Liquidity Management During the Covid-19 Pandemic*

Heitor Almeida**
Gies School of Business, University of Illinois at Urbana Champaign, United States

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Abstract

With the help of the United States Government and committed funding from bank credit lines, the United States corporate sector responded to the Covid-19 cash flow shock by issuing long-term debt to increase cash holdings. I use a case study, evidence from recent research, and a theoretical model to explain the logic behind the changes in corporate financial policy that happened during 2020, and to discuss the importance of United States Government policies to support the market for long-term debt. I also point to open research questions about liquidity management, in particular questions that were highlighted by how companies reacted to the Covid-19 pandemic.

Keywords  Cash; Credit lines; Financial crisis; Credit spreads

JEL Classification: G32, G38

1. Introduction

The Covid-19 pandemic created a large direct shock to corporate profits in the United States and other world economies during 2020. This shock increased liquidity risk for many firms and generated an unprecedented increase in the demand for liquidity from affected firms. My goal in this article is to understand firms' reaction to the pandemic shock in light of recent research on liquidity management. As it turns out, changes in corporate financial policies during 2020 are the best real-world example that I have seen of liquidity management in practice. In particular, the

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**Corresponding author: Gies School of Business, University of Illinois at Urbana Champaign, 515 East Gregory Dr. Room 4037 Champaign IL 61820, United States. Tel: +1-217-333-2704, email: halmeida@illinois.edu.
Covid-19 shock highlighted the key roles of precautionary borrowing and credit line liquidity insurance for corporate finance.

The magnitude of the Covid-19 shock to corporate profits can be illustrated by examining rolling profit forecasts for SP 500 firms in the United States, which are widely available. According to Standard and Poor, as of February 2020, analysts expected earnings-per-share (EPS) to grow from approximately $140 to $160 during 2020 for a portfolio of SP 500 firms (data collected from Seekingalpha.com). This growth in earnings is in line with earnings growth in the last few years, since mid-2016. The lockdowns in March 2020, which significantly reduced consumer demand for many sectors of the economy, had a rapid and dramatic effect on earnings expectations for 2020. As of May 2020, analysts expected EPS to decrease from $140 (December 2019) to approximately $90 (December 2020). Earnings growth was presumed to resume in 2021, with EPS predicted to increase to approximately $140 by the end of 2021. These expectations have been confirmed by new forecasts that have been released in August and November 2020.

These forecasts reflect the average effect of Covid-19 on corporate profits. Some sectors of the economy, such as the travel industry, entertainment, and retail were hit even harder by the shock. In a nutshell, affected companies were dealing with a steep and rapid decline in profits during 2020, a decline which most expected to be temporary. How should companies’ financial policies respond to this negative shock? Why did the United States Government have to intervene to provide liquidity to debt markets? These are some of the questions that I will try to address in this paper.

The paper proceeds as follows. Section 2 will illustrate the liquidity management problem that companies had to solve during 2020 using a case study that focuses on a company that was heavily affected by the crisis (Ruth’s hospitality group). Section 3 discusses evidence that shows that Ruth’s response to the shock generalizes to many companies in the United States economy. It also discusses the importance of United States Government policies to support the market for long-term debt. Section 4 attempts to formalize companies’ response to Covid-19 and the role of the United States Government’s policies to support liquidity. This model is also used in Section 5, to discuss open research questions in the field of liquidity management and in particular issues that were highlighted by the Covid-19 pandemic.

The paper focuses mostly on United States data and the United States experience with Covid-19. Besides the topics discussed in Section 5, an obvious area for future research is to broaden our understanding of how corporations and governments around the world responded to the liquidity shock engendered by Covid-19.

2. Case Study: Ruth’s Hospitality Group

Ruth’s hospitality group is the owner of Ruth’s Chris Steakhouse, a high-end restaurant that focuses on indoor dining. It is a good example of a company that had to deal with a significant decline in demand, hitting the company hard and fast
as lockdowns were introduced in March 2020. Ruth’s reported EBITDA (earnings before interest, taxes, and depreciation) was $74.4 million a year in 2019. EBITDA forecasts for 2020 were cut to $5.9 million by May 2020. EBITDA forecasts stood at $8.9 million a year by November 2020.\(^1\) Consistent with the SP 500 forecasts above, analysts expect Ruth’s Chris to return to profit growth in 2020 and beyond. As of May 2020, EBITDA was expected to equal $49.9 million for 2021. As of November, analysis expected EBITDA to equal $47.6 million for 2021, and $60.7 million for 2022.

Ruth’s had to deal with this large, but hopefully temporary, shock to profits during 2020. In addition, it is important to recall that in March and April 2020 there was significant uncertainty about the length and magnitude of the Covid-19 shock to profits. Ruth’s CFO could not really be sure that profits would be back up by 2021. What should the CFO do?

