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Anatomy of Corporate Credit Spreads: The Great Recession vs. COVID-19*

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Preliminary

Abstract

We compare the evolution of corporate credit spreads during the Great Recession and the COVID-19 pandemic. The two crises featured increases of similar magnitudes in the median and cross-sectional dispersion of credit spreads, but the pandemic was short-lived and different sectors were affected. The micro-data reveal larger differences between the two episodes: the Great Recession featured an increase in the across-firm dispersion, and leverage was an important predictor of credit spreads. Differently, the COVID-19 crisis displayed a larger increase in within-firm dispersion, and funding liquidity was a more important predictor of movements in spreads. These findings suggest that, at the corporate level, the Great Recession was primarily a solvency crisis, while COVID-19 was a liquidity crisis.

JEL Classification: E44, G12, G32.

Keywords: Credit Spreads, Great Recession, COVID-19.

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1 Introduction

The COVID-19 pandemic has caused significant disruption in economic activity across the globe. Financial markets, in particular, have experienced surges in volatility that have not been seen since the 2007-09 financial crisis. Policymakers have responded by deploying a variety of measures aimed at stabilizing these markets and preventing a full-blown financial crisis. The Federal Reserve, in particular, has returned to its financial crisis toolkit by creating facilities to purchase asset-backed securities (such as mortgage-backed securities) and other types of securities (such as corporate debt).

In this paper, we compare the evolution of corporate credit spreads around the COVID-19 pandemic and the Great Recession. We try to compare the nature of the two crises and policy responses. Is it that the economy suffered a similar shock in both episodes, or are the two crises characterized by different shocks? Our evidence suggests that the Great Recession was primarily a solvency crisis, while the COVID-19 crisis was more related to liquidity. The government, as a lender of last resort, may be better equipped to deal with liquidity rather than solvency crises; this may be one reason why the COVID-19 pandemic resulted in a shorter-lived crisis than the Great Recession.

Our analysis is based on maturity-matched corporate credit spreads as in Gilchrist and Zakrajsek (2012). In many respects, the aggregate behavior of corporate credit spreads was quantitatively and qualitatively similar in the two events, in spite of different dynamics and timing of policy responses. We find similar patterns of sectoral heterogeneity between the two events. In both cases, there was a clear sector outlier in terms of movements of credit spreads, but also in terms of real outcomes (such as changes in employment): Construction in the the Great Recession and Leisure & Hospitality in the COVID-19 crisis.

We also find a tight correlation between movements in average credit spreads and the dispersion of credit spreads across sectors for both events. This motivates us to focus on studying the entire distribution of credit spreads at each point in time and its higher order moments. Moments such as the average or median spread hide a significant amount of variation during the two crises, namely a significant increase in skewness. We perform a variance decomposition where we isolate what fraction of the variance of credit spreads can be attributed to differences between sectors, differences between firms in the same sector, and differences between bonds issued by the same firm. We find that differences between firms explain a larger share of the variation during the Great Recession, while "within-firm dispersion" (credit spread dispersion for bonds issued by the same firm) gained importance during the COVID-19 crisis. Given that default risk equally affects all bonds issued by the same firm (of equal seniority), these results suggest that the large increase in dispersion during the Great Recession is mostly attributable to solvency concerns, but the same is not true for the COVID-19 crisis. Other factors, such as market liquidity, may have been more important during the pandemic crisis.

Finally, we study how the change in credit spreads and their dispersion correlates with firm-level characteristics in the two events. Our findings suggest that measures of solvency such as leverage were key in explaining the rise in credit spreads during the Great Recession. For the COVID-19 pandemic we find, however, that measures of firm liquidity positions and buffers seem to have played a much more significant role than measures of solvency. Taken together, our results suggest that the Great Recession was primarily a solvency crisis, while the COVID-19 crisis was not so much about firm solvency but rather funding and market liquidity.

We believe that the evidence we uncover is important to understand some of the key differences between the two crises. While, as mentioned, there are many similar qualitative and quantitative patterns (such as the magnitude of the median increase, or the tight correlation between first and second moments across sectors), the dynamics of the two crises were different, as was the perceived effectiveness of the Fed's unconventional monetary policy measures. The timing of the interventions and expectations of market agents regarding those interventions were certainly different between the two crises. However, it could also be that while superficially similar, these two crises were caused by fundamentally different aggregate shocks, and that this played an important role in determining the effectiveness of the policy response.

Literature Our analysis is related to a large body of the literature that has emerged in the wake of the COVID-19 crisis and that analyzes the effects of this phenomenon on financial markets and policy interventions. We focus on work that is more closely related to this paper. Kargar et al. (2020) study the evolution of liquidity conditions in corporate bond markets during the pandemic and its aftermath. They find that liquidity in corporate bond markets deteriorated substantially before the Fed interventions, with traders shifting from corporate to agency trades. Exploiting differential eligibility conditions for the Fed's programs, they find large announcement effects on liquidity for eligible bonds. This analysis complements ours, as we find that the evolution of corporate credit spreads during the pandemic is less related to firm-specific characteristics during the pandemic (such as solvency) and more related to other factors, such as liquidity disruptions.

Boyarchenko et al. (2020b) and Gilchrist et al. (2020) directly study the effects of the Fed's programs on corporate credit spreads, analyzing the same type of maturity-matched spreads that we study in this paper and that are based on previous work by Gilchrist and Zakrajsek (2012). Both studies focus on Federal Reserve programs directly involved with corporate bond purchases and find large positive effects of these programs. Boyarchenko et al. (2020b) focus on both the primary and secondary market facilities (PMCCF and SMCCF) and attribute about one third of the total effect to the announcement, with the remainder being associated with the purchases themselves. Gilchrist et al. (2020) focus on the secondary market program (SMCCF) and find a 70 bp reduction in credit spreads for eligible bonds on announcement. They find a particularly significant effect on "fallen angels," companies that were downgraded during this period. They also find additional effects from the purchases themselves. We complement these authors' analysis by focusing on the determinants of credit spread increases before the Fed interventions.

Also related to our work is a series of blog posts by Crouzet and Gourio (2020), who study the financial position of US public companies before and during the pandemic. Their analysis emphasizes the COVID-19 crisis as a funding liquidity shock, and the risks that this poses to US corporations. In this paper, we find that funding liquidity seems to have been a major driver of changes in corporate borrowing costs during the pandemic, even more so than pre-pandemic solvency conditions.

