Why did bank stocks crash during COVID-19?

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Online Appendix

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Appendix A. Reversal of Credit Line Drawdowns

To investigate the effect of credit risk on corporate cash holdings during the COVID-19 pandemic, we construct a sample of all publicly listed U.S. firms, for which financial variables are available at the end of 2019 in Capital IQ. We drop financial firms and utilities and firms with total assets below US\$100 million at the end of 2019. Our final sample comprises 1,971 U.S. nonfinancial firms. We construct the sample following Acharya and Steffen (2020).

We use quarterly debt capital structure data from CapitalIQ and investigate changes in different debt capital structure components during Q4 2019 and Q4 2020 (Table A.1) and quarterly from Q4 2019 to Q3 2020 (Table A.2). Specifically, we inspect the following: drawn credit lines (*Drawn CL/Assets*), credit line usage (*Drawn CL/(Drawn CL + Undrawn CL)*), bond debt (*Bonds /Assets*), term loans (*Term loans/Assets*), total debt (*Total Debt / Assets*), and preference for cash (*Cash + Undrawn CL*)).

	Q4 2019	Q3 2020	Delta	t-stat
A. Full sample	-			
Drawn CL / (Drawn CL + Undrawn CL)	0.188	0.193	0.005	-1.469
Drawn CL / Assets	0.036	0.033	-0.003	2.874***
Bonds / Assets	0.156	0.166	0.01	-4.589***
Term Loans / Assets	0.078	0.070	-0.008	4.761***
Total Debt / Assets	0.344	0.355	0.011	-5.153***
Cash / (Cash + Undrawn CL)	0.497	0.580	0.083	-16.892***
B. AAA-A rated firms				
Drawn CL / (Drawn CL + Undrawn CL)	0.031	0.027	-0.004	0.394
Drawn CL / Assets	0.003	0.002	-0.001	1.445
Bonds / Assets	0.299	0.308	0.009	-0.894
Term Loans / Assets	0.007	0.007	0	0.386
Total Debt / Assets	0.349	0.363	0.014	-2.647***
Cash / (Cash + Undrawn CL)	0.498	0.548	0.05	-2.723***
C. BBB rated firms				
Drawn CL / (Drawn CL + Undrawn CL)	0.072	0.079	0.007	-0.412
Drawn CL / Assets	0.011	0.010	-0.001	0.531
Bonds / Assets	0.274	0.290	0.016	-3.395***
Term Loans / Assets	0.017	0.018	0.001	-0.357
Total Debt / Assets	0.356	0.372	0.016	-4.641***
Cash / (Cash + Undrawn CL)	0.333	0.437	0.104	-8.574***
D. NonIG rated firms				
Drawn CL / (Drawn CL + Undrawn CL)	0.162	0.215	0.053	-3.706***
Drawn CL / Assets	0.033	0.036	0.003	-1.57
Bonds / Assets	0.235	0.246	0.011	-2.042**
Term Loans / Assets	0.142	0.132	-0.01	3.264***
Total Debt / Assets	0.482	0.499	0.017	-3.861***
Cash / (Cash + Undrawn CL)	0.363	0.482	0.119	-10.894***
E. Unrated firms				
Drawn CL / (Drawn CL + Undrawn CL)	0.259	0.237	-0.022	1.303
Drawn CL / Assets	0.046	0.040	-0.006	4.227***
Bonds / Assets	0.080	0.089	0.009	-3.139***
Term Loans / Assets	0.070	0.061	-0.009	3.775***
Total Debt / Assets	0.280	0.286	0.006	-2.241**
Cash / (Cash + Undrawn CL)	0.592	0.658	0.066	-10.344***

A.1 Descriptive statistics of firm's capital structure (Q4 2019 vs. Q3 2020)

Table A.2. Descriptive statistics of firm's capital structure	(Q4 2019 to Q3 2020)

Panel A. Full sample				
Variable	Mean	Std dev	Min	Max
Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019	0.188	0.269	0.000	1.000
Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020	0.381	0.353	0.000	1.000
Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020	0.277	0.332	0.000	1.000
Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020	0.193	0.288	0.000	1.000
Drawn CL / Assets - Q4 2019	0.036	0.073	0.000	0.355
Drawn CL / Assets - Q1 2020	0.058	0.086	0.000	0.400
Drawn CL / Assets - Q2 2020	0.046	0.081	0.000	0.396
Drawn CL / Assets - Q3 2020	0.033	0.069	0.000	0.340
Bonds / Assets - Q4 2019	0.156	0.192	0.000	0.909
Bonds / Assets - Q1 2020	0.158	0.194	0.000	0.923
Bonds / Assets - Q2 2020	0.167	0.198	0.000	0.873
Bonds / Assets - Q3 2020	0.166	0.198	0.000	0.855
Term Loans / Assets - Q4 2019	0.078	0.134	0.000	0.645
Term Loans / Assets - Q1 2020	0.078	0.132	0.000	0.617
Term Loans / Assets - Q2 2020	0.078	0.131	0.000	0.598
Term Loans / Assets - Q3 2020	0.070	0.124	0.000	0.565
Total Debt / Assets - Q4 2019	0.344	0.229	0.002	1.134
Total Debt / Assets - Q1 2020	0.370	0.240	0.002	1.180
Total Debt / Assets - Q2 2020	0.368	0.243	0.002	1.242
Total Debt / Assets - Q3 2020	0.355	0.241	0.002	1.228
Cash / (Cash + Undrawn CL) - Q4 2019	0.497	0.344	0.002	1.000
Cash / (Cash + Undrawn CL) - Q1 2020	0.608	0.333	0.002	1.000
Cash / (Cash + Undrawn CL) - Q2 2020	0.593	0.329	0.005	1.000
Cash / (Cash + Undrawn CL) - Q3 2020	0.580	0.331	0.004	1.000
Panel B. AAA-A rated firms				
Panel B. AAA-A rated firms Variable	Mean	Std dev	Min	Max
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019	0.031	0.113	0.000	0.911
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020	0.031 0.156	0.113 0.290	0.000 0.000	0.911 1.000
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020	0.031	0.113 0.290 0.195	0.000	0.911 1.000 0.958
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020	0.031 0.156	0.113 0.290	0.000 0.000	0.911 1.000 0.958 0.445
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020	0.031 0.156 0.069	0.113 0.290 0.195	$0.000 \\ 0.000 \\ 0.000$	0.911 1.000 0.958
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019	0.031 0.156 0.069 0.027	0.113 0.290 0.195 0.085	$\begin{array}{c} 0.000 \\ 0.000 \\ 0.000 \\ 0.000 \end{array}$	0.911 1.000 0.958 0.445
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020	0.031 0.156 0.069 0.027 0.003	0.113 0.290 0.195 0.085 0.014	0.000 0.000 0.000 0.000 0.000	0.911 1.000 0.958 0.445 0.125
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020	0.031 0.156 0.069 0.027 0.003 0.013	0.113 0.290 0.195 0.085 0.014 0.028	0.000 0.000 0.000 0.000 0.000 0.000	0.911 1.000 0.958 0.445 0.125 0.142
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q4 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020	0.031 0.156 0.069 0.027 0.003 0.013 0.007	0.113 0.290 0.195 0.085 0.014 0.028 0.023	0.000 0.000 0.000 0.000 0.000 0.000 0.000	0.911 1.000 0.958 0.445 0.125 0.142 0.147
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q4 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q4 2019	$\begin{array}{c} 0.031 \\ 0.156 \\ 0.069 \\ 0.027 \\ 0.003 \\ 0.013 \\ 0.007 \\ 0.002 \end{array}$	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	$\begin{array}{c} 0.911 \\ 1.000 \\ 0.958 \\ 0.445 \\ 0.125 \\ 0.142 \\ 0.147 \\ 0.053 \end{array}$
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q4 2019 Bonds / Assets - Q1 2020	0.031 0.156 0.069 0.027 0.003 0.013 0.007 0.002 0.299	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008 0.154	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	0.911 1.000 0.958 0.445 0.125 0.142 0.147 0.053 0.754
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q4 2019 Bonds / Assets - Q1 2020 Bonds / Assets - Q1 2020 Bonds / Assets - Q2 2020	0.031 0.156 0.069 0.027 0.003 0.013 0.007 0.002 0.299 0.308	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008 0.154 0.151	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	0.911 1.000 0.958 0.445 0.125 0.142 0.147 0.053 0.754 0.781
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q1 2020 Bonds / Assets - Q2 2020 Bonds / Assets - Q3 2020 Bonds / Assets - Q3 2020	$\begin{array}{c} 0.031\\ 0.156\\ 0.069\\ 0.027\\ \hline 0.003\\ 0.013\\ 0.007\\ \hline 0.002\\ \hline 0.299\\ 0.308\\ 0.319\\ 0.308\\ \hline \end{array}$	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008 0.154 0.151 0.138 0.133	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.011 0.000	0.911 1.000 0.958 0.445 0.125 0.142 0.147 0.053 0.754 0.781 0.779 0.770
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q1 2020 Bonds / Assets - Q2 2020 Bonds / Assets - Q3 2020 Bonds / Assets - Q3 2020 Term Loans / Assets - Q4 2019	0.031 0.156 0.069 0.027 0.003 0.013 0.007 0.002 0.299 0.308 0.319	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008 0.154 0.151 0.138	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.011	0.911 1.000 0.958 0.445 0.125 0.142 0.147 0.053 0.754 0.781 0.779
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q4 2019 Bonds / Assets - Q2 2020 Bonds / Assets - Q3 2020 Bonds / Assets - Q3 2020 Term Loans / Assets - Q4 2019 Term Loans / Assets - Q1 2020	0.031 0.156 0.069 0.027 0.003 0.013 0.007 0.002 0.299 0.308 0.319 0.308 0.007	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008 0.154 0.151 0.138 0.133 0.017	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.011 0.000 0.000	0.911 1.000 0.958 0.445 0.125 0.142 0.147 0.053 0.754 0.781 0.779 0.770 0.108