In order to think about this question, it is also important to consider the company’s balance sheet. Most pressingly, I estimate that Ruth’s had approximately $60 million of short-term liabilities that had to be met during 2020, including accounts payable, accrued expenses, and lease payments.\(^2\) On the asset side, Ruth’s had $5.6 million dollars in cash and equivalents, and $23.8 million in accounts receivable for 2020. Even under the optimistic assumption of zero default risk on receivables, it is clear that Ruth’s suddenly became short of cash and was facing significant liquidity risk in early 2020. In the absence of external funding or other operational adjustments (such as extending payables with suppliers), the company was facing outright bankruptcy. Clearly, Ruth’s had to raise additional funding from investors in March 2020. In addition, it was crucial that such new funding had to be either some form of long-term debt or equity. Issuing short-term debt that had to repaid in 2020 would not increase the company’s liquidity for a sufficiently long period of time.

It is well known in corporate finance that, at least in the United States, companies avoid issuing equity in general, and particularly so when stock prices are low (see Chapter 2 in Tirole 2006 for a summary of empirical evidence and discussion). In the case of Ruth’s, the stock price dropped from a pre-crisis value of approximately $21 a share to a low of close to $5 a share in early March 2020.\(^3\) Consistent with the evidence, Ruth’s decided to issue long-term debt in March 2020. By the end of the first quarter (data from 29 March 2020), Ruth’s had issued $85 million in new long-term debt.

At first glance it is somewhat surprising that Ruth’s managed to issue that much long-term debt in early March 2020. Ruth’s is a highly leveraged company, that does not have access to bond markets. Including leases, Ruth had approximately

\(^1\) Data for EBITDA forecasts, and other financial data in this Section come from Standard and Poor’s Capital IQ.

\(^2\) This estimate excludes $53 million in current unearned revenue, since these represent mostly non-refundable gift cards that the company sold to customers.

\(^3\) As of November 2020, Ruth’s stock price was back up to $16 a share.
$300 million in total debt as of December 2019. Using the market value of equity as of early March 2020 (which was approximately $180 million), Ruth’s debt-to-value ratio was up at 63%, which would have likely placed Ruth in a “junk bond” category. However, the company did not have a credit rating because it does not issue bonds. It is common in corporate finance to use the lack of a bond rating as a proxy for financial constraints (see, e.g., Almeida et al. 2004). There is also empirical evidence that unrated companies are, on average, financially weaker than firms that have junk bonds (Lemmon and Roberts 2010). In sum, Ruth’s is a good example of a company that would have difficulty raising new funding from markets in particular in crisis times.

Data on the pricing of bank loans for highly leveraged companies such as Ruth’s, in fact, indicates that the market for new loans virtually shut down in the beginning of March 2020. Acharya and Steffen (2020) report that prices of highly leveraged loans fell from approximately 97% of face value to close to 75% of face value in the first days of March. This decrease in price corresponds to huge increases in interest rates. While the exact map from loan prices to interest rates depends on many variables, such as maturity, coupons, and non-price features, this drop in face value can be thought of as a near tripling in yield-to-maturities (for example, if yields had been 4% pre-Covid, they would have gone up to close to 12% after the shock hit loan markets). In any case, exact interest rates may be moot because when interest rates increase to that extent adverse selection takes over loan markets and companies are basically shut down from borrowing (only “bad” companies would be willing to borrow, and thus banks restrict new lending to everyone).

How did Ruth’s manage to issue $85 million in new debt (which was equivalent to 50% of its market capitalization at the time), if the market for new loans was virtually shut down? The answer is that the company relied on its existing credit lines. According to the company’s financial statements, total revolving credit increased by $81 million in the first quarter of 2021 (total lease liabilities also increased by $4 million, making up the difference). The key advantage of a credit line drawdown for Ruth’s in March 2020 is that loan terms in a credit line contract are pre-determined, including the spreads on the loan and maximum drawdowns to which the firm has access. In the case of Ruth’s, according to the company’s disclosures, the interest rate on the credit line drawdown is 2.74%, and the loan matures in February 2022. Thus, the company was able to issue a long-term (2-year) loan at an interest rate that was significantly lower than that it would have obtained in the open market at the same time (if it could borrow at all). This example clearly shows the liquidity insurance role of corporate credit lines, which has been emphasized in recent academic literature (see, e.g., Acharya et al. 2012).

The other important observation to make is that Ruth’s issued long-term debt in excess of what the company immediately needed to fund immediate operations. Cash holdings went up in March from $5.6 million to $70.8 million. The numbers above show that the difference between short-term liabilities and liquid short-term
assets (cash and receivables) was approximately $30 million during 2020. Assuming zero cash flow, this calculation suggests that Ruth’s increased cash beyond immediate needs for 2020. In fact, as of the latest quarterly statement of September 2020, cash and equivalents were in fact even higher ($103.1 million). The company’s intention was clearly to increase cash holdings, and not only to fund current expenditures. This simultaneous increase in both cash and long-term debt is what I like to refer to as “precautionary borrowing,” following Acharya et al. (2007). In particular, as Acharya et al. show, a financial position with high cash holdings and high long-term debt (as Ruth’s post-March 2020) can offer greater financial flexibility than a low cash, lower long-term debt position (as Ruth’s pre-March 2020). I discuss this point in greater detail in Section 3 below.

How did Ruth’s manage to increase cash and equivalents beyond the level that it established in March? This new funding did not come from a credit line draw-down (the company’s credit line was exhausted in March and undrawn credit stood at zero after that, according to Capital IQ data). The company did not believe that the increase in liquidity in March gave it sufficient financial flexibility and continued to seek long-term funding. First, the company tried to access a government loan using the paycheck protection program (PPP). At that time Ruth’s qualified for a PPP loan, which was a very advantageous way for small companies to raise capital during 2020 (the PPP is discussed further below). However, Ruth’s PPP loan (together with those from other public companies such as Shake Shack) generated significant backlash from the media. Ruth’s thus decided to return the loan that it received through PPP. Second, Ruth’s leverage was too high to qualify for the other Government facility that focused on bank-dependent firms (the Main Street Lending Program). The upper limit on the Debt-to-EBITDA ratio to qualify for Main Street was initially set at four times, including credit lines. Ruth’s easily exceeded this limit. Thus, Ruth did not have any additional source of long-term debt, other than initiating a new bank loan at high interest rates.

It turns out that Ruth’s raised cash by issuing equity. On 20 May 2020, the company announced it was issuing $43.5 million in equity, to boost its liquidity position. As we discuss further in Section 3, issuing equity to increase cash is an alternative way to increase financial flexibility (see, McLean 2011 for evidence that companies issue equity to hold cash). Interestingly, the equity issuance did not seem to have a material effect on Ruth’s stock price. Ruth’s stock price was $9.16 on 20 May. It decreased to $8.08 on 21 May, the first trading day after the announcement. This decrease is consistent with previous evidence that suggests that equity issuance tends to have a negative effect on stock prices (Eckbo and Masulis 1995). But the stock price was back up at $9.38 on 27 May, a week after the announcement. Given

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4This quote from Ruth’s financial disclosures nicely captures the nature of precautionary borrowing: “We borrowed the remaining available amount under our revolving credit facility as a precautionary measure in order to increase our cash position and preserve financial flexibility.”
the company’s difficulty in raising additional funding from debt markets, the stock market may have taken the equity issuance as good news about the company in this case.

3. The Dash-for-Cash and the Role of Credit Lines and Government Liquidity Provision

Ruth’s case study is very representative of the way in which corporate financial policy reacted to the Covid-19 shock in the United States. The most relevant study for my purposes is Acharya and Steffen (2020). They find that firms increased the debt to assets by 2.4% on average in the United States, from the fourth quarter of 2019 to the first quarter 2020 (7% of the mean debt to assets ratio). This increase is not as large as Ruth’s, because it reflects an average across the entire economy, including firms that were not heavily affected by Covid-19. Clearly, the increase in the demand for debt in 2020 is prevalent across United States firms.

This increase in debt was funded mostly with drawdowns in credit lines, particularly so for firms with lower credit ratings or firms that are unrated (like Ruth’s). However, Acharya and Steffen show that even highly rated firms (A and higher) increased drawdowns of credit lines in March 2020. Overall, they document that from 5 March 2020 to 23 March 2020 (the date on which the Federal Reserve announced policies to support liquidity in debt markets), firms drew down $240 billion from outstanding credit lines.5 They also compare this level of drawdowns with drawdowns that happened during the 2007–2009 financial crisis, and find that while the magnitudes were similar overall, during the Covid-19 pandemic drawdowns were much more clustered in a short period of time rather than spread out over the crisis. This run to credit lines is what they call the “dash-for-cash.”

The term “dash-for-cash” is particularly appropriate given how companies used the funds that they drew from their credit lines. Consistent with the Ruth’s case above, Acharya and Steffen show that there was a generalized increase in cash holdings by United States companies in the first quarter of 2020, across firms with different levels of credit risk. Thus, companies drew on credit lines not only to fund current cash flow shortages, but also to boost liquidity and protect against future shortages (precautionary borrowing).

Credit line drawdowns are not the full story though. Not all firms rely on credit lines for liquidity management to begin with. In particular, smaller firms and firms with high credit risk are less likely to have undrawn credit lines (they rely mostly

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5See also the Financial Times article entitled “Dash for Cash: Companies Draw 124B from Credit Lines⁵", 24 March 2020, for some visible examples of companies that dashed to banks to draw on credit lines. Consistent with expectations, firms in heavily hit industries, such as cruise companies, hotels, and airlines, drew billions of dollars from outstanding credit lines.
A firm with no credit line and short on cash in March 2020 would have been in deep trouble in the face of a Covid-19 cash flow shock. This firm would have an increased demand for long-term debt, but in the absence of a credit line it would probably have been unable to raise funds in the first weeks of March. For example, Acharya and Steffen document that BBB-rated firms issued virtually no bonds in early March, before the announcement of the Fed-Treasury credit facilities. As discussed in Section 1, the market for new long-term debt was virtually closed.

The second half of the story is the United States Government interventions to provide liquidity to debt markets. As in other crisis episodes, the United States Government fulfilled its role as lender of last resort in the first half 2020. The specific interventions during Covid-19 reflect the nature of the shock and the characteristics of the demand for liquidity. While during the 2007–2009 crisis liquidity support was directed mostly to the financial sector, during Covid-19 the overarching goal was to help satisfy the increase in the demand for long-term debt from the (non-financial) corporate sector.