2 Data

We construct a weekly panel of US corporate bond spreads from the beginning of 2002 through the duration of the COVID-19 pandemic, July 2020. We closely follow Gilchrist and Zakrajsek (2012) in estimating credit spreads by first constructing synthetic securities, which mimic cash flow of bonds, but discounting by risk-free rate for the corresponding maturity. Credit spreads are then the difference between the yield-to-maturity of the corporate bond and the yield-to-maturity of the synthetic bond. To estimate the credit spreads we require secondary market prices, risk-free rates, and bond characteristics to reconstruct the cash flows for the observed bonds.

Secondary market price of corporate bonds are sourced from the TRACE database. TRACE provides transaction-level data on bond trades with information on trade execution time, price, and quantity traded.[1] We clean TRACE data following Dick-Nielsen and Poulsen (2019), taking

[1]We're using TRACE data recently released before further dissemination of trade information. As a conse-

care of cancellations and reversals in reported transactions. We aggregate the transaction level data to the weekly level, creating a weekly panel of bond prices.[2]

Bond characteristics are sourced from Mergent FISD, which covers a significant number of US corporate issues. Data on bond issuance and maturity date, coupon, principal, and issuer are available. We combine bond characteristics from Mergent FISD with weekly secondary market prices for corporate issues. For an issuer f, bond i, on week t from TRACE we observe a trading price p_{ift}, and with FISD's data on bond characteristics we can construct cash flows $\{C_{ifs}\}_{s=t_{0i}}^{s=T_i}$, where t_{0i} and T_i are the issuance and maturity dates of bond i, respectively.

2.1 Credit Spreads

The yield to maturity (YTM) of a bond is denoted y_{ift} and solves the following equation:

$$p_{ift} = \sum_{s=1}^{T_i - t} \frac{C_{ift+s}}{(1 + y_{ift})^{s/52}}$$

As stated previously, to avoid duration mismatch between the YTM described and yields on treasury securities, we follow Gilchrist and Zakrajsek (2012) in constructing a synthetic risk-free security that replicates the cash flows of a corporate bond. Let $y_{t,s}^{RF}$ be the yield on treasuries at date t and maturity s. We obtain data on the yield curve of treasuries from Gurkaynak et al. (2007).[3] Using the sequence of cash flows, we compute price of the synthetic security as:

$$p_{ift}^{RF} = \sum_{s=1}^{T_i - t} \frac{C_{ift+s}}{(1 + y_{t,s}^{RF})^{s/52}}$$

Then we compute the risk-free YTM for this synthetic price y_{ift}^{RF} by solving:

$$p_{ift}^{RF} = \sum_{s=1}^{T_i - t} \frac{C_{ift+s}}{(1 + y_{ift}^{RF})^{s/52}}$$

The maturity-adjusted credit spread is the difference between the two computed yields:

$$s_{ift} = y_{ift} - y_{ift}^{RF} \tag{1}$$

We also broadly follow Gilchrist and Zakrajsek (2012) in terms of sample selection. We keep

quence, for some large trades only a lower bound on the quantity traded is reported.

[2] Weekly bond prices are average trading price for a bond within a week, weighted by trade volume.

[3] Data can be downloaded from the Federal Reserve Board https://www.federalreserve.gov/data/nominal-yield-curve.htm.

Table 1: Summary Statistics of Bond Panel

Variable	Mean	SD	Min	Median	Max
Number of bonds per firm/week	5.53	19.64	1.00	2.00	828.00
Market value of issue (mil)	208.58	250.25	1.00	145.10	6422.77
Maturity at issue (years)	9.40	6.93	1.00	8.00	30.00
Coupon (pct.)	5.43	2.72	0.00	5.50	22.50
Credit Spread (basis points)	284.04	369.76	5.00	164.93	3499.99
Nominal yield (basis points)	611.39	472.94	17.55	528.43	10457.79
Number of observations	6,501,482				
Number of bonds	50,059				
Number of firms	3,646				
Callable (pct)	0.63				

only US corporate bonds, fixed- and zero-coupon bonds, bonds with credit spreads between 5 and 3500 basis points, issuance amount greater than $1 million, and maturity at issuance between 1 and 30 years. Table 1 reports summary statistics on this sample.[4]

Finally, we merge our bond panel with quarterly firm financial data from Compustat. We observe Compustat firms for 2002 to 2020. We use firm-ticker information from TRACE and Compustat to match issuers with their financial statements.[5] For firms matched in 2020:Q1 and 2020:Q2, since the link is for a quite recent period, we match unmatched bonds to Compustat with their 6-digit CUSIP ID. The summary statistics for this sub-sample of matched issues can be seen in Table A1 in the Data Appendix.[6]

3 The Great Recession vs. COVID-19

We start by comparing the Great Recession with the COVID-19 crisis in terms of aggregate credit spreads, credit spreads dispersion and differences across sectors.

3.1 Aggregate Changes in Credit Spreads

We begin our analysis by looking at aggregate measures of credit spreads, in the spirit of Gilchrist and Zakrajsek (2012), and comparing their evolution during the COVID-19 crisis to the financial crisis of 2007-08 and subsequent Great Recession. The first and second panels of Figure 1 plot the median credit spread around the Great Recession and the COVID-19 crisis,

[4]These summary statistics are very similar when only non-financial firms are included. In fact, our empirical results are robust to a sample of only non-financial firms. Results available upon request.

[5]We utilize the WRDS Bond-CRSP Link.

[6]It is important to note the definition of a firm in Table 1 is the parent or underwriting firm of the issue. In Table A1, the firm is identified by Compustat firm variable `GVKEY`.

respectively.[7] These panels highlight major events during these crises that serve as natural dividing points for the remainder of our analysis.

Panel (a) of Figure 1 plots the median spread starting on July 2007, when financial markets start displaying signs of potential stress. Median spreads hover around 120 bps in early Summer of 2007, when they start rising. There is a local peak of 300 bps in the first quarter of 2008, around the time of the failure (and rescue) of the investment bank Bear Stearns. The first dashed line corresponds to September 15, 2008, the date of the failure of the investment bank Lehman Brothers, which triggers a large jump in the median spread to about 600 bps. The second dashed line corresponds to the announcement of the first round of unconventional monetary policy measures by the Federal Reserve (including the first round of quantitative easing and the Term Asset-Backed Securities Loan Facility, TALF). The final dashed line corresponds to March 3, 2009, when TALF is implemented, and after which the median spread falls consistently, stabilizing at around 200 bps for the following year. The Lehman and TALF implementation dates are therefore natural dates to "bound" the crisis in the corporate bond market around the Great Recession.

