COVID-19 PIT PD for a Baa2 large firm. We see the Consumer Products risk more than doubles while Auto and Trade PDs nearly double, reflecting the additional impact on industries already under some pressure. Utilities and Agriculture remain near the bottom in terms of rank ordering.

The table on the right in Exhibit 7 presents the PD percentage change for each sector from the TTC to pre-COVID-19 PIT PD as well as the percentage change from pre-COVID-19 PIT PD to the COVID-19 PIT PD. Users can apply the same logic to their large firms to adjust their PDs as presented in the middle-market analysis results, multiplying their starting PD by the appropriate percentage change to approximate the COVID-19 PIT PD. For example, if you have an agriculture firm that has a risk profile similar to a Baa2 risk rating with a TTC PD of 0.35%, you can multiply that 0.35% TTC PD by (1 + 40%) to get a point-in-time default risk measure of 0.49% that incorporates COVID-19 credit cycle stressors. If you have an agriculture firm that has a pre-COVID-19 PIT PD of 0.34%, you can multiply that 0.34% pre-COVID-19 PIT PD by (1 + 45%) to adjust the point-in-time default risk measure for the coronavirus, resulting in a COVID-19 PIT PD of 0.49%. Appendix II: Expected Movements in PIT PD Due to COVID-19 presents tables with percentage change adjustments for each industry and implied-rating grade combination.

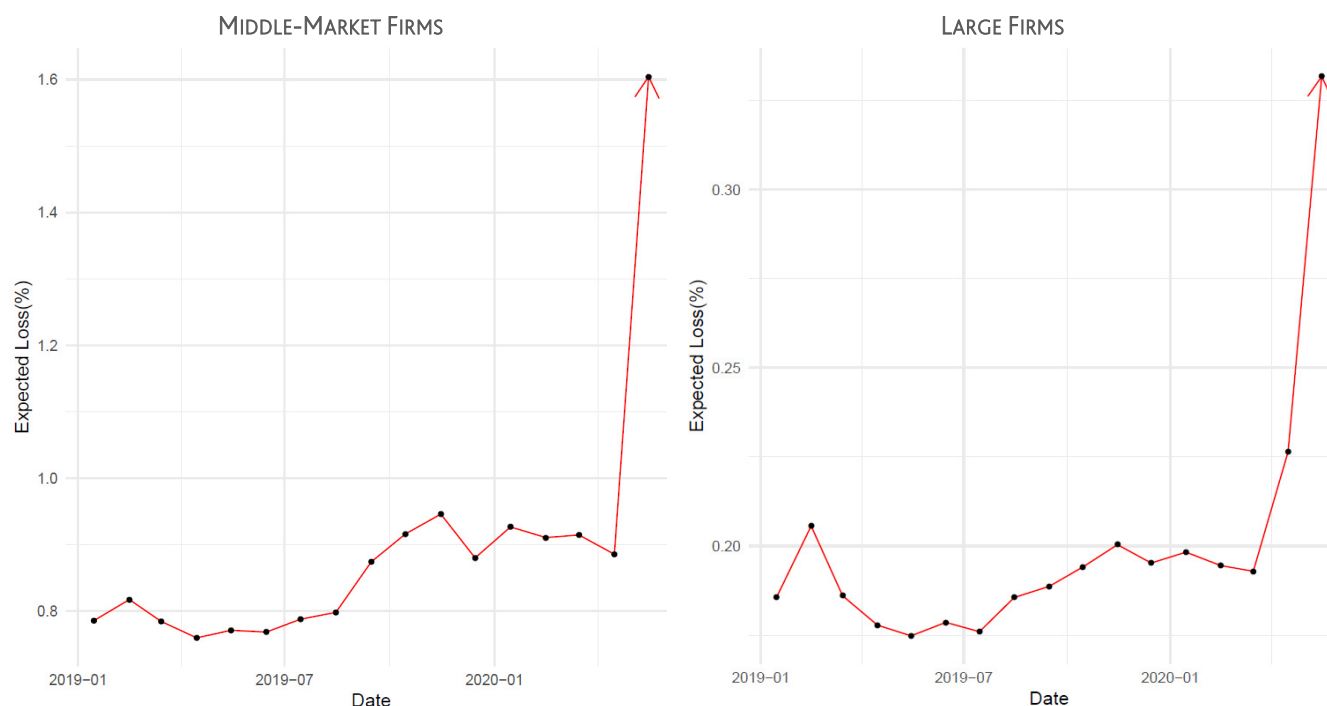
Exhibit 7: Change from the TTC PD and pre-COVID-19 PIT PD to the COVID-19 PIT PD by industry for Baa2 large firms