Details about the United States Government lending facilities are widely available elsewhere (see, for example, the webinar by Jeremy Stein for an excellent discussion). I would like to point out some specific features that I believe are specially interesting for corporate finance researchers. First, the United States Government was aware that it was important to provide support to different segments of debt markets. Corporate finance research suggests that the debt market is fairly specialized: some firms rely on bonds for raising new long-term debt, while other firms rely on bank financing (see, e.g., Holmstrom and Tirole 1997; Rauh and Sufi 2010; Colla et al. 2013). The United States Government thus created different credit facilities to support bond markets (the “Corporate Credit Facility,” or CCF), and the loan market (the “Main Street Lending Facility,” or MSLF). In addition, the government created the PPP, which is similar to MSLF in that it targets bank lending, but different in that the “loans” do not have to be repaid if the company qualifies for the program and complies to certain conditions, such as employment maintenance.

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6See Acharya et al. (2020a) for theory and evidence on the cross-sectional distribution of liquidity management policies.

7See Holmstrom and Tirole (2011) for a discussion of government liquidity support during the 2007–2009 financial crisis using a liquidity management framework that is similar to the one we use in this paper.

8Jeremy Stein’s 2020, webinar “An Evaluation of the Fed-Treasury Credit Programs” is available at https://bcf.princeton.edu/event-directory/covid19_15/.

9I do not imply here that there is perfect specialization across banks and bonds. It is fairly common, for example, for firms to borrow mostly from the bond market, but also have a bank-provided credit line as a liquidity insurance tool (Acharya et al. 2020a).
In short, the CCF essentially allows the United States Government to use Treasury funds to buy bonds directly in the debt market. This facility is thus targeted at companies that have access to bond markets (larger and safer firms, on average). The MSLF, in turn, is an attempt to directly support bank lending by allowing the United States Government to buy participation in loans originated by lenders, who must also retain a percentage of the loans. The requirement that banks retain a participation in loans is also a good reflection of corporate finance research. As shown by Holmstrom and Tirole (1997) among many others, bank lending can be understood as a form of lending that involves some monitoring or screening. But monitoring/screening requires banks to retain a stake in projects that they finance to mitigate moral hazard issues (see chapter 13 in Tirole 2006, for a simple model of this mechanism). Loans through the MSLF are only available for certain types of firms (fewer than 15,000 employees or less than $5 billion in revenue), again reflecting the characteristics of firms that typically rely on bank loans.\(^\text{10}\)

While there is a lot of debate about details on the implementation of these government facilities (in particular PPP), the big picture is fairly clear in my view: intervention successfully restored liquidity to debt markets, which was the policy’s main goal. Acharya and Steffen, for example, show evidence of an increase in bond issuance right after the announcement of the CCF (23 March 2020), in particular for firms that had an investment grade rating (non-investment-grade firms were not able to issue new bonds in the early stages of the crisis, and continued to rely on bank financing even after the program’s announcement).\(^\text{11}\)

Despite this asymmetry across firms of different credit quality,\(^\text{12}\) evidence from credit spreads in both bond and loan markets suggests that liquidity has been restored across the board, and that credit risk is back to pre-crisis levels as of November 2020. Data from the St Louis Federal Reserve shows that as of November 2020, bond spreads have returned to levels that are similar to those from before March 2020. For example, bonds rated as AAA by Moody’s were trading at spreads (relative to Treasury bonds of similar maturity) of approximately 0.6% prior to March. Once the crisis hit, in the first weeks of March, AAA spreads shot up to

\(^{10}\)As discussed in Section 2, the MSLF also includes a leverage restriction that shuts down lending to highly leveraged firms such as Ruth’s. See the webinar by Jeremy Stein for a critical discussion of this feature.

\(^{11}\)See the Wall Street Journal article titled “Corporate Debt, Distress and More Borrowing”, 10 May 2020, for a nice chart showing that the volume of bond issuance by investment-grade firms in the United States in the first half of 2020 was visibly larger than in any period during the previous years. This increase is a reflection of the increase in demand for long-term debt that I discussed above, and the role of the government in increasing bond market liquidity.

\(^{12}\)See also the article on Bloomberg Businessweek titled “The Fed Effort to Save Midsize Firms Isn’t Working, and Here’s Why”, 30 November 2020, for some evidence that not many loans were made through the MSLF.
2.4%. Intervention in late March immediately reduced spreads to around 1%. Since then AAA spreads have decreased almost monotonically and are now back at around 0.6% (November 2020). A similar picture holds for BAA bonds. Spreads shot up from 1.5% to close to 5% in early March, and then back down to 3% right after intervention (April 2020), and have decreased monotonically since then. BAA spreads are back at 1.5% as of November 2020. The picture is virtually identical for high-yield bonds. Pre-crisis spreads were approximately 4%. High-yield spreads shot up to close to 11% in early March but have responded strongly to government intervention as well. While high-yield spreads were still around 8% in May 2020, they have also come down to pre-crisis levels (close to 4%) as of November 2020. The evidence on high-yield bonds is particularly important, given the evidence from Acharya and Steffen that junk-rated firms were not able to issue new bonds in the early stages of the crisis.