Panel (b) of Figure 1 plots the median spread since the beginning of the year 2020. Starting from a stable level of around 100 bps, credit spreads start rising at the end of February 2020, as it starts becoming evident that COVID-19 would directly affect advanced economies. The first dashed line corresponds to February 28, 2020, the date of the largest single-week stock market decline since 2008. The median spread rises during March, reaching 500 bps, until the 23rd day of that month, when the Federal Reserve announces a series of interventions aimed at stabilizing financial markets. From then on, the median spread started falling, and by July 2020 it was already below 200 bps. Interestingly, and unlike in the Great Recession, most of the decrease seems to have been triggered by the announcement, and not necessarily the implementation, of most policy programs: the third dashed line corresponds to May 12, 2020, when the Secondary Market Corporate Credit Facility was implemented.

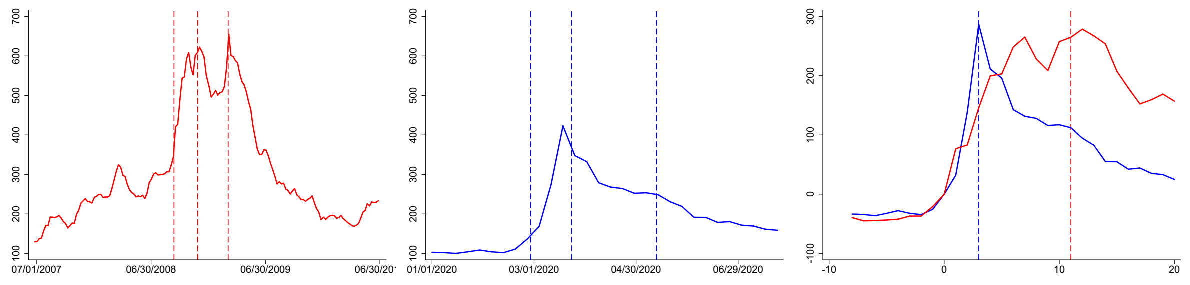
Panel (c) compares the two events, plotting the difference between the median spread and its value at the respective "crisis time zero" date, which we take to be September 15, 2008 for the Great Recession and February 28, 2020 for COVID-19. The vertical dashed lines correspond to the Fed policy announcements: the blue dashed line is March 23, 2020, and the red dashed line is November 25, 2008. This panel highlights that the onset of each crisis was relatively similar

[7] In this section we focus on the median instead of the mean because, as we document later on, the distribution of credit spreads features counter-cyclical skewness, which generates larger movements on the mean than the median.

in both cases and featured spread increases of similar magnitudes. Overall, there are two key differences between the behavior of median spreads in these two events: (i) the Great Recession was a much more slow-moving affair, with a sustained increase in spreads for a year before the onset of the crisis, and (ii) the Fed's announcements seem to have had a much smaller effect in containing spreads in 2008.

In what follows, we investigate whether the apparent similarities in overall dynamics and magnitudes may be masking important differences at more disaggregated levels. In particular, we are interested in understanding whether these two crises implied very different behavior for credit spreads in different sectors of the economy and for different firms.

Figure 1: Median Credit Spreads during the Great Recession and the COVID-19 Pandemic



(a) Great Recession (b) COVID-19 (c) Comparison

3.2 Credit Spreads and Real Activity across Sectors

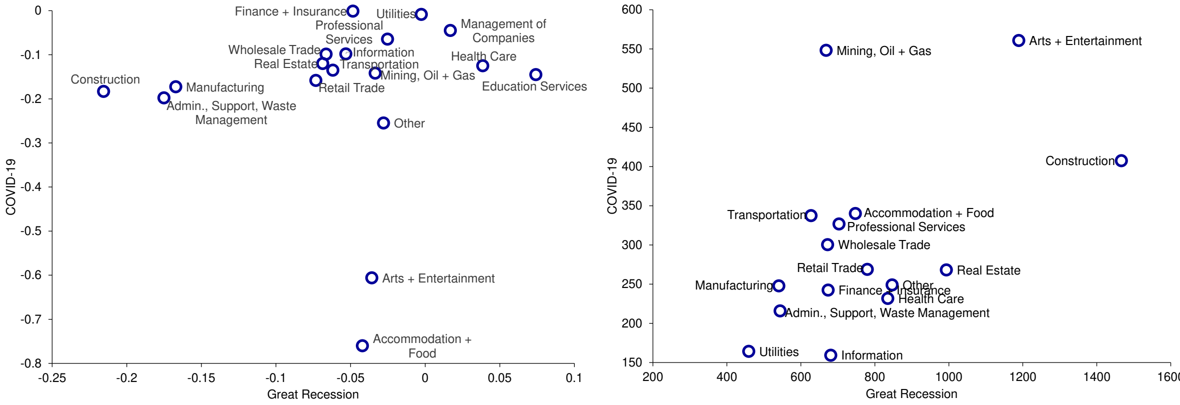
The COVID-19 crisis and associated Great Lockdown disproportionately affected some sectors of the economy, namely those that revolve around economic activities that require a high level of physical contact intensity (Famiglietti et al., 2020) or where the ability of working-from-home (WFH) is limited (Dingel and Neiman, 2020). However, the effect of aggregate shocks is usually heterogeneous across sectors not only for COVID-19 but for all recessions. In this section we explore whether *this time is different*, i.e., if COVID-19 manifested itself in substantially larger heterogeneity across sectors than did the Great Recession.

Figure 2 compares sectoral changes before and at the peak of the Great Recession and COVID-19 pandemic in hours of employment and mean credit spreads.[8] For the Great Recession, pre-crisis and peak-crisis dates for employment hours are July 2007 and March 2009, and the dates for credit spreads include two-week windows around both July 1, 2007 and March 3, 2009. For the COVID-19 pandemic, pre-crisis and peak-crisis dates for employment hours are January 2020 and April 2020, and for credit spreads include two-week windows around February

[8]Employment hours by sector are sourced from the CES survey and include hours of all employees.

1, 2020 and March 23, 2020. [9]

Figure 2: Changes in Credit Spreads and Hours of Employment by 2-digit NAICS Industry



(a) Hours of Employment

(b) Credit Spreads

Panel (a) of Figure 2 plots the percentage change in hours worked across 2-digit NAICS sectors during the Great Recession (horizontal axis) vs. the COVID-19 crisis (vertical axis). The COVID-19 crisis features relatively much larger declines in hours worked across all sectors, with Arts & Entertainment and Accommodation & Food being particularly affected with declines of around 80% between February 2020 and April 2020. By contrast, the Great Recession featured relatively smaller declines, but still a nontrivial amount of heterogeneity across sectors: Construction was the most affected sector, with hours declining by about 25% between July 2007 and March 2009. Other sectors such as Manufacturing also featured large declines, of about 15%. In terms of hours worked, a measure of real activity, the sectors that were most affected were very different between the two crises.