Impact on expected losses

To assess potential impacts on expected losses, we assume a constant loss given default (LGD) of 50% and multiply it by our monthly weighted average PIT PDs. Exhibit 8 charts the weighted average expected loss rates beginning in January 2019 through March 24, 2020. The final datapoint shows the COVID-19 PIT PD based on the latest coronavirus and oil price shock credit cycle information. We see expected loss rates increase by nearly 80%.

Exhibit 8: Progression of expected loss rates for middle-market and large firms



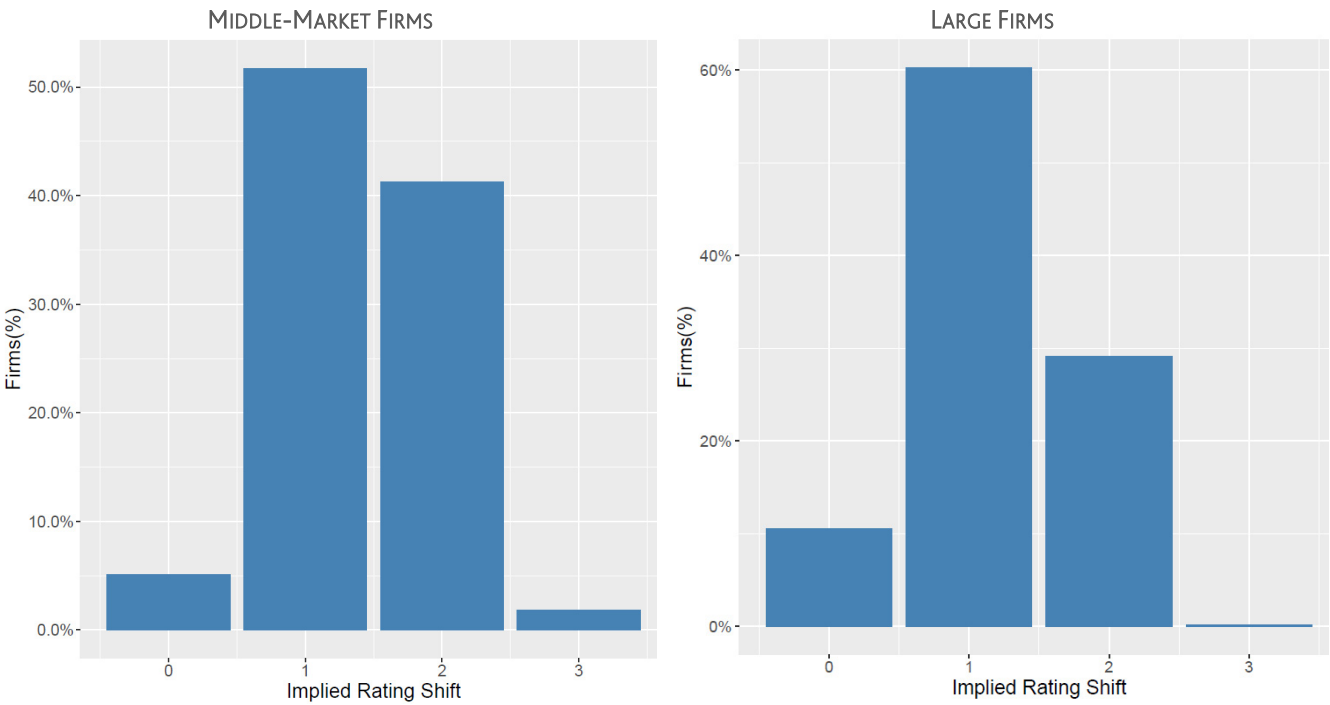
Conclusion

The recent global coronavirus contagion and the drop in oil prices has shocked firms across all sectors and sizes. Month-over-month, we typically do not expect many PIT risk rating grade changes—and if there are changes, they are typically not more than a one-rating grade upgrade or downgrade. Exhibit 9 illustrates that COVID-19 and oil price shocks have, in general, downgraded borrowers by one or two rating grades across sectors and firm sizes. Although their default probability is increasing, roughly 5% of middle-market and 10% of large firm borrowers see no rating grade impact. More than 50% of middle-market firms see a one-grade downgrade and nearly 40% see a two-grade downgrade. Approximately 60% of large firms see a one-grade downgrade and nearly 30% see a two-grade downgrade.

Construction, Transportation, and Services sectors see the largest increase in default risk, while industries already showing some signs of weakness before COVID-19 continue to outpace other sectors in terms of absolute default risk. This includes Services and Communication middle-market firms and Consumer Products, Auto, and Trade large firms.

For our analysis, we use an estimated unemployment rate of 5.4% and incorporate the public equity market signals through March 24, 2020. We continue to watch for the latest unemployment figures that may increase or reduce the PIT PD.

Exhibit 9: Change in implied ratings from the pre-COVID-19 PIT PD to the COVID-19 PIT PD for middle-market and large firms (all downgrades)