Evidence from loan markets corroborates the hypothesis that credit risk has essentially come down to pre-crisis levels as of the end 2020. As discussed above, prices of highly leveraged loans fell from approximately 97% of face value to close to 75% of face value, in the first days of March. Interestingly, despite the evidence suggesting that the MSLP was slow to take off, the announcement of the Government bond buying programs on 23 March also had an immediate effect on loan markets. Prices of highly leveraged loans were back up above 85% of face value in April and have steadily climbed back towards close to pre-crisis levels as of November (around 95% of face value). Thus, despite the fact that the United States Government ended up not making many loans through the banking sector, loan markets have also stabilized in line with the bond market. What is the explanation for this evidence? Holmstrom and Tirole (1997) may offer some clues. In their model, high credit quality firms borrow from the bond market while lower credit quality firms rely on banks. A reduction in bond interest rates allows a greater fraction of firms to borrow in the bond market and reduces the demand for bank lending in the loan market. If bank capital is limited, this mechanism implies that banks can make loans at better terms when more firms borrow in the bond market. Future research can examine whether this mechanism is behind the reduction in credit risk in the loan market during 2020.

Financial markets are telling us that the economic impacts of Covid-19 will be over soon. Clearly, the improvement in debt (and equity) market conditions is a consequence of the underlying public health implications of the pandemic. The expectations in November 2020 reflect the increased likelihood that vaccines will end the Covid-19 pandemic at some point during 2021. These expectations significantly reduce risk-premia and increase both bond and stock prices. While this improvement in expectations is likely to be the first order effect driving prices, it is important to point out that in the absence of clever liquidity management by corporations and swift government intervention things could have turned out very differently.
4. A Model of Liquidity Management during Covid-19

I present a model of liquidity management based on Holmstrom and Tirole (1998) and Tirole (2006), and following Almeida et al. (2014). Almeida et al. use this model to interpret the empirical evidence on corporate liquidity policies. Here I adapt the model to characterize companies’ dash for cash in the aftermath of Covid-19, and the key role of existing credit lines discussed informally in Sections 1 and 2. The model can also be used to depict the importance of government liquidity provision policies for companies that could not rely entirely on existing credit lines. In Section 5 I use the model to discuss possible directions for future research, in particular those that have been raised by the Covid-19 crisis. In particular, I will emphasize the areas in which this standard model of liquidity management fails to capture the richness of liquidity management decisions in the real world.

4.1. Model Set Up

Consider a firm with an investment project that requires $I_0$ at a date-0. The investment opportunity also requires an additional investment at date-1. The date-1 investment requirement can equal either $\rho I$, with probability $\lambda$, or zero, with probability $(1-\lambda)$. An interpretation for this set up is that state $\lambda$ is a state in which the firm produces low short-term cash flows, which may be insufficient to cover date-1 investment requirements. For example if an investment $I_1$ is required at date-1, then we have $\rho = I_1 - r$, where $r$ is a random short term cash flow. Thus with probability $(1-\lambda)$ the cash flow $r$ is exactly equal to $I_1$, and with probability $\lambda$ we have $r < I_1$. Let $r_\lambda$ denote the low cash flow. There is no discounting and everyone is risk-neutral.

A firm will only continue its date-0 investment until date-2 if it can also make the date-1 investment. Otherwise the firm is liquidated and the project produces a date-2 cash flow equal to zero. Thus the required investment $I_1$ should be thought of as any required expenditures that the firm must make at date-1 in order to avoid liquidation. If the firm continues, the investment produces a date-2 cash flow $R$ that occurs with probability $p$. With probability $1-p$, the investment produces nothing. The probability of success depends on the input of specific human capital by the firms’ managers. If the managers exert high effort, the probability of success is equal to $p_G$. Otherwise, the probability is $p_B$, but the managers consume a private benefit equal to $B$. This moral hazard problem implies that the firms’ cash flows cannot be pledged in their entirety to outside investors. Following Holmstrom and Tirole (1998), define:

$$\rho_0 \equiv p_G \frac{R - B}{p_G - p_B} < \rho_1 \equiv p_GR. \quad (1)$$

The parameter $\rho_0$ represents the investment’s pledgeable income, and $\rho_1$ its total expected payoff. The model’s main friction is this wedge between the total expected payoff and the pledgeable income.
I maintain the following assumption throughout:

$$\rho_1 > I_1$$  \hspace{1cm} (2)

This assumption means that it is always optimal to continue the project, given that the expected payoff given continuation $\rho_1$ is greater than the required investment $I_1$.

### 4.2. Modeling the Covid-19 Shock

To gain a good grasp of how the Covid-19 shock may affect liquidity management using this model, it is convenient to assume that the initial investment $I_0$ has already been made. In addition assume for now that the firm has no existing external financing commitments (for example the initial investment may have been funded using internal funds).\(^{13}\) The question then is whether the firm can finance the date-1 investment, or not.

