The risk of being a fallen angel and the corporate dash for cash in the midst of COVID

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Abstract

Data on firm-loan-level daily credit line drawdowns in the United States reveals a corporate "dash for cash" induced by COVID-19. In the first phase of extreme precaution and heightened aggregate risk, *all* firms drew down bank credit lines and raised cash levels. In the second phase following the adoption of stabilization policies, only the highest-rated firms switched to capital markets to raise cash. Consistent with the risk of becoming a fallen angel, the lowest-quality BBB-rated firms behaved more similarly to non-investment grade firms. The observed corporate behavior reveals the significant impact of credit risk on corporate cash holdings.

Keywords: Liquidity, liquidity risk, cash holdings, bank lines of credit, pandemic

JEL-Classification: G01, G14, G32, G35

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1. Introduction

A large literature highlights the importance of financial constraints for corporate cash holdings (Opler et al., 1999; Almeida et al., 2004; and Bates et al., 2009). This literature usually focuses on the precautionary motive of financially constrained firms to hoard cash. Acharya et al. (2012) show that cash holdings are also likely endogenous to a firm's credit risk and that even some high-rated firms behave qualitatively similar to those that are lower rated and likely more financially constrained. During economic boom periods, the determinants of cash holdings are thus difficult to isolate, particularly when there is abundant credit supply even for riskier firms. An important example is the case of BBB-rated firms. Since the 2008 to 2009 global financial crisis, the volume of BBB-rated debt has more than quadrupled.[3] Within this rating class, credit has geared towards riskier customers with high leverage, in turn raising concerns about their possible future downgrades to non-investment grade (non-IG) status and the associated "cliff" risk of losing access to or facing heightened costs of financing in bond and equity markets.[4]

The outbreak of the COVID-19 pandemic induced governments globally to close down major parts of their economies potentially plunging a vast majority of their firms into an impending liquidity crisis. COVID-19 thus exogenously increased the default risk for many firms by directly impacting their stream of future cash flows and simultaneously increasing their rollover risk (He and Xiong, 2012).[5] This impact was felt particularly by BBB-rated firms, who experienced a sudden increase in the risk of being downgraded to non-investment grade and to become the so-called "fallen angels". The COVID-19 induced shock thus provides an

[3] Dealogic data suggest that during the 2015 to 2019 period alone, U.S. firms issued about USD 4.5 trillion in corporate bonds. BBB-rated firms alone issued USD 1.4 trillion, *i.e.*, about 31% of the overall corporate bond volume.

[4] Altman (2020) estimates that about 34 % of BBB-rated firms can be classified as NonIG firms based on their Z-Score. A downgrade of a significant number of firms to non-investment-grade status might also have important financial stability concerns, as both banks (through loans) and insurance companies (through corporate bond holdings) have large exposures to these firms (e.g., Ellul et al., 2011; Chodorow-Reich et al., 2019).

[5] Haddad et al. (2020) document that the default risk of riskier firms increases in early March 2020, but not of safer firms.

interesting laboratory to investigate the impact of credit risk on corporate cash holdings and the role of financial markets in providing the immediate liquidity.

Using a novel dataset of daily credit line drawdowns at the firm-loan-level during the pandemic as well as quarterly capital structure data, we study the resulting "dash for cash" among publicly listed non-financial firms in the United States. Do riskier firms increase cash holdings more than safer firms? How intense was the initial "dash-for-cash" and when did it reverse; specifically, how did the monetary and fiscal response of the Federal Reserve and the U.S. government affect the "dash-for-cash"? Was the stabilization impact of these policies felt uniformly across firms of different ratings? Equally importantly, how did firms raise cash (through credit lines drawdowns, term loans, bond issuances, or equity issuances)? And, did the stock market differentially price firms based on their *ex-ante* balance sheet and off-balance sheet liquidity relative to short-term debt? These are some of the questions on corporate and market behavior that we investigate in this paper.

[Figure 1]

Panel A of Figure 1 shows quarterly cash-to-assets ratios of U.S. non-financial firms since 1 January 2018 for different rating categories (AAA-A, BBB-, non-investment-grade (NonIG) and unrated firms). Panel B of Figure 1 shows the time-series of cash over cash plus undrawn credit. In both figures, we document that upon the onset of the pandemic the overall cash levels – and the preference for cash relative to bank lines of credit – rose for the corporate sector as a whole, and especially so for lower-rated (BBB- and NonIG-rated) firms, signifying the primacy of cash in corporate liquidity management during times of heightened aggregate risk.

We show in a regression framework that – consistent with Figure 1 above – BBB-rated and NonIG-rated firms increased their cash-holdings between 1 January and 31 March 2020 (a period we usually refer to as Q1 2020 throughout the paper) significantly more than AAA-A

and unrated firms even after controlling for determinants of corporate cash holdings frequently used in the corporate finance literature (e.g. Bates et al., 2009; Azar et al., 2016).

How did firms raise cash during the first quarter of 2020? We use quarterly data about firms' debt capital structure choice obtained from Capital IQ and show that firms significantly increased their leverage ratio (i.e., total debt-to-assets ratio) across all rating classes, particularly low-rated and unrated firms. We document several other interesting empirical facts. All firms drew down their credit lines, but usage rates were highest among BBB-rated and NonIG rated firms. AAA-A-rated firms maintained access to capital markets and raised cash through bond and equity issuances (in addition to credit line drawdowns). Some BBB-rated firms still had access to public debt but mainly increased cash-holdings through credit line drawdowns and term loan issuances. NonIG-rated and unrated firms – arguably the most constrained firms or firms experiencing the greatest rollover risk – had to rely fully on credit-line drawdowns and term loans from banks.

This quarterly data provides a window into corporate capital structure choice and is informative as to changes in a firm's balance-sheet positions between two quarters; however, the consequences of the pandemic and the lockdown were visible in a compressed "time capsule" after mid-February within a matter of a few weeks. Quarterly balance-sheet data might therefore mask important daily dynamics. Moreover, at the time of writing of this paper, quarterly data were only available until the end of the first quarter of 2020. We thus explore the "dash-for-cash" using daily drawdown data during the pandemic that is available to us also over the April to June 2020 period. Figure 2 uses daily data from the beginning of March 2020.

[Figure 2]

Panel A of Figure 2 shows the cumulative daily credit line drawdowns of U.S. non-financial firms. From March 5, 2020 until March 23, 2020, the day the Federal Reserve announced its corporate bond-buying program, firms had withdrawn about USD 240 billion (bn) from outstanding credit lines. Panel B of Figure 2 shows the cumulative drawdowns by

rating class. Across all rating categories, we document that the "dash-for-cash" through credit line drawdowns was concentrated early in the pandemic in March up to the beginning of April 2020. AAA-A and eventually BBB-rated firms stopped drawing down credit lines, while NonIG and unrated firms relied on credit line funding until June 2020.

When comparing this credit line usage during COVID-19 to the usage during the global financial crisis (at the end of 2008), we find that the overall usage of credit drawdowns seems comparable between the two shocks. Drawdowns, however, were more clustered and the drawdown intensity was much larger in the current pandemic within a few weeks compared to 2008.

Interestingly, we find that the weighted average Z-Score (a commonly used measure for credit risk developed in Altman, 1968) of firms that drew down credit lines increased until the beginning of April 2020 and then declined meaningfully until the end of April 2020, confirming that even higher quality firms (i.e., AAA-A rated firms) drew down early in the pandemic. For high-quality firms, however, other funding sources opened up eventually, whereas those firms with poor credit quality had to rely on credit lines for raising cash.

We investigate this differential pattern in detail using daily bond issuances of U.S. non-financial firms. NonIG-rated firms appear to have lost access to public debt market since the beginning of March 2020. BBB-rated firms hardly issued any new bonds from the middle of February until the end of March 2020. The surge in bond issuances that started mid-March 2020 following the interventions by the Federal Reserve and the U.S. Treasury was mainly driven by AAA-A rated firms. Evidently, however, even the highest-rated firms that issued bonds during the COVID-induced stress could only do so only at substantially higher yields compared to the period before the middle of February 2020.

Importantly, we show that the "dash-for-cash" was overall the highest among low-quality BBB-rated firms, i.e., BBB-rated firms with low Z-Scores. These firms perform similarly to BB-rated firms after matching firms from both rating categories based on their Z-

Score (possibly because BBB-rated firms are probably of worse quality than their credit rating suggests (Altman, 2020)). These firm therefore likely faced a downgrade if the stress worsened. Consistent with a "dash for cash" of firms that are at the risk of becoming a fallen angel, and facing the "cliff" risk of losing access to or facing heightened costs of financing in bond and equity markets, we find that BBB-rated firms drew down from their credit lines significantly more than comparable BB-rated firms.[6]

Taken together, therefore we find that there have been two distinct phases in the dash for cash. In the first phase of extreme precaution, firms across *all* rating classes, including the highest-rated investment-grade firms, drew down on their credit lines at an unprecedented pace and scale, a phase that ended only with the decisive monetary and fiscal response towards the end of March 2020. In the second phase that followed policy stabilization measures, AAA-A rated firms, i.e., high-quality investment-grade firms, issued bonds as well as equity in public capital markets, particularly after the Federal Reserve Bank initiated its corporate bond buying program, and halted their credit line drawdowns. In contrast, bond issuances of BBB-rated firms, i.e., the lowest-rated investment-grade firms, remained mostly flat at first and only slowly accelerated with continuing support from the Fed. Issuances of sub-investment grade-rated firms never took off; instead, these firms took out term loans from banks or rushed to convert their credit line commitments from banks into cash accounting for about half of all the credit line drawdowns.

In our last set of tests, we investigate whether the stock market rewarded firms with access to ex-ante liquidity. Access to ex-ante liquidity might dampen the impact of COVID-19 on the stream of future cash flows of some firms if they are better able to meet their operating expenses and maintain productive capacity during the lockdown, and also mitigating their

[6] Consistent with this dash-for-cash of particularly high-risk firms, Carletti et al. (2020) provide estimates as to a substantial equity capital shortfall of Italian firms as a consequence of the lockdown, particularly for firms that became distressed.

elevated rollover risk.[7] We construct a measure of balance-sheet liquidity of non-financial firms taken all these components into account, as the sum of undrawn credit lines and cash minus short-term liabilities over total assets. We show that corporates with liquidity buffers were being rewarded by stock markets upon the onset of the pandemic. However, prior to the pandemic as well as starting in April 2020 and following the liquidity interventions by the Federal Reserve and the Treasury, stock price movements were not significantly different for firms based on their liquidity.

Overall, our results highlight the important role of having access to liquidity in the financial resilience of corporations to large aggregate shocks and also reveal the significant role played by credit risk in determining corporate cash holdings.

The rest of the paper proceeds as follows. We discuss our results in the context of the related literature and describe our data in Section 2. In Section 3, we investigate changes in cash holdings of U.S. firms between Q4 2019 and Q1 2020. In Section 4, we document the "dash-for-cash" using daily credit line drawdowns and the implications for firms that are at risk of becoming a fallen angel. We investigate whether stock markets reward firms with ex-ante access to liquidity in Section 5. Section 6 concludes.

2. Related literature and data

2.1 Related literature

Our paper relates to the literature that highlights a precautionary motive of more financially constrained firms to hoard cash (Opler et al., 1999; Almeida et al., 2004; and Bates et al., 2009). Eisfeldt and Muir (2016) investigate the implications of financial constraints for the dynamics of corporate cash holdings. Acharya et al. (2012) argue that credit risk is a salient determinant

[7] Campello et al. (2010) show that constrained firms increase credit line drawdowns, are less able to borrow externally and reduce investments. Duchin et al. (2010) show that ex-ante cash can help dampen credit supply shocks. Berg (2018) shows that precautionary savings can aggregate real effects.

of cash holdings. We find that firms with higher credit risk (i.e., NonIG-rated and low-quality BBB-rated firms) particularly increased their cash holdings in the first quarter of 2020.

Our paper also relates to the literature on the choice between cash and lines of credit. Sufi (2009) and Disatnik et al. (2010) show that bank lines of credit have become an important source of firm financing; they show that firms trade off using cash and bank lines of credit as a function of their idiosyncratic risk. Acharya et al. (2013) show that firms with high exposure to systematic risk have a higher ratio of cash to credit lines and face higher costs on their credit lines.[8] We find consistent evidence during the COVID-19 induced shock as cash to credit line-ratios increase from Q4 2019 to Q1 2020, particularly for firms with lower credit quality who might find it costlier to raise external capital. These firms were more dependent on committed bank credit lines relative to safer, for example, AAA-A-rated firms that could also issue public debt.

Finally, our paper relates to the quickly emerging literature on the effect of the COVID-19 shock on the corporate sector. Halling et al. (2020) investigate U.S. firms' access to public capital markets and show that particularly highly rated firms issued public debt after the onset of the pandemic, but substantially less equity. Other papers investigate stock price reactions to COVID-19. Stock price reactions emphasize the importance for firm value of financial policies (Ramelli and Wagner, 2020), financial constraints and cash needs of affected firms (Fahlenbrach et al., 2020), changing discount rates due to higher uncertainty (Gormsen and Koijen, 2020; Landier and Thesmar, 2020), and of social distancing (Pagano et al., 2020). We show the importance of cash – even relative to bank lines of credit – during aggregate risk episodes such as the pandemic. Moreover, we document two important phases of the COVID-

[8] Other papers explore the determinants of credit line drawdowns in previous crises. Ivashina and Scharfstein (2010) provide consistent evidence and document an acceleration of credit line drawdowns during the 2007-2009 crisis. Berg et al. (2016) show that credit lines are more likely to be used if a borrower's economic performance deteriorates, particularly for non-investment grade and non-rated firms. Berg et al. (2017) show that particularly U.S. firms' drawdown behavior is sensitive to the overall market return. We show that pandemic drawdowns have been more intense but similar in spirit.

19 induced shock (pre- and post-Fed intervention), which helps us understand the relative importance of cash for firms with different credit quality and the implications of central banks' liquidity support for credit markets by differential firm credit quality. This latter evidence is consistent with the evidence in Acharya et al. (2020) that firms build cash reserves from external finance issuances if the current cost of capital is low compared to the expected future costs in order to smooth the overall cost of capital over time.

While most papers focus on the corporate sector, also a few investigate the effects of the COVID-19 shock on the banking sector. Li et al. (2020) document the largest ever liquidity demand by firms drawing down pre-existing credit lines using bank regulatory filings. Banks were able to accommodate the liquidity demand due to cash inflow from the Federal Reserve and from depositors.[9] Acharya et al. (2020) show how this aggregate liquidity demand is priced in banks' stock returns and how this can be incorporated in bank stress tests. We show this "dash-for-cash" of the corporate sector and an unprecedented pace of (precautionary) credit line drawdowns in the first three weeks of the pandemic because of a differential demand for cash of firms with different credit quality.

2.2 Data

To investigate the effect of credit risk on corporate cash holdings during COVID, 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 USD 100 million at the end of 2019. Our final sample comprises 1,971 U.S. non-financial firms.