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q4 2019 Bonds / Assets - Q2 2020 Bonds / Assets - Q3 2020 Term Loans / Assets - Q4 2019 Term Loans / Assets - Q1 2020 Term Loans / Assets - Q1 2020 Term Loans / Assets - Q2 2020	$\begin{array}{c} 0.031\\ 0.156\\ 0.069\\ 0.027\\ \hline 0.003\\ 0.013\\ 0.007\\ \hline 0.002\\ \hline 0.299\\ 0.308\\ \hline 0.319\\ \hline 0.308\\ \hline 0.007\\ \hline 0.008\\ \hline \end{array}$	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008 0.154 0.151 0.138 0.133 0.017 0.019	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.011 0.000 0.000 0.000 0.000	0.911 1.000 0.958 0.445 0.125 0.142 0.147 0.053 0.754 0.781 0.779 0.770 0.108 0.145
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q3 2020 Bonds / Assets - Q3 2020 Bonds / Assets - Q3 2020 Term Loans / Assets - Q1 2020 Term Loans / Assets - Q2 2020 Term Loans / Assets - Q3 2020 Term Loans / Assets - Q3 2020	0.031 0.156 0.069 0.027 0.003 0.013 0.007 0.002 0.299 0.308 0.319 0.308 0.007 0.008 0.007	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008 0.154 0.151 0.138 0.133 0.017 0.019 0.013	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.011 0.000 0.000 0.000 0.000 0.000 0.000	0.911 1.000 0.958 0.445 0.125 0.142 0.147 0.053 0.754 0.781 0.779 0.770 0.108 0.145 0.058
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q3 2020 Bonds / Assets - Q3 2020 Bonds / Assets - Q3 2020 Term Loans / Assets - Q4 2019 Term Loans / Assets - Q3 2020 Term Loans / Assets - Q3 2020 Total Debt / Assets - Q4 2019	0.031 0.156 0.069 0.027 0.003 0.013 0.007 0.002 0.299 0.308 0.319 0.308 0.007 0.008 0.007 0.008 0.007 0.007 0.007 0.007 0.349	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008 0.154 0.151 0.138 0.133 0.017 0.019 0.013 0.013 0.013	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.011 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	0.911 1.000 0.958 0.445 0.125 0.142 0.147 0.053 0.754 0.779 0.770 0.108 0.145 0.058 0.060 0.753
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q3 2020 Bonds / Assets - Q3 2020 Bonds / Assets - Q3 2020 Term Loans / Assets - Q4 2019 Term Loans / Assets - Q3 2020 Term Loans / Assets - Q3 2020 Total Debt / Assets - Q4 2019 Total Debt / Assets - Q1 2020	0.031 0.156 0.069 0.027 0.003 0.013 0.007 0.002 0.299 0.308 0.319 0.308 0.007 0.008 0.007 0.008 0.007 0.007 0.007 0.349 0.369	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008 0.154 0.151 0.138 0.133 0.017 0.019 0.013 0.013 0.013 0.145 0.147	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.011 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	0.911 1.000 0.958 0.445 0.125 0.142 0.147 0.053 0.754 0.781 0.779 0.770 0.108 0.145 0.058 0.060 0.753 0.757
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q3 2020 Term Loans / Assets - Q4 2019 Term Loans / Assets - Q3 2020 Term Loans / Assets - Q3 2020 Total Debt / Assets - Q4 2019 Total Debt / Assets - Q1 2020 Total Debt / Assets - Q2	0.031 0.156 0.069 0.027 0.003 0.013 0.007 0.002 0.299 0.308 0.319 0.308 0.007 0.008 0.007 0.008 0.007 0.007 0.007 0.349 0.369 0.376	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008 0.154 0.151 0.138 0.133 0.017 0.019 0.013 0.013 0.013 0.145 0.147 0.135	0.000 0.000	0.911 1.000 0.958 0.445 0.125 0.142 0.147 0.053 0.754 0.779 0.770 0.108 0.145 0.058 0.060 0.753 0.757 0.757
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q3 2020 Term Loans / Assets - Q4 2019 Term Loans / Assets - Q3 2020 Term Loans / Assets - Q3 2020 Total Debt / Assets - Q4 2019 Total Debt / Assets - Q2 2020 Total Debt / Assets - Q3	$\begin{array}{c} 0.031\\ 0.156\\ 0.069\\ 0.027\\ 0.003\\ 0.013\\ 0.007\\ 0.002\\ 0.299\\ 0.308\\ 0.319\\ 0.308\\ 0.319\\ 0.308\\ 0.007\\ 0.008\\ 0.007\\ 0.008\\ 0.007\\ 0.008\\ 0.007\\ 0.007\\ 0.008\\ 0.007\\ 0.369\\ 0.376\\ 0.363\\ \end{array}$	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008 0.154 0.151 0.138 0.133 0.017 0.019 0.013 0.013 0.013 0.145 0.147 0.135 0.130	0.000 0.0000 0.0000 0.0000 0.0000 0.000000	0.911 1.000 0.958 0.445 0.125 0.142 0.147 0.053 0.754 0.779 0.770 0.108 0.145 0.058 0.060 0.753 0.757 0.757 0.754
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q3 2020 Term Loans / Assets - Q4 2019 Term Loans / Assets - Q3 2020 Term Loans / Assets - Q3 2020 Total Debt / Assets - Q3 2020 Cash / (Cash + Undrawn CL) - Q4 2019	$\begin{array}{c} 0.031\\ 0.156\\ 0.069\\ 0.027\\ 0.003\\ 0.013\\ 0.007\\ 0.002\\ 0.299\\ 0.308\\ 0.319\\ 0.308\\ 0.319\\ 0.308\\ 0.007\\ 0.008\\ 0.007\\ 0.008\\ 0.007\\ 0.008\\ 0.007\\ 0.007\\ 0.349\\ 0.369\\ 0.376\\ 0.363\\ 0.498\\ \end{array}$	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008 0.154 0.151 0.138 0.133 0.017 0.019 0.013 0.013 0.013 0.145 0.147 0.135 0.130 0.322	0.000 0.0000 0.0000 0.0000 0.0000 0.000000	0.911 1.000 0.958 0.445 0.125 0.142 0.147 0.053 0.754 0.779 0.770 0.108 0.145 0.058 0.060 0.753 0.757 0.757 0.754 1.000
Variable Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019 Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020 Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020 Drawn CL / Assets - Q4 2019 Drawn CL / Assets - Q1 2020 Drawn CL / Assets - Q2 2020 Drawn CL / Assets - Q3 2020 Bonds / Assets - Q1 2020 Bonds / Assets - Q2 2020 Bonds / Assets - Q2 2020 Bonds / Assets - Q3 2020	$\begin{array}{c} 0.031\\ 0.156\\ 0.069\\ 0.027\\ 0.003\\ 0.013\\ 0.007\\ 0.002\\ 0.299\\ 0.308\\ 0.319\\ 0.308\\ 0.319\\ 0.308\\ 0.007\\ 0.008\\ 0.007\\ 0.008\\ 0.007\\ 0.008\\ 0.007\\ 0.007\\ 0.008\\ 0.007\\ 0.369\\ 0.376\\ 0.363\\ \end{array}$	0.113 0.290 0.195 0.085 0.014 0.028 0.023 0.008 0.154 0.151 0.138 0.133 0.017 0.019 0.013 0.013 0.013 0.145 0.147 0.135 0.130	0.000 0.0000 0.0000 0.0000 0.0000 0.000000	0.911 1.000 0.958 0.445 0.125 0.142 0.147 0.053 0.754 0.781 0.779 0.770 0.108 0.145 0.058 0.060 0.753 0.757 0.757 0.754