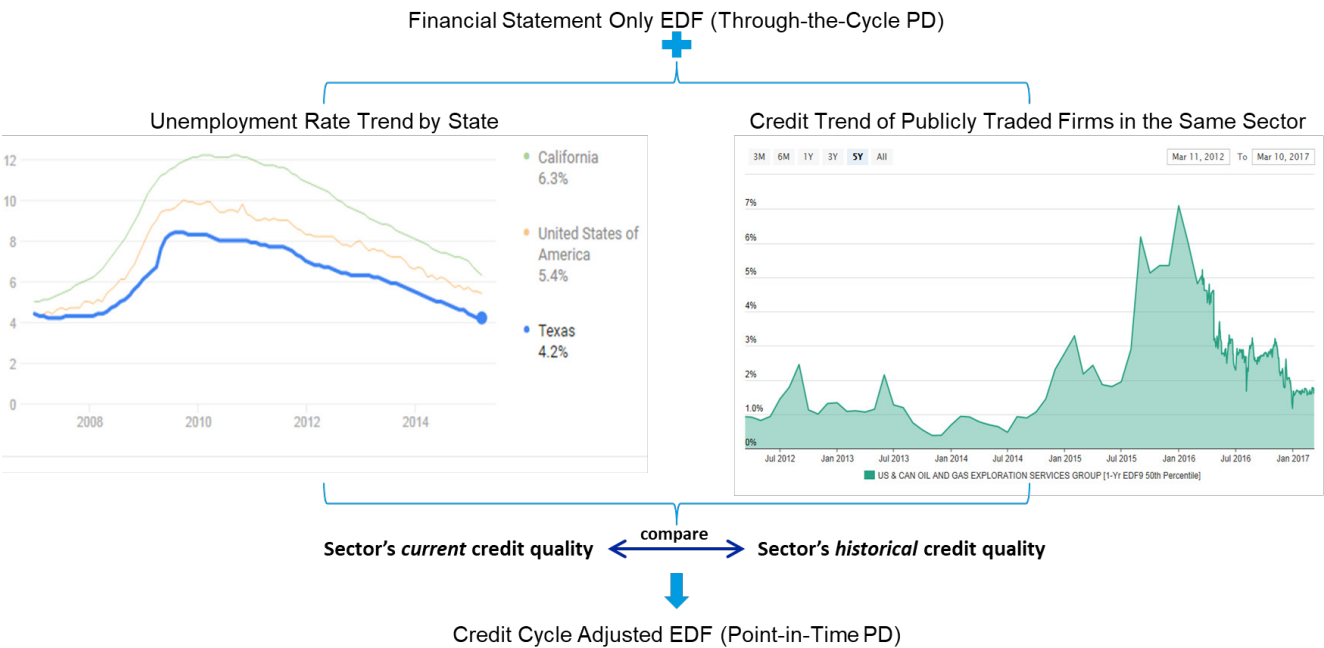
Appendixes

Appendix I: Credit Cycle Adjustment Overview

The credit cycle adjustment (CCA) model produces our PIT risk measures. It accounts for the credit cycle by combining the distance-to-default (DD) and (for middle-market US Corporate) unemployment rate by state. DD factors for a given month are obtained in the beginning of the next month. Data goes through quality checks and additional transformations to be released in the CCA for the following month. Unemployment-related adjustments are updated in the CCA with a two-month lag. For this exercise, we have updated the CCA to reflect data as of March 24, 2020.

Exhibit 10 illustrates the progression of the through-the-cycle default risk measure through our financial statement only (FSO) model (TTC PD model) before applying the adjustment to produce the point-in-time CCA default risk measure. The CCA model demonstrates how the current market signals compare to historical market signals. If the current credit environment is better than the historical average, we adjust the FSO expected default frequency (EDF) down to arrive at a less risky CCA EDF. If the current credit environment is worse than the historical average, we adjust the FSO EDF up to arrive at a riskier CCA EDF. Note that this methodology does not include unemployment. EDF is Moody's Analytics nomenclature for probability of default.

Exhibit 10: Illustrative progression of the CCA model



Appendix II: Expected Movements in PIT PD Due to COVID-19

Middle-market movements