We use different datasets in our analysis. We obtain quarterly borrower characteristics from the Compustat database and debt capital structure information as well as information on

[9] This stands in contrast to the global financial crisis of 2007 to 2009, during which the role of banks as liquidity provider was severely impaired until the government stepped in after the Lehman Brothers default (Acharya and Mora, 2015). At the beginning of the COVID-19 pandemic, banks appeared to have been better capitalized eventually enabling them to provide the liquidity to the corporate sector.

equity issuances and payouts (dividends and share repurchases) from the S&P CapitalIQ database. Debt capital structure information includes unused (off-balance sheet credit lines), used credit lines, term loans and bonds. Bond issuance data are collected from Dealogic. Stock returns are obtained from CRSP.

Finally, we obtain information about daily credit line drawdowns from the S&P Leveraged Commentary & Data (LCD) database, which starts in March 2020 and is collected from SEC filings or other data sources (e.g., private equity sponsor disclosures). It includes information such as the drawn amount, credit line limit, lead agent that originates the loan, time of drawdown, maturity of the credit line, narrow and broad industry (based on the S&P industry classification) and the link to the original filing.[10] This data is particularly helpful to study the dynamics of credit line drawdowns of firms in the early stages of the pandemic.[11]

3. Cash-holdings of U.S. non-financial firms

3.1. Methodology and descriptive statistics

Methodology. We first investigate more formally which firms raise cash in Q1 2020 and trace out the quarterly changes in cash holdings that we plot in Figure 1 above in this paper. We use quarterly data of firms' *Cash-to-Asset ratios*, where cash is defined as cash plus short-term investments. Following the earlier literature on firms' cash holdings (e.g., Bates et al., 2009), we estimate the following regression over the Q1 2018 to Q1 2020 period:

$$\mathrm{Cash_{it}} = \alpha + \sum \beta_i \times \mathrm{Q_1 2020} \times \mathrm{Rating_i} + \sum \gamma_i \times \mathrm{Rating_i} + \gamma' \mathrm{Q} + \theta' \mathrm{Y_{it-1}} + \eta_{i,t}$$

Where $\mathrm{Cash_{it}}$ can take two forms: (i) $\Delta \mathrm{Log}\,(Cash - to - Assets_{it})$, which is the change of the natural logarithm of quarterly cash and short-term investments scaled by total assets; and (ii) $Cash_{it}$ / $(Cash_{it} + Undrawn\,CL_{it})$, a frequently used measure for the

[10] While most firms have and draw from revolving credit lines, a few firms use so-called delay draw term loan facilities (DDTL). We do not differentiate between both loan types in our analysis.
[11] For the matched Capital IQ – LCD dataset, we compare the difference between the quarterly drawdowns reported in Capital IQ and the total daily drawdowns of the same firm as reported in the LCD until March 2020, and find that the mean (median) difference is 1.4% (0%).

preference for cash over bank credit lines in the literature (e.g., Sufi, 2009). $Rating_i$ is an indicator for each rating class (*AAA-A, BBB, NonIG, IG* or *Rated*), Q is a vector of quarter dummies and Y_{it-1} is a vector of lagged control variables. There are: *Leverage, Book-to-Market Ratio, CapEx-to-Assets, R&D-to-Sales*, a *Dividend* and a *Loss Dummy*. All control variables are constructed based on earlier literature and defined in Appendix I. η_i is a firm fixed effect.

Table 1 summarizes these variables. For example, the mean change in *Cash-to-Asset* is 0.02 with a standard deviation of 0.64, and the mean in $Cash_{it}$ / $(Cash_{it}$ + $Undrawn\ CL_{it})$ is 54%. The average firm has a leverage ratio of 31% and a book-to-market ratio of 0.52. 44% of all firms are rated, 25% have a NonIG rating, and 19% of firms have an IG rating. 13% are BBB-rated and 6% a AAA-A rating.

[Table 1]

Results. Regression results are reported in Table 2. Our dependent variable is ΔLog $(Cash - to - Assets_{it})$ in columns (1) to (3). In each column, we sequentially introduce interaction terms of a dummy variable for *Q1 2020* with $Rating_i$. The individual rating classes are included but not shown for brevity.[12]

[Table 2]

The quarterly dummy variables show the significant increase in ΔLog$(Cash - to - Assets)$ in Q1 2020, which is 31% (=exp(0.2701) – 1) larger compared to Q2 2018 (the omitted group) as shown in column (3)). Importantly, the increase is mainly driven by NonIG and BBB-rated firms. NonIG-rated (BBB-rated) firms increased their cash-to-asset ratios in Q1 2020 by 18.7% (21%) more relative to unrated firms. Overall, we observe a significant increase in cash-holdings for all firms between Q4 2019 and Q1 2020.

[12] As shown in Figure 1 in the introduction, financially constrained (i.e., unrated) firms have higher cash holdings. Among rated firms, the importance of cash over rating classes seems U-shaped, with AAA-A-rated and NonIG-rated firms holding more cash (confirming the pattern in Acharya et al., 2012).

Our dependent variable is $Cash_{it} / (Cash_{it} + Undrawn\ CL_{it})$ in columns (4) to (6). We use the same interaction terms and control variables, but add a one-quarter lagged beta of the firm with the S&P 500.[13] We find that riskier firms have a preference for cash over bank lines of credit in Q1 2020, controlling for overall liquidity. Riskier (i.e., NonIG-rated) firms increase this ratio by 6.71 percentage points more compared to unrated firms, which is about twice compared to the average firm on our sample.

3.2. How do firms raise cash?

How do firms increase cash in Q1 2020? We use quarterly debt capital structure data from CapitalIQ and investigate changes in different debt capital structure components from Q4 2019 to Q1 2020. There are: (i) drawn credit lines (*Drawn CL / Assets*), (ii) credit line usage (*Drawn CL / (Drawn CL + Undrawn CL*), (iii) bond debt (*Bond Debt / Assets*), and (iv) term loans (*Term Loans / Assets*). We also investigate whether some firms were able to issue equity during this quarter. All capital structure variables are defined in Appendix 1.

Descriptive evidence. In Panel A of Table 3, we provide differences-in-mean tests to show how, on average, the different debt capital structure components have changed between Q4 2019 and Q1 2020, in the full sample of firms and separately in each rating class.

[Table 3]

We document that the increase in cash has been funded with a significant increase in debt. On average, firms increased *Total Debt / Assets* by 2.4 percentage points (pp), which is about 7% relative to the mean Q4 2019 *Total Debt / Assets*-ratio. Interestingly, this is particularly driven by low quality (NonIG) and unrated firms.

Higher-quality firms relied more on bond debt finance and less on credit lines or term loans already in Q4 2019 and this pattern has solidified in Q1 2020. That is, AAA-A and BBB-rated firms somewhat increased bond debt relative to total assets (but also both type of firms

[13] Acharya et al. (2014) and Berg et al. (2017) highlight the sensitivity of credit line drawdowns to systematic risk.

significantly drew down their credit lines, particularly BBB-rated firms, which increased usage rates by 16.5pp). BBB-rated firms also increased their reliance on term loans as part of their debt capital structure. NonIG firms did not access public debt markets and, evidently, also term loans relative to total assets somewhat declined. Their cash increase was funded mainly through drawdowns of credit lines. Usage rates increased by about 26.5pp relative to the previous quarter. Similarly, also unrated firms substantially increased usage rates of credit lines. Across all firms, we find an increase in the preference for cash over bank lines of credit between Q4 2019 and Q1 2020, but particularly for firms with higher credit risk.

Methodology. We test this empirically using the following OLS regression specification:

$$\text{Leverage}_i = a_i + a_k + \beta\, \text{Rating}_i + \theta' Y_{it-1} + \varepsilon_i$$

We use different proxies for *Leverage* to investigate both levels (in Q1 2020) and changes (between Q4 2019 and Q1 2020) of different debt capital structure components as described in more detail below. *Y* is a set of firm characteristics that determine a firm's demand for debt: we include firm size, measured as the natural logarithm of total assets; firm profitability, which we measure as EBITDA over total assets; tangible assets of the firm; and the market-to-book ratio (e.g. Faulkender and Petersen, 2006; Sufi, 2009). All control variables enter our regression with a one-quarter lag. a_k is a 2-digit industry fixed effect. These fixed effects account for shocks for a narrowly defined industry group (two-digit SIC codes) that might affect a firm's choice of debt. Standard errors are heteroscedasticity robust.

Results. In Panel B of Table 3, we investigate the differences in levels of different debt structure components in Q1 2020 across rating classes. *Leverage* thus takes the following form: *Drawn CL / Assets*, *Bond Debt / Assets*, and *Term Loans / Assets*. The results broadly mirror the descriptive evidence presented in Panel A of Table 3. Drawn credit line-asset-ratios are significantly lower, the higher the rating class. Similarly, bond-debt dependence is larger for firms with higher ratings. Term loan dependence is larger for lower rated and unrated firms,

and NonIG firms have the largest term loan-to-asset ratios. We also use Equity Issuance / Assets and Payouts / Assets (all measured in Q1 2020) as dependent variables. AAA-A rated firms issued more equity in Q1 2020 compared to firms in all other rating classes, followed by BBB-rated firms. That is, these firms are able to fund some of their cash increase with the issuance of common or preferred stock. Payouts, measured as the sum of share repurchases and dividend payments, is cash reducing and only capital market dependent, investment-grade rated firms, were able to payout cash to their shareholders.

In Panel C of Table 3, we investigate changes in the volume of different debt structure components between Q4 2019 and Q1 2020 (scaled by lagged total assets) across rating classes. *Leverage* thus takes the following form: Δ *Drawn CL / Assets*$_{t-1}$, Δ*Credit Lines Usage*, Δ*Bond Debt / Assets*$_{t-1}$ and Δ*Term Loans / Assets*$_{t-1}$. This table shows a clear and very intuitive result: firms that are more bank dependent raise cash through changes in bank credit (either drawing down credit lines or issuing term loans), while capital market-oriented firms (i.e., those with an investment-grade rating), issued debt. For example, AAA-A rated firms drew down credit lines significantly less than firms from all other rating classes. The increase in drawn credit line volume relative to total assets of AAA-A rated firms is about 0.9pp less compared the increase of unrated firms. NonIG firms, in contrast, increased credit line drawdowns relative to total assets by about 1pp more compared to unrated firms (column (1)). The change in credit line usage supports this interpretation (column (2)). AAA-A rated firms, however, issued significantly more bonds, also compared to BBB-rated firms (column (3)), but fewer term loans (column (4)).

Overall, our results suggest that the increase in cash documented in subsection 3.1 is financed mainly with an increase in debt. While AAA-A rated firms, i.e. high-quality investment-grade rated firms, were able to use public debt and equity capital markets, all other firms had to rely on bank debt to fund the necessary increase in cash during the pandemic. Importantly, and across all rating classes, we observe a significant increase in the reliance on

credit lines as part of their debt capital structure and a preference for cash over bank lines of credit in managing liquidity.

4. Dash-for-cash and risk of being a fallen angel

As shown in Figure 2 in the introduction, the "dash-for-cash" through credit line drawdowns was concentrated very early in the pandemic, i.e., in March up to the beginning of April 2020. Changes in quarterly balance-sheet debt capital structure components might not capture important dynamics related to cash-needs of firms during the early stages of the pandemic. We thus explore the "dash-for-cash" using daily drawdown data during the pandemic that is available to us also over the April to June 2020 period.

4.1. Dash-for-cash at the beginning of the pandemic

Figure 2 in the introduction shows that firms from all rating classes used credit lines, but particularly unrated and NonIG firms were using credit lines earlier than others. Among rated U.S. firms, BBB-rated firms drew down the most (about half of all drawdowns until March 23, 2020), followed by NonIG firms.[14] Even AAA-A rated firms used credit line drawdowns, *albeit* with only comparably small dollar amounts and clustered at the beginning of the pandemic in early March 2020, nevertheless underscoring that this was a phase of extreme precautionary corporate behavior. Unrated firms even drew down more compared to AAA-A rated firms (which is further magnified if scaled by assets as unrated firms are substantially smaller). In this subsection, we investigate the intensity of these drawdowns focusing on the March to April 2020 period where most drawdowns occurred.[15]

[14] We observe a spike in drawdowns on April 1, 2020, which might be related to quarter-end reporting or specific debt contract requirements.

[15] Based on S&P industry classifications, the three broad sectors accounting for more than 60% of all credit line drawdowns in March and April 2020 are Consumer Discretionary, Industrials and Information Technology (about USD 213bn in total). Among those, these are particularly firms in the automotive industry, hotels & gaming, aerospace and defense and airline industry. Firms in the healthcare and utilities/energy sector drew down least. The companies with the largest drawdowns are General Motors, Ford and Boeing who together drew down 13% of the total drawdown amount.

We first analyze daily drawdown intensities (i.e., daily borrowing amounts relative to a firm's credit line limit on this day). Panel A of Figure 3 shows percentage drawdowns for the full sample of firms, Panel B for each rating category. The full sample figure shows a significant decline in drawdown intensity, a result that extends broadly to all rating categories. That is, at the beginning of the COVID-19 induced shock, arguably when uncertainty was at its peak, we observe a "run" on bank credit lines with firms almost fully using their credit lines. Importantly, drawdown intensities decrease less for firms with higher credit risk consistent with a precautionary demand for cash at the beginning of the pandemic across all rating classes. While the precautionary demand attenuated for AAA-A, the highest quality firms, already in March 2020, it persisted among the high-risk firms, where drawdown intensities were still elevated at the end of April 2020.

[Figure 3]

How do these drawdowns compare to previous recession periods? In Acharya and Steffen (2020), we outline stress scenarios for banks with respect to expected credit line drawdowns. In one scenario, we use the end of 2008 (global financial crisis, GFC henceforth) drawdown rate, immediately after the failure of Lehman Brothers in September 2008. We use the GFC stress-scenario drawdown rates (which are based on end-of-2008 realized drawdowns) for different rating classes to calculate an expected volume of credit line drawdowns. We then compare this estimate to the actual US dollar amount of credit line drawdowns since the beginning of March 2020. Table 4 shows this comparison expressed in million USD.

[Table 4]

As we observed earlier in Figure 2, U.S. firms have drawn down USD 298bn from outstanding credit lines in March 2020 (and USD 39bn in April 2020). Out of this aggregate amount, the lion's share of USD239bn (i.e., more than 80%) was drown by BBB and NonIG-rated firms in March 2020. Interestingly, and comparing COVID-19 drawdowns to those observed during the GFC, we find that the credit line usage of BBB (about 30%) and NonIG

(about 33%) rated firms is even larger compared to the GFC. However, and in contrast, AAA-A rated and unrated firms draw down less compared to what we would have expected based on pervious crisis episodes.[16] In other words, low-quality firms have rushed to drawn down credit lines in an unprecedented scale and, consequently, banks' loan portfolios have expanded by USD 269bn in borderline investment-grade and non-investment-grade debt in March and April 2020.