Panel (b) in the same Figure plots the change in credit spreads from bottom to peak for these two crises. The Great Recession features larger increases in spreads across the board, and again there is substantial variation across sectors in the two crises. Table 2 presents summary statistics regarding the increases in credit spreads and changes in hours worked across sectors for these two periods. One thing to note is that while there were Sector outliers both in terms of employment and credit spreads in each of the events, the coefficient of variation for changes in hours and credit spreads is relatively similar between the two events.

The Great Recession had larger effects on real estate, while COVID-19 had larger effects on services. However, the magnitude of the effects on those two sectors is quite similar. Both for Construction in 2008 and Services in 2020 employment contracted by about 3.5 standard

[9]Results in 2(b) are robust to increasing the window for mean spreads up to 8 weeks.

deviations. This similarity is not only for the outlier but holds across sectors. For example, both during the Great Recession and during COVID-19 the coefficient of variation of employment changes was about -1.05. As seen at the bottom of Table 2, these similarities also hold when looking at credit spreads instead of employment.

These sectoral comparisons do not account for the importance of each sector in the total economy. However, the most affected sectors in each period, Construction and Accommodation & Food, accounted for a similar share of total employment at the beginning of each event: 7.3% and 9.7%, respectively. A better measure of the importance of each sector in the economy is its centrality in terms of the input-output structure (Baqaee and Farhi, 2020). A measure of centrality that follows Carvalho (2014) yields similar values for the two sectors: 0.049 and 0.054, respectively.[10] Hence, it seems that both the Great Recession and the COVID-19 crisis are similar in terms of sectoral shock and dispersion, with the difference being that the former was a construction shock and the latter a service shock.

Table 2: Summary Statistics of Sectoral Credit Spreads and Employment Hours

	Credit spreads		Employment	
	Great Recession	COVID-19	Great Recession	COVID-19
Mean	776.75	304.27	-5.37	-18.42
Standard deviation	256.03	116.96	7.25	19.43
Min	459.24	159.31	-21.55	-76.02
Median	691.98	268.46	-4.52	-13.83
Max	1466.75	560.75	7.42	-0.11
CV	0.33	0.38	-1.35	-1.05
Outlier as SD	5.1	5.3	-3.4	-3.5

3.3 First and second moments

We now proceed to compare the evolution of first and second moments of credit spreads across sectors. Figure 3 plots the change in the first moment (mean) of credit spreads vs. the second moment (standard deviation) within each sector, for the Great Recession (panel a) and the COVID-19 crisis (panel b).[11]

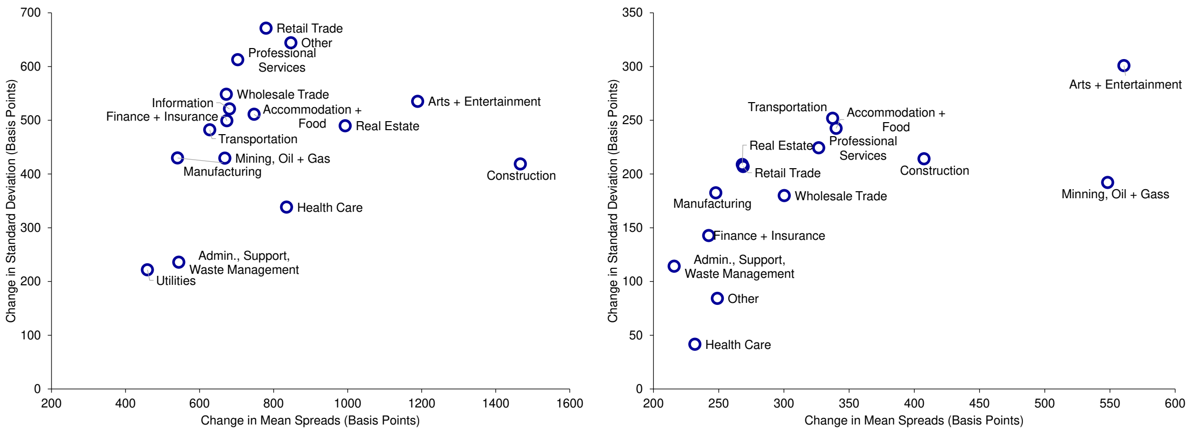
The figure shows that there is a tight positive correlation between the first and second moments of credit spreads across sectors in both events. Sectors that experienced larger increases

[10]More specifically, we compute the Katz-Bonacich eigenvector centrality for each sector, using the Industry-by-Industry Total Requirements table from the BEA (2017) as the I/O matrix.

[11]The dates before and at the peak of the crises are the same as dates for the changes in Panel (b) of 2. As before, the results are robust to increasing the window of both moments up to 8 weeks.

in average spreads also tended to display larger increases in the variance of those spreads. This relationship suggests that the second moment of credit spreads may contain information that is useful in assessing the similarities and differences between the two crises. This motivates us to start looking at the entire distribution of credit spreads in the next section.

Figure 3: Changes in First and Second Moments, by 2-digit NAICS Industry



(a) Great Recession (b) Pandemic

4 Inspecting the cross-sectional dispersion

As a starting point, it is useful to analyze how the entire distribution of credit spreads behaves during the two crises. There are many different ways of doing this, one way is to look at the evolution of different percentiles of the credit spread distribution at a given point in time. Panel (a) of Figure 4 plots the 10th, 50th, 90th, and 95th percentiles of the distribution of credit spreads in our sample.[12] Two facts emerge immediately from observing this figure:

(i) The cross-sectional distribution of credit spreads at any given point in time displays positive skewness, which increases considerably during crises (Great Recession and COVID-19). The distribution widens during crises and compresses outside of crises.

(ii) While the movement in median spreads was relatively similar in terms of magnitudes during the two crises, the same is not true of the right tail of the distribution. The Great Recession featured much larger increases of the top percentiles than did the COVID-19 crisis (almost triple).

Note that at this point we are looking at the entire distribution of bonds for which we have

[12]Percentiles plotted are of a sample without the credit spread upper bound from Gilchrist and Zakrajsek (2012).

computed credit spreads, regardless of whichever firms issued them. We proceed by asking the following question: do these changes in the variance of the distribution of credit spreads arise due to difference between firms' average credit spreads, or variation in the spreads of bonds issued by the same firm? That is, are the movements in the dispersion of credit spreads mostly driven by variation across firms or within firms?

To study this question, we run a regression of the type

$$s_{ift} = \alpha_{st} + \gamma_{ft} + \varepsilon_{ift} \tag{2}$$

where α_{st} is a sector-time fixed effect and γ_{ft} is a firm-time fixed effect.

Panel (b) of Figure 4 plots different percentiles for the distribution of the firm-time fixed effects γ_{ft} at each point in time. The figure shows that the distribution of these fixed-effects behaves in a way that is similar to that of individual bond credit spreads. This is suggestive evidence that most of the dispersion in the distribution of credit spreads is due to variation *across* firms.

4.1 Variance Decomposition

We decompose the cross-sectional dispersion of credit spreads into three components: i) variation across sectors, ii) variation across firms (within a sector), and iii) variation across bonds (within a firm, and a sector) in equation (2). Where ε_{ift} captures variation within the firm.

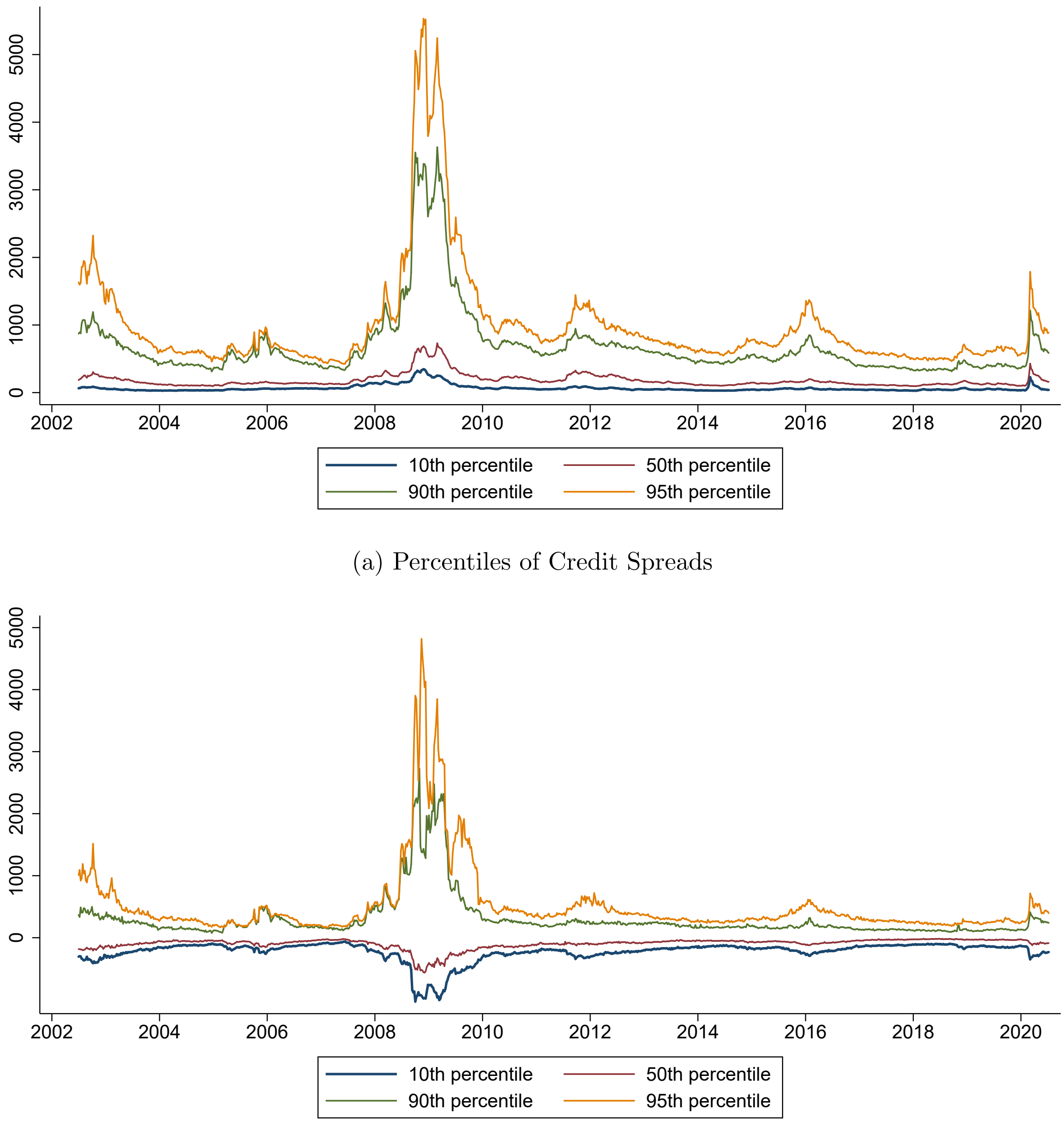
Table 3 reports the relative contribution of each component to the total variance in credit spreads in pre-, during- and post-crisis periods, both for the Great Recession and COVID-19.[13] First, the contribution of variation across sectors is relatively low and stable in the two crises. Hence, despite seeing heterogeneous effects across sectors, this does not contribute to the variance decomposition.

Second, the Great Recession was characterized by an increase in variation across firms at the expense of variation within firms. Third, and in contrast, the COVID-19 crisis was marked by a sharp drop in the variation across firms at the expense of variation within firms, and these movements reverted after the Fed's March intervention.

What does this mean? Across-firm dispersion captures changes that are common across firms' issuances, while within-firm dispersion captures variation across issuances of the same

[13] Variances taken of each component of equation (2) during a two-week window around dates in Table 3. Results are similar if the window is increased up to 8 weeks.

Figure 4: Percentiles



(a) Percentiles of Credit Spreads

(b) Percentiles of Firm FE

firm. Since we only consider unsecured bonds of the same seniority, movements in firm credit risk should affect all bonds issued by a firm in roughly the same way, and will therefore be reflected in changes in across-firm dispersion. Within-firm dispersion arises from variation in the spreads of bonds issued by the same firm. Firms can have different liabilities with different characteristics (e.g., maturity, covenants) affecting their market liquidity. Hence, we can interpret across-firm dispersion as credit risk, and within-firm dispersion as liquidity risk (e.g., Kozlowski, 2020). Under this interpretation, the data suggest that increases in firm default risk were more significant during the Great Recession, while the COVID-19 crisis was more characterized by changes in market liquidity risk. This result is consistent with the findings of

Boyarchenko et al. (2020a) and Kargar et al. (2020).