If you are using the RiskCalc™ CCA EDF (PIT PD) with an analysis date in March, the CCA EDF is using credit cycle information from the end of January. Exhibit 11 shows the expected change in CCA EDF when using the latest credit market signals and unemployment data as of March 24, 2020. These tables help users bridge the gap to the latest coronavirus and oil price shocks.

Exhibit 11: Change in PD from the pre-COVID-19 PIT PD to the COVID-19 PIT PD

SECTOR	A1	A2	A3	BAA1	BAA2	BAA3	BA1	BA2	BA3	B1	B2	B3	CAA/C
Agriculture	12%	20%	32%	38%	43%	52%	72%	72%	79%	76%	98%	87%	41%
Business Products	16%	32%	45%	50%	59%	83%	92%	101%	97%	118%	122%	85%	50%
Business Services	17%	33%	47%	53%	61%	86%	97%	106%	102%	124%	130%	90%	53%
Communication	15%	31%	40%	44%	51%	76%	76%	84%	85%	106%	82%	55%	41%
Construction	20%	37%	57%	68%	78%	106%	134%	140%	145%	167%	177%	154%	71%
Consumer Products	14%	29%	39%	43%	51%	72%	75%	83%	79%	100%	88%	60%	41%
Health Care	14%	24%	37%	44%	51%	62%	84%	86%	94%	93%	114%	104%	47%
High Tech	12%	22%	33%	38%	43%	58%	67%	72%	75%	80%	97%	71%	38%
Mining	15%	29%	41%	47%	53%	75%	84%	91%	90%	106%	114%	80%	46%
Services	20%	41%	58%	65%	75%	109%	120%	131%	137%	155%	145%	100%	62%
Trade	15%	30%	41%	46%	53%	76%	83%	90%	87%	106%	107%	74%	45%
Transportation	17%	32%	48%	56%	64%	88%	107%	111%	114%	132%	146%	112%	57%
Unassigned	15%	29%	41%	46%	53%	74%	83%	90%	89%	105%	113%	79%	46%
Utilities	20%	35%	54%	66%	77%	101%	130%	140%	148%	161%	178%	176%	73%

Exhibit 12 identifies the expected change in CCA EDF (PIT PD) relative to the FSO EDF (TTC PD) when using the latest credit market signals and unemployment data as of March 24, 2020.

Exhibit 12: Change in PD from the TTC to the COVID-19 PIT PD

SECTOR	A1	A2	A3	BAA1	BAA2	BAA3	BA1	BA2	BA3	B1	B2	B3	CAA/C
Agriculture	8%	13%	20%	23%	26%	32%	40%	42%	45%	41%	57%	45%	24%
Business Products	16%	31%	44%	49%	57%	81%	90%	98%	94%	115%	118%	82%	49%
Business Services	16%	31%	45%	49%	57%	81%	90%	98%	95%	116%	118%	82%	49%
Communication	20%	40%	56%	64%	73%	105%	117%	127%	132%	150%	142%	98%	61%
Construction	14%	26%	37%	42%	48%	67%	75%	80%	80%	94%	102%	72%	42%
Consumer Products	17%	34%	49%	54%	63%	90%	99%	109%	106%	128%	126%	88%	53%
Health Care	8%	15%	22%	26%	29%	37%	44%	47%	50%	48%	63%	48%	26%
High Tech	11%	21%	30%	34%	39%	53%	60%	64%	66%	72%	84%	62%	34%
Mining	15%	28%	40%	45%	52%	72%	81%	87%	86%	102%	108%	76%	45%
Services	20%	41%	58%	65%	75%	108%	120%	130%	137%	155%	144%	100%	62%
Trade	16%	31%	44%	48%	56%	79%	88%	96%	93%	113%	116%	81%	48%
Transportation	14%	26%	37%	42%	48%	67%	75%	80%	81%	94%	102%	72%	42%
Unassigned	14%	28%	40%	45%	51%	72%	80%	87%	86%	102%	108%	76%	44%
Utilities	11%	20%	29%	34%	38%	51%	58%	62%	65%	69%	82%	61%	34%

Large firm movements

If you are using the CCA EDF (PIT PD) with an analysis date in March, the CCA EDF is using credit cycle information from the end of January. Exhibit 13 identifies the expected change in CCA EDF when using the latest credit market signals and unemployment data as of March 24, 2020. These tables help users bridge the gap to the latest COVID-19 and oil price shocks.

Exhibit 13: Change in PD from the pre-COVID-19 PIT PD to the COVID-19 PIT PD

SECTOR	AAA	AA1	AA2	AA3	A1	A2	A3	BAA1	BAA2	BAA3	BA1	BA2	BA3	B1	B2	B3	CAA/C
Business Products	27%	47%	111%	95%	48%	42%	44%	66%	76%	84%	65%	66%	83%	130%	132%	119%	96%
High Tech	16%	22%	66%	43%	23%	23%	25%	31%	41%	54%	28%	32%	34%	64%	72%	66%	54%
Construction	29%	48%	116%	123%	78%	58%	52%	71%	105%	108%	100%	85%	92%	161%	160%	156%	119%
Communication	20%	34%	88%	62%	30%	32%	25%	51%	53%	58%	49%	43%	52%	85%	92%	80%	65%
Trade	25%	45%	77%	72%	29%	40%	45%	60%	68%	69%	52%	48%	84%	107%	103%	91%	76%
Services	28%	50%	112%	94%	48%	42%	47%	66%	77%	88%	67%	69%	87%	135%	137%	123%	99%
Mining	10%	13%	48%	24%	12%	13%	16%	18%	23%	34%	22%	21%	16%	41%	48%	43%	35%
Unassigned	23%	37%	107%	85%	52%	41%	37%	56%	69%	71%	53%	52%	65%	107%	112%	103%	82%
Consumer Products	31%	49%	95%	76%	36%	46%	62%	79%	99%	75%	62%	51%	106%	134%	128%	112%	94%
Auto	28%	46%	84%	72%	30%	43%	53%	68%	82%	70%	55%	49%	94%	117%	112%	98%	83%
Health	22%	32%	79%	80%	52%	45%	43%	46%	78%	92%	69%	63%	59%	112%	117%	118%	90%
Agriculture	15%	20%	57%	56%	41%	29%	34%	25%	45%	53%	40%	38%	31%	70%	74%	74%	58%
Transportation	26%	40%	97%	102%	70%	52%	47%	58%	97%	107%	85%	74%	75%	138%	145%	146%	110%
Utilities	22%	31%	75%	114%	105%	54%	58%	48%	71%	90%	101%	76%	69%	97%	147%	151%	125%