4.2. Drawdowns and borrower risk

To get a better understanding of the risks associated with the credit line usage, we use the Z-Score as a firm-specific measure of credit risk that allows us to compare the risk of default of firms within and across rating classes when they draw down credit lines. In other words, we want to study the relation between firm-specific credit-line usage and firm-specific default risk across rating categories on a specific day and over time within a rating class.

[Figure 4]

We plot drawdown intensities (left-hand scale) together with their Z-Score (right-hand scale) for the full sample of firms in Panel A of Figure 4.[17] The average quality of borrowers improves during March until the beginning of April 2020 and then significantly declines reaching its lowest value at the end of April 2020. At the beginning of this stress period, also high-quality (AAA-A and BBB-rated) firms participated in this dash-for-cash, either for precautionary purposes or because credit lines were a relatively cheaper funding option when public debt was more difficult to issue and / or only at high yields.

Panel B of Figure 4 plots the average across firms of credit-line drawdown intensities (left-hand scale) together with their Z-Score (right-hand scale) for each rating group on a given

[16] This is consistent with our results from section 3. AAA-A rated firms use other forms of credit (e.g., bond and equity issuances) to raise cash. Unrated firms, however, have limited external finance options. Either they have sufficient cash on balance sheet to decide not to use their liquidity insurance, or they raise cash through loan issuances in the loan market, or they rely on trade credit. As such, working-capital related loan issuances have been muted since March 2020.

[17] We use a smoothing function to plot the Z-Score estimates.

day. Somewhat surprisingly, unrated firms appear to be less risky than both BBB- and NonIG-rated firms. In all rating categories, we observe that the average quality of borrowers improves during March until the beginning of April 2020. Importantly, those firms that continue to use their credit lines towards the end of the sample period, appear to be, on average, riskier, consistent with the importance of credit risk for corporate cash holdings. High-quality firms might have been able to issue bonds in public capital markets, an issue we investigate next.

Overall, high-quality investment-grade rated firms, particularly AAA-A but also BBB-rated firm, i.e., those firms that are usually capital market oriented, drew down credit line very concentrated and with high intensity in March until the beginning of April. Riskier (i.e., NonIG-rated) firms and more financially constrained (i.e., unrated) firms were limited in accessing public debt markets and continued to rely on credit lines throughout April with, on average, a higher drawdown intensity. A possible interpretation is that interventions by the Federal Reserve and the U.S. Treasury facilitated the access of public debt markets for the highest-quality firms, an issue we investigate in the next subsection.

4.3. The impact of interventions by the Federal Reserve on bond market access

4.3.1. Corporate bond issuances during COVID-19

In section 3, we have documented that particularly AAA-A rated firms raised cash by issuing public bonds between Q4 2019 and Q1 2020. To investigate which firms accessed public debt markets during the early phase of the pandemic, we use daily corporate bond issuance data for U.S. firms, which we obtain from Dealogic.

Corporate bond volume. In Figure 5, we plot the cumulative bond issuance volume (solid line, left-hand axis) and each day's average yield to maturity of newly issued bonds (dotted line, right-hand axis) for the 1 January to 30 June 2020 period, for the full sample in Panel A and by rating class in Panel B (note that all bond issuers are rated, i.e., there is no "unrated" category). The vertical line indicates the Fed's announcement of the corporate bond

buying program on 23 March 2020. We discuss the effect of the actions taken by the Fed and the U.S. government in the next subsection.

[Figure 5]

In total, U.S. non-financial firms issued about USD 150bn in public bonds until mid-February. From this point onwards, issuance volume was muted until mid-March as spreads in the investment-grade and high-yield market were elevated. From mid-March until end of April 2020, however, issuance volume increased within from about USD 180bn to USD 545bn.[18]

The evidence in Panel B of Figure 5 suggests that the cumulative bond issuance volume of BBB-rated firms was flat from middle of February until 23 March 2020, i.e., they hardly issued any new bonds until the Fed announced the corporate bond buying program. The surge in bond issuances that started after March 15, 2020 was thus (at first) primarily driven by AAA-A rated firms. NonIG firms have lost access to public debt markets since the beginning of March 2020; between March 4 and March 30, there has not been a single NonIG bond issue.

Corporate bond yields. Panel A of Figure 5 already suggests that firms that issued bonds during the COVID-19 induced stress period could only do so at substantially higher yields compared to the period before middle of February (as the dotted line suggests). We also plot the difference between the yield-to-maturity (YTM) of newly issued corporate bonds between BBB- and AAA-A-rated firms and NonIG and BBB-rated firms in Panel C of Figure 5. Evidently, the YTM of riskier bonds is increasing over the 1 Jan 2020 to 30 June 2020 periods relative to safer firms, i.e., it becomes costlier, particularly for NonIG-rated firms, to issue bonds in public debt markets.

Overall, the difference between issuance volume and YTM of BBB-rated and NonIG-rated firms emphasizes the "cliff" risk of losing access to or facing heightened costs of financing in bond markets when firms are downgraded to a NonIG rating.

[18] We exclude the bond issuance of about USD 20bn on April 2, 2020 by T-Mobile to finance the Sprint merger.

4.3.2. Federal Reserve interventions

Interventions. To address the COVID-19 induced stress in the economy and associated stress in the financial markets, the Federal Reserve Bank (Fed) and the U.S. Treasury reacted introducing a series of measures. After having reduced the fed fund rate close to zero and reinstating its Treasury and agency Mortgage Backed Securities (MBS) quantitative easing program, the Fed introduced a series of programs, among those: it announced, among others, the Commercial Paper Funding Facility (CPFF), the Primary Dealer Credit Facility (PDCF) and the Money Market Mutual Fund Facility (MMFF) on March 15. On March 17, it announced a USD 5tn repurchase program. The Fed introduced two facilities to support credit supply to large firms, the Primary Market Corporate Credit Facility (PMCCF) and the Secondary Market Corporate Credit Facility (SMCCF), through which the Fed can purchase investment-grade rated corporate bonds. This program was announced on March 23. On March 25, the Senate voted for a USD 2tn fiscal package (that was approved by the House on March 27).

While the Fed targeted short-term funding markets with its earlier initiatives, the corporate bond buying program that was announced on March 23, 2020 likely affects long-term corporate funding options. This should be particularly valuable for BBB and NonIG-rated firms that have – up to this point – been constrained to borrow in public capital markets as documented above. To assess this empirically, we study the effect of the announcement of the corporate bond buying program on stock and loan market returns. A lacking access to liquidity was likely an important driver of firms' stock price decline at the beginning of the stress period, alleviating funding problems might help reversing this trend.[19] Moreover, the secondary loan market is an important indicator for funding stress in corporate debt markets (Saunders et al., 2020).[20]

[19] We discuss this in more detail in Section 5 below.
[20] To investigate loan market returns, we use an index of about 1,500 loans issued by U.S. non-financial firms that are traded in the secondary loan market with a market value of about USD 1.5 trillion as of 2 Jan 2020.

Interventions and loan/stock returns and drawdowns. We plot stock and loan market returns in Panel D of Figure 5. Also loan market returns fell about 20% since the beginning of January 2020 indicating the lack of supply of credit to firms. Both stocks and loans increased significantly after the announcement of the corporate bond buying program on 23 March 2020. Stock (loan) market returns increased by about 10pp (5pp) after the announcement suggesting that the program might have to some degree reduced liquidity problems for U.S. non-financial firms.

When we add the cumulative credit line drawdowns since the beginning of March 2020 to the figure, we observe that – if anything – credit line drawdowns even accelerated after the announcement of the bond buying program. This is puzzling as – in contrast to an increase in stock and loan returns – this implies that funding problems of some firms persisted even after the Fed's announcements to buy investment-grade-rated corporate bonds.

Interventions and bond issuances. Investigating corporate bond issuances around this announcement might help us understand this. In Panel B of Figure 5 above, we show the cumulative bond issuances by rating class and a vertical line on the day of the announcement of the Fed corporate bond buying program. It seems that the impact on corporate debt markets is asymmetric.

- **AAA-A-rated firms**: Issuance volumes of AAA-A rated firms increased after the announcement of the CPFF, PDCF and MMFF (15 March 2020). Issuance volumes increased from USD 40bn to more than USD 160bn until 23 March 2020. About 75% of all bonds during this period have been issued by AAA-A-rated firms. Until the end of April 2020, cumulative issuance volumes increased to USD 230bn.
- **BBB-rated firms**: The dollar volume of cumulative bond issues of BBB-rated firms was muted relative to AAA-A rated firms before the announcement of the corporate bond purchase program. Only after 23 March 2020, issuance volumes accelerated reaching about USD 212bn at then of April 2020. Cumulative bond issuance volume of

BBB-rated firms had been about 40% higher compared to AAA-A-rated firms before the start of the pandemic in March 2020. Thus, the relatively smaller increase after the Fed interventions suggests that BBB-rated firms only selectively had access to public debt, which is consistent with the credit line drawdown behavior of some BBB-rated firms even in April 2020.

- **Non-IG rated firms**: NonIG-rated firms were still not able to borrow in public bond markets after the Fed interventions and, therefore, continued to rely on banks, which is consistent with an additional demand for loans and drawdown of committed credit lines in the corporate loan market.

Taken together, we find that there have been two distinct phases in the dash for cash. In the first phase, firms across *all* rating classes, including the highest-rated investment-grade firms, drew down on their credit lines at an unprecedented pace and scale, a phase that ended only with the decisive monetary and fiscal response towards the end of March 2020. In the second phase, AAA-A rated firms, i.e., high-quality investment-grade firms, issued bonds as well as equity in public capital markets, particularly after the Federal Reserve Bank initiated its corporate bond buying program and halted their credit line drawdowns. In contrast, bond issuances of BBB-rated firms, i.e., the lowest-rated investment-grade firms, initially increased issuances at a slower pace compared to AAA-A rated firms. Issuances of sub-investment grade and non-rated firms never took off; instead, these firms continued to convert their credit line commitments from banks into cash accounting for about 65% of all the credit line drawdowns in April 2020.

4.5. Dash-for-cash of fallen angels

4.5.1. Stock price performance of BBB vs BB rated firms

Since the 2008 to 2009 global financial crisis, the volume of BBB-rated debt has more than quadrupled. Within this rating class, credit geared towards riskier customers with high leverage, raising concerns as to whether its rating meaningfully reflect the risk of the company and about

possible future downgrades to non-investment grade status. Altman (2020) estimates that about 34 % of BBB-rated firms can be classified as NonIG firms based on their Z-Score.

Rating agencies usually hesitate to downgrade a firm into non-investment-grade territory as such a downgrade might have severe consequences. E.g. many institutional investors are limited to holding investment-grade-rated debt and would be forced to sell. Moreover, the initial corporate bond buying program announced on 23 March 2020 included only the purchases of investment-grade corporate debt. Also, borrowing costs in the loan market might increase in addition to higher collateral requirements or an increase in covenant strictness. Taken together, BBB-rated firms likely face a steep a reduction in the access to credit and a steep increase in their funding costs after a downgrade.

[Figure 6]

Stock price performance by rating. A deep and prolonged recession because of the economic lockdown might result in the downgrade of some these BBB-rated firms and stock market prices might already reflect the risk of being a "fallen angel". In Panel A of Figure 6, we plot the stock price of U.S. non-financial firms by rating class. AAA-A rated companies perform much better compared to lower-rated firms. These firms have healthier balance sheets and better access to credit markets in case of liquidity needs (as shown also above). Interestingly, BBB-rated firms perform, if anything, more similar to NonIG-rated as markets appear to be worried about the sustainability of the leverage of BBB-rated firms.

BBB-rated firms vs. "fallen angels". Some firms have already been downgraded to non-investment-grade by credit rating agencies at the end of March 2020 (so-called "fallen angels"). Based on our earlier analysis of the stock price response of BBB vs. BB-rated firms, we would expect to observe a significantly worse performance of fallen angels relative to other BBB-rated firms during our sample period. Panel B of Figure 6 compares the stock market

performance of these fallen angels with other BBB-rated firms since January 1, 2020.[21] Consistent with our previous discussion, fallen angels perform significantly worse, particularly since the beginning of the COVID-19 shock, where stock prices dropped by about 80% relative to their 1 January 2020 levels and did not recover.

We test this more formally and investigate the stock price performance of firms at the investment-grade boundary, i.e., we compare BBB to BB-rated firms. We use the Z-Score as a continuous measure to match firms from both rating classes that have very similar Z-Scores (and therefore similar default risk) but one firm is investment-grade and the other firm is non-investment grade rated. We then simply compare their cumulative stock returns during the March 1, 2020 – March 23, 2020 period.

[Table 5]

We report the results in Panel A of Table 5. Simply comparing all firms from both rating classes (without matching) shows that BB-rated firms perform worse. The average stock price drops about 61% during this period compared with a 49% drop of BBB-rated firms. However, comparing the return of those firms with similar Z-Score shows that the stock performance of both group firms is not significantly different from each other. The average stock market decline of the matched control (i.e., BB-rated) firms is about 54% and thus similar to the performance of BBB-rated firms.

4.5.2. "Cliff risk" and credit line drawdowns

That is, the stock market performance suggests that BBB-rated firms are probably of worse quality than their credit rating suggests. These firms, therefore, might face a downgrade if the stress deepens. It is thus an interesting question to ask whether they increase borrowing by drawing down their credit lines to avoid a downgrade and the associated steep increase in borrowing costs if a downgrade materializes.

[21] The fallen angels that are stock exchange listed and thus included in our dataset are Apache Corporation (APA), Continental Resources (CLR), Delta Airlines (DAL), Ford (F), Macy's (M), Occidental Petroleum (OXY) and Patterson Energy (PTEN).

Methodology. We analyze the cross-section of credit lines drawdowns during the March 1 to March 23, 2020 period and ask whether firms that are more likely to be downgraded to a NonIG category use their credit lines more compared to other firms. We test this empirically using the following OLS regression specification:

$$\text{Log(Total Drawdown)}_i = a_i + a_k + \beta' \text{Rating}_i \times Z - \text{Score}_i$$

$$+\gamma' \text{Rating}_i + \theta' Y_{it-1} + \varepsilon_i$$

For each firm, we construct a measure of total drawdowns as the natural logarithm of total drawdowns during this period (*Log(Total Drawdown)*). This is our dependent variable. Our explanatory variables include indicator variables for each rating class and their interaction with the *Z-Score* as our measure of credit quality ($\text{Rating}_i \times Z - \text{Score}_i$). BBB-rated firms with a higher *Z-Score* have lower default risk. In column (1) of Panel B, we add the *Z-Score* as control variables in addition to industry fixed effects (a_k) defined as S&P industry classification provided by LCD. We do not add other balance sheet characteristics (*Y*) as the Z-Score is constructed from these measures.

Results. We report the results in Panel B of Table 5. As expected, using the full sample of firms, those BBB-rated firms that have a higher likelihood to be downgraded (i.e., a lower Z-Score) use their credit lines more compared to safer firms.