Table 3: Across vs Within Firm Dispersion

Great Recession

	Across Sectors	Across Firms	Within Firms
Jul. 1st, 2007	0.03	0.66	0.28
Nov. 25th, 2008	0.05	0.70	0.23
Jul. 1st, 2010	0.04	0.80	0.14

COVID-19

	Across Sectors	Across Firms	Within Firms
Nov. 1st, 2019	0.08	0.77	0.13
Mar. 23rd, 2020	0.10	0.56	0.33
Jun. 1st, 2010	0.07	0.78	0.14

To further illustrate this point, Figures 5 and 6 compare changes in mean spreads across sectors to changes (between the same dates used in Figure 2(b)) in the across-firm and within-firm dispersion components.[14] Figure 5 plots the change in variation across firms against the change in average spread of the sector. Similarly, Figure 6 plots the change in the variation of the within-firm component also against the change in the average spread of the sector.

While both components are positively related to the average spread, the correlations are different during the Great Recession and the COVID-19 crisis. On the one hand, during the financial crisis, we see a stronger correlation between mean spreads and across-firm dispersion. On the other hand, during the pandemic, the correlation is much stronger for the variation across issuances within firms.[15] This means that sectors with larger increases in credit spreads tended to register larger increases common across firms during the Great Financial Crisis. During the pandemic, we observe more dispersion across spreads of bonds issued by the same firm.

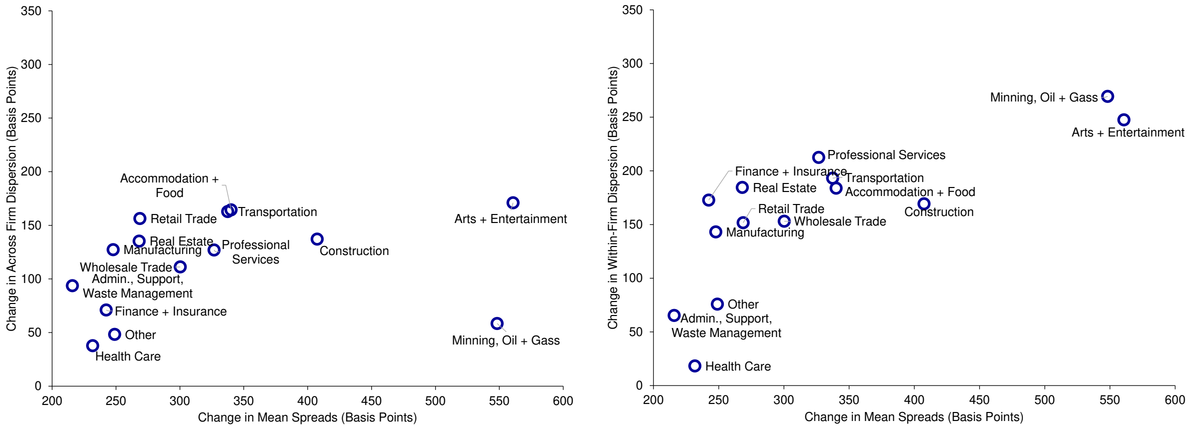
5 Credit Spreads, Leverage, and Liquid Assets

We now proceed to investigate whether there is a systematic relationship between the increase in credit spreads during each of the events and firm-level characteristics. We focus on two potentially obvious characteristics: (i) a measure of solvency, such as leverage, and (ii) a measure of funding liquidity, such as a firm's holdings of liquid assets or its liquid net worth.

[14] Changes in mean spreads and dispersion are taken over a two-week window. As before, our results are robust to taking larger windows, up to 8 weeks.

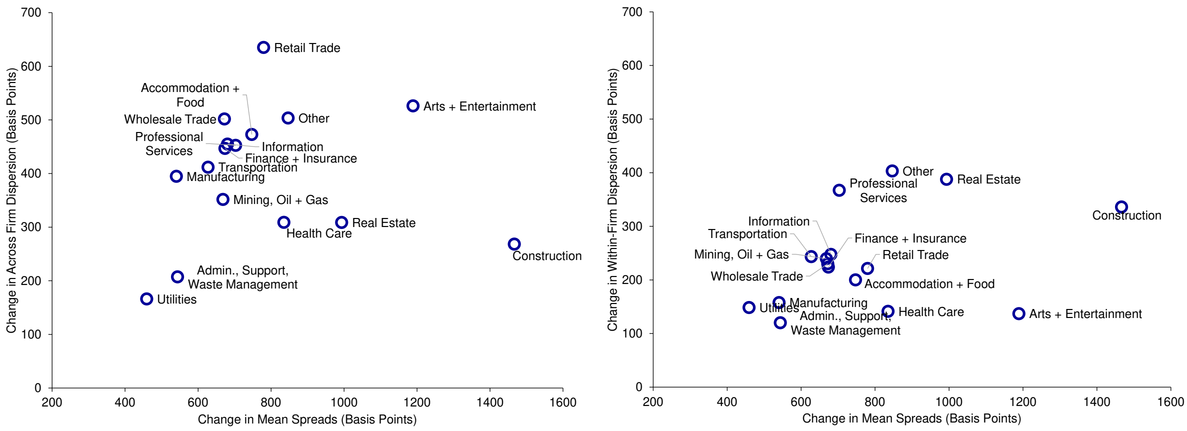
[15] See Appendix Table A2 for OLS regression coefficients.

Figure 5: Changes in Mean Spreads versus Across-Firm and Within-Firm Dispersion during the Pandemic, by 2-digit NAICS Industry



(a) Across-Firm (b) Within-Firm

Figure 6: Changes in Mean Spreads versus Across-Firm and Within-Firm Dispersion during the Great Recession, by 2-digit NAICS Industry



(a) Across-Firm (b) Within-Firm

More specifically, we estimate cross-sectional regressions of the type:

$$s_{ft_2} - s_{ft_1} = \alpha_s + \beta \text{liq}_{ft_1} + \gamma \text{lev}_{ft_1} + X_{ft_1} + \varepsilon_f \quad (3)$$

where s_{ft} is the average spread of firm f at time t (t_2 is a two-week window around the peak of the crisis, and t_1 is a two-week window around the pre-crisis period), lev_{ft_1} is a measure of leverage before the crisis, liq_{ft_1} is a measure of funding liquidity before the crisis, X_{ft_1} are other firm-level controls, such as firm size, and α_s is a sector-fixed effect. We use the same pre-crisis and peak-crisis dates we used in all the earlier sections.