Panel C. BBB rated firms

Taller C. DDD Talled III IIIs				
Variable	Mean	Std dev	Min	Max
Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019	0.072	0.165	0.000	1.000
Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020	0.235	0.285	0.000	1.000
Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020	0.129	0.241	0.000	1.000
Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020	0.079	0.182	0.000	1.000
Drawn CL / Assets - Q4 2019	0.011	0.039	0.000	0.344
Drawn CL / Assets - Q1 2020	0.030	0.053	0.000	0.400
Drawn CL / Assets - Q2 2020	0.019	0.046	0.000	0.396
Drawn CL / Assets - Q3 2020	0.010	0.026	0.000	0.240
Bonds / Assets - Q4 2019	0.274	0.136	0.000	0.909
Bonds / Assets - Q1 2020	0.279	0.138	0.000	0.923
Bonds / Assets - Q2 2020	0.292	0.141	0.000	0.873
Bonds / Assets - Q3 2020	0.290	0.146	0.000	0.855
Term Loans / Assets - Q4 2019	0.017	0.035	0.000	0.203
Term Loans / Assets - Q1 2020	0.022	0.042	0.000	0.286
Term Loans / Assets - Q2 2020	0.021	0.038	0.000	0.221
Term Loans / Assets - Q3 2020	0.018	0.036	0.000	0.232
Total Debt / Assets - Q4 2019	0.356	0.145	0.048	1.001
Total Debt / Assets - Q1 2020	0.381	0.148	0.075	1.034
Total Debt / Assets - Q2 2020	0.382	0.148	0.064	1.040
Total Debt / Assets - Q3 2020	0.372	0.145	0.054	1.017
Cash / (Cash + Undrawn CL) - Q4 2019	0.333	0.254	0.002	1.000
Cash / (Cash + Undrawn CL) - Q1 2020	0.439	0.269	0.015	1.000
Cash / (Cash + Undrawn CL) - Q2 2020	0.446	0.267	0.004	1.000
Cash / (Cash + Undrawn CL) - Q3 2020	0.437	0.268	0.006	1.000

Panel D. NonIG rated firms

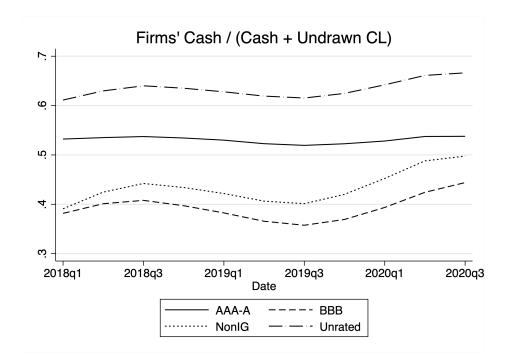
Variable	Mean	Std dev	Min	Max
Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019	0.162	0.241	0.000	1.000
Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020	0.443	0.353	0.000	1.000
Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020	0.310	0.335	0.000	1.000
Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020	0.215	0.301	0.000	1.000
Drawn CL / Assets - Q4 2019 n	0.033	0.066	0.000	0.355
Drawn CL / Assets - Q1 2020	0.067	0.078	0.000	0.400
Drawn CL / Assets - Q2 2020	0.048	0.071	0.000	0.396
Drawn CL / Assets - Q3 2020	0.036	0.068	0.000	0.340
Bonds / Assets - Q4 2019	0.235	0.187	0.000	0.909
Bonds / Assets - Q1 2020	0.236	0.190	0.000	0.923
Bonds / Assets - Q2 2020	0.252	0.199	0.000	0.873
Bonds / Assets - Q3 2020	0.246	0.199	0.000	0.855
Term Loans / Assets - Q4 2019	0.142	0.157	0.000	0.645
Term Loans / Assets - Q1 2020	0.141	0.157	0.000	0.617
Term Loans / Assets - Q2 2020	0.141	0.156	0.000	0.598
Term Loans / Assets - Q3 2020	0.132	0.150	0.000	0.565
Total Debt / Assets - Q4 2019	0.482	0.198	0.051	1.134
Total Debt / Assets - Q1 2020	0.518	0.205	0.059	1.180
Total Debt / Assets - Q2 2020	0.518	0.215	0.058	1.242
Total Debt / Assets - Q3 2020	0.499	0.217	0.053	1.228
Cash / (Cash + Undrawn CL) - Q4 2019	0.363	0.263	0.002	1.000
Cash / (Cash + Undrawn CL) - Q1 2020	0.540	0.320	0.005	1.000
Cash / (Cash + Undrawn CL) - Q2 2020	0.500	0.311	0.004	1.000
Cash / (Cash + Undrawn CL) - Q3 2020	0.482	0.302	0.006	1.000

Panel E. Unrated firms

Variable	Mean	Std dev	Min	Max
Drawn CL / (Drawn CL + Undrawn CL) - Q4 2019	0.259	0.300	0.000	1.000
Drawn CL / (Drawn CL + Undrawn CL) - Q1 2020	0.415	0.356	0.000	1.000
Drawn CL / (Drawn CL + Undrawn CL) - Q2 2020	0.329	0.345	0.000	1.000
Drawn CL / (Drawn CL + Undrawn CL) - Q3 2020	0.237	0.307	0.000	1.000
Drawn CL / Assets - Q4 2019	0.046	0.083	0.000	0.355
Drawn CL / Assets - Q1 2020	0.065	0.096	0.000	0.400
Drawn CL / Assets - Q2 2020	0.055	0.091	0.000	0.396
Drawn CL / Assets - Q3 2020	0.040	0.078	0.000	0.340
Bonds / Assets - Q4 2019	0.080	0.171	0.000	0.909
Bonds / Assets - Q1 2020	0.082	0.172	0.000	0.923
Bonds / Assets - Q2 2020	0.087	0.175	0.000	0.873
Bonds / Assets - Q3 2020	0.089	0.176	0.000	0.855
Term Loans / Assets - Q4 2019	0.070	0.132	0.000	0.645
Term Loans / Assets - Q1 2020	0.069	0.129	0.000	0.617
Term Loans / Assets - Q2 2020	0.070	0.127	0.000	0.598
Term Loans / Assets - Q3 2020	0.061	0.119	0.000	0.565
Total Debt / Assets - Q4 2019	0.280	0.236	0.002	1.134
Total Debt / Assets - Q1 2020	0.303	0.248	0.002	1.180
Total Debt / Assets - Q2 2020	0.299	0.250	0.002	1.242
Total Debt / Assets - Q3 2020	0.286	0.248	0.002	1.228
Cash / (Cash + Undrawn CL) - Q4 2019	0.592	0.362	0.002	1.000
Cash / (Cash + Undrawn CL) - Q1 2020	0.677	0.334	0.005	1.000
Cash / (Cash + Undrawn CL) - Q2 2020	0.670	0.331	0.004	1.000
Cash / (Cash + Undrawn CL) - Q3 2020	0.658	0.337	0.006	1.000

Figure A.1. Preference for cash

This figure shows the median Cash / (Cash + Undrawn CL) ratio (panel B) of U.S. nonfinancial firms over the Q1 2018 to Q3 2020 period.



Preference for cash has increased / remained high during the 3 quarters in 2020, particularly of lower rated and unrated firms.

Appendix B.

This figure shows the time-series difference of loan and bond spreads (Figure B.1.) and splitting loans by rating classes (Figure B.2.). The loan spread is calculated based on Saunders et al. (2021). The sample is based on all loans traded in 2020 that were traded in the U.S. Leveraged Loan Index (LLI) obtained from Leveraged Commentary and Data (LCD) and matched to secondary loan market trading data from Refinitiv. The sample thus comprises about 1,000 U.S. non-financial firms. 3% of the observations are unrated (based on S&P ratings), 25% are CCC-C rated, 54% are B rated, 15% BB rated and 3% BBB rated. Loans with a "D" rating are dropped from the sample (35 firms). Loan spreads are constructed using a weighted average (with facility amounts as weights). Bond spreads are constructed based on Gilchrist and Zakrajšek (2012) and obtained from the Federal Reserve website.



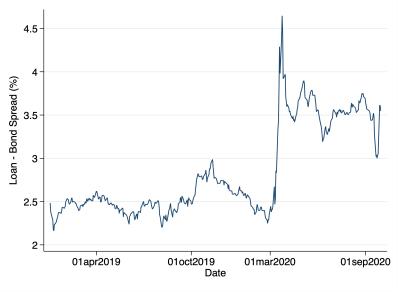
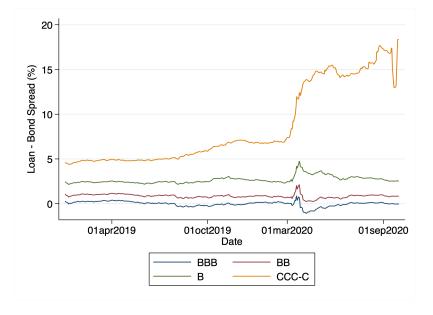


Figure B.2. Loan-bond-spread difference (by rating)



Appendix C - Discussion

Finally, we discuss the robustness of our results and its extensions along several dimensions in section 8 in the main body of the paper. (1) Alternative liquidity proxies used in the literature; (2) pricing of contingent drawdown options through credit line fees; (3) the role of covenants during the pandemic; and (4) repayment of credit lines after fiscal and monetary interventions.

C.1. Constructing our liquidity proxies

In Online Appendix D.1, we discuss provide a more extensive discussion of the different liquidity proxies used in the literature.

A. Berger and Bouwman (2009) liquidity creation measure

To replicate the Berger-Bouwman (2009) measure on liquidity creation using FR Y-9C data, we apply the data mapping available in Berger et al. (2020).¹ Individual on- and off-balance sheet items are aggregated and weighted in line with the classification provided by Berger & Bouwman (2009). Finally, the weighted positions are combined to the aggregate liquidity creation measure for each bank holding company. Note that we only replicate Berger & Bouwman's so-called "catfat" measure, which is constructed by classifying balance sheet items by category (see Berger & Bouwman, 2009) and includes on- as well as off-balance sheet positions.

B. Bai et al. (2018) liquidity risk measure (LMI)

To construct the Bai et al. (2018) liquidity mismatch index (LMI), we use information provided in the paper's Online Appendix together with the FR Y-9C call report template for 2019Q4 to map all balance sheet items, except deposits, to the variables in our dataset. The deposit data is constructed in line with the approach outlined in Bai et al. (2018), using FFIEC 031 call report data for commercial banks aggregated for the respective parent bank holding company.²

¹ Berger, A.N., C.H.S. Bouwman, B. Imbierowicz and C. Rauch (2020), How are banks special? – Let me count the ways.

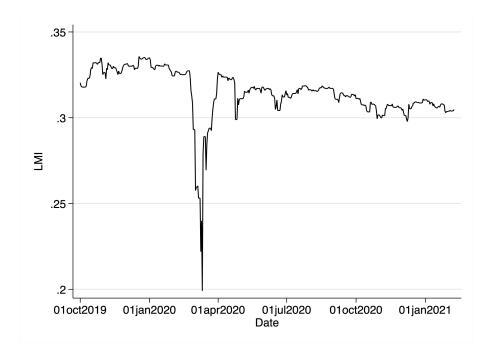
² We thank Jennie Bai for detailed guidance how to construct their measure.

Commercial banks and bank holding companies are matched with the help of the FSSD's relationship table. We consider a bank holding company to be a commercial bank's parent, if their relationship exists at least until 31 December 2019.

In the next step, we calculate the asset and liability weights per category as indicated in Bai et al. (2018) using the parameters and estimates provided by the authors. Accordingly, haircut values as well as the magnitude of the Frist Principal Component used in constructing our measure are averages taken from Bai et al. (2018). As described in the main text of the paper, we use two different proxies for the liquidity premium μ_t , which is defined as the OIS -3m Treasury Bill spread. We create the LMIs using the worst liquidity condition in March 2020 (*LMI* – 2020). We weigh the aggregate positions with the respective asset/liability weight to calculate the liquidity risk measure per bank holding company.

The LMI measure is constructed as of Q4 2019. We also construct a time-series LMI measure using a daily adjusting liquidity weight. We plot the time-series in Figure D.1. below. Liquidity risk increases significantly in March 2020 within a few days and then returned almost to a pre-COVID-19 level when monetary and fiscal policy measures have been implemented.

Figure C.1. Dynamic LMI during COVID-19 Figure C.1. plots the times-series LMI measure using a daily adjusted OIS-3m Treasury spread measure as liquidity weight.



D. Pricing of drawdown options in credit line fees

Do banks consider the deep out-of-the-money put option associated with aggregate drawdown risk when setting ex-ante price terms of credit lines? We follow earlier work on the pricing of credit lines such as Acharya et al. (2013) and Berg et al. (2015) and build a panel data set of U.S. non-financial firms that have obtained credit lines in the primary loan market over the 2010 to 2019 period. That is, using all originated loans from the Refinitiv Dealscan database, we keep only credit lines issued over the sample period, keep the lead arranger (following the procedures outlined in many previous papers) and collapse the All-In-Spread-Drawn (AISD) and the All-In-Spread-Undrawn (AISU) at their respective means to construct a firm-year-lead-arranger level panel.

We then use the merged CRSP/Compustat database to add firm characteristics that affect a firm's cost of credit, in particular a firm's equity volatility as a measure of idiosyncratic risk and a firm's market beta for systematic risk. Other control variables include size, profitability, tangibility, Tobin's Q and leverage. We source bank characteristics from call report data including NPL/Loans, capital, non-interest income, bank size and bank profitability. Importantly, we obtain data on banks' aggregate risk exposure from call reports, CRSP and vlab including *Bank Equity Beta* (as a measure of systematic risk), *LRMES* (as a measure of downside risk), *SRISK/Assets* (as a measure of equity shortfall in times of a severe crisis) and *Liquidity Risk* (as a measure of aggregate drawdown risk). *LIBOR* is included as all contracts are floating rate and prior literature has shown that spreads and fees are sensitive to the current level of LIBOR.

We estimate the following regression:

 $Cost_{i,j,t} = \mu_0 + \mu_1 AggRisk_{j,t} + \mu_3 LIBOR_t + \mu_4 X_{j,t} + \mu_5 X_{i,t} + \gamma_t + \lambda_k + \varepsilon_{i,j,t}$

Where $AggRisk_{j,t}$ are bank-specific aggregate risk proxies, $X_{j,t}$ ($X_{i,t}$) are bank (firm) characteristics, γ_t are year and λ_k industry fixed effects.

The results are reported in Table E.1. We first show that idiosyncratic drawdown risk (measured using a firm's realized equity volatility over the past 12 months) and systematic drawdown risk (measured using a firm's stock beta) are priced in both commitment fee (*AISU*) and spread (*AISD*). This is consistent with, for example, Acharya et al. (2013) and Berg et al. (2015).

However, while a higher *Bank Beta* and *LRMES* both somewhat increase the price of credit lines, *Liquidity Risk* or *Unused C&I / Assets*, on average, do not. Also, *SRISK / Assets*, which measures bank capital shortfall in times of aggregate market downturn, does not appear to be priced either. In other words, banks do not appear to be considering the deep out-of-the-money put option associated with aggregate drawdown risk when setting ex-ante price terms of credit lines. This may partly explain their need to fund aggregate drawdown risk with equity capital, as witnessed during the pandemic.

Table D.1. Pricing of drawdown options in credit line fees

This table reports the results of OLS regressions of the All-In-Spread-Drawn (AISD) and the All-In-Spread-Undrawn (AISU) ratio on **banks' aggregate risk exposures** including *Bank Equity Beta* (as a measure of systematic risk), *LRMES* (as a measure of downside risk; LRMES is the Long Run Marginal Expected Shortfall, approximated in Acharya et al. (2012) as 1-e^((-18×MES)), where MES is the one-day loss expected in bank i's return if market returns are less than -2%), *SRISK/Assets* (as a measure of equity shortfall in times of a severe crisis) and *Liquidity Risk* (as a measure of aggregate drawdown risk and defined as Unused Commitments plus Wholesale Funding minus Liquidity (% Assets)). We include them individually in regressions (2) to (5) and (7) to (10). All regressions include **bank characteristics**: *NPL/Loans* (Non-performing loans (%Loans)), *Capital* (Equity/Assets), *Non-Interest Income* (Non-interest-income (%Operating revenues)), *Bank Size* (Log of Total Assets), *Bank Profitability* (Return on assets: Net Income / Assets). All regressions further include **borrower characteristics**: *Equity Volatility* (12-months firms equity volatility), *Firm Equity Beta* (12-month daily beta with the S&P 500 return), *Firm Size* (Log of Total Assets; deflated using the U.S. PPI), *Firm Profitability* (EBITDA / Assets), *Tangibility* (Net PP&E / Assets), *Tobin's Q* (Market Assets / Assets), *Leverage* ((LT Debt + ST Debt) / Market Assets). All regressions include the LIBOR as well as year and industry (2-digit) fixed effects. Standard errors are clustered at the firm level.

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	(1)	(2)	(3) AISD	(4)	(5)	(6)	(7)	(8) AISU	(9)	(10)
Bank Equity Beta		0.0582 (0.147)					0.0161** (0.021)			
LRMES			1.293** (0.039)					0.187* (0.085)		
SRISK / Assets				1.772 (0.293)					0.255 (0.382)	
Liquidity Risk					-0.330 (0.185)					-0.0253 (0.581)
LIBOR	-0.288***	-0.278***	-0.243***	-0.272***	-0.311***	-0.0516***	-0.0488***	-0.0451***	-0.0492***	-0.0534***
	(0.000)	(0.001)	(0.006)	(0.002)	(0.000)	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)
Bank Characteristics										
NPL / Loans	1.864	2.298	2.120	2.474	1.832	0.565*	0.684**	0.602*	0.652*	0.562*
	(0.342)	(0.261)	(0.281)	(0.242)	(0.339)	(0.072)	(0.032)	(0.054)	(0.053)	(0.072)
Capital	-5.395**	-4.925**	-4.967**	-4.981**	-5.412***	-0.576	-0.446	-0.514	-0.516	-0.577
	(0.013)	(0.018)	(0.013)	(0.020)	(0.009)	(0.153)	(0.246)	(0.173)	(0.198)	(0.146)
Non-Interest Income	-0.0560	-0.0490	-0.171	-0.0628	-0.163	0.0103	0.0122	-0.00638	0.00930	0.00208
	(0.796)	(0.820)	(0.458)	(0.773)	(0.476)	(0.795)	(0.752)	(0.880)	(0.815)	(0.962)
Bank Size	-0.107***	-0.111***	-0.110***	-0.119***	-0.126***	-0.0117**	-0.0127**	-0.0122**	-0.0135**	-0.0132**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.034)	(0.019)	(0.022)	(0.025)	(0.040)
Bank Profitability	-10.20**	-8.032	0.132	-2.877	-10.47**	-1.486*	-0.887	0.0100	-0.430	-1.507*
	(0.042)	(0.113)	(0.984)	(0.741)	(0.036)	(0.077)	(0.300)	(0.993)	(0.765)	(0.074)
Firm Characteristics										
Equity Volatility	0.360**	0.366**	0.367**	0.364**	0.360**	0.0700***	0.0716***	0.0709***	0.0706***	0.0700***
	(0.019)	(0.015)	(0.015)	(0.016)	(0.020)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm Equity Beta	0.175***	0.176***	0.173***	0.174***	0.176***	0.0482***	0.0485***	0.0480***	0.0480***	0.0482***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm Size	-0.170***	-0.169***	-0.167***	-0.169***	-0.170***	-0.0326***	-0.0324***	-0.0323***	-0.0325***	-0.0327***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Firm Profitability	-0.200	-0.201	-0.193	-0.203	-0.211	0.0113	0.0110	0.0123	0.0108	0.0105
	(0.327)	(0.328)	(0.345)	(0.318)	(0.290)	(0.716)	(0.725)	(0.693)	(0.726)	(0.735)
Tangibility	-0.475***	-0.478***	-0.475***	-0.474***	-0.476***	-0.0904***	-0.0913***	-0.0905***	-0.0903***	-0.0905***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tobin's Q	-0.0279**	-0.0281**	-0.0274**	-0.0275**	-0.0265**	-0.0103***	-0.0104***	-0.0103***	-0.0103***	-0.0102***
	(0.040)	(0.038)	(0.042)	(0.042)	(0.049)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Leverage	1.756***	1.753***	1.764***	1.755***	1.757***	0.320***	0.319***	0.321***	0.320***	0.320***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.463	0.463	0.464	0.463	0.463	0.472	0.473	0.473	0.472	0.472
Number obs.	2657	2657	2657	2657	2657	2657	2657	2657	2657	2657