To capture the Covid-19 shock in a simple way, assume that prior to the realization of the shock the firm’s date-1 cash flow is such that:

$$\rho = \frac{I_1}{C_0} r < \rho_0$$  \hspace{1cm} (3)

In this case the firm has no trouble financing the required investment in the event that the short-term cash flow turns out to be lower than expected. The firm can raise financing using the pledgeable income from date-2, which is sufficient to finance the required investment conditional on the low cash flow realization. The firm is financially unconstrained.

Now consider the effect of the shock, by assuming that the low cash flow $r_\lambda$ is now such that:\(^{14}\)

$$\rho = \frac{I_1}{C_0} r \lambda > \rho_0$$  \hspace{1cm} (4)

In addition assume for now that all the other model parameters are unchanged.

In this case, the firm does not have sufficient liquidity if the low cash flow realizes. The firm is financially constrained. As explained in Almeida et al. (2014), the key insight of liquidity management models is that in this case the firm must increase liquidity by pledging cash flows in the good state of the world in which it has excess pledgeable income. In other words, liquidity management is a transfer of cash from good to bad states of the world. In our simple case, the firm has pledgeable income $\rho_0$ with probability $(1-\lambda)$, which it does not need in that state. To access this pledgeable income the firm raises financing against the date-2 cash

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\(^{13}\)This assumption is not necessary, one could alternatively assume (as in Tirole 2006) that date-0 claims can be fully diluted at date-1.

\(^{14}\)Suppose for now that this reduction in $r_\lambda$ was completely unexpected by the firm (a “zero probability” event). If this had not been the case, the firm should already have had liquidity management mechanisms in place prior to shock.
flow and uses the proceeds to increase liquidity. For example, the firm can issue a
debt claim to external investors equal to $D$ to raise cash, which we denote by $C$.
Following Tirole (2006) we assume that cash is fully pledgeable so that the external
investor owns the cash in the good state of the world, in which cash is not
needed. In that case the maximum amount of cash that the firm can raise is given
by:
\[ C_{\text{max}} = (1 - \lambda)(\rho_0 + C_{\text{max}}) \]  
\( (5) \)

The firm needs $\rho - \rho_0$ in liquidity in the bad state of the world. Thus, as long
as $C_{\text{max}} > \rho - \rho_0$, the firm will be able to pay for the required investment $I_1$ in the
bad state of the world as well. The required condition is then:
\[ \lambda(\rho - \rho_0) < (1 - \lambda)\rho_0 \]  
\( (6) \)

If this inequality holds the firm can raise enough cash to manage the liquidity
risk associated with the Covid-19 shock.

4.3. Precautionary Borrowing

In the scenario above, the firm that is hit with the negative shock to cash flow
moves from a situation in which it has zero debt (and no cash) to a financial
position with positive debt and cash holdings that are raised by issuing debt. As
pointed out by Acharya et al. (2007), the high debt and high cash position gives
the firm more financial flexibility than the initial situation in which it has no
debt. In other words, cash is not equivalent to negative debt if a firm is finan-
cially constrained. As in the Ruth’s hospitality group case study of Section 2, the
firm in Section 3.2 is engaging in precautionary borrowing.

As in the Ruth’s example, it is essential that the firm raises cash by issuing
long-term debt. In the model, the debt cannot be due at date-1, together with
the required investment. If that is the case, then the firm must use cash to sup-
port debt and cash does not increase financial flexibility. In other words, cash is
equivalent to negative short-term debt. Since the debt repayment is only due at
date-2, the firm in the model can use the cash holdings to help finance the
required investment $I_1$ if the short-term cash flow turns out to be low. Debt is
repaid using the pledgeable part of the long-term cash flow $R$. Finally, note that
the firm can also issue equity in our example to raise cash (as Ruth’s did as
well). The model does not distinguish between equity and long-term debt. In
fact, there is some evidence in the literature that firms do issue equity to raise
cash (McLean 2011).

While this solution of the model roughly matches the “dash for cash” that we
observed in the United States economy during March and April 2020, there are
important issues that need to be addressed, starting with the role of credit lines in
the dash for cash and for liquidity management in general.
4.4. The Role of Credit Lines

As I discuss in Section 2, prior to Government intervention in debt markets, United States companies issued a specific type of long-term debt: bank loans that originated from existing credit lines. The explanation for this pattern is clear: back in March 2020, the market for long term debt was virtually closed. Thus the corporate demand for precautionary borrowing could not have been met by issuing new long-term debt in the market.

In the model above, we can capture this situation by changing additional model parameters. Equation (6) above makes it clear that the precautionary borrowing response to the crisis is only feasible if pledgeable income $\rho_0$ is high enough, and the probability of a liquidity shortfall $\lambda$ is low enough. While I assume above that these parameters did not change with the crisis, it is clear that both likely changed in a direction that makes precautionary borrowing harder. First, pledgeable income $\rho_0$ very likely decreased, reflecting the difficulty that firms faced in raising new funds.15 Second, liquidity risk very likely increased as well. For example, as Section 2 discussed, Ruth’s hospitality group would have run out of funds during 2020 if it had not raised new funding. In the model we can think of such a situation as one in which the parameter $\lambda$ increases and approaches one. With significantly lower $\rho_0$ and significantly higher $\lambda$, the inequality (6) may not hold.