We take leverage, defined as total liabilities divided by total assets, as a proxy for solvency as it is common in the literature. As a measure of funding liquidity, we focus on liquid net worth: the difference between liquid asset holdings and short-term liabilities, divided by total assets of the firm. This measure captures how many liquid resources the firm has access to, after repaying short-term commitments. We believe that it is an appropriate measure of the true size of a firm's liquidity buffer to deal with potentially unexpected shocks such as sudden drops in revenues.

Tables 4 and 5 present the results for the Great Recession and the COVID-19 Pandemic, respectively. Our preferred specification in column (4) displays two important differences between the two crises. First, while leverage was a significant predictor of the rise in credit spreads for both events, it seemed to be quantitatively more significant during the Great Recession, as the coefficient is three times larger. Second, funding liquidity seems to have significantly helped curb the rise of credit spreads during the COVID crisis, but not during the Great Recession. While the coefficient has the same sign, it is not statistically significant and is four times smaller in magnitude than the one for the COVID regression. For example, an increase in leverage of one standard deviation implies an increase in credit spreads of 137 bps during the Great Recession, accounting for about 20% of the dispersion in credit spreads. During COVID, however, it is associated with an increase of only 45 bps and accounts for about 10% of the dispersion in credit spreads.

These results are robust to alternative specifications. Appendix A.3 shows that the results still hold under an alternative measure of funding liquidity (liquid assets to total assets), and that we can also retrieve these results when estimating a dynamic version of equation (3) in the context of a panel.[16] Moreover, like other results, definitions t_1 and t_2 are robust to larger windows.

Within-Firm Dispersion We re-estimate equation 3 with the within-firm dispersion of credit spreads as the left-hand side variable:

$$\sigma_{ft_2} - \sigma_{ft_1} = \alpha_s + \beta \text{liq}_{ft_1} + \gamma \text{lev}_{ft_1} + X_{ft_1} + \varepsilon_f \tag{4}$$

where $\sigma_{ft_2} - \sigma_{ft_1}$ measures the change in the within-firm credit spread dispersion during the crisis period; that is, the change in the dispersion of credit spreads for bonds issued by the same firm. The results in Tables 6 and 7 show a similar pattern to that found for the average spreads: during the Great Recession, leverage seemes to have positively contributed to increases in firm-level credit spread dispersion, but not funding liquidity. For the COVID-19 crisis we

[16]We prefer to focus on cross-sectional regressions in the main text due to the fact that COVID-19 was a short-lived crisis that corresponds to a single-quarter observation.

Table 4: Change s_{ft} on Liquid Net Worth to Total Assets, Great Recession

	(1)	(2)	(3)	(4)
Liquid Net Worth to Total Assets	276.610	400.729**	-179.844	-12.657
	(206.147)	(195.402)	(194.274)	(192.398)
Leverage		1113.365***		725.851***
		(137.440)		(139.164)
Size			-183.141***	-148.527***
			(18.029)	(18.814)
N	557	557	557	557
R2	0.09	0.19	0.23	0.27

Table 5: Change s_{ft} on Liquid Net Worth to Total Assets, COVID-19 Pandemic

	(1)	(2)	(3)	(4)
Liquid Net Worth to Total Assets	-266.264**	-237.173**	-477.325***	-431.220***
	(115.352)	(113.751)	(116.822)	(116.948)
Leverage		367.832***		259.362***
		(84.529)		(85.042)
Size			-63.750***	-56.019***
			(10.318)	(10.551)
N	578	578	578	578
R2	0.17	0.20	0.22	0.23

find the opposite result: firms with better funding liquidity measures experienced a smaller increase in credit spread dispersion, while leverage does not seem to have played a significant role. Taken together, these results seem to reinforce the hypothesis that the COVID-19 crisis was more of a liquidity rather than a solvency crisis, when compared to the Great Recession.

Table 6: Change in σ_{ft} on Liquid Net Worth to Total Assets, Great Recession

	(1)	(2)	(3)	(4)
Liquid Net Worth to Total Assets	129.587**	139.907**	77.953	98.431
	(64.306)	(63.722)	(65.362)	(65.716)
Leverage		146.663***		106.110**
		(44.124)		(47.039)
Size			-20.792***	-15.553**
			(6.068)	(6.473)
N	500	500	500	500
R2	0.07	0.09	0.10	0.10

Table 7: Change in σ_{ft} on Liquid Net Worth to Total Assets, COVID-19 Pandemic

	(1)	(2)	(3)	(4)
Liquid Net Worth to Total Assets	-116.936*	-108.987*	-220.551***	-211.012***
	(63.973)	(63.750)	(64.731)	(65.097)
Leverage		116.703**		61.557
		(46.992)		(47.010)
Size			-32.790***	-31.098***
			(5.712)	(5.853)
N	557	557	557	557
R2	0.14	0.15	0.19	0.19

6 Conclusion

In this paper, we compare the evolution of corporate credit spreads during the two most volatile moments in recent financial markets history: the financial crisis of 2007-08 and subsequent Great Recession, and the COVID-19 pandemic. While the timing is different, we find relatively similar patterns between the two events. The initial increases in credit spreads were of similar magnitudes, but the policy response to the COVID-19 crisis seems to have had much more immediate effects, thus turning this into a shorter crisis. In spite of large differences in terms of which sectors were affected, we find some commonalities, such as the presence of clear outlier sectors (Construction and Accommodation & Food, respectively), which are of similar importance to the total economy according to multiple measures (share of total employment and sectoral centrality).

We then proceeded to look at second moments of corporate credit spreads and found that the increase in dispersion of credit spreads during the Great Recession was more related to an increase in dispersion across firms, while the within-firm component was more important during the COVID-19 crisis. This means that these increases in dispersion seemed to be more associated with firm-level factors during the Great Recession (such as solvency).

The analysis in this paper suggests that movements in both average credit spreads and their volatility at the firm level seem to have been more related to measures of solvency during the Great Recession and to measures of funding liquidity during the COVID-19 crisis. While there are important differences in terms of the timing of the Fed's interventions and private agents' expectations regarding those interventions, the fact that these two crises may have been of a very different nature (solvency vs. liquidity) could potentially be a factor in explaining why these interventions seemed to have been so much more effective at curbing the rise of corporate bond spreads during the COVID-19 crisis as opposed to the Great Recession. In other words, the financial market turmoil to which the Fed was responding was caused by an aggregate shock of a different nature, which could have played a role in determining the effectiveness of that response.