Exhibit 14 identifies the expected change in CCA EDF (PIT PD) relative to the FSO EDF (TTC PD) when using the latest credit market signals and unemployment data as of March 24, 2020.

Exhibit 14: Change in PD from the TTC to the COVID-19 PIT PD

SECTOR	AAA	AA1	AA2	AA3	A1	A2	A3	BAA1	BAA2	BAA3	BA1	BA2	BA3	B1	B2	B3	CAA/C
Agriculture	14%	19%	56%	52%	37%	25%	30%	24%	40%	48%	34%	34%	29%	64%	68%	67%	53%
Auto	40%	65%	155%	127%	74%	70%	88%	91%	129%	116%	97%	85%	138%	211%	205%	188%	149%
Business Products	30%	51%	114%	119%	67%	56%	55%	72%	91%	101%	76%	77%	96%	152%	152%	142%	112%
Communication	26%	43%	111%	104%	63%	51%	45%	64%	82%	85%	66%	65%	79%	128%	131%	123%	97%
Construction	26%	42%	111%	103%	63%	51%	45%	63%	81%	84%	66%	64%	78%	126%	130%	121%	96%
Consumer Products	43%	67%	165%	129%	81%	72%	98%	102%	149%	121%	103%	87%	152%	230%	222%	204%	161%
Health	19%	27%	74%	63%	39%	38%	36%	39%	57%	69%	40%	44%	47%	84%	91%	87%	69%
High Tech	18%	26%	69%	61%	39%	36%	36%	36%	54%	68%	37%	42%	44%	80%	87%	84%	66%
Mining	15%	20%	59%	55%	37%	28%	32%	28%	44%	54%	35%	36%	33%	69%	74%	72%	57%
Services	31%	54%	116%	120%	68%	58%	59%	73%	94%	105%	79%	81%	101%	160%	159%	148%	117%
Trade	37%	63%	144%	125%	72%	66%	78%	82%	111%	114%	92%	84%	126%	194%	189%	174%	138%
Transportation	21%	32%	88%	75%	48%	43%	39%	47%	67%	73%	48%	49%	56%	97%	103%	98%	77%
Unassigned	24%	39%	109%	96%	61%	49%	43%	58%	77%	79%	60%	59%	71%	117%	121%	114%	90%
Utilities	8%	11%	30%	29%	33%	18%	21%	12%	25%	25%	22%	22%	22%	37%	36%	39%	30%

Appendix III: Average Probability of Default by Rating Grade

Exhibit 15 presents the average EDF (or PD) by rating grade.

Exhibit 15: Average PD by rating grade

RATING	AVERAGE PD
Aaa	0.01%
Aa1	0.02%
Aa2	0.04%
Aa3	0.07%
A1	0.11%
A2	0.16%
A3	0.20%
Baa1	0.25%
Baa2	0.35%
Baa3	0.53%
Ba1	0.85%
Ba2	1.35%
Ba3	2.02%
B1	3.03%
B2	4.55%
B3	6.82%
Caa/C	17.10%

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