As discussed above, the key feature of bank credit lines is that they provide companies with liquidity insurance against precisely such situations as those of March 2020. To capture this situation in the model above, one needs to assume that the firm already had a credit line in place. As discussed in Almeida et al. (2014), one can think of a credit line in this model as a set of two parameters ($w, x$). The parameter $w$ represents the maximum amount that the firm can borrow using the credit line, at a pre-determined interest rate that does not depend on current market conditions. The firm pays for this liquidity insurance by paying the commitment fee $x$ to the bank. The commitment fee is paid for as long as the credit line contract remains open, irrespective of usage. During 2020, United States firms borrowed from banks using the credit limit $w$, at significantly lower rates than what they would have paid in the market. These funds were used to pay for expenses during 2020, but also to increase cash holdings (precautionary borrowing).

While this narrative is pretty clear, the model above has some challenges in capturing this run from credit lines into cash. In the traditional liquidity management model, the firm chooses between credit lines or precautionary borrowing (see Almeida et al. 2014). This decision is made once, prior to the realization of the liquidity shock. I am not aware of any model in the literature that captures a run on existing credit lines to increase cash holdings. This limitation is due to the static nature of existing theories of liquidity management, as I discuss below in Section 4.

15In the model above the interest rate is assumed to be zero (no discounting). An increase in interest rates (which was observed in March 2020) will decrease pledgeable income in this model (see chapter 13 of Tirole 2006, for example).
4.5. Government Liquidity Support

Finally, it is straightforward to understand the importance and the impact of the Government credit facilities. As the discussion above suggests, the reduction in \( \rho_0 \) and the increase in \( \lambda \) that likely happened in March 2020 made it difficult for firms to satisfy their demand for precautionary borrowing. In the absence of a large enough existing credit line, firms’ liquidity demand would not have been met.

Government credit facilities can be thought of as an attempt by the United States Government to increase pledgeable income \( \rho_0 \) for different firms, making it easier for the United States corporate sector to satisfy its demand for precautionary borrowing. The United States Government policies also recognize the fact that different types of firms rely on different types of long-term debt (for example banks vs. bonds), as we discussed in Section 2. Finally, by increasing pledgeable income, the United States Government likely also affected liquidity risk. While these are fixed and unrelated parameters in the model above, in the real world these parameters are time-varying and also depend on variables outside of the model, such as the degree of risk aversion in the economy. That is another limitation of this simple model.

5. Possible Directions for Future Research

The Covid-19 shock provides a unique opportunity to understand the importance of liquidity management for corporate finance. In particular, the Covid-19 shock highlights the key roles of precautionary borrowing and credit line liquidity insurance. Nevertheless, it also shows the limits of what we understand and points to possible directions for future research.

5.1. The Dynamics of Liquidity Management

The standard model of liquidity management discussed above has three periods. Liquidity management decisions are made at the initial date together with a decision about the long-term investments and the scale of the project (date-0). Then the liquidity shock either hits or not (date-1) and in date-2 payoffs are realized. The literature has taken this model far, shedding light in issues such as aggregate liquidity shortages (Holmstrom and Tirole 1998), cash policy (Almeida et al. 2004), the limits of debt capacity (Acharya et al. 2007), the choice between cash and credit lines (Acharya et al. 2012, 2013), and the interplay between risk management and liquidity management decisions (Almeida et al. 2017).

Nevertheless, this model has a limited ability to shed light on the dynamics of corporate liquidity decisions due to its artificial timing. In the real world, firms are continuously making decisions about project scale and how much liquidity to keep for the future or to use today. The literature on dynamic corporate finance has made progress in this direction (see, for example, Bolton et al. 2011). However, it is challenging to model the choice between cash and credit lines. Bolton et al. (2011), for example, take credit lines as given and do not analyze what determines the
optimal size and characteristics of credit lines, or the choice between cash and credit lines as a liquidity management tool. Introducing endogenous credit lines in a dynamic corporate finance model seems to be a first order topic for future research. Such a model can allow us to better understand the role of time-variation in key parameters such as liquidity risk and pledgeability.

It is pretty clear from both recent crisis episodes (the 2007–2009 financial crisis and Covid-19) that during a crisis firms use existing credit lines to increase cash holdings (see Campello et al. 2011 for evidence on the 2007–2009 crisis). While we do understand why an increase in aggregate risk may make cash more desirable for companies relative to credit lines (Acharya et al. 2013, 2020a), some questions remain unanswered.

For example, consider a company such as Ruth’s that has access to an existing credit line that does not expire for a few years. If the company has current expenditures that require additional financing, it is natural to expect the company to draw on the credit line (as in the benchmark model above). However, as we learned above, in some cases companies draw on credit lines not to fund current expenditures, but to increase cash holdings. What are the drivers of this decision to switch from credit lines to cash? In particular, the company must consider the potential implications of credit line drawdowns for future credit line access. At the time of maturity, does the renewal of the credit line (or its terms) depend on the company’s past drawdown behavior? To my knowledge these questions have not been addressed in the literature, either by theory or empirical work.

5.2. Dynamic Liquidity Management by Banks

The discussion above largely ignores the fact that the credit line contract has an important counterparty: a bank. There is now significant evidence that banks are not passive providers of insurance, but also constantly monitor firms’ financial situation and restrict access to credit lines in some situations. In particular, evidence suggests that following covenant violations banks can restrict access to existing credit lines, leading to significant consequences for firms’ financial and real policies (Sufi 2009).

This point suggests that banks also face a dynamic decision-making process when providing credit lines to firms. First, banks need to decide how to react to covenant violations. The literature suggests that banks do not always restrict access or change financing terms when firms violate covenants (Acharya et al. 2020b). Many covenant violations are, in fact, waived. The literature suggests that bank health is an important determinant of this decision: banks that are less capitalized or less liquid are more likely to react to violations by restricting credit supply (Acharya et al. 2020b; Chodorow-Reich and Falato 2020). However, bank health is unlikely to be the only determinant of the waiver/revocation decision. Previous literature also suggests that banks actively monitor firm behavior during the life of a credit line contract. Acharya et al. (2012) present a theoretical model of credit lines as monitored insurance. As we further discuss below, this observation
suggests that the type of the liquidity shock that drives credit line drawdowns can also matter.

We have limited understanding to date as to whether and how covenant violations mattered for credit line access during Covid-19. Sufi (2009) shows that the main determinant of covenant violations is firm profitability. Given the magnitude of the Covid-19 shock to corporate profits (take Ruth’s as an example), it seems hard to believe that covenants were not violated by some or many companies in the United States economy. However, companies did not seem to have problems drawing on credit lines (Acharya and Steffen 2020). What exactly happened? At first glance, the evidence suggests that banks make complex dynamic decisions when faced with corporate liquidity shocks. For example, they may have decided to waive violations, or even redesign covenant thresholds. More work is certainly needed to understand the dynamics of credit line origination, maintenance, usage, and renegotiation both from the perspective of firms and banks.

5.3. Does the Type of Liquidity Shock Matter?

A key point that is emerging from the literature on liquidity management is that the type of liquidity shock that companies face is an important determinant of how banks react to covenant violations, and thus of whether companies can have access to credit lines or not. Two key dimensions are whether the shock is exogenous to firm decisions, and whether the shock has implications for aggregate liquidity demand or not (purely idiosyncratic).

The ideal shock for credit line liquidity management is an exogenous and idiosyncratic shock. A shock to liquidity that is clearly not driven by bad managerial decisions or misbehavior is a much better candidate for insurance than a shock that is a consequence of poor decisions. Acharya et al. (2012) show how banks can use monitoring and credit line revocation to weed out managerial decisions that increase the potential for liquidity shocks. However, companies may have limited credit line insurance even for shocks that are truly exogenous, if such shocks have an important aggregate component (Acharya et al. 2013). If all companies demand liquidity at the same time, banks may run out of liquidity themselves.

Does such an ideal shock exist? The answer may be yes. Brown et al. (2020) examine liquidity management responses to weather shocks (worse than expected winter weather in specific areas, and thus exogenous and largely idiosyncratic). Interestingly, not only do firms rely on credit line drawdowns to mitigate the impact of weather shocks on cash flows, but banks also immediately replenish credit line drawdown limits for the future (for example, if a firm draws down $50 million from an existing line of $100 million, the drawdown limit continues to be equal to $100 million rather than dropping to $50 million). This striking evidence suggests that credit lines are, in fact, a powerful mechanism to hedge shocks that are exogenous and idiosyncratic.

On the other hand, and perhaps obviously, poor firm performance that is simply a consequence of bad managerial decisions should not deserve credit line
insurance. As discussed above, there is some theory and evidence on this topic (Sufi 2009; Acharya et al. 2012), but more empirical work can be done in the future to establish that banks are likely to react very harshly to covenant violations that are driven by poor decisions.

A liquidity shock such as Covid-19 (or the 2007–2009 financial crisis) stands in the middle. Clearly the reduction in demand caused by Covid-19 is completely exogenous to firm decisions. However, Covid-19 is, to a large extent, an aggregate shock: as shown in Section 2, a large fraction of the United States economy ran to the banking sector to drawdown credit lines. Going forward, it is important to understand why banks were able to honor such drawdowns and thus help companies mitigate the effect of the shock. One interesting conjecture is that banks may have been in a strong financial position at the beginning of the Covid-19 crisis, partly because of how the financial sector readjusted following the previous financial crisis of 2007–2009 (more financial regulation and increases in bank capitalization and liquidity).

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16An interesting possibility is that while banks were able to honor drawdowns, that might have affected their ability to make fresh loans, in particular to small firms that are less likely to have long-term credit lines (a “contamination effect”). See Acharya et al. (2020a) and Greenwald et al. (2020).

17See, Acharya and Steffen, https://voxeu.org/article/stress-tests-banks-liquidity-insurers-time-covid.

18Firms were also able to drawdown on credit lines following the 2007–2009 financial crisis (Campello et al. 2011). However, during that crisis, it is clearly the case than banks in worse financial health were forced to cut credit supply to firms (Chodorow-Reich 2014), including by restricting access to credit lines (Chodorow-Reich and Falato 2020).
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