In future work, we plan to augment our analysis of the evolution of credit spreads during these two crises with a structural model that, when combined with data, may help us disentangle aggregate solvency from liquidity shocks and the role of policy interventions.

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Appendix

A Data

A.1 Descriptive Statistics

Table A1: Summary Statistics of Bond - Compustat Panel

Variable	Mean	SD	Min	Median	Max
Number of bonds per firm/week	6.09	18.10	1.00	2.00	541.00
Market value of issue (mil)	215.01	258.06	1.00	148.72	6422.77
Maturity at issue (years)	9.80	7.37	1.00	8.08	30.00
Coupon (pct.)	5.02	2.51	0.00	5.25	22.50
Credit Spread (basis points)	235.07	302.41	5.00	144.23	3499.99
Nominal yield (basis points)	559.16	426.70	17.55	491.12	10457.79
Number of observations	4,920,819				
Number of bonds	36,963				
Number of firms	2,657				
Callable (pct)	0.60				

A.2 Across vs. Within-Firm Dispersion

Table A2: Correlations of Changes Across-Firm and Within-Firm Dispersion with Changes in Mean Spreads, by 2-digit NAICS Industry

	Great Recession		Pandemic	
	Across-Firm	Within-Firm	Across-Firm	Within-Firm
Mean Spreads	0.042	0.133	0.205	0.473***
	(0.130)	(0.089)	(0.112)	(0.093)
R-squared	0.01	0.14	0.19	0.65
N	16	16	16	16

A.3 Robustness for Leverage and Liquidity Regressions

A.3.1 Summary Statistics

Table A3: Great Recession

Variable	Mean	Meadian	SD
Leverage	0.33	0.30	0.19
Liquid Assets to Total Assets	0.08	0.04	0.11
Liquid Net Worth to Total Assets	0.05	0.02	0.13
$\Delta\mu_{f,2}$	872.03	650.12	645.45
$\Delta\sigma_{f,2}$	183.61	121.46	192.09

Table A4: COVID-19

Variable	Mean	Meadian	SD
Leverage	0.42	0.39	0.18
Liquid Assets to Total Assets	0.09	0.04	0.12
Liquid Net Worth to Total Assets	0.05	0.01	0.13
$\Delta\mu_{f,2}$	341.98	212.82	369.23
$\Delta\sigma_{f,2}$	156.85	100.84	192.60

A.3.2 Liquid Assets instead of Liquid Net Worth

Table A5: Change s_{ft} on Liquid Assets to Total Assets, Great Recession

	(1)	(2)	(3)	(4)
Liquid Assets to Total Assets	213.447	261.567	-187.441	-120.010
	(231.944)	(220.921)	(218.967)	(213.948)
Leverage		1094.121***		720.446***
		(137.394)		(137.734)
Size			-172.957***	-150.479***
			(17.513)	(18.553)
N	614	557	614	557
R2	0.10	0.18	0.23	0.27

Table A6: Change s_{ft} on Liquid Assets to Total Assets, COVID-19 Pandemic

	(1)	(2)	(3)	(4)
Liquid Assets to Total Assets	-220.347*	-228.221*	-404.556***	-388.775***
	(120.265)	(121.942)	(120.806)	(123.585)
Leverage		377.228***		283.153***
		(84.447)		(84.770)
Size			-60.392***	-52.323***
			(10.078)	(10.409)
N	601	578	601	578
R2	0.17	0.20	0.21	0.23

Table A7: Change in σ_{ft} on Liquid Assets to Total Assets, Great Recession

	(1)	(2)	(3)	(4)
Liquid Assets to Total Assets	157.583**	152.861**	124.354*	114.535
	(73.266)	(72.229)	(74.154)	(73.438)
Leverage		140.115***		100.218**
		(44.095)		(46.644)
Size			-14.527**	-16.030**
			(5.886)	(6.384)
N	556	500	556	500
R2	0.13	0.09	0.14	0.11

Table A8: Change in σ_{ft} on Liquid Assets to Total Assets, COVID-19 Pandemic

	(1)	(2)	(3)	(4)
Liquid Assets to Total Assets	-127.261*	-132.753*	-220.305***	-216.822***
	(67.550)	(68.347)	(67.608)	(68.720)
Leverage		120.946**		71.857
		(46.896)		(46.787)
Size			-32.670***	-29.797***
			(5.633)	(5.758)
N	580	557	580	557
R2	0.13	0.15	0.18	0.19

A.3.3 Panel Regressions

We run panel regressions of the type

$$s_{ft} = \alpha_f + \gamma_t + \beta \text{lev}_{ft-r} + \beta_{E(t)} \text{lev}_{ft-r} + \phi \text{liq}_{ft-r} + \phi_{E(t)} \text{liq}_{ft-r} + \varepsilon_{ft}$$

where r is the lag-length and $E(t)$ indicates whether at time t the observation is during the Great Recession (2008:Q2 - 2009:Q2) or COVID-19 pandemic (2020:Q1 - Present). We run regressions with s_{ft} and σ_{ft} as independent variables. We choose r to be 4 quarters. Results below are qualitatively similar for 1- to 4-quarter lag-lengths.

Table A9: Quarterly Panel, using Liquid Net Worth

	s_{ft}	σ_{ft}
Leverage	305.55***	91.97***
	(23.79)	(7.31)
GR	468.16***	92.47***
	(134.55)	(27.54)
COVID	131.93***	109.66***
	(36.64)	(11.34)
Liquidity	-90.25***	-6.87
	(27.81)	(8.48)
GR	187.44*	35.91***
	(97.42)	(12.48)
COVID	-95.27***	-39.17*
	(31.09)	(20.74)
Size	-19.36***	4.32*
	(6.70)	(2.36)
N	47050	46371
R2	0.68	0.42

Notes: Firm, quarter FE. Standard errors are clustered by quarter. *0.10 **0.05 ***0.01.

Table A10: Quarterly Panel, using Liquid Assets

	s_{ft}	σ_{ft}
Leverage	311.03***	92.53***
	(23.91)	(7.39)
GR	460.46***	90.92***
	(130.46)	(27.04)
COVID	133.76***	109.45***
	(34.20)	(11.17)
Liquidity	-138.26***	-3.62
	(34.04)	(9.96)
GR	148.39*	17.00
	(82.76)	(12.10)
COVID	-251.58***	-111.71***
	(52.90)	(23.48)
Size	-20.41***	4.31*
	(6.47)	(2.29)
N	47050	46371
R2	0.68	0.42

Notes: Firm, quarter FE. Standard errors are clustered by quarter. *0.10 **0.05 ***0.01.