We then perform a propensity score matching and focus exclusively on BBB and BB-rated firms. We match these firms in two different ways using (1) only Altman's *Z-Score* and (2) also using a set of firm characteristics that explains both the default risk (BBB vs. BB rating) as well the outcome variable (i.e. credit line drawdowns). There are: *Log(Market Assets)*[22]*, MTB, Debt/EBITDA, Undrawn CL, Debt/Assets, Current Ratio, Tangible Assets / Assets*. That is, we focus on a set of firms that are most similar in terms of their characteristics (such as

[22] We use (quasi-) market assets, defined as total asset minus book equity plus market equity, as size variable as it is a better measure to compare BBB- and BB-rated firms due to the substantial decline in equity prices of low-quality BBB-rated firms.

default risk) and only differ as one firm is investment-grade rated and the other firm is non-investment-grade rated.

The results are reported in columns (2) to (4) and we compare differences in credit line drawdowns in the matched sample (columns (3) – (4)) to the unmatched sample (column (2)). Consistent with a "dash for cash" of firms that are at risk of becoming a fallen angel, we find that BBB-rated firms draw down significantly more than comparable, BB-rated firms, even in the unmatched sample. We first match BBB- and BB-rated firms based on their respective Z-Score matching 1 treatment (i.e., BBB-rated firm) to many possible control group (i.e., BB-rated) firms. We thus use a frequency weight, which weights the control group observations based on their propensity score to get the closest match possible (thus, the number of control group firms matches the number of treatment firms).

As expected, the difference in credit line drawdowns is even more pronounced in the matched sample (column (3)). When we add other covariates improves the match and naturally produces economically somewhat smaller coefficient estimates (column (4)). This is likely the most conservative approach, but the point estimate is still statistically highly significant. The coefficient suggests that matched BBB-rated firms draw down, on average, 88% more from their credit line compared to similar BB-rated firms during our sample period.[23]

5. Balance sheet liquidity and stock market performance

5.1. Potential real effects of COVID-19

In our last set of tests, we investigate whether the stock market rewarded firms with access to ex-ante liquidity through either cash or committed lines of credit from banks relative to their short-term debt. If the access to (committed) sources of liquidity helps firms weather better this

[23] While drawing down credit line might send a signal as to a deteriorating credit quality of the borrower to rating agencies, in an aggregate shock – as U.S. firms have experienced early March – firms across all rating classes (also among the highest quality firms) draw down credit lines as, for example, the quality of a bank's credit commitment might deteriorate with the quality of the bank.

unexpected shock, stock prices should reflect this and the stock price performance should be better of those firms that have secured ex-ante access to liquidity.

We construct a new measure of balance-sheet liquidity of firms that includes the following components:

- *Unused Credit Lines*: The sum of undrawn revolvers, undrawn credit lines as backup for commercial paper, and undrawn term loans.
- *Cash and Short-Term Investments*: The sum of cash and short-term investments.
- *Short-Term Debt*: The current portion of debt.

Hence, we construct a comprehensive measure of firm liquidity as:

$$Liquidity = \frac{Unused\ credit\ lines + cash\ and\ short\ term\ investments - short\ term\ debt}{Total\ assets}$$

Descriptive evidence. Panel A of Figure 7 shows the time-series of *Liquidity* as well of its components (all scaled by total assets).[24]

[Figure 7]

In Panel B of Figure 7, we split firms into those with high (low) balance-sheet liquidity and plot the stock price differential of both types of firms since January 1, 2020. Stock prices of firms with access to ex-ante on- or off-balance-sheet liquidity persistently outperformed those of firms that lack access to liquidity by up to 10 percentage points starting end of February 2020.

Methodology. To investigate whether firms are rewarded for having access to ex-ante balance-sheet liquidity, we run the following cross-sectional regressions:

$$r_i = \alpha + \gamma \times \text{Liquidity}_i + \beta\,'Y_i + \varepsilon_i$$

[24] Consistent with the descriptive evidence presented above, corporate cash-to-assets ratios (undrawn credit line-to-assets ratios) were increasing (declining) in Q1 2020.

Where r_i is a firm's stock return, *Liquidity* is the balance-sheet liquidity measure (or the individual components as described above) and *Y* is a vector of firm characteristics that have been shown to affect stock returns: *Log(Market Cap)*, *Book-to-Market Ratio*, *Equity Beta*, *Profitability* and *Momentum*. All variables are described in Appendix 1.

Table 6 provides summary statistics. In Panel A of Table 6, we show the mean of *Liquidity* and its components by rating class. Intuitively, lower rated and unrated firms, those that are arguably more financially constrained, have higher ex-ante balance-sheet liquidity compared to AAA-A rated firms.

[Table 6]

We provide summary statistics for stock returns (reported as log-returns) and balance sheet characteristics of our sample firms in Panel B of Table 6. The average stock return of U.S. non-financial firms over the Jan 1 to March 23, 2020 period was -45% (=exp(-0.6)-1) . While average stock returns were already negative in January and February 2020 (-4.9% and -9.5%, respectively), stock prices dropped by about 36%, on average, in March 2020.

Results. We show the results of the cross-sectional regression in Table 7. Our dependent variable is a firm's stock return over the Jan 1 to March 23, 2020 period (column (1)), and for the individual months January (column (2)), February (column (3)), 1 – 23 March (column (4)) and April (column (5)).[25]

[Table 7]

Over the full sample period, we find that ex-ante balance-sheet liquidity of firms is priced in the cross-section of stock returns. A one standard deviation increase in *Liquidity* increased stock returns by 12.2 %. When we run the regression on a monthly basis, we find that balance-sheet liquidity was not priced in January 2020, but to some extent in February 2020 and particularly in March 2020 when the coefficient almost quadruples. In April 2020, i.e., after

[25] The results are qualitatively similar when we use a beta-adjusted return as dependent variable.

the Fed interventions, liquidity is no significantly affecting stock returns consistent with the Fed providing sufficient liquidity that ex-ante secured liquidity through either cash or credit lines is not further rewarded.

In Panel B of Table 7, we run month-month regression starting in February until April 2020 (the post-Fed intervention period) including the components of our liquidity measure individually. During the February – March 2020 period, firms with ex-ante more cash & short-term investments (scaled by total assets) had substantially higher stock returns, dominating the availability of credit lines in the first phase of this stress period. Also, firms with ex-ante more short-term debt over total assets performed worse during March 2020. Overall, the stock market rewarded firms with access to liquidity through cash before and through bank lines of credit in after the Fed interventions, highlighting their important role in corporate financial resilience to large aggregate shocks. [26]

5.2. Global financial crisis (2007-2009) vs. COVID-19

How does COVID-19 compare to the global financial crisis of 2007-2009 (GFC)? While the GFC also featured an aggregate demand for credit lines (Ivashina and Scharfstein, 2010), firms drew down at a much smaller pace and over a longer time horizon compared to the current stress period. To understand whether firms with ex-ante access to liquidity through cash or committed lines of credit also performed better during the GFC, we construct *Liquidity* as of Q4 2006 and plot the stock returns of firms with high (low) *Liquidity* over the 2007 to 2009 period in Figure 8. Consistent with our evidence during COVID-19, stock prices of firms with access to ex-ante on- or off-balance-sheet liquidity persistently outperformed those of firms that lack access to liquidity.

[Figure 8]

[26] Further cross-sectional tests show that credit lines are particularly valuable for firms with ex-ante low cash on their balance sheet, firms that are more constrained and firms with high COVID exposures.

In Table 8, we run month-by-month regressions starting in Q1 2007 until Q2 2009 and use the *Liquidity* measure in Panel A. Again, firms seem to be rewarded for having access to ex-ante balance-sheet liquidity in aggregate economic downturns. Consistent with Figure 8, firms with more liquidity perform significantly better in Q2 2007 and, particularly, Q3 2007, i.e., in the first phase of the GFC when the Asset Backed Commercial Paper (ABCP) market froze as documented in Acharya et al. (2013). A similar performance differential occurred in Q2 2018, before the Lehman Brothers default, and in Q1 2009. The Federal Reserve and U.S. government responded to the economic fallout of the Lehman Brothers default with a variety of measures to support the economy, following which we do not see any pricing of liquidity in firm stock returns.

[Table 8]

6. Conclusion

The lockdown as a response to the COVID-19 pandemic caused a high demand for liquidity for firms affected by the crisis. Using a novel dataset of daily credit line drawdowns at the firm-loan-level, we provide evidence consistent a "cash for cash" of BBB-rated firms, particularly those that might be more similar in terms of credit quality to non-investment-grade rated firms. The announcement of an investment-grade corporate bond buying program by the Federal Reserve did not alleviate this cliff risk of being downgraded and these firms continue to convert committed credit lines into cash.

This "dash for cash" also impacts the balance sheets of banks when commitments turn into loans as banks have to fund these exposures with equity. Worse, banks usually hold additional term loan exposure to the same firms, i.e., they accumulate a concentrated exposure to firms at the risk of being downgraded. Even though banks are better capitalized compared to 2007 and before the global financial crisis, the accelerated drawdowns of credit lines and provision for possible future credit losses for on-balance sheet exposures might bring them

closer to the regulatory minimum capital requirement, which not only endangers their financial stability but can constrain future intermediation with likely spillovers into the real economy.

Regulators should therefore insist that banks do everything possible to conserve capital. Requiring them to withhold dividend payments or stop repurchasing shares can only be the minimum response at the beginning of a crisis, which the International Monetary Fund describes as possibly the "worst economic downturn since the Great Depression" and an unprecedented challenge for the global economy. In an Op-Ed in the Financial Times, the president of the Federal Reserve Bank of Minneapolis, Neel Kashkari, recently requested that banks raise USD 200bn now, which compares to the amount raised privately by the U.S. banks following the stress tests of 2009. As it seems within reasonable chance that this crisis will eventually dwarf what we observed in the 2008 to 2009 global financial crisis, it might be desirable to have an immediate regulatory prescription to banks to raise an even larger amount to build resilience in their balance-sheets and lend well to the real economy in the phase of economic recovery.

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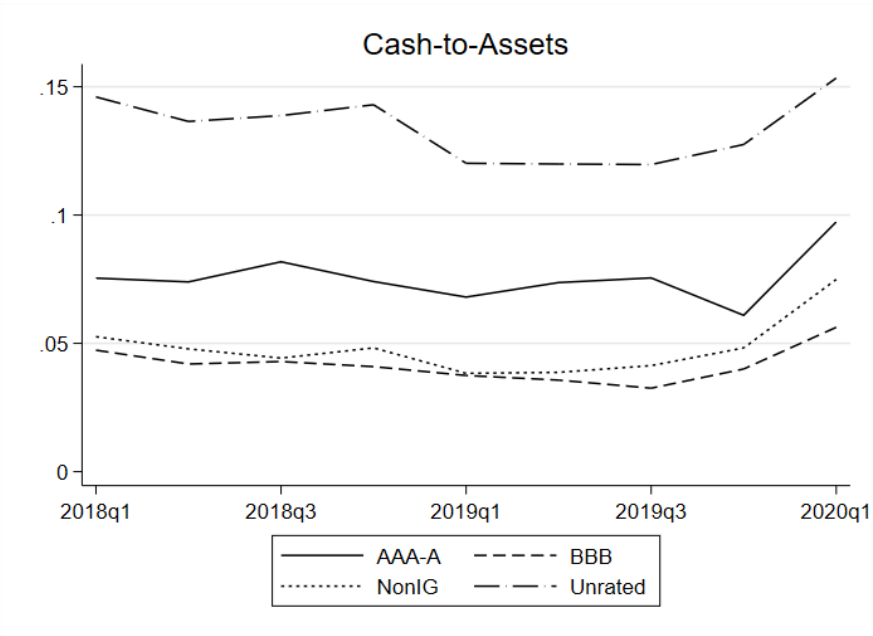
Figure 1. Time-series of cash holdings of U.S.

This figure shows the median cash-to-asset ratio (Panel A) and median Cash / (Cash + Undrawn CL) – ratio (Panel B) of U.S. non-financial firms over the Q1 2018 to Q1 2020 period.

Panel A. Cash & Short-term Investments over Total Assets



Panel B. Cash & Short-term Investments over Cash & Short-term Investments and Undrawn CL

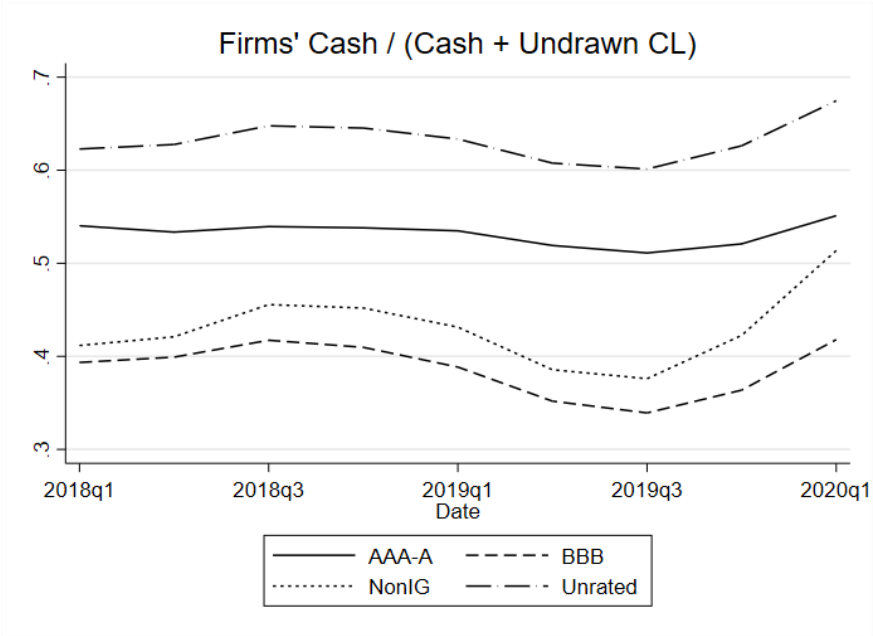
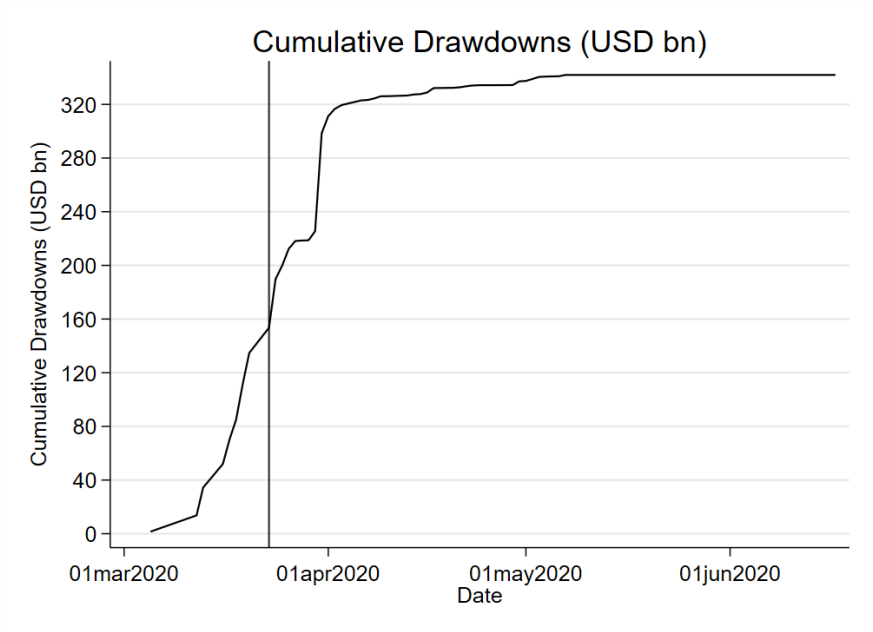


Figure 2. Cumulative drawdowns

This figure shows the cumulative daily credit line drawdowns (in USD billion) of U.S. non-financial firms over the March 1, 2020 to June 26, 2020 period (Panel A) and by rating classes, i.e., AAA-A, BBB, NonIG and Unrated firms (Panel B). Panel C shows the total drawdowns by rating class in March and April 2020. The vertical line indicates the Fed's announcement of the corporate bond buying program on 23 March 2020.

Panel A. Cumulative drawdowns (in USD bn)



Panel B. Monthly Drawdowns by rating class (in USD bn)

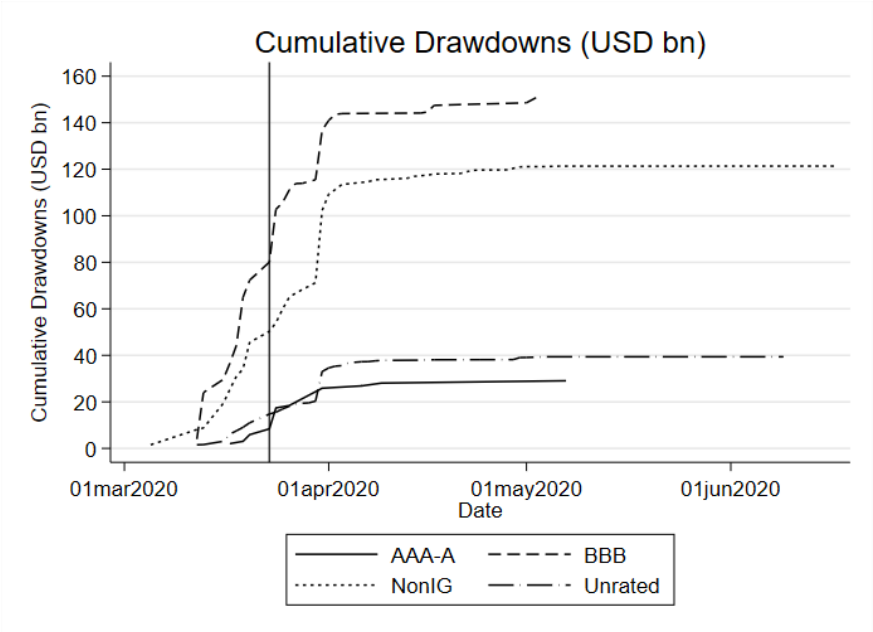
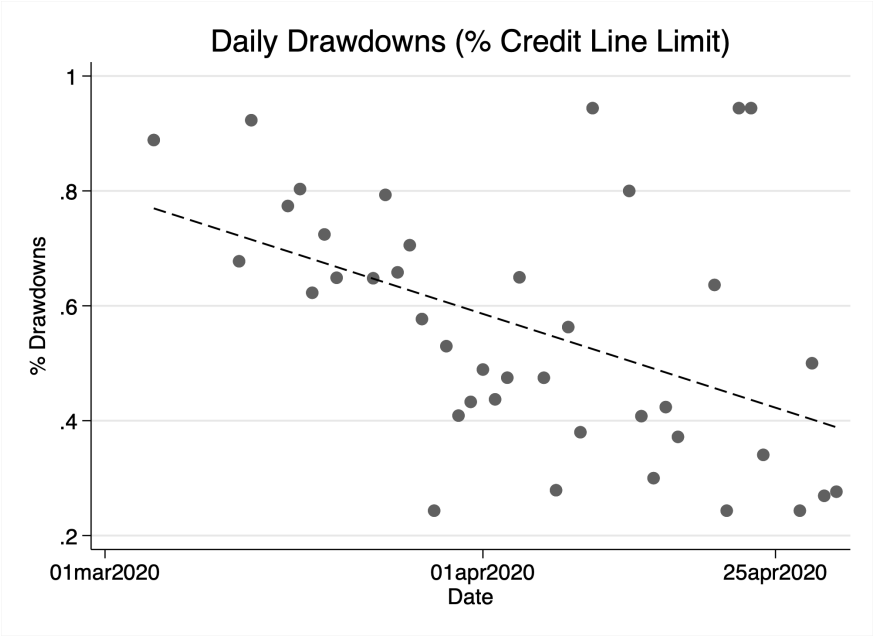


Figure 3. Cumulative drawdowns and drawdown percentage rate

Figure 3 plots the daily credit line drawdowns of U.S. non-financial firms as percent of the credit line limit for the full sample of firms (Panel A) and by rating class (Panel B).

Panel A. Full Sample



Panel B. By Rating Category

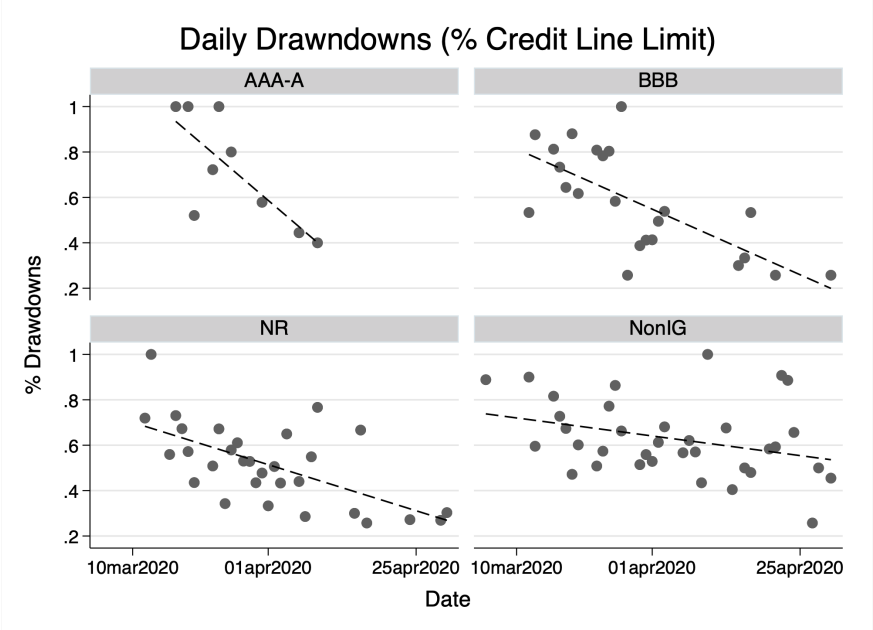
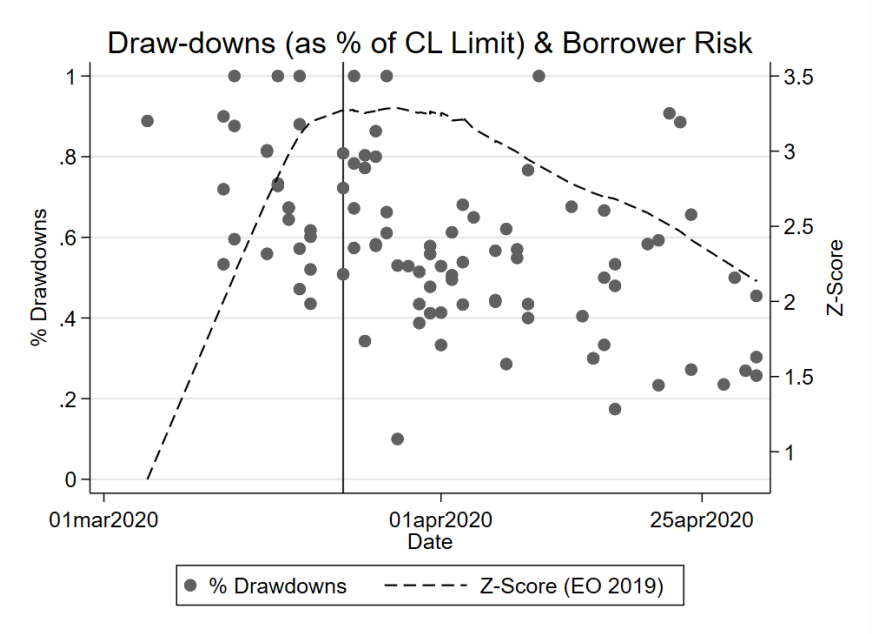


Figure 4. Cumulative drawdowns and drawdown percentage rate

Figure 4 plots the daily credit line drawdowns of U.S. non-financial firms as percent of the credit line limit (left-hand scale) together with their Z-Score (right-hand scale) for the full sample of firms (Panel A) and by rating class (Panel B). The vertical line indicates the Fed's announcement of the corporate bond buying program on 23 March 2020.

Panel A. Full Sample



Panel B. By Rating Category

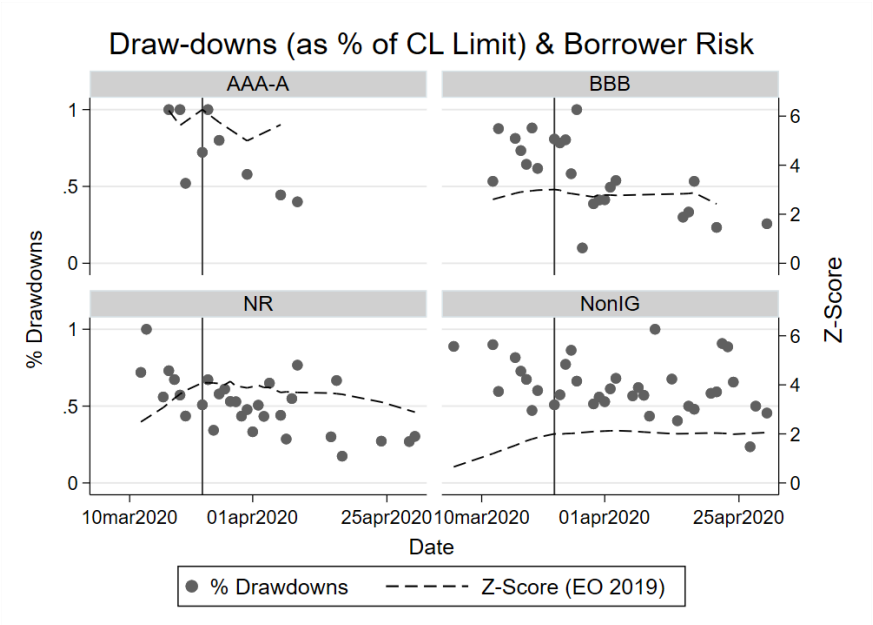
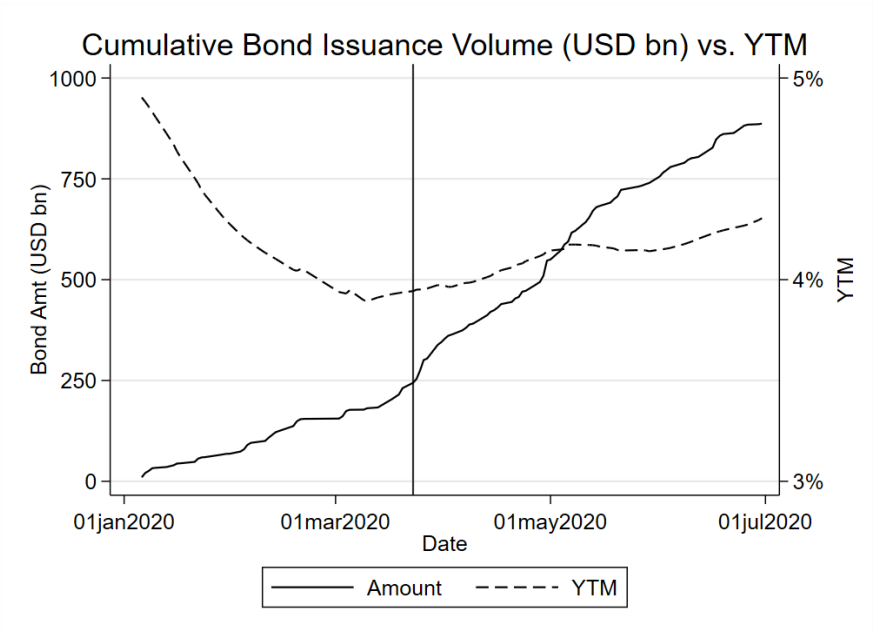


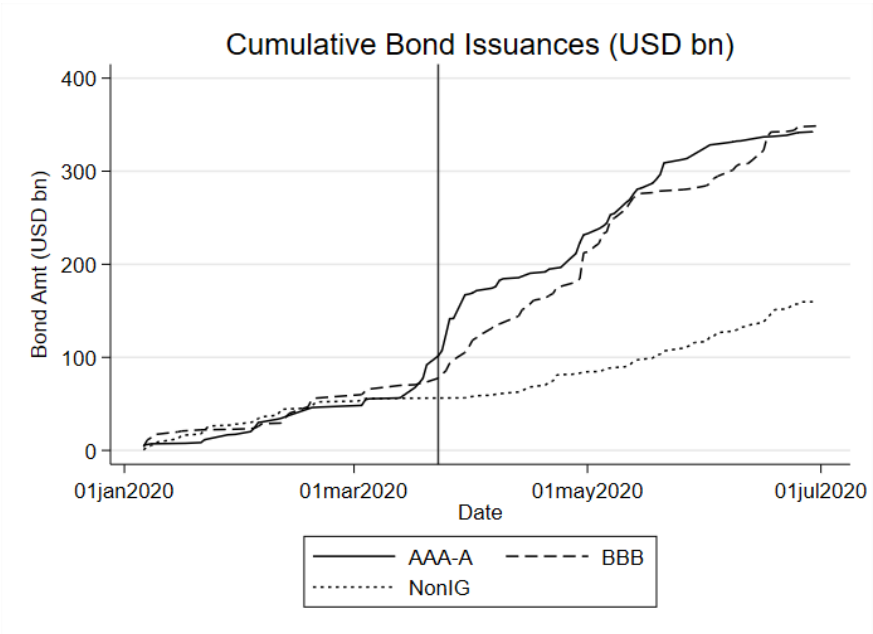
Figure 5. Cumulative bond issuances by U.S. non-financial firms

Figure 5 plots cumulative bond issuances (in USD bn) of U.S. non-financial firms over the Jan 1 to April 9, 2020 period and the average yield-to-maturity of bond issuers for the full sample (Panel A) and by rating class (Panel B). Panel C plots the yield-to-maturity of bond issues by rating class. Panel D plots the time-series of loan and stock returns and credit line drawdowns over the Jan 1 to April 9, 2020 period. The vertical line indicates the Fed's announcement of the corporate bond buying program on 23 March 2020.

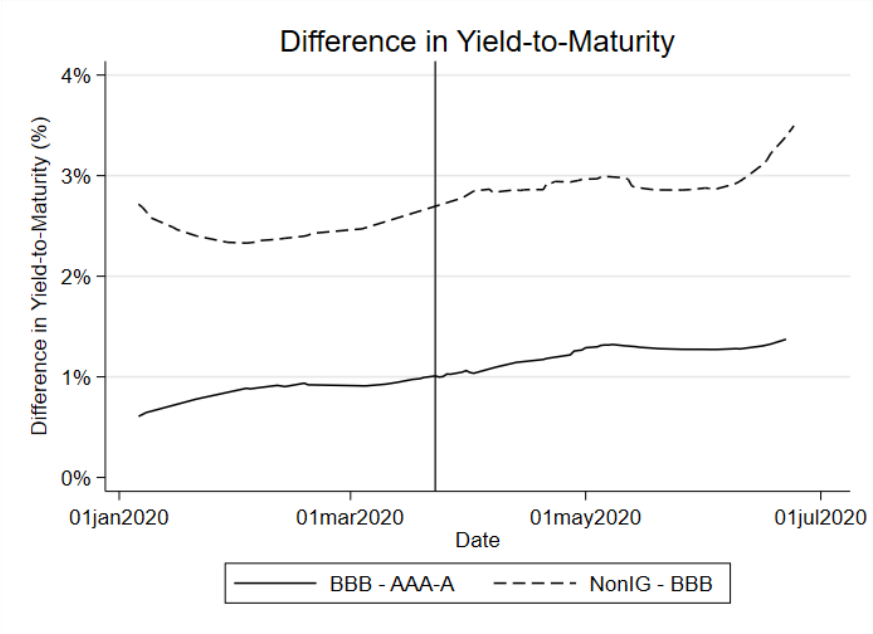
Panel A. Full Sample



Panel B. By Rating Category



Panel C. Difference in Yield-to-Maturity between Rating Categories



Panel D. Loan, stock returns and drawdowns

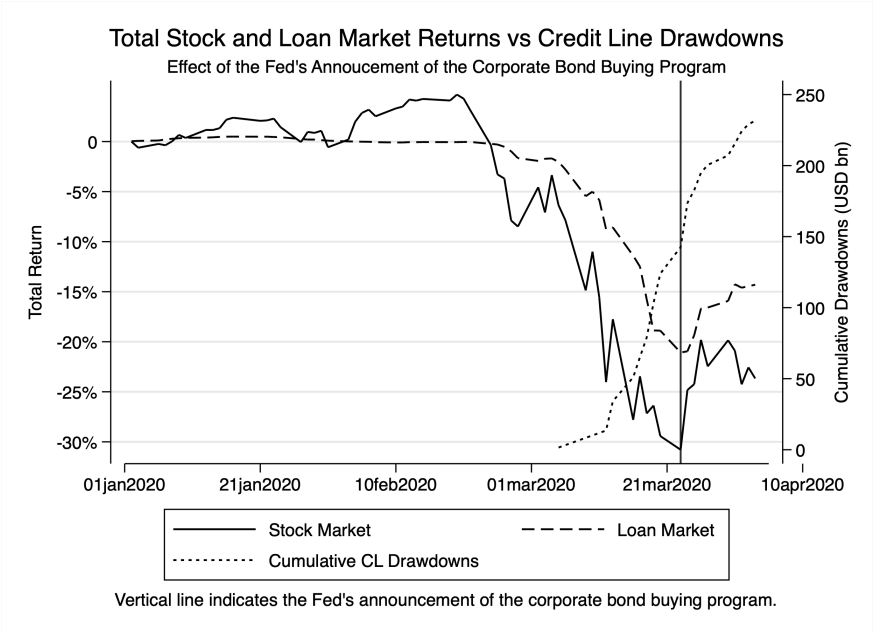
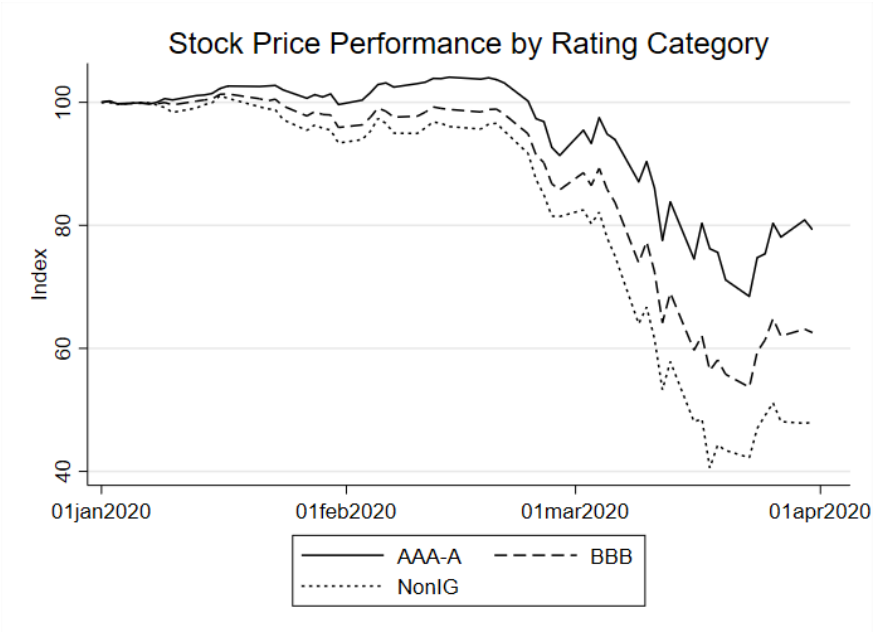


Figure 6. Stock price performance by rating class

Figure 6 plots the stock price performance of U.S. non-financial firms by rating class (Panel A) and for "fallen angels" and BBB-rated firms in Panel B.

Panel A. By Rating Category



Panel B. Fallen Angels vs BBB

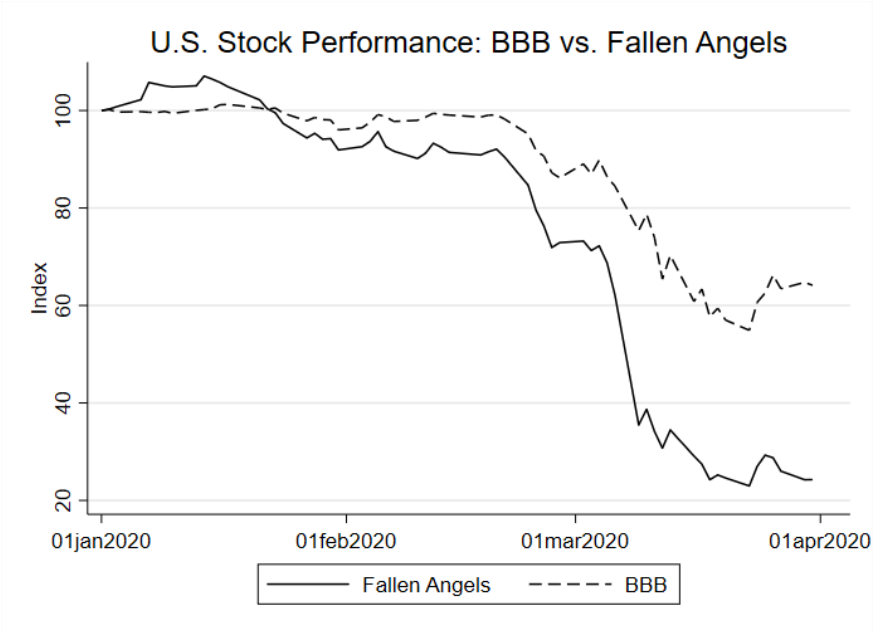
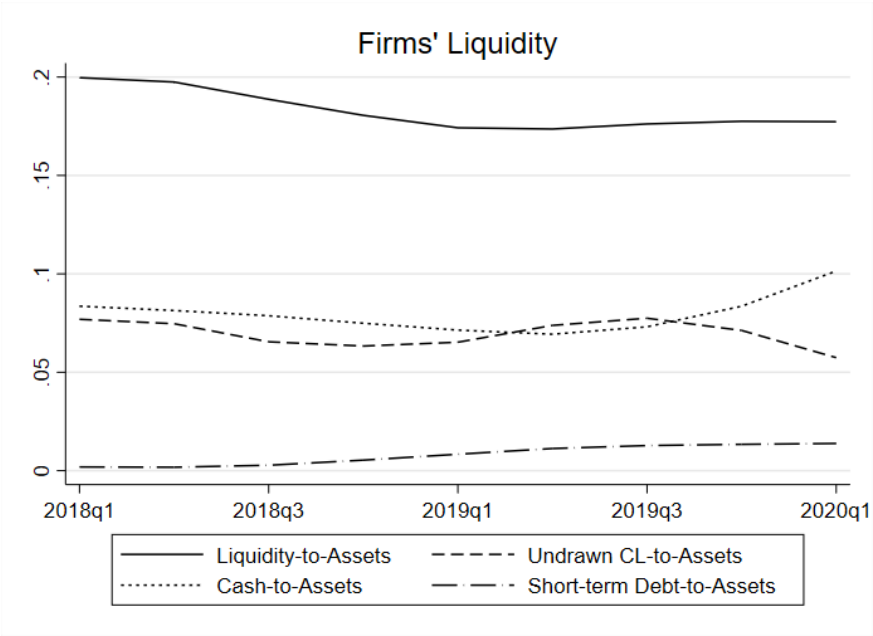


Figure 7. Time-series of balance-sheet liquidity of U.S. non-financial firms

Figure 7 shows the time-series of (median) balance-sheet liquidity of U.S. non-financial firms over the Q1 2018 to Q1 2020 period as well as of its components (undrawn credit lines-to-assets, cash-to-assets, and short-term-debt-to-assets). Panel B shows the differential stock price development of firms with high- vs low liquidity risk. The vertical line indicates the Fed's announcement of the corporate bond buying program on 23 March 2020.

Panel A. Firm liquidity (components)



Panel B. Stock price difference between low liquidity and high liquidity firms

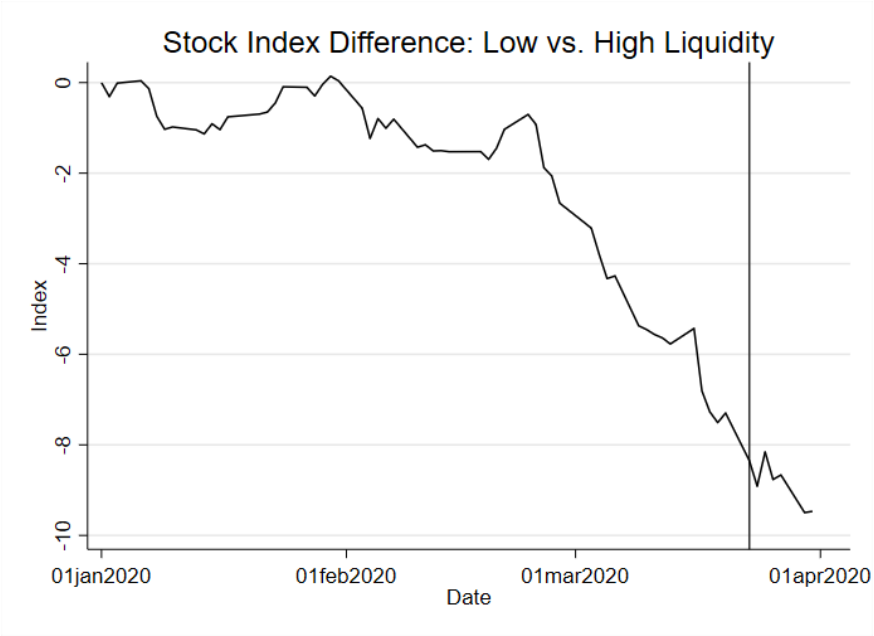
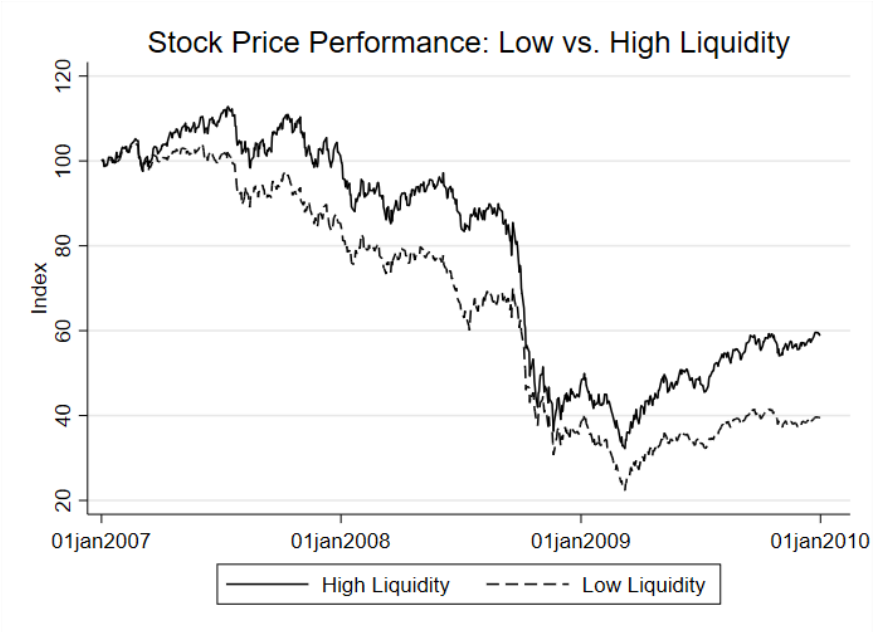


Figure 8. Stock price performance by liquidity 2007-2009

Figure 8 shows the stock price performance of U.S. non-financial firms with high vs. low balance-sheet liquidity over the 2007 to 2009 period (Panel A) and the stock price difference between both group of firms (Panel B).

Panel A. Performance



Panel B. Difference in Performance

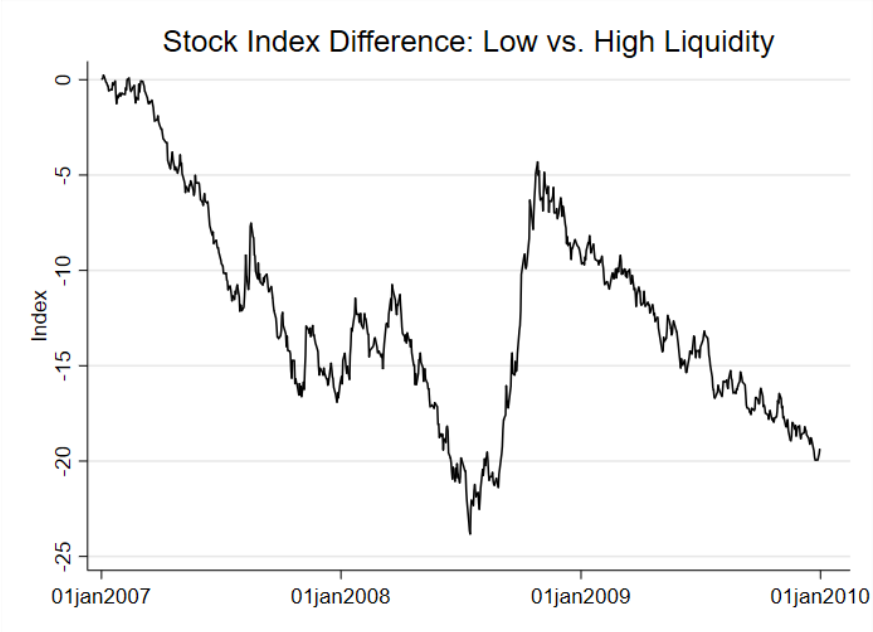


Table 1. Descriptive statistics

Table 1 shows descriptive statistics of 1,803 U.S. non-financial firms over the Q1 2018 to Q1 2020 period. All variables are defined in Appendix I.

	N	Mean	Std. Dev.	p5	p50	p95
Dependent Variables						
Δ Log(Cash-to-Assets)	13,646	0.02	0.64	-0.79	0.00	0.97
Cash / (Cash + Undrawn CL)	13,646	0.54	0.35	0.03	0.50	1.00
Independent Variables						
Log(Total Assets)	13,646	7.53	1.70	5.00	7.41	10.61
Log(Cash)	13,646	4.77	2.02	1.46	4.83	7.96
Leverage	13,646	0.31	0.22	0.00	0.30	0.73
Book-to-Market Ratio	13,646	0.52	0.75	-0.04	0.36	1.54
CapEx-to-Assets	13,646	0.04	0.05	0.00	0.03	0.14
R&D-to-Sales	13,646	0.24	1.01	0.00	0.00	0.66
Dividend Dummy	13,646	0.48	0.50	0.00	0.00	1.00
Loss Dummy	13,646	0.30	0.46	0.00	0.00	1.00
Beta (36-month)	12,954	1.17	0.80	0.04	1.11	2.57
Rating Indicators						
Rated	13,646	0.44	0.50	0.00	0.00	1.00
NonIG Rating	13,646	0.25	0.43	0.00	0.00	1.00
IG Rating	13,646	0.19	0.39	0.00	0.00	1.00
AAA-A Rating	13,646	0.06	0.23	0.00	0.00	1.00
BBB Rating	13,646	0.13	0.34	0.00	0.00	1.00

Table 2. Cash holdings

Table 2 shows the results of OLS regressions of *Δ Log(Cash-to-Assets)* on quarter dummies, quarter dummies interacted with rating classes and control variables. These include*: Leverage, Book-to-Market Ratio, CapEx-to-Assets, R&D-to-Sales, a Dividend* and a *Loss Dummy*. Control variables remain unreported for brevity. In addition, we control for the respective rating category in columns (1) to (3), and add *Beta* as additional control in columns (4) to (6). All regressions include firm fixed effects. Standard errors are clustered at the firm level. We report p-values based on standard errors clustered at the firm level in parentheses. All variables are defined in Appendix I. ***, **, * denote significance at the 1, 5 and 10 % level, respectively.

	Δ Log(Cash-to-Assets)			Cash / (Cash + Undrawn CL)		
	(1)	(2)	(3)	(4)	(5)	(6)
Q1 2020 x Rated	0.2016***			0.0381***		
	(0.000)			(0.000)		
Q1 2020 x IG Rating		0.1902***			0.0003	
		(0.000)			(0.981)	
Q1 2020 x NonIG Rating		0.2101***	0.2101***		0.0671***	0.0671***
		(0.000)	(0.000)		(0.000)	(0.000)
Q1 2020 x AAA-A Rating			0.0913			-0.0111
			(0.293)			(0.575)
Q1 2020 x BBB Rating			0.2336***			0.0053
			(0.000)			(0.710)
Q1 2020	0.2523***	0.2523***	0.2524***	0.0630***	0.0630***	0.0630***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Q4 2019	0.0607***	0.0607***	0.0607***	-0.0316***	-0.0314***	-0.0314***
	(0.002)	(0.002)	(0.002)	(0.000)	(0.000)	(0.000)
Q3 2019	0.0486***	0.0486***	0.0486***	-0.0331***	-0.0330***	-0.0330***
	(0.006)	(0.006)	(0.006)	(0.000)	(0.000)	(0.000)
Q2 2019	0.0280	0.0280	0.0280	-0.0334***	-0.0334***	-0.0334***
	(0.134)	(0.134)	(0.134)	(0.000)	(0.000)	(0.000)
Q1 2019	-0.1374***	-0.1374***	-0.1373***	-0.0152***	-0.0152***	-0.0151***
	(0.000)	(0.000)	(0.000)	(0.004)	(0.004)	(0.004)
Q4 2018	0.0250	0.0250	0.0251	0.1464***	0.1463***	0.1463***
	(0.199)	(0.199)	(0.198)	(0.000)	(0.000)	(0.000)
Q3 2018	0.0091	0.0091	0.0091	0.0095*	0.0094*	0.0094*
	(0.632)	(0.632)	(0.630)	(0.063)	(0.064)	(0.064)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE				Yes	Yes	Yes
R-squared	0.1117	0.1117	0.1121	0.1282	0.1300	0.1300
Number obs.	13,646	13,646	13,646	12,954	12,954	12,954

Table 3. Raising cash (quarterly balance sheet data)

In this table, we focus on how firms raised cash during Q1 2020. Panel A reports the results of differences-in-mean tests of debt structure components of U.S. firms, for the full sample, and for each rating category individually. There are: *Drawn CL / Assets, Drawn CL / (Drawn CL + Undrawn CL), Bond Debt / Assets, Term Loans / Assets, Total Debt / Assets and Cash / (Cash + Undrawn CL)*. Panel B reports the results of cross-sectional regressions analyzing the debt structure differences among firms across rating classes in Q1 2020. The dependent variables are *Drawn CL / Assets* (columns (1)), *Bond Debt / Assets* (column (2)), *Term Loans / Assets* (column (3)). To study differences as to equity issuances and payouts, the dependent variables are *Equity Issuances/Assets* (column (4)) and *Payouts /Assets* (column (5)). Panel C reports the results of cross-sectional regressions analyzing changes in debt structure components from Q4 2019 to Q1 2019 across rating classes. The dependent variables are: Δ *Drawn CL / Asset*$_{t-1}$ (column (1)), Δ *Credit Line Usage* (column (2)), Δ *Bond Debt / Asset*$_{t-1}$ (column (3)), and Δ *Term Loans / Asset*$_{t-1}$ (column (4)). We include in all regression a set of firm characteristics that determine a firm's demand for debt: *Log(Assets)*, *EBITDA/Assets*, *Tangible Assets/Assets*, *Leverage*, *Current Ratio*, and the *MTB-ratio*, and industry fixed effects (2-digit SIC codes). All control variables enter our regression with a one-quarter lag. All variables are defined in Appendix I. We report robust standard errors in parentheses. ***, **, * denote significance at the 1, 5 and 10 % level, respectively.

Panel A. Differences-in-mean tests

Full Sample (N = 1,971)

	Q4 2019	Q1 2020	t-test (diff)	p-value
Drawn CL / Assets	0.035	0.054	0.019	<0.001***
Drawn CL / (Drawn CL + Undrawn CL)	0.192	0.374	0.182	<0.001***
Bond Debt / Assets	0.144	0.145	0.001	0.422
Term Loans / Assets	0.083	0.082	-0.001	0.175
Total Debt / Assets	0.334	0.358	0.024	<0.001***
Cash / (Cash + Undrawn CL)	0.525	0.629	0.105	<0.001***

AAA-A-Rating

	Q4 2019	Q1 2020	t-test (diff)	p-value
Drawn CL / Assets	0.003	0.012	0.009	<0.001***
Drawn CL / (Drawn CL + Undrawn CL)	0.033	0.141	0.109	<0.001***
Bond Debt / Assets	0.291	0.301	0.010	0.11
Term Loans / Assets	0.007	0.008	0.001	0.612
Total Debt / Assets	0.341	0.351	0.010	0.07*
Cash / (Cash + Undrawn CL)	0.484	0.574	0.090	<0.001***

BBB-Rating

	Q4 2019	Q1 2020	t-test (diff)	p-value
Drawn CL / Assets	0.011	0.030	0.019	<0.001***
Drawn CL / (Drawn CL + Undrawn CL)	0.070	0.235	0.165	<0.001***
Bond Debt / Assets	0.277	0.282	0.005	0.02**
Term Loans / Assets	0.017	0.022	0.005	<0.001***
Total Debt / Assets	0.360	0.378	0.018	<0.001***
Cash / (Cash + Undrawn CL)	0.333	0.438	0.106	<0.001***

NonIG-Rating

	Q4 2019	Q1 2020	t-test (diff)	p-value
Drawn CL / Assets	0.034	0.065	0.032	<0.001***
Drawn CL / (Drawn CL + Undrawn CL)	0.161	0.426	0.265	<0.001***
Bond Debt / Assets	0.225	0.225	0.000	0.95
Term Loans / Assets	0.156	0.152	-0.004	0.04**
Total Debt / Assets	0.484	0.520	0.036	<0.001***
Cash / (Cash + Undrawn CL)	0.365	0.534	0.168	<0.001***

Not Rated

	Q4 2019	Q1 2020	t-test (diff)	p-value
Drawn CL / Assets	0.043	0.056	0.014	<0.001***
Drawn CL / (Drawn CL + Undrawn CL)	0.260	0.407	0.147	<0.001***
Bond Debt / Assets	0.074	0.075	0.001	0.97
Term Loans / Assets	0.073	0.071	-0.002	0.3
Total Debt / Assets	0.269	0.291	0.022	<0.001***
Cash / (Cash + Undrawn CL)	0.626	0.707	0.080	<0.001***

Panel B. Regression results (Q1 2020 levels)

	(1) Q1 2020: Drawn CL / Assets	(2) Q1 2020: Bond Debt/ Assets	(3) Q1 2020: Term Loans / Assets	(4) Q1 2020: Equity Issuances /Assets	(5) Q1 2020: Payouts/Assets
AAA-A	-0.049***	0.088***	-0.039***	0.007*	0.006***
	(0.007)	(0.014)	(0.010)	(0.003)	(0.001)
BBB	-0.042***	0.093***	-0.038***	0.002	0.003***
	(0.006)	(0.010)	(0.008)	(0.002)	(0.000)
NonIG	-0.026***	0.027**	0.036***	-0.001	0.000
	(0.006)	(0.011)	(0.009)	(0.002)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes
R-squared	0.270	0.522	0.347	0.194	0.264
Number obs.	1971	1971	1971	1960	1960
AAA-A = BBB	0.0948*	0.615	0.877	0.003***	<0.001***
BBB = NonIG	0.003***	<0.001***	<0.001***	0.050*	<0.001***

Panel C. Regression results (changes Q4 2019 – Q1 2020)

	(1) Δ Drawn CL / $Asset_{t-1}$	(2) Δ Credit Line Usage	(3) Δ Bond Debt / $Asset_{t-1}$	(4) Δ Term Loans / $Asset_{t-1}$
AAA-A	-0.009*	-0.047	0.015**	-0.004
	(0.005)	(0.039)	(0.006)	(0.003)
BBB	0.001	0.009	0.002	0.002
	(0.004)	(0.003)	(0.003)	(0.002)
NonIG	0.011***	0.085***	-0.004	0.000
	(0.003)	(0.022)	(0.002)	(0.002)
Controls	Yes	Yes	Yes	Yes
R-squared	0.155	0.179	0.0573	0.0509
Number obs.	1971	1512	1971	1971
AAA-A = BBB	0.004***	0.092*	0.009***	0.005***
BBB = NonIG	0.004***	0.005***	0.060*	0.5122

Table 4. Stress test / Drawdowns in March

This table reports a comparison of credit line usage of US firms in March and April 2020 with credit line usage rates at the end of 2008. *Undrawn CL* are the undrawn credit lines of firms at the end of 2019. *Expected Drawdown Rate (2008)* is Credit Line / (Credit Line + Undrawn CL) measured at the end of 2008. *Expected Drawdowns* equals *Undrawn CL x Expected Drawdown Rate (2008). Actual Drawdowns* are the realized drawdowns at the end of March (*March (Drawdowns)*) or the end of April (*April (Drawdowns)*). *March (Drawdown Rate)* and *April (Drawdown Rate)* is calculated as the *Actual Drawdowns* in the particular month divided by *Undrawn CL*. *March & April (Drawdowns)* is the sum of *March (Drawdowns)* and *April (Drawdowns)*. Amounts are in billion USD.

	Undrawn CL	Expected Drawdown Rate (2008)	Expected Drawdowns	Actual Drawdowns					
				March (Drawdowns)	March (Drawdown Rate)	April (Drawdowns)	April (Drawdown Rate)	March & April (Drawdowns)	March & April (Drawdown Rate)
AAA-A	322,183	17.00%	54,771	25,872	8.03%	2,200	0.74%	28,072	8.71%
BBB	449,817	23.80%	107,056	136,766	30.40%	11,684	3.73%	148,450	33.00%
Non-IG	309,163	28.50%	88,111	102,256	33.08%	18,744	9.06%	121,000	39.14%
Not Rated	162,725	39.20%	63,788	33,034	20.30%	6,012	4.64%	39,047	24.00%
Total	1,243,888		313,726	297,928		38,640		336,568	

Table 5. Dash-for-cash of fallen angels

Panel A of Table 5 reports the realized stock returns of BBB and BB-rated firms. The matched sample results are based on a propensity score matching process. We calculate the propensity score using a logit model where the dependent variable is an indicator that is one if the firm has a BBB-rating and zero if it has a BB-rating. The regressor is the Z-Score. Panel B reports results from a cross-sectional regression analyzing the drawdown behavior of US non-financial firms as a function of their respective risk. AAA-A, BBB, and NonIG are the rating categories (unrated is the omitted group). In column (1), we use the Z-Score and interaction of rating indicators with the *Z-Score* in the full sample as risk measure. Column (2) shows the results of the unmatched sample of BBB-rated and BB-rated firms. The results in column (3) are obtained from a matched sample using propensity score (PS) matching. We calculate the propensity score using logit models where the dependent variable is an indicator that is one if the firm has a BBB-rating and zero if it has a BB-rating. The regressor is the Z-Score. We also include industry fixed effects in the logit models. We use frequency weights (based on the number of observations from the treated group for which the control group observation is a match) in the matched-sample regression. In column (4), we also match on other differential covariates for being BBB- or BB-rated or the outcome variable: *Log(Market Assets), MTB, Debt/EBITDA, Undrawn CL, Debt/Assets, Current Ratio, Tangible Assets / Assets*, all measured at the end of 2019. T-statistics are in parentheses. All variables are defined in Appendix I. ***, **, * denote significance at the 1, 5 and 10 % level, respectively.

Panel A. Stock returns

	Sample	BBB	BB	Difference	S.E.	T-stat
Stock return	Unmatched	-0.49	-0.612	0.13	0.032	3.79
	Matched Sample (Z-Score)	-0.49	-0.54	0.05	0.047	1.11

Panel B. Drawdowns

	Dependent Variable: Log (Total Drawdowns)			
	Full Sample	Cliff (BBB vs BB rated firms)		
		Unmatched	PS-Matched (Z-Score)	PS-Matched (Z-Score+Controls)
	(1)	(2)	(3)	(4)
AAA-A x Z-Score	0.02			
	(.46)			
BBB x Z-Score	-0.277**			
	(-2.31)			
NonIG x Z-Score	0.05			
	(1.1)			
Z-Score	0.017			
	(.3)			
AAA-A	1.23***			
	(4.45)			
BBB	2.111***	0.926***	1.216***	0.633***
	(5.06)	(5.25)	(6.73)	(3.41)
NonIG	-1.154***			
	(-6.69)			
Controls	Yes			Yes
Industry FE	Yes	Yes	Yes	Yes
Frequency Weights			Yes	Yes
N	408	151	114	106
R^2	36.83%	16.49%	28.79%	10.06%
Treated			57	53
Control			57	53

Table 6. Descriptive statistics

This table reports summary statistics for the key variables in our stock return sample. In Panel A, we show descriptive statistics of the Liquidity measure, i.e., Undrawn CL-to-Assets, Cash-to-Assets, Short-term Debt-to-Assets, for different rating classes. Panel B reports other firm characteristics and stock returns. All variables are defined in Appendix I.

Panel A. Liquidity by rating category

	AAA-A		BBB		NonIG		Unrated	
	N	Mean	N	Mean	N	Mean	N	Mean
Liquidity	100	0.178	230	0.155	470	0.160	1051	0.297
Undrawn CL-to-Assets	100	0.085	230	0.106	470	0.113	1051	0.091
Cash-to-Assets	100	0.120	230	0.074	470	0.071	1051	0.231
Short-term Debt-to-Assets	100	0.050	230	0.035	470	0.034	1051	0.033

Panel B. Firm characteristics (Q4 2019)

	N	Mean	Std. Dev.	p5	p50	p95
Dependent Variables						
Return 01/01/-23/03/20	1,851	-0.60	0.42	-1.38	-0.53	-0.07
Return 01/01/-31/01/20	1,851	-0.05	0.14	-0.29	-0.04	0.14
Return 01/02/-29/02/20	1,851	-0.10	0.14	-0.33	-0.10	0.09
Return 01/03/-23/03/20	1,851	-0.45	0.33	-1.06	-0.39	-0.04
Return 01/04/-30/04/20	1,849	0.17	0.21	-0.08	0.14	0.51
Liquidity Components						
Liquidity	1,851	0.24	0.21	0.01	0.18	0.70
Undrawn CL-to-Assets	1,851	0.10	0.10	0.00	0.08	0.28
Cash-to-Assets	1,851	0.17	0.21	0.00	0.08	0.67
Short-term Debt-to-Assets	1,851	0.03	0.05	0.00	0.02	0.12
Independent Variables						
Log(Market Cap)	1,851	7.55	1.93	4.46	7.54	10.87
Book-to-Market Ratio	1,851	0.52	0.94	-0.05	0.36	1.85
Equity Beta (daily 01/01/-31/12/19)	1,851	1.15	0.49	0.33	1.14	1.99
Profitability	1,851	0.27	0.23	-0.04	0.26	0.65
Momentum (01/01/-31/12/19)	1,851	0.11	0.45	-0.69	0.17	0.66

Table 7. Balance-sheet liquidity and stock market performance

The table shows results from cross-sectional regressions of stock returns in excess of the risk-free interest rate on firm characteristics. The dependent variables are stock returns over the Jan 1 – March 23 period (column (1)), Jan 1 – Jan 31 period (column (2)), Feb 1 – Feb 29 period (column (3)), March 1 – March 23 period (column 4)), and April 1 – April 30 period (column (5)). Panel A shows the results from regressions of stock returns on *Liquidity*. *Liquidity* is measured at the end of 2019. Control variables are from the asset pricing literature and include the firm's *Equity Beta*, the stock return in calendar year 2019 (*Momentum*), the *Book-to-Market Ratio*, *Log(Market Cap)*, and *Profitability*. Panel B shows the results from regressions of stock returns on the components of Liquidity. All variables are defined in Appendix I. ***, **, * denote significance at the 1, 5 and 10 % level, respectively.

Panel A. Liquidity and stock returns

	(1) Return 01/01/-23/03/20	(2) Return 01/01/-31/01/20	(3) Return 01/02/-29/02/20	(4) Return 01/03/-23/03/20	(5) Return 01/04/-30/04/20
Liquidity	0.582***	0.010	0.102***	0.471***	-0.002
	(0.000)	(0.582)	(0.000)	(0.000)	(0.934)
Controls	Yes	Yes	Yes	Yes	Yes
R-squared	0.1831	0.1329	0.0548	0.1314	0.0661
Number obs.	1851	1851	1851	1851	1849

Panel B. Liquidity components by time period

	(1) Return 01/02/-23/03/20	(2) Return 01/02/-29/02/20	(3) Return 01/03/-23/03/20	(4) Return 01/04/-30/04/20
Undrawn CL-to-Assets	0.096	-0.052	0.148	0.175***
	(0.258)	(0.108)	(0.051)	(0.001)
Cash-to-Assets	0.631***	0.124***	0.506***	-0.032
	(0.000)	(0.000)	(0.000)	(0.210)
Short-term Debt-to-Assets	-0.469	-0.056	-0.413*	-0.238
	(0.126)	(0.763)	(0.077)	(0.289)
Controls	Yes	Yes	Yes	Yes
R-squared	0.1647	0.0708	0.1414	0.0760
Number obs.	1851	1851	1851	1849

Table 8. Balance-sheet liquidity and stock market performance in 2007-09

The table shows results from quarterly cross-sectional regressions of stock returns in excess of the risk-free interest rate on firm characteristics. The dependent variables are stock returns over the Q1 2007 to Q2 2009 period. Panel A shows the results from regressions of stock returns on *Liquidity*. *Liquidity* is measured at the end of 2006. Control variables are from the asset pricing literature and include the firm's *Equity Beta*, the stock return in the (pre-crisis) calendar year 2006 (*Momentum*), the *Book-to-Market Ratio*, *Log(Market Cap)*, and *Profitability*, all measured at the end of 2006. Panel B shows the results from regressions of stock returns on the components of Liquidity. All variables are defined in Appendix I. ***, **, * denote significance at the 1, 5 and 10 % level, respectively.

Panel A. Liquidity and stock returns

	(1) 2007 Q1	(2) 2007 Q2	(3) 2007 Q3	(4) 2007 Q4	(5) 2008 Q1	(6) 2008 Q2	(7) 2008 Q3	(8) 2008 Q4	(9) 2009 Q1	(10) 2009 Q2
Liquidity	-0.0001	0.1216***	0.1686***	0.0151	-0.0411	0.0802*	-0.0378	0.0864	0.1870***	-0.0124
	(0.996)	(0.000)	(0.000)	(0.669)	(0.452)	(0.093)	(0.526)	(0.259)	(0.000)	(0.740)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.0264	0.1647	0.1317	0.0622	0.0724	0.1265	0.1732	0.0939	0.1095	0.1894
Number obs.	309	309	309	309	218.	218	218	218	221	221

Panel B. Liquidity components and stock returns

	(1) 2007 Q1	(2) 2007 Q2	(3) 2007 Q3	(4) 2007 Q4	(5) 2008 Q1	(6) 2008 Q2	(7) 2008 Q3	(8) 2008 Q4	(9) 2009 Q1	(10) 2009 Q2
Undrawn CL-to-Assets	-0.0005	0.1187***	0.1810***	-0.0214	-0.0444	0.0686	-0.0570	0.1052	0.1699***	-0.0308
	(0.987)	(0.000)	(0.000)	(0.566)	(0.453)	(0.144)	(0.352)	(0.135)	(0.000)	(0.375)
Cash-to-Assets	-0.0481	0.1423**	0.1293*	0.1363	-0.0910	-0.0164	0.1227	0.1262	0.5842***	0.0300
	(0.546)	(0.022)	(0.088)	(0.120)	(0.519)	(0.906)	(0.433)	(0.548)	(0.001)	(0.849)
Short-term Debt-to-Assets	-0.2976*	0.0229	-0.0433	0.0220	-0.1390	-0.3784	0.1079	0.2036	0.7988**	-0.2334
	(0.080)	(0.850)	(0.836)	(0.910)	(0.497)	(0.238)	(0.742)	(0.537)	(0.017)	(0.349)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.0404	0.1670	0.1330	0.0695	0.0761	0.1354	0.1759	0.0970	0.1697	0.1973
Number obs.	309	309	309	309	218	218	218	218	221	221

Appendix Table I. Variable Definitions

Variable name	Definition	Source
AAA-A Rating	A dummy equal to one if a firm's S&P rating is equal to A- or higher	CapitalIQ
BBB Rating	A dummy equal to one if a firm's S&P rating is equal to BBB-, BBB or BBB+	CapitalIQ
Beta (36 month)	Beta coefficient from a regression of monthly log excess returns on monthly market (S&P500) log excess returns over (past) 36 months	CRSP
Bond Debt / Assets	(Total Senior Bonds and Notes + Total Subordinated Bonds and Notes + Total Commercial Papers) / Total Assets	CapitalIQ
Book-to-Market Ratio	Total Common Book Equity / Market Value of Equity	Compustat North America / CRSP
CapEx-to-Assets	Capital Expenditures / Total Assets $_{t-1}$	Compustat North America
Cash / (Cash + Undrawn CL)	Cash & Short-term Investments / (Cash & Short-term Investments + Undrawn Revolving Credit)	CapitalIQ
Cash-to-Assets	Cash & Short-term Investments / Total Assets	CapitalIQ
Current Ratio	Current Assets / Current Liabilities	CapitalIQ
Dividend Dummy	A dummy equal to one if a firm paid a common dividend in a given period, zero otherwise	Compustat North America
Drawn CL / (Drawn CL + Undrawn CL)	Total Revolving Credit / (Total Revolving Credit + Undrawn Revolving Credit)	CapitalIQ
Drawn CL / Assets	Total Revolving Credit / Total Assets	CapitalIQ
EBITDA-to-Assets	EBITDA / Total Assets	CapitalIQ
Equity Beta	Beta coefficient from a regression of daily log excess returns on daily market (S&P500) log excess returns from 01.01.-31.12.2019	CRSP
Equity Issuances / Assets	(Issuance of Common Stock + Issuance of Preferred Stock) / Total Assets	CapitalIQ
IG Rating	A dummy equal to one if a firm's S&P rating is equal to BBB- or higher	CapitalIQ
Leverage	(Total long-term Debt + Current Debt in Total Debt) / Total Assets	Compustat North America
Liquidity	(Undrawn Revolving Credit + Cash & Short-term Investments - Current Portion of long-term Debt) / Total Assets	CapitalIQ
Log(Cash)	Log(Cash & Short-term Investments)	CapitalIQ
Log(Market Cap)	Log(Market Value of Equity)	CRSP
Log(Total Assets)	Log(Total Assets)	CapitalIQ
Log(Total Drawdown)	Log(Total Drawdowns) from 01.03.-09.06.2020	LCD
Loss Dummy	A dummy equal to one if a firm's net income was below zero in a given period, zero otherwise	Compustat North America
Momentum (01/01/-31/12/19)	Sum of log excess returns from 01.01.-31.12.2019	CRSP
NonIG Rating	A dummy equal to one if a firm's S&P rating is equal to BB or lower	CapitalIQ
Payouts / Assets	(Repurchases of Preferred Stock + Common Dividends Paid) / Total Assets	CapitalIQ
Profitability	Gross Profit / Total Assets	Compustat North America
R&D-to-Sales	Research & Development Expense / Sales (Net)	Compustat North America
Rated	A dummy equal to one if a firm has a S&P rating in CapitalIQ	CapitalIQ
Return 01/01/-23/03/20	Cumulative stock return from 01.01.-23.03.2020; log excess returns are calculated as the $\log(1 + r - r_f)$, where r is the simple daily return (based on the daily closing price, adjusted for total return factor and daily adjustment factor) and r_f is the one-month daily treasury bill rate	CRSP
Return 01/01/-31/01/20	Cumulative stock return from 01.01.-31.01.2020	CRSP
Return 01/02/-29/02/20	Cumulative stock return from 01.02.-29.02.2020	CRSP
Return 01/03/-23/03/20	Cumulative stock return from 01.03. 23.03.2020	CRSP
Return 01/04/-30/04/20	Cumulative stock return from 01.04.-30.04.2020	CRSP

Variable Definitions – *Continued*

Variable name	Definition	Source
Return 2007 Q1 - 2009 Q4	Cumulative stock return over the respective quarter	CRSP
Short-term Debt-to-Assets	Current Portion of long-term Debt / Total Assets	CapitalIQ
Tangible Assets / Assets	Net Property Plant and Equipment / Total Assets	CapitalIQ
Term Loans / Assets	Total Term Loans / Total Assets	CapitalIQ
Total Debt / Assets	Total Debt / Total Assets	CapitalIQ
Undrawn CL-to-Assets	Undrawn Revolving Credit / Total Assets	CapitalIQ
Z-Score	Altman Z-Score (Altman, 1986)	CapitalIQ
Δ Bond Debt / $Asset_{t-1}$	Bond Debt $_t$ - Bond Debt $_{t-1}$)) / Total Assets $_{t-1}$	CapitalIQ
Δ Credit Line Usage	(Drawn CL / (Drawn CL + Undrawn CL)) $_t$ – (Drawn CL / (Drawn CL + Undrawn CL)) $_{t-1}$	CapitalIQ
Δ Drawn CL / $Asset_{t-1}$	(Drawn CL $_t$ - Drawn CL $_{t-1}$) / Total Assets $_{t-1}$	CapitalIQ
Δ Log(Cash-to-Assets)	Log(Cash-to-Assets $_t$) - Log(Cash-to-Assets $_{t-1}$)	CapitalIQ
Δ Term Loans / $Asset_{t-1}$	(Term Loans $_t$ - Term Loans $_{t-1}$) / Total Assets $_{t-1}$	CapitalIQ