

# Contingent Credit Under Stress

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## Abstract

Over the past two decades, banks have increasingly focused on offering contingent credit in the form of credit lines as a primary means of corporate borrowing. We review the existing body of research regarding the rationales for banks' provision of liquidity insurance in the form of credit lines, their significance in managing corporate liquidity, and the reasons and circumstances under which firms opt to utilize them. We emphasize that the options for firms to both draw down and repay credit lines are put options issued by banks, which are exercised by firms in a correlated manner during periods of widespread stress, with adverse effects on bank intermediation thereafter. We discuss the bank capital and the bank funding channels that can drive these effects, contrasting their roles during the Global Financial Crisis and the Covid-19 outbreak. We conclude by discussing the increasing extension of bank credit lines to non-bank financial intermediaries, as well as the role of stress tests and monetary policy in managing the risks of contingent credit under stress.

**JEL classification:** G01, G21

**Keywords:** credit lines, banks, bank capital, COVID

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# 1 Introduction

In the last two decades, there has been a significant transformation in corporate borrowing, along with notable shifts in the behaviors and interactions of firms, banks, and capital markets. Figure 1 shows the time-series development of the debt structure of publicly listed firms in the U.S. Several discernible trends emerge. Credit lines and bonds (both as % of GDP) have increased significantly after the Global Financial Crisis (GFC), while bank term-lending has somewhat declined. A substantial part of term loans is now provided by institutional investors (such as Collateralized Loan Obligations (CLOs) or mutual funds) and not banks (Berg, Saunders, and Steffen, 2021). In essence, the primary function of banks in corporate borrowing has significantly transitioned towards offering credit lines.

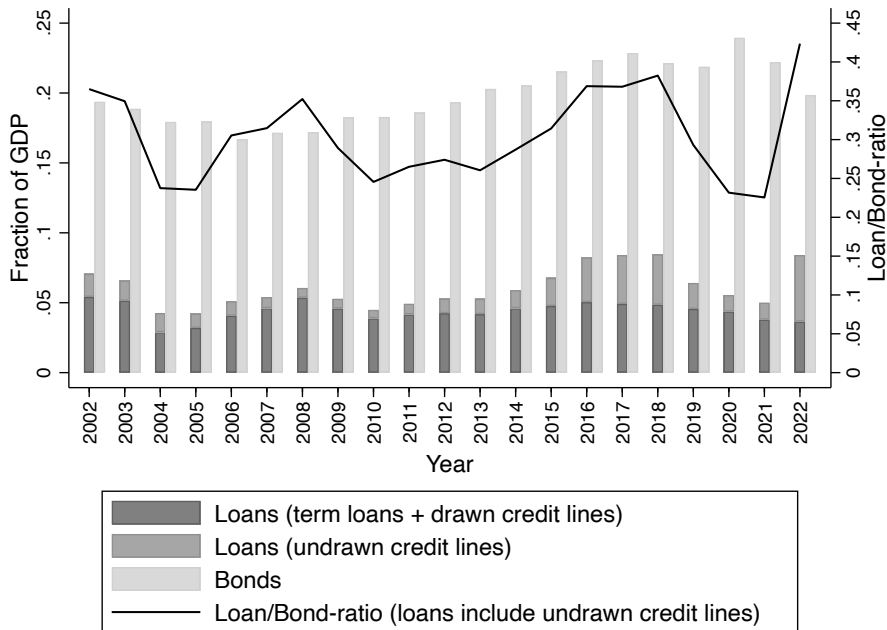
Credit lines, however, are a form of contingent credit in that they represent put options issued by banks, granting firms the flexibility to draw down and repay funds at their discretion, viz., the GFC and the Covid-19 outbreak. In recent years, amidst two profound economic crises, credit lines have been heavily drawn down by firms under stress and yet have gained increasing prominence. This trend prompts a crucial question: how does the exposure of banks to credit lines influence their role as financial intermediaries during times of widespread economic stress? This is a key question that we try to address in this paper. To answer this, we conduct a thorough review of the existing body of research regarding the rationales for banks' provision of credit lines, their significance in managing corporate liquidity, and the reasons and circumstances under which firms opt to utilize them. We gather new data, and perform additional analyses.

In Section 2, we first describe important institutional details associated with credit lines. In particular, we show how they affect bank and firm balance-sheets at origination and in contingencies when they are drawn. We then discuss the motives why banks issue credit lines and rationalize banks – as they simultaneously issue credit lines as well as demand deposits – as being special in their role of liquidity insurance provision in this market. We summarize the literature that discusses how the exercise of draw-down options by firms affects the pricing structure of credit lines (vis-a-vis regular term

loans) and provide some more recent data to support earlier results.

Figure 1: Overview of the corporate debt structure in the US

This figure shows the debt structure of public non-financial US corporations over the period 2002-2022. Loans and bonds (as a percentage of GDP) (grey bars, left) and the loan:bond ratio (red line, right) are shown. The sample is based on the intersection of data from Capital IQ and Compustat. All variables refer to outstanding amounts at the end of the fiscal year and are collected from Capital IQ. All ratios are defined as the sum of the numerator variable divided by the sum of the denominator variable (instead of an average of the firm-level ratios), thus effectively giving larger firms greater weight. This figure is the updated Figure 1 in [Berg et al. \(2021\)](#)



In Section 3, we explore the reasons firms use credit lines instead of other instruments such as cash, commercial paper or term loans. Firms mainly use credit lines as insurance against either cash-flow shocks or in order to invest in (short-lived) profitable business opportunities. The literature highlights that credit lines and cash are more often complements than substitutes, fulfilling distinct purposes in corporate liquidity management. We further describe the empirical literature that highlights credit line drawdowns as a response to idiosyncratic shocks, but use recent data to show the increasing use of credit lines under stress including the most recent crisis periods, viz., the global financial crisis of 2007-2008 (GFC) and the COVID-19 pandemic. Our data suggest that junk-rated (or speculative-grade) firms draw down, on average, twice as much in percentage of outstanding credit lines compared to investment-grade rated firms. Both types of firms, however, substantially increase credit line usage during pe-

riods of aggregate shocks – approximately by a factor of two. Does this trend of firms heavily drawing down liquidity during widespread economic distress pose challenges for the overall balance sheets of banks, in terms of liquidity depletion and/or capital commitment?

We answer this question in Section 4. To that end, we examine the literature that investigates the effects of credit line drawdowns on banks, particularly during times of stress. The literature emphasizes a “double bank run” during the GFC as firms drew down credit lines as well as deposits, but a “dash for cash” during the COVID-19 pandemic as funds drawn down from credit lines were re-deposited. However, while the banking sector on aggregate did not suffer a deposit outflow during the Covid-19 outbreak, we highlight possible disparities in liquidity access between weaker and stronger banks when funds are mainly deposited with stronger banks.

Importantly, we focus on possible real spillovers of bank exposure to credit line drawdowns during periods of aggregate stress. We highlight the importance of a “capital channel” (vis-a-vis a “funding channel”) in understanding the mechanisms through which credit line exposures of banks impact their lending.

We then discuss a few additional topics associated with bank credit lines during periods of aggregate liquidity shocks in Section 5. First, we point out a “two-sided credit line channel” and highlight the importance of the repayment option in understanding the effects of banks’ credit line exposure and drawdowns. We then illustrate how the contingent (drawdown) risk of credit line exposures can be regulated by including them in regular stress stress for bank capital calculations. Finally, we review the literature that emphasises that credit line exposure might accumulate in the banking sector during periods of quantitative easing with potential risks to financial stability. Section 6 concludes.

## 2 Institutional Details - Credit Lines

### 2.1 What are credit lines and how do they work?

A credit line is a bank loan arrangement, in which a bank agrees to lend to a firm in the future up to a stated maximum amount.<sup>1</sup> In particular, the credit line has a fixed maturity during which the firm can draw down (and then repay) the credit line a number of times and at terms that are fixed ex ante (i.e., upon the origination of the credit line) fixed.

Figure 7 illustrates the balance-sheet ramifications of a credit line agreement between a bank and a firm (FIRM A). Panel 2a displays the balance sheets post commitment. The bank incurs an off-balance-sheet liability, while the firm gains an off-balance-sheet asset, granting the firm the flexibility to transition a portion of the total commitment to an on-balance-sheet loan. Panel 2b outlines the balance-sheet changes for both entities when the firm opts to draw down an amount of, say, 50. This action decreases the off-balance-sheet positions for both by 50 and introduces a new on-balance-sheet loan of 50 for both the bank (as an asset) and the firm (as a liability). Here, it is assumed the firm retains the liquidity as cash (e.g., invests it in marketable securities), making the drawdown neutral for the bank's balance sheet size, while the firm's balance sheet expands by 50. Alternatively, as shown in Panel 2c, if the firm deposits the liquidity in the same bank instead of holding it as cash, the bank's balance sheet grows. Alongside the new on-balance-sheet loan, there is no cash outflow, but instead the creation of an added deposit of 50 on the liability side, enlarging the bank's balance sheet by 50.

Banks face nuanced impacts as well. In Panel 2b, there's a transition from (risk-free) cash to loans that are both risky and illiquid, amplifying the bank's liquidity risk. Concurrently, banks must allocate equity capital to fund the loan, adhering to Basel III regulations, which ties up capital that might be utilized elsewhere.<sup>2</sup> In Panel 2c, the capital requirement mirrors that in Panel 2b.

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<sup>1</sup>In the literature as well as in practice, credit lines might have different names, such as contingent credit (as the loan is state-contingent) or revolving lines of credit, or revolving credit facilities. We use all of these expressions interchangeably.

<sup>2</sup>It's worth noting that contingent credit also demands some capital allocation.

Figure 2: Balance sheets of banks and firms: Effects of credit line origination and drawdown

This figure shows the balance sheets of a hypothetical BANK and FIRM A. The bank provides an off-balance-sheet credit line to the firm (Panel 2a). The firm draws down 50 from the credit line and keeps it as cash, e.g. in marketable securities (Panel 2b). Alternatively, it deposits the funds with the bank (Panel 2c).

BANK		FIRM A	
Assets	Liabilities	Assets	Liabilities
Cash	Deposits	Cash	Bank loans
Loans	Capital	Long-Term Assets	Capital
	<u>Off Balance Sheet</u> Credit Line A	<u>Off Balance Sheet</u> Credit Line A	

(a) Before FIRM A draws down the credit line

BANK		FIRM A	
Assets	Liabilities	Assets	Liabilities
Cash (-50)	Deposits	Cash (+50)	Bank loans (+50)
Loans (+ 50)	Capital	Long-Term Assets	Capital
	<u>Off Balance Sheet</u> Credit Line A (-50)	<u>Off Balance Sheet</u> Credit Line A (-50)	

(b) FIRM A draws down 50 from credit line and keeps it as cash

BANK		FIRM A	
Assets	Liabilities	Assets	Liabilities
Cash	Deposits (+50)	Cash	Bank loans (+50)
Loans (+ 50)	Capital	Bank deposits (+50)	Capital
	<u>Off Balance Sheet</u> Credit Line A (-50)	<u>Off Balance Sheet</u> Credit Line A (-50)	

(c) FIRM A draws down 50 from credit line and deposits it with the bank

However, the bank benefits from a deposit influx, effectively mitigating liquidity risk. This rudimentary balance-sheet representation is consistently used in the paper to explain the effects of contingent credit on banks and firms. Specifically, Section 4 investigates how firms' varied uses of contingent credit—whether aligned with Panel 2b or Panel 2c—yielded distinct repercussions for banks during the two recent significant

crises (the Global Financial Crisis (GFC) in 2007-09 and the Covid-19 shock in March 2020).

## 2.2 Why do banks provide credit lines?

This chapter investigates the dynamics of banks providing contingent credit from the lens of credit supply, i.e. the reasons behind banks' preference to offer these agreements, banks' predominant role in providing contingent credit compared to other financial institutions, and the methodologies that banks employ in structuring these contracts.

**The rationale for supplying credit lines.** To which borrowers do banks provide credit lines, and why do they assume the associated liquidity risks?<sup>3</sup>

According to [Avery and Berger \(1991\)](#), banks employ a selection mechanism, offering credit commitments predominantly to safer firms. As per the rationale in [Kanas \(1987\)](#), these firms can then use such commitments as a signaling tool, indicating their inclusion in the group of low-risk entities. This literature assumes that banks have a more efficient screening process for identifying low-risk borrowers compared to the term loan market. Furthermore, [Shockley and Thakor \(1997\)](#) illustrates that the intricate fee structures in credit commitments enable banks to distinguish more effectively between borrowers of varying risk profiles, making it a more adept solution to address information asymmetry than traditional term loan formats.

[Thakor \(1982\)](#) emphasizes the role of interest rate unpredictability. The exact interest rate that will be applied in the event of a liquidity crisis for a firm remains uncertain. Therefore, disparities in anticipated future interest rate movements between lenders and borrowers can shape the supply-demand dynamics. For instance, if a firm anticipates a rise in future interest rates, but banks predict a decline, both entities might be inclined to agree on a commitment contract with a predetermined interest rate. [Morgan \(1994\)](#) posits that banks could leverage credit commitment contracts to maximize profits during periods when the demand for term loans is subdued, thereby avoiding potential losses from missed interest payments. This perspective complements the insurance-driven motive of firms: while firms seek to shield themselves from liq-

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<sup>3</sup>Insuring or managing liquidity risk is a major component in firms' decision to obtain credit commitments. Chapter 3 provides more details about a firm's motive to use credit line in its corporate liquidity management.

liquidity challenges in periods of stress by requesting committed credit, banks aim to safeguard their revenue streams by offering it.

**Bank credit line provision.** Why are banks the primary suppliers of credit lines? [Kashyap, Rajan, and Stein \(2002\)](#) argue that deposit-taking and credit-line provision are part of the key intermediation function of banks: to provide liquidity to *both* households and firms. They highlight synergies between both activities and an efficiency in risk management as each of them requires banks to hold liquidity. Specifically, if credit line usage and deposit withdrawals are not highly correlated, liquidity held as a hedge against possible deposit withdrawal can be used to meet credit-line drawdowns and does not sit idle on bank balance sheets. [Kashyap et al. \(2002\)](#) also argue that by virtue of being special in provision of credit lines to firms, banks gain access to information that can in turn make them special also in the extension of term loans relative to bond markets and other financial intermediaries. [Gatev and Strahan \(2006\)](#) argue that banks can offer firms protection against broad market liquidity shocks by issuing loan commitments more affordably than other intermediaries due to the hedging effect of deposit inflows. In typical scenarios, investors directly fund firms. However, during market stress, investors view banks as safe havens, which may be due to deposit insurance and other backstops (e.g., [Pennacchi \(2006\)](#)), leading to increased deposits just as borrowers draw from their commitments. This balance allows banks to provide cost-effective liquidity insurance to firms and households.

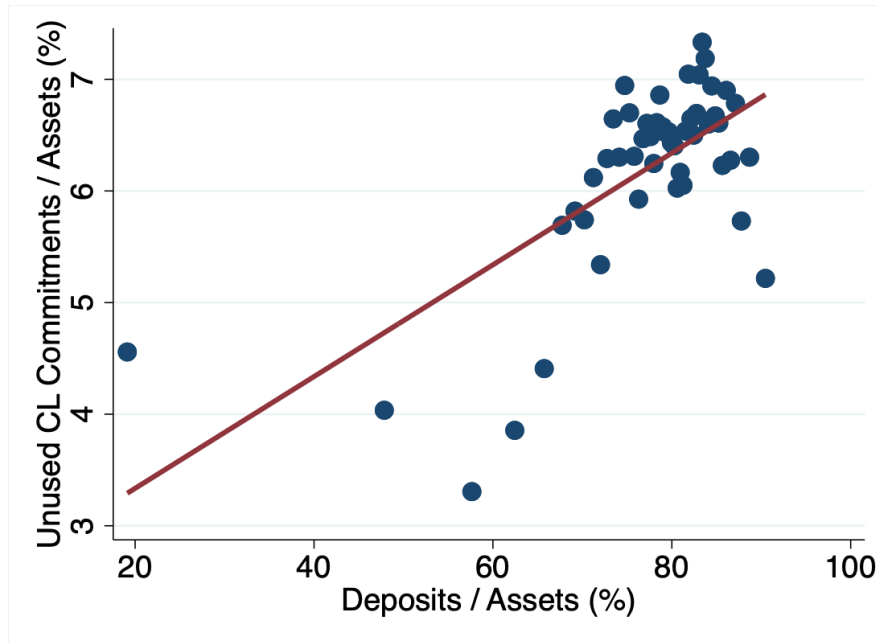
Referring to Figure 7 above, when firms utilize significant portions of their committed credit and, as illustrated in Panel 2b, choose not to retain the funds in their bank deposit accounts, it results in a tangible liquidity outflow. To effectively manage this outflow, banks require a robust and liquid funding source that remains stable. [Kashyap et al. \(2002\)](#) and [Gatev and Strahan \(2006\)](#) suggest that such stability is more likely to come from deposits than from wholesale funding, as a part of wholesale deposits stems from corporate savings.

Taking this argument to the data, Figure 3 presents the relationship between funding sources from the previous quarter and unutilized credit line commitments (both adjusted by total assets) for nearly 1000 bank holding companies that filed FR Y-9C with the FED from 2010 to 2023Q2. Panel 3a shows a positive link between deposits

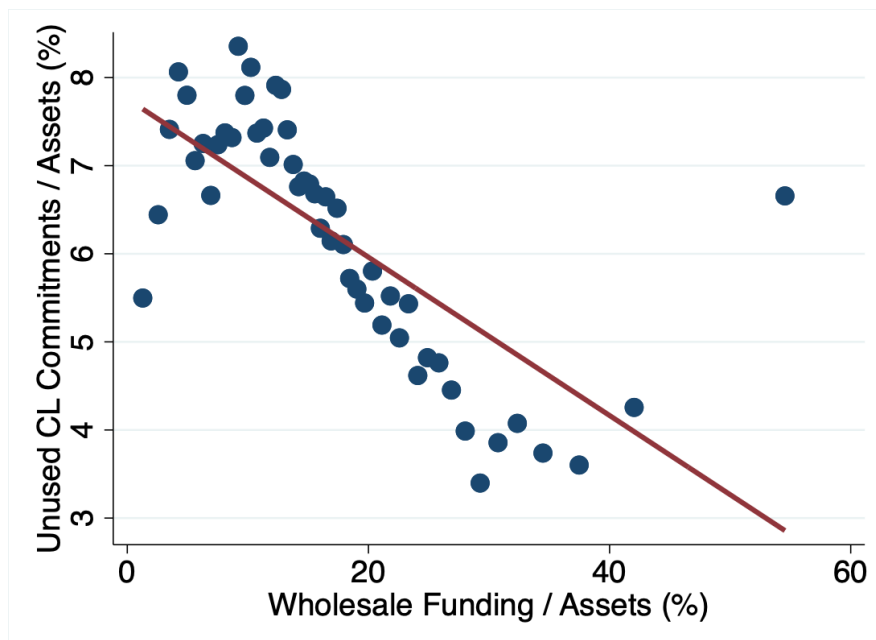


Figure 3: Binned scatterplot of funding source vs. unused credit line commitments

This figure shows binned scatterplots of banks' total credit commitment divided by total assets versus, in Panel 3a, their deposits-to-assets ratio, and, in Panel 3b, their wholesale funding-to-assets ratio. Each dot represents an average of 100 data points of a pooled sample of banks' FR Y-9C filings from 2010Q1 to 2023Q2.



(a) Deposits vs. commitments



(b) Wholesale funding vs. commitments

and credit line commitments. The presence of high deposits, which serve as a consistent funding source unaffected by general market or liquidity fluctuations, allows banks to pledge more substantial amounts of contingent credit. Conversely, Panel 3b reveals a pronounced negative association between wholesale funding and credit line commitments. As posited in [Gatev and Strahan \(2006\)](#), wholesale funding is unstable and reacts to market shifts. Banks heavily reliant on wholesale funding, mirroring non-bank financial entities, face challenges in offering liquidity insurance to borrowers as they anticipate liquidity outflows in periods of stress.

### 2.3 The structure and pricing of credit lines

Credit lines are rather complex loan agreements compared to, for example, a term loan. While the latter is usually paid out at origination by the bank, credit lines are state-contingent loans paid out at the discretion of the borrower. They resemble a set of options, specifically the option to draw down and then to repay the credit line. The literature discussed in this section has mainly focused on the option to draw down. A notable exception is [Acharya, Engle, Jager, and Steffen \(2023b\)](#) who highlight the importance of the repayment option – besides the drawdown option – in understanding bank stock returns during the COVID-19 pandemic. We discuss the repayment option in Section 5.

To illustrate the structure and pricing of credit lines, we provide a leading example.

**Example.** On June 16th, 2010, Meredith Corp., an American media conglomerate, entered into a USD 150mn credit line, a commitment by a syndicate of Bank of America, JP Morgan Chase, Wells Fargo and BBVA Compass Bank under which Meredith can borrow up to the committed amount over a period of 36 months. The contract specifies that Meredith has to pay 50bps of the committed amount upfront. Moreover, during the 36 months, Meredith pays 37.5bps annually for each dollar that is committed but not borrowed. For each dollar borrowed under the commitment, it has to pay LIBOR plus 250bps (the interest rate spread). While it is insufficient to describe the contract by simply referring to the interest rate spread, credit line fees are important because of their magnitude and as they are intimately linked to states of the world in which

Meredith decides to draw down the credit line.<sup>4</sup>

We use loan data from Refinitive Dealscan over the 1986 to 2023Q1 period to investigate the prevalence of spread and fees in credit line and term loan contracts. About 76% (27%) of credit line contracts contain a commitment fee (annual fee).<sup>5</sup> Approximately 17% of credit line contracts incorporate upfront fees, while 8% include utilization fees. In contrast, term loans have a distinct fee structure: upfront fees are present in 28% of contracts, and cancellation fees appear in 15%. When juxtaposing the two financial products, it becomes evident that a standard credit line encompasses three pricing dimensions: all-in-spread-undrawn, all-in-spread-drawn, and a commitment fee. In contrast, a conventional term loan primarily features a single pricing dimension: the all-in-spread drawn, essentially the interest rate on the loan. The theoretical literature previously mentioned hints at banks leveraging these pricing margins for borrower screening. Next, we discuss empirical findings detailing how banks execute this strategy.

Berg et al. (2016) and Berg, Saunders, Steffen, and Streitz (2017) provide a comprehensive overview of the pricing structure of credit lines both in the U.S. and in Europe.<sup>6</sup> Berg et al. (2016) focus on U.S. non-financial firms. They argue that borrowers utilize the credit line if term lending in the spot market is more expensive than the terms set out in the credit line contract. In other words, banks do not get a revised risk-adjusted spread when firms draw down the credit line. They need to get compensated for bearing this risk and, therefore, price credit line usage using fees. Consistently, the authors document that banks increase upfront and commitment fees if borrowers are more likely to draw down the credit line, which makes acquiring the drawdown option ex ante costlier for firms. Consistent with the theoretical literature (Thakor and Udell, 1987), they also show that fees can be used to screen borrowers. Similar to insurance contracts, borrowers who have private information that they do not intend to use the

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<sup>4</sup>The Dealscan FacilityID of this agreement is 256725. The full credit agreement is available [here](#). Information on spreads and fees can be found in Section 2.08 (spread) and Section 2.09 (fees). The example is also used to motivate the pricing structure of credit lines in Berg, Saunders, and Steffen (2016).

<sup>5</sup>Annual fees are sometimes called facility fees. Note that only one of these fee types is present in a contract, but not both. See Berg et al. (2016) for further details.

<sup>6</sup>While most of the literature focuses on the pricing structure, early work by Melnik and Plaut (1986) has pointed out that lenders and borrowers optimize over a multi-dimensional loan package, including collateral, maturity and various fees. See also Mabile and Wang (2022) for a theoretical framework that yields such price and non-price terms in intermediary-based loan pricing.

credit line select themselves into contracts with a higher deductible (a higher spread paid on usage) but a lower option fee (commitment fee).

Examining the difference between the European and U.S. credit line markets, [Berg et al. \(2017\)](#) illustrate that Europe’s reduced sensitivity to aggregate shocks in credit line drawdowns results in lower drawn spreads but elevated undrawn spreads. Essentially, the European context diminishes the emphasis on screening incentives documented in [Berg et al. \(2016\)](#), which utilizes higher undrawn spreads to ward off less borrowers who are highly sensitive to aggregate market stress.

Finally, consistent with a cyclical in credit line usage, [Acharya, Almeida, and Campello \(2013\)](#) argue that banks should be less willing to provide commitments to firms who are likely to draw down in times of aggregate market or liquidity stress. They empirically validate this hypothesis showing that credit lines issued to firms with higher market beta are more expensive. [Acharya et al. \(2023b\)](#) find consistent results.

### 3 Credit lines and corporate liquidity management

In this section, we explore the reasons firms opt for contingent credit over other external financing methods like term loans or commercial paper, and internal resources such as cash. Subsequently, we highlight the motivations and patterns of firms when utilizing their available credit commitments.

#### 3.1 Why do firms issue credit lines?

**Credit lines vs. spot market – an insurance motive.** When should firms consider securing external financing through a credit line as opposed to a term loan? Pioneering research by [Campbell \(1978\)](#) posits that firms anticipated to require future financing face escalating costs in spot market financing proportional to their liquidity needs. This is because heightened liquidity demands can be interpreted as signals of increased risk, leading to a steeper risk premium. As a result, firms leverage credit lines as a safeguard against significant liquidity shocks or downside risks. [Boot, Thakor, and Udell \(1987\)](#) further contend that borrowers opt for credit lines to shield themselves from roll-over or funding risks during economic downturns. [Gatev and Strahan](#)

(2006) note that credit lines often serve as backup mechanisms for commercial paper, offering protection against market liquidity shocks. In a similar vein, [Berkovitch and Greenbaum \(1991\)](#) demonstrate that credit lines can address underinvestment problems, reminiscent of the insights from [Myers \(1977\)](#). [Martin and Santomero \(1997\)](#) suggest that tapping into a pre-established credit line offers a swifter liquidity access route compared to floating a new debt instrument. In scenarios marked by fleeting investment opportunities where prompt action is crucial, firms are thus propelled to secure contingent credit. In essence, the primary driver for firms to acquire contingent credit is an insurance-oriented motive, be it as a buffer against unfavorable shocks or in order not to forego profitable investment opportunities.

**Credit lines vs. cash – substitutes or complements?** In classical corporate models, cash reserves either act as a signaling mechanism ([Leland and Pyle \(1977\)](#)) or as a liquidity safeguard against financial constraints ([Fazzari, Hubbard, and Petersen \(1988\)](#)). Pioneering empirical studies by [Opler, Pinkowitz, Stulz, and Williamson \(1999\)](#) and [Almeida, Campello, and Weisbach \(2004\)](#) reveal that firms facing stringent financial limitations tend to allocate a larger portion of their operational cash flows to increase liquidity reserves, consistent with an insurance-driven motive. [Fahlenbrach, Rageth, and Stulz \(2021\)](#) further demonstrates that this approach effectively preserves firm value during times of widespread economic strain such as that witnessed in the aftermath of the Covid-19 outbreak.

Given this context, how should one interpret the balance between cash and credit lines as instruments of firm liquidity protection? [Sufi \(2009\)](#) contends that cash and credit lines are not seamlessly interchangeable. This stems from the fact that credit lines often encompass covenants that are sensitive to cash flows. Consequently, to guarantee uninterrupted access to their committed credit, firms must sustain robust cash flows, challenging the notion of these liquidity sources being interchangeable.<sup>7</sup> This perspective gains further support in the theory and evidence of [Acharya, Almeida, Ippolito, and Perez \(2014\)](#). Meanwhile, [Disatnik, Duchin, and Schmidt \(2014\)](#) endorses the idea of interchangeability, emphasizing the need to consider a firm’s derivative posi-

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<sup>7</sup>Anticipating a potential breach of covenants, firms might proactively utilize their credit line to avert potential access restrictions ([Campello, Graham, and Harvey \(2010\)](#)).

tion to comprehensively grasp their balancing act between cash and external financing. [Lins, Servaes, and Tufano \(2010\)](#) notes that while both cash reserves and committed credit are driven by an insurance motive, firms perceive the inherent risks differently. Cash reserves act as cushions during periods of diminished operational cash flows, whereas credit lines are viewed as contingent financing avenues for seizing business opportunities, echoing the sentiments of [Martin and Santomero \(1997\)](#). In essence, while credit lines share similarities with cash reserves, they seem to fulfill a unique and complementary role, in particular as a liquidity backstop when firms' regular cash flows are under stress.

### 3.2 When do firms draw down credit lines?

**Drawdowns as a response to idiosyncratic shocks.** The rationale behind acquiring credit lines, as reflected in the literature reviewed thus far, invariably ties back to certain contingencies. But what do these contingencies entail in real-world scenarios, or in other words, when do firms actually tap into their credit lines? The research by [Jiménez, Lopez, and Saurina \(2009\)](#) offered an initial in-depth look into firms' behavior concerning credit line utilization. Notably, they found that younger firms, especially those with a higher default probability, diminished profitability, and past default records, are more inclined to draw down. This aligns with the notion of credit line usage serving as an alternate funding avenue amidst capital market barriers ([Fazzari et al. \(1988\)](#)). It also resonates with the overarching insurance-driven motive, where credit line drawdowns often coincide with adverse idiosyncratic liquidity shocks, which in turn, correlate with the broader firm performance metrics outlined by [Jiménez et al. \(2009\)](#).<sup>8</sup> Reversing the causality lens, [Norden and Weber \(2010\)](#) reveals that heightened credit line utilization can foreshadow bankruptcy, underscoring its significance in monitoring borrowers. [Brown, Gustafson, and Ivanov \(2021\)](#) demonstrates that firms resort to credit line drawdowns in response to unexpected weather-related events, emphasizing the idiosyncratic nature of such drawdowns under typical circumstances.

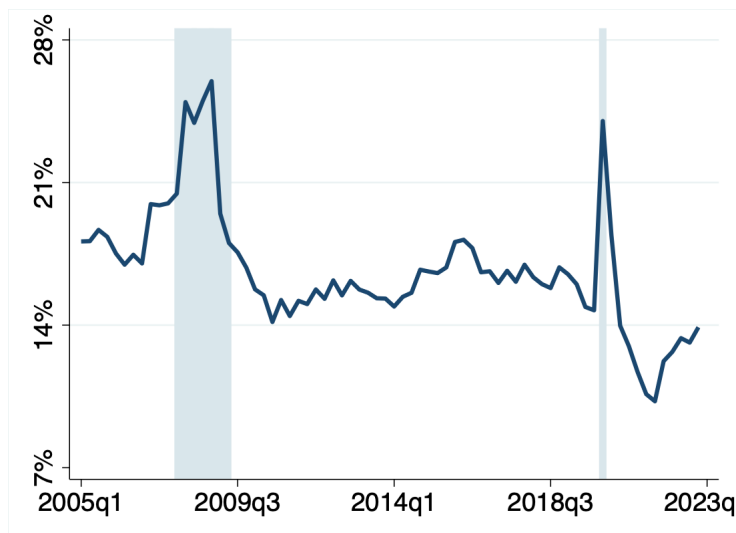
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<sup>8</sup>[Bosshardt and Kakhbod \(2021\)](#) indicates that 2020's firm drawdowns were predominantly driven by precautionary motives rather than investment opportunities.

Importantly, credit line utilization surges during crises. In this context, [Campello, Giambona, Graham, and Harvey \(2011\)](#) and [Campello, Giambona, Graham, and Harvey \(2012\)](#) focus on the patterns of credit line usage during the Great Financial Crisis in both the US and Europe. Their findings echo those of [Jiménez et al. \(2009\)](#), reinforcing the insurance-centric motive. Notably, they present evidence supporting the interchangeability hypothesis between cash and credit lines, observing that firms with more substantial cash reserves were less likely to draw down. We provide a more detailed discussion as to credit line usage and their implications during periods of aggregate stress in [Section 4](#).

Figure 4: Utilization rate of borrowing firms over time

This figure shows the average level of drawn credit over total committed credit. The sample is the universe of US corporations with available credit commitment and balance sheet data in Capital IQ from 2005Q1 to 2022Q2. Grey areas show NBER recessions.

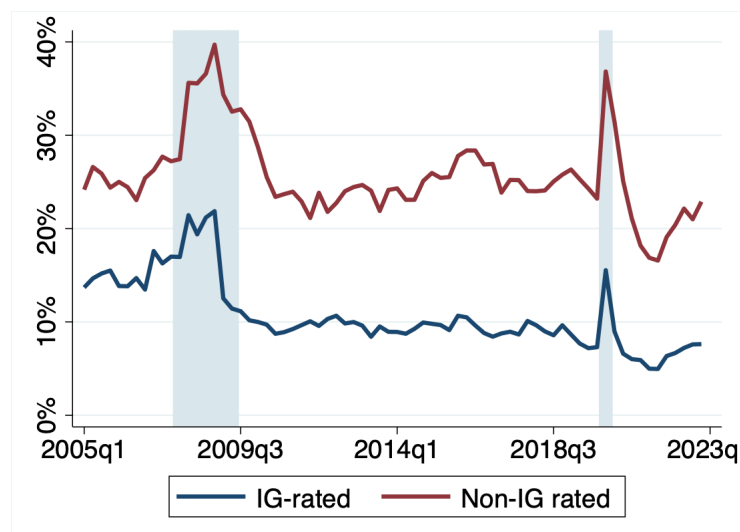


**Drawdown patterns.** Utilizing drawdown data from US corporations sourced from Capital IQ, [Figures 4 and 5](#) emphasize the patterns highlighted in existing literature. [Figure 4](#) illustrates the average utilization rate over time, defined as the proportion of drawn credit volume to the total committed volume, for all corporations. Two observations stand out: (1) Firms consistently utilize credit lines, reflecting both the idiosyncratic nature of liquidity shocks and the arrival of investment opportunities. The long-term average utilization rate stands at 17%, with a meaningful variation in the form of a standard deviation of 3%. (2) During crisis periods, firms significantly

increase their drawdowns as liquidity shocks become more correlated across firms and the broader economic landscape becomes less predictable. In a similar vein, Figure 5 reveals notable differences in utilization rates between IG-rated firms (shown in blue) and non-IG-rated firms (depicted in red). On average, non-IG-rated firms draw down approximately double the amount as percentage of committed credit compared to their IG-rated counterparts. This underscores the impact of capital market constraints, as firms with lower ratings face greater challenges in accessing funding, especially during crises, leading them to lean more on their pre-established credit arrangements.

Figure 5: Utilization rate of non-financial corporations by rating class

This figure shows the average level of drawn credit over total committed credit for subgroups defined by rating categories. The sample is the universe of US corporations with available credit commitment, credit rating and balance sheet data in Capital IQ from 2005Q1 to 2022Q2. Grey areas show NBER recessions.



In summary, existing literature suggests that firms seek contingent credit as a safeguard against unpredictable shocks, lapse of investment opportunities, and present or anticipated capital market constraints. In line with this, firms tend to tap into these credit lines specifically when such risks emerge or appear imminent, especially during economy-wide stress. Does this trend of firms heavily drawing down liquidity during widespread economic distress pose challenges for the overall balance sheets of banks, both in terms of liquidity depletion and capital commitment? We answer this question next.



## 4 Contingent credit during periods of aggregate stress

We now shift our attention towards aggregate drawdowns of credit lines by firms during instances of widespread economic stress — periods where the economy encounters pervasive liquidity shocks. Two recent instances providing noteworthy contexts for this examination include the Global Financial Crisis (2007-2008, herein referred to as “GFC”) and the COVID-19 pandemic. These shocks represent compelling environments to explore the effects of comprehensive credit line drawdowns on banks — both at an individual level and across the entire banking system — as well as the potential pathways through which credit line drawdowns from banks transmit to the real economy.<sup>9</sup>

### 4.1 Aggregate credit line drawdowns and bank liquidity

Figures 4 and 5 previously presented in this review article depicted the elevated drawdowns of credit lines during the GFC as well as during the COVID-19 pandemic. We review a selection of papers that have investigated the implications of these drawdowns for banks below. We contrast the effects during both periods and highlight differences as well as similarities.

**A “double bank run” during the GFC.** [Ivashina and Scharfstein \(2010\)](#) show a growing divergence between aggregate C&I loans outstanding (which escalated during the GFC) and loan originations by banks (which concurrently diminished). They provide evidence suggesting that an acceleration of credit line drawdowns induced the uptick in outstanding C&I loans in the U.S.. Crucially, these drawdowns were part of a “run” on the banks from both sides of their balance-sheet, due to concerns about the banking sector’s liquidity and solvency: Unsecured commercial paper holders withheld rollovers, repo lenders and trading counterparties sought more collateral, and borrowers drew on their credit lines, collectively draining the system’s liquidity.

[Acharya and Mora \(2015\)](#) argue that U.S. banks faced a crisis as liquidity providers

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<sup>9</sup>The GFC ignited a surge in new academic research focused on the significance of credit lines. This surge was, in no small part, due to the altered disclosure rules stemming from the GFC. Firms in the US were required to report credit line usage to the SEC, enhancing transparency within the corporate loan market.

during the 2007-2008 period (until the default of Lehman Brothers). It was not only for the weakest banks, but the deposit funding pressure was widespread as a substantial portion of deposits was uninsured. These depositors, in turn, were seeking an explicit insurance of the government causing massive deposit outflows (e.g., into government money market funds). [Acharya and Mora \(2015\)](#) show that banks eventually could only provide liquidity insurance to firms because of explicit and large support the government that was implemented after Lehman Brothers' collapse.

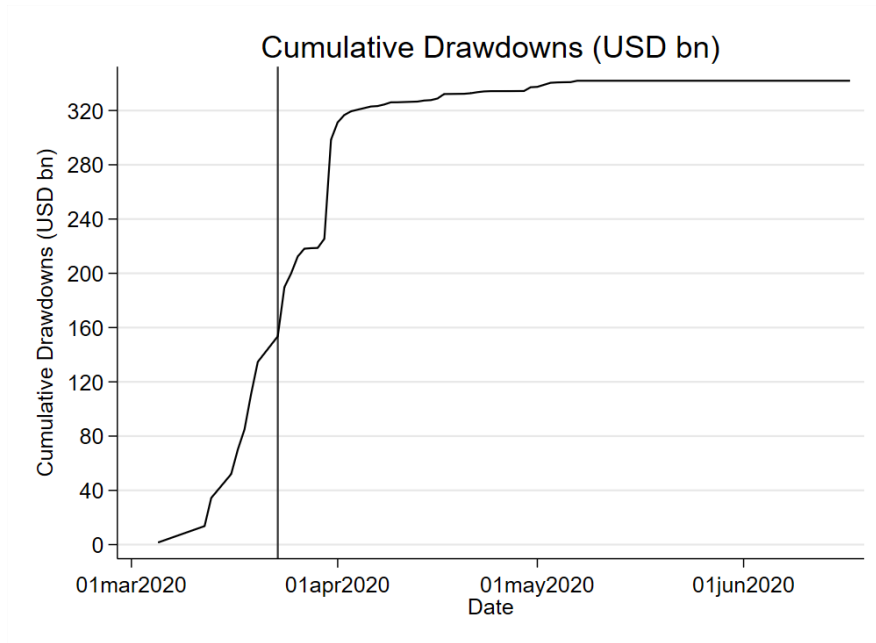
[Ippolito, Peydró, Polo, and Sette \(2016\)](#) use detailed administrative data from Italy to investigate the double bank run by (unsecured) wholesale funding investors as well as firms with undrawn credit lines during the GFC. They document that a credit-line run was common to all firms and banks, but it was relatively stronger for financially constrained firms as well as for banks with greater pre-crisis exposure to wholesale funding. Interestingly and consistent with theoretical work such as [Hanson, Shleifer, Stein, and Vishny \(2015\)](#), banks manage liquidity risk by providing fewer credit lines if they have higher ex-ante wholesale funding exposure. In a related paper, [Santos \(2012\)](#) shows that, during recessions, if a bank's financial health wanes, depositors are motivated to withdraw their funds, while corporations may find it beneficial to expedite their credit line drawdowns.

**A "dash for cash" during the COVID-19 pandemic.** In contrast to the GFC, the initial stress during the onset of the COVID-19 pandemic did not stem from arising solvency issues within the banking sector. Instead, it resulted from a comprehensive economic shutdown in response to the COVID-19 outbreak, an action intended to curb the spread of an infectious disease but that potentially plunged a vast majority of firms into an impending liquidity crisis and significantly disrupted the operation of capital markets.

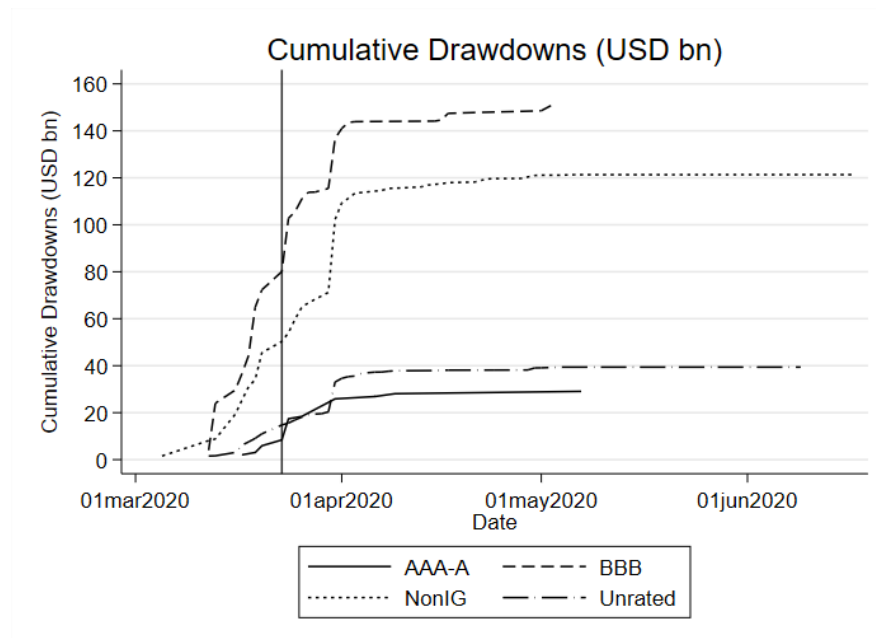
[Acharya and Steffen \(2020\)](#) and [Kashyap \(2020\)](#) document a "dash for cash" during the COVID-19 pandemic. At the pandemic's inception, overall cash levels, as well as a preference for cash over bank lines of credit, surged across the entire corporate sector. [Figure 6](#) shows that U.S. publicly listed firms alone drew down more than USD 300 billion from their credit lines within a three-week period until the Federal Reserve interventions initiated March 23, 2020 ([Panel 6a](#)). This was particularly pronounced for

Figure 6: Dash for Cash - Credit Line Drawdowns during COVID-19

Panel 6a shows cumulative drawdowns of US publicly listed firms at the beginning of the COVID-19 pandemic during the period March-June 2020. Panel 6b shows cumulative drawdowns by rating class. The data were collected from companies' 10Q/10K-filings.



(a) Total cumulative credit line drawdowns



(b) Cumulative drawdowns by rating class

lower-rated firms (BBB-rated and non-investment grade), underscoring the paramount importance of cash in corporate liquidity management during periods of elevated aggregate risk (Panel 6b). Focusing on U.S. publicly listed companies and comparing credit line usage during COVID-19 with that during the GFC, the authors observe that the general use of credit drawdowns appears similar across both crises. However, drawdowns during the COVID-19 pandemic were more concentrated in that there was a significantly greater intensity of utilization within a few weeks compared to those in 2007 and 2008.

Acharya et al. (2023b) and Greenwald, Krainer, and Paul (2023) provide corroborating evidence that firms with pre-arranged credit lines from banks drew down their undrawn facilities with a far greater intensity than in past recessions, specifically below-investment-grade rated firms. Using confidential Y14 data from the Federal Reserve, Chodorow-Reich, Darmouni, Luck, and Plosser (2022) show that at the inception of the COVID-19 pandemic, only large firms, not small ones, utilized their credit lines. Crucially, while large firms demonstrated an elevated sensitivity to the industry-level measure of exposure to the COVID recession in their drawdown rates, disparities in drawdowns between large and small firms did not stem from variations in firm credit demand. Instead, they reflected banks' discretionary decision to withhold lending to small firms, e.g. by withdrawing commitments.

Li, Strahan, and Zhang (2020) focus on the supply-side (i.e., banks), asserting that especially large banks encountered an unparalleled liquidity demand from firms at the onset of the COVID-19 pandemic, during which companies simultaneously drew down their credit lines while accumulating cash reserves (in particular, in the form of bank deposits). In stark contrast to the GFC, banks in aggregate were therefore able to meet the liquidity demand during COVID. There were two additional factors at work: Firstly, they had established substantial capital and liquidity buffers following the GFC; and secondly, an aggregate liquidity supply, originating both from the Federal Reserve and depositors, was infused onto banks' balance sheets concurrently with the period of firms' liquidity demand.<sup>10</sup> Consistent with high deposit inflows, Levine, Lin, Tai,

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<sup>10</sup>Gatev, Schuermann, and Strahan (2007) show that banks experienced both credit line withdrawals as well as deposit inflows also after the Russian default in 1998.

Figure 7: Balance sheets of weak and strong banks after credit line drawdowns

This figure shows the implications of credit line drawdowns for the banking sector as a whole (Panel 7a), as well as weak and strong banks (Panel 7b)

BANKING SECTOR	
Assets	Liabilities
Cash	Deposits (+500)
Loans (+ 500)	Capital
	<u>Off Balance Sheet</u> Credit Line A (-500)

(a) Banking sector

WEAK BANKS		STRONG BANKS	
Assets	Liabilities	Assets	Liabilities
Cash (-250)	Deposits	Cash (+250)	Deposits (+500)
Loans (+250)	Capital	Loans (+250)	Capital
	<u>Off Balance Sheet</u> Credit Lines (-250)		<u>Off Balance Sheet</u> Credit Lines (-250)

(b) Weak vs strong banks

and Xie (2021)) show that banks, on average, reduced rather than increased deposit rates at the onset of Covid-19 as they did during the GFC; during the GFC, firms were doing both, drawing down their credit lines as well as deposits due to a concern about banks' ability to provide funds in the future. Cooperman, Duffie, Luck, Wang, and Yang (2023) also emphasize the precautionary motive of firms to draw down credit lines during COVID to obtain cash, which then was immediately deposited with banks. In summary, banks – in contrast to the GFC – did not have to raise costly external funds to meet the liquidity withdrawals during the Covid-19 outbreak.

The empirical evidence thus suggests that banks during the GFC suffered a double bank run as both aggregate deposit outflows as well as credit line withdrawals accelerated. During the COVID-19 pandemic, banks faced an exceptional surge in credit line drawdowns, yet these withdrawn funds were promptly re-deposited, likely because of a stronger banking system at the onset of the stress period. Panel 7a illustrates this concept using our balance sheet model from Figure 2 for the collective banking sector.

Yet, even if deposits remain within the banking sector as a whole, there could be disparities in liquidity access between weaker and stronger banks. Panel 7b shows this

scenario. Both weak and strong banks face credit line drawdowns of 250, but depositors choose to place all their funds in the stronger bank, perceiving it (and its deposits) as a safer option.<sup>11</sup> In other words, access to liquidity (e.g., via deposits) and potential claims banks need to meet (such as credit line withdrawals) might be asymmetrically distributed during times of aggregate stress with potential adverse implications for financial stability.

## 4.2 How do aggregate shocks transmit into the real economy? The role of bank capital vs. liquidity

Several papers document that credit line drawdowns during the COVID-19 pandemic had important spillovers into the real economy and discuss possible transmission channels. We summarize some of their findings below, paying special attention to the exact bank balance-sheet mechanism (capital vs. liquidity) via which the transmission appears to have occurred.

**Real sector spillovers.** Spillovers of aggregate credit line drawdowns into the real economy can be identified in different ways such as the availability of credit commitments during periods of stress, the supply and origination of new loans or the (corporate finance) implications for those firms that do not have access to credit during these periods. Researchers have found evidence that these spillovers were economically meaningful.

[Chodorow-Reich et al. \(2022\)](#), for example, underscore that small firms, despite managing liquidity by accessing credit lines in standard times, lack access to liquidity insurance during adverse times (and usually cannot substitute into nonbank sources of liquidity). Consequently, aggregate shocks can transmit to the real economy, especially via small firms, forcing them to curtail investments and elevating their default likelihood. In a related paper, [Greenwald et al. \(2023\)](#) show externalities to term loan lending by banks exposed to drawdowns. In particular, they find that banks experiencing larger credit line drawdowns contract their term lending more, specifically

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<sup>11</sup>[Schumacher \(1998\)](#) highlights that bank runs moved funds from weak to strong private banks with greater credit discipline in Argentina in the 1990s. Runs and the resulting flight to safety were also a key issue confronting U.S. policymakers in the wake of the runs on Silicon Valley Bank and other institutions in March 2023 ([Caglio, Dlugosz, and Rezende, 2023](#)).

for smaller and non-syndicated loans. Consistent with a lack of alternative sources of liquidity, these firms could not replace lost credit. Instead, they reduced investments and cash holdings. [Kapan and Minoiu \(2021\)](#) also show that banks with larger ex-ante credit line commitments tightened loan supply and loan terms, especially to small firms.<sup>12</sup>

Bank stock prices also provide a window into possible externalities of credit line drawdowns. [Acharya et al. \(2023b\)](#) document that banks' share prices crashed at the onset of the COVID-19 pandemic and persistently underperformed those of non-financial firms as well as non-bank financial firms even after the interventions of the Fed as well as the U.S. government. They argue that investors in bank stocks price liquidity risk based on their expectations of credit line drawdowns during crises. During the COVID-19 pandemic, these expectations deviated from actual drawdowns as firms utilized their credit lines more intensively than, for example, during the GFC. The cross-section of bank stock-price declines in relation to their pre-existing drawdown risk during COVID reflects the disparity between expected and realized drawdown risks and the associated loss in intermediation activities of banks with large pre-crisis credit commitments. The empirical evidence supports this hypothesis. Figure 8 plots bank stock returns during Q1 2020 on ex-ante credit line exposure (measured as percentage of total assets and as of Q4 2019). Evidently, bank stock prices declined more for banks with high credit-line exposures. Moreover, [Acharya et al. \(2023b\)](#) show that these banks curtailed the supply of their loans (both credit lines and term loans) more relative to those banks less exposure to aggregate drawdown risk. While affected firms did not significantly alter their assets or investments in response to a contraction in lending supply, they adjusted their working capital requirements reducing current assets and R&D expenditures, which could have long-term consequences for innovation and competition.

Overall, the literature emphasizes substantial spillovers as a consequence of aggregate credit line drawdowns on banks.

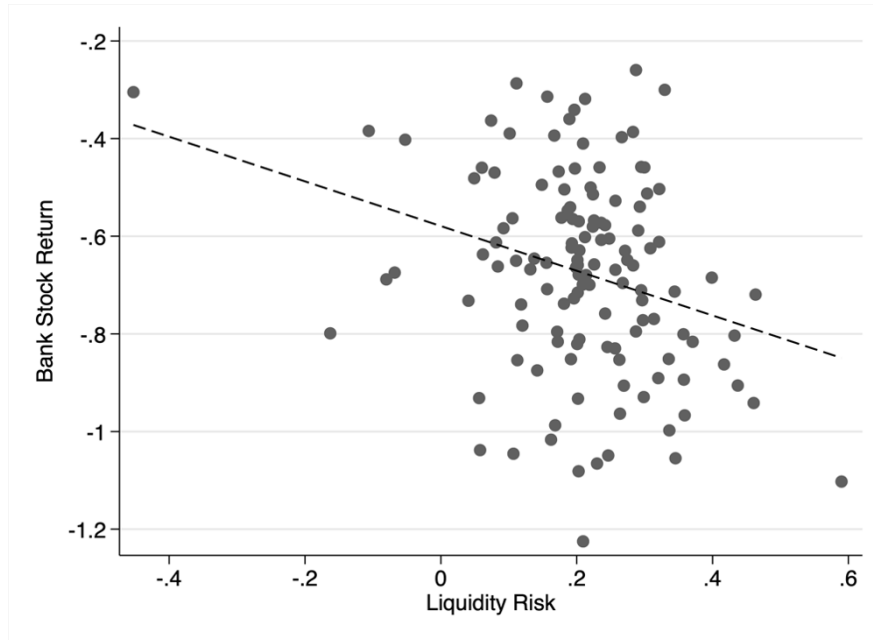
**Capital versus funding channel.** There are two main channels to understand

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<sup>12</sup>[Cornett, McNutt, Strahan, and Tehranian \(2011\)](#) show that banks that had issued high levels of credit commitments before the GFC had to cut back on new lending during and after the crisis when they had to honor all the drawdowns by their borrowers.

Figure 8: Bank stock returns and liquidity risk during 2020Q1

This figure shows stock prices of U.S. banks in relationship to their liquidity risk. We measure liquidity Risk as undrawn C&I commitments plus wholesale finance minus cash or cash equivalents (all relative to assets).



the transmission from credit line drawdowns to the real economy. The first is the "funding channel," which suggests that banks may face constraints in sourcing new loans if deposit funding does not keep pace with credit line drawdowns. Essentially, if banks cannot secure sufficient deposits to support their lending activities, it can limit their ability to extend credit. The second channel is the "capital channel," wherein the drawdown of credit lines can lock up, or encumber, scarce bank capital against drawn facilities whose credit risk requires corresponding capital requirements that are greater than for lines when undrawn. This capital constraint can hinder banks' intermediation activities.

To differentiate between these channels, [Acharya et al. \(2023b\)](#) construct two proxies: *Gross Drawdowns* and *Net Drawdowns*. *Gross Drawdowns* represent the change in credit line drawdowns relative to total assets, providing insights into the impact of drawdowns on bank stock returns which primarily relates to the capital channel. In contrast, *Net Drawdowns*, defined as the change in unused C&I commitments minus the change in deposits relative to total assets, helps gauge the importance of bank deposit funding, which affects the ability to meet drawdowns. This measure primarily relates



to the funding channel. By keeping net drawdowns constant, one can effectively isolate the impact of the capital channel across banks. Conversely, by keeping gross drawdowns constant, one can effectively isolate the impact of the funding channel across banks. These proxies enable a more nuanced understanding of the relative importance of the capital and funding channels in explaining credit line drawdowns during the COVID-19 pandemic.

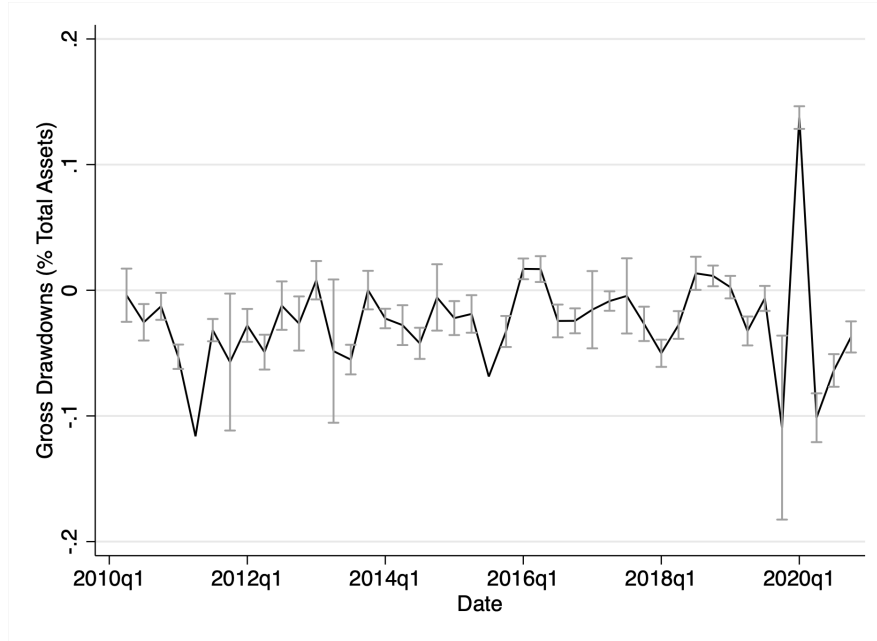
Figure 9 provides a visual representation of the descriptive evidence regarding Gross Drawdowns and Net Drawdowns since Q1 2010. In Panel 9a, we observe the trajectory of Gross Drawdowns. These drawdowns remained relatively stable from 2015 onwards. However, there was a sudden surge of approximately 13.5% in Gross Drawdowns from Q4 2019 to Q1 2020, coinciding with the onset of the COVID-19 pandemic. Remarkably, by the end of Q2 2020, Gross Drawdowns had already reverted back to their pre-pandemic levels, mirroring the trend in banks' off-balance-sheet unused C&I loans.

Panel 9b illustrates the evolution of Net Drawdowns over the same period. Net Drawdowns had exhibited stability since 2015 and actually decreased by about 5% in Q1 2020. This decrease indicates that the change in deposits during the first quarter of 2020 outpaced the change in unused C&I commitments, suggesting that funding for new loans may not have posed a significant constraint for banks during that period. Similar to Gross Drawdowns, Net Drawdowns also returned to pre-COVID-19 levels by Q3 2020. These figures offer valuable descriptive insights into the dynamics of drawdowns during the pandemic, shedding light on the relative importance of funding and capital channels.

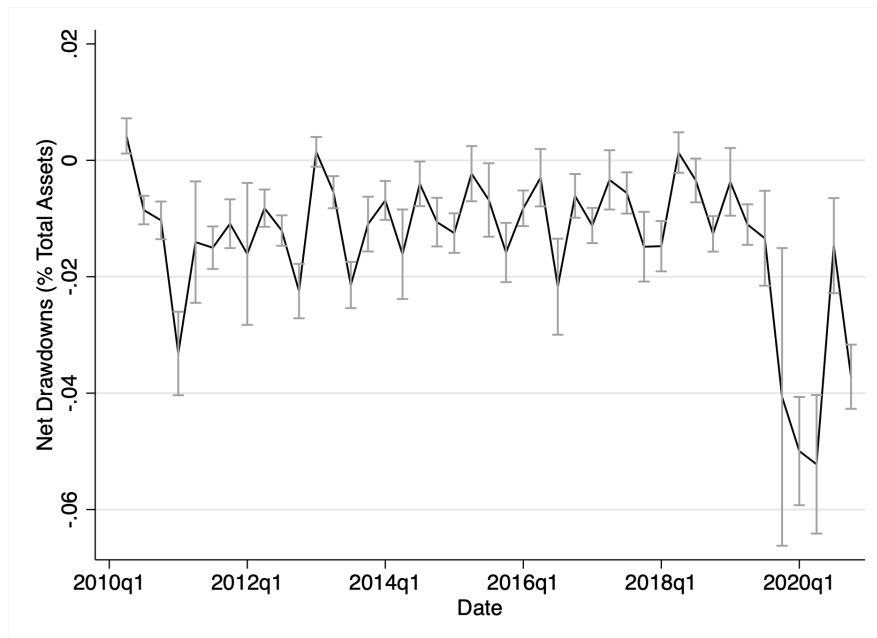
Consistently, Acharya et al. (2023b) find that bank stock returns during the COVID onset are sensitive to gross drawdowns but not significantly to net drawdowns. Banks with higher capital (buffers) experience less negative impact on stock returns during gross drawdowns. In essence, banks' balance-sheet liquidity risk influences stock returns, as credit line drawdowns encumber bank capital away from more lucrative intermediation opportunities. Importantly, they show that banks with high gross drawdowns increased credit-line exposures while actively reducing term-loan exposures, consistent with the capital channel theory. They show that banks become cautious about their loan portfolios when drawdowns are significant compared to the sample median.

Figure 9: Gross vs. Net Drawdowns on Bank Credit Lines from 2010 to 2020

This figure shows the time-series of *Gross Drawdowns* (Panel 9a) and *Net Drawdowns* (Panel 9b) over the Q1 2010 to Q4 2020 period. *Gross Drawdowns* is the percentage change in a bank's off-balance-sheet unused C&I loan commitments, relative to total assets. *Net Drawdowns* are defined as the change in a bank's off-balance-sheet unused C&I loan commitments minus the change in deposits, relative to total assets.



(a) Gross drawdowns



(b) Net drawdowns

Particularly banks with high gross drawdowns reduce new loan originations, again emphasizing the importance of the capital channel over the funding channel during the COVID-19 crisis.

Other recent papers show similar results. For example, [Greenwald et al. \(2023\)](#) show that liquidity could not have been a binding constraint for banks, but document that banks with lower pre-crisis capital buffers cut lending more to small firms when they experienced large credit line drawdowns. [Kapan and Minoiu \(2021\)](#) highlight a broad reduction in risk tolerance as an important channel next to balance-sheet constraints.

## 5 Discussion

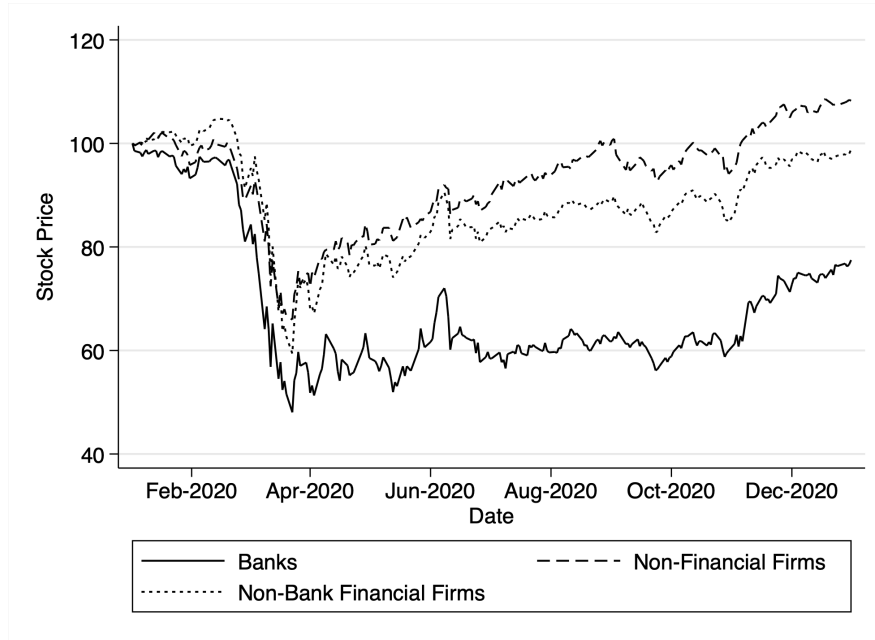
### 5.1 A two-sided credit line channel – drawdowns and repayments

As described above, [Acharya et al. \(2023b\)](#) document the crash of bank stock prices at the onset of the COVID-19 pandemic in March 2020. Interestingly, despite the fast and massive interventions by the Federal Reserve as well as the U.S. Treasury starting March 23rd, 2020, bank stock prices did not recover until Q4 2020, while stock prices of non-financial as well as non-bank financial firms almost immediately rebounded after these interventions, as shown in [Figure 10](#).

To understand the post-intervention performance of bank stocks vis-a-vis non-financial firms, the authors investigate what they coin a “two-sided credit-line channel.” This channel considers firms’ options to both *draw* and *repay* credit lines, with a focus on the significance of the repayment option in explaining bank stock performance. Repayments by top-rated firms in Q2 and Q3 2020, as capital market activity resumed, played a crucial role in affecting banks’ stock performance. To assess the effects of repayments, they construct two key variables. The first measures the liquidity returning to banks’ balance sheets relative to the committed amount of a credit line, highlighting the liquidity – or the funding – dimension. The second variable examines the difference in revenue (from fees and interest rates) between the drawn credit line and potential

Figure 10: Bank stock prices during the COVID-19 shock

This figure shows the stock prices of U.S. publicly listed banks, non-bank financial and non-financial firms over the Jan 1st to Dec 31st, 2020 period.



alternative investments of similar risk profiles, i.e., the capital dimension.

The findings underscore that both liquidity and capital considerations influenced the partial recovery of bank stock returns in 2020Q2. Repayments positively impacted stock returns by providing liquidity. However, bank investors preferred repayments from credit lines with lower opportunity-cost adjusted fees, as they sought compensation for the encumbered capital and drawdown risk. This emphasizes – even beyond the COVID episode – the importance of the capital channel in understanding how credit lines, through drawdowns and repayments, affect bank stock returns in periods of aggregate risk.

## 5.2 Regulating aggregate drawdown risk

Bank supervisors currently consider *idiosyncratic* credit line drawdowns of firms in their supervisory framework. However, to proactively manage *aggregate* drawdown risk, policymakers can consider incorporating credit line drawdown effects into bank capital stress tests. This involves requiring banks to hold more equity capital to support these exposures in advance. To that end, [Choi \(2022\)](#) documents that optimal capital

requirements should be raised to reflect the substantial risk banks expose themselves to through credit line underwriting. [Acharya et al. \(2023b\)](#) propose two adjustments to the standard SRISK framework to estimate impact on banks' balance sheet: (1) Accounting for the equity capital needed when contingent liabilities become actual liabilities during stress periods based on drawdown rates seen in historical stress episodes (see, e.g., Figure 9a), and (2) Reflecting the adverse impact of liquidity risk on bank market value during stress periods, which they estimate econometrically using data for the Covid-19 shock and the GFC.

The analysis reveals that the sensitivity of credit-line drawdowns to market returns was higher during the COVID-19 pandemic compared to the GFC. This translates to higher projected drawdown rates in a 40% market downturn stress scenario. In such a scenario, the two adjustments described above result in a substantial additional capital deficit for the U.S. banking sector, estimated at over USD 366 billion.

Importantly, their analysis emphasizes that most of the impact on banks' balance sheets arises from the market's re-evaluation of liquidity risk in bank equity. This market reaction is economically significant and should be factored into stress tests and regulatory assessments. Overall, these findings underscore the need for proactive regulatory measures to manage drawdown risk and ensure the resilience of the banking sector in times of aggregate risk. In alignment with this perspective, U.S. regulators have proposed, in their Basel III endgame proposal, that banks put up capital for their credit line commitments at a level of 40% in comparison to on-balance sheet loans.<sup>13</sup> This proportion roughly corresponds to the peak drawdown rates identified in the SRISK analysis by [Acharya et al. \(2023b\)](#).

[Yankov \(2020\)](#) further highlights that banks over the recent decade started to provide significant liquidity backstops to the nonbank financial sector in form of credit lines. [Acharya, Gopal, Jager, and Steffen \(2023c\)](#) document that nonbank financial companies exhibit an even higher sensitivity to market stress (measured, e.g., by the VIX) than non-financial corporations, even and especially outside of aggregate stress episodes. These inter-financial linkages therefore expose banks to even higher, and more frequent, drawdowns – an aspect to further be considered in stress tests and

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<sup>13</sup>See, <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20230727a.htm>.

academic research.

### 5.3 Monetary policy and credit line commitments

In Figure 1, we observe a significant rise in outstanding credit line commitments from the global financial crisis (GFC) through the early stages of the COVID-19 pandemic, as well as in the period following the pandemic until 2022. Intriguingly, this noteworthy trend has received limited attention in the existing literature.

Acharya, Chauhan, Rajan, and Steffen (2023a) investigate the dynamics of the Fed balance sheet from 2009 to 2021 and its impact on the banking sector, with a particular focus on the role of monetary policy in relation to issuances of credit lines. They document an increase in credit lines (as well as other demandable liquidity “claims”) issued by commercial banks during various phases of Fed balance sheet expansion (quantitative easing or, in short, QE). Importantly, the end of QE or the initiation of quantitative tightening (QT) does not significantly reduce bank-written claims on liquidity (e.g., banks would find it costly from a relationship standpoint to simply terminate outstanding credit line commitments when QT is announced), leading to a phenomenon they term “liquidity dependence.” This dependence might necessitate greater central bank balance sheet support in the future. Importantly, these effects are more pronounced for banks with weaker capital positions and the dispersion of liquidity claims across banks relative to their liquid assets widens during QT.

These insights have policy implications, as they indicate that reserve creation during QE could incentivize an accumulation of liquidity risk in some banks (including in the form of credit line issuance) that QT may exacerbate. Understanding the exact channels of transmission of QE to bank credit line provision and the creation of fragility during QT via credit line drawdowns is an important area for further research.

## 6 Conclusion

This review article offers a comprehensive overview of the current literature on credit lines, emphasizing their role in banks’ lending portfolios and firms’ corporate liquidity management. We underscore the contingent, option-like nature of credit lines, which

serve as effective tools for firms to hedge against adverse (liquidity) shocks, as well as the pricing structure that enables banks to effectively screen borrowers. Drawing on nearly two decades of recent data, we illustrate the widespread and cyclical nature of firm drawdowns, highlighting how drawdowns, particularly from low-rated borrowers, tend to double during periods of economy-wide stress.

We emphasize the amplified and correlated nature of credit line drawdowns under stress, and the bank capital channel (during the COVID-19 outbreak) versus the bank funding channel (during the Global Financial Crisis) that can lead to adverse real spillovers from such drawdowns.

The total debt on the balance sheets of non-financial firms has significantly risen post COVID, leading to increased leverage and exposure to capital markets. At the same time, banks' exposure to undrawn credit lines has also significantly increased. Consequently, banks face heightened ex-ante risks of aggregate drawdowns in the event of another widespread economic shock, such as a surge in interest rates or a recession. In such scenarios, the value of bank credit lines as a put option for corporations and capital markets could become more critical, especially if bond market liquidity conditions worsen substantially. In essence, the additional corporate leverage accumulated since the pandemic has likely heightened the potential future impact on bank stock health, stock returns, and future lending, through the credit-line drawdown (and repayment) channel. This underscores the importance of incorporating aggregate drawdown risk in the regulatory stress-test and supervisory frameworks. Clearly, there remains considerable room for further research and policy reform concerning the provision of contingent credit by banks and its usage by borrowers under stress.

## References

- ACHARYA, V., H. ALMEIDA, F. IPPOLITO, AND A. PEREZ (2014): "Credit lines as monitored liquidity insurance: Theory and evidence", *Journal of financial economics*, 112, 287–319.
- ACHARYA, V. V., H. ALMEIDA, AND M. CAMPELLO (2013): "Aggregate risk and the choice between cash and lines of credit", *The Journal of Finance*, 68, 2059–2116.

- ACHARYA, V. V., R. S. CHAUHAN, R. RAJAN, AND S. STEFFEN (2023a): “Liquidity dependence and the waxing and waning of central bank balance sheets”, Tech. rep., National Bureau of Economic Research.
- ACHARYA, V. V., R. F. ENGLE, M. JAGER, AND S. STEFFEN (2023b): “Why did bank stocks crash during COVID-19?” Tech. rep., National Bureau of Economic Research.
- ACHARYA, V. V., M. GOPAL, M. JAGER, AND S. STEFFEN (2023c): “Shadow Always Touches the Feet: Implications of Bank Credit Lines to Non-Bank Financial Intermediaries”, *NYU Stern School of Business, Work in Progress*.
- ACHARYA, V. V. AND N. MORA (2015): “A crisis of banks as liquidity providers”, *The journal of Finance*, 70, 1–43.
- ACHARYA, V. V. AND S. STEFFEN (2020): “The risk of being a fallen angel and the corporate dash for cash in the midst of COVID”, *The Review of Corporate Finance Studies*, 9, 430–471.
- ALMEIDA, H., M. CAMPELLO, AND M. S. WEISBACH (2004): “The cash flow sensitivity of cash”, *The journal of finance*, 59, 1777–1804.
- AVERY, R. B. AND A. N. BERGER (1991): “Loan commitments and bank risk exposure”, *Journal of Banking & Finance*, 15, 173–192.
- BERG, T., A. SAUNDERS, AND S. STEFFEN (2016): “The total cost of corporate borrowing in the loan market: Don’t ignore the fees”, *The Journal of Finance*, 71, 1357–1392.
- (2021): “Trends in Corporate Borrowing”, *Annual Review of Financial Economics*, 13, 321–340.
- BERG, T., A. SAUNDERS, S. STEFFEN, AND D. STREITZ (2017): “Mind the gap: The difference between US and European loan rates”, *The Review of Financial Studies*, 30, 948–987.



- BERKOVITCH, E. AND S. I. GREENBAUM (1991): “The loan commitment as an optimal financing contract”, *Journal of Financial and Quantitative Analysis*, 26, 83–95.
- BOOT, A., A. V. THAKOR, AND G. F. UDELL (1987): “Competition, risk neutrality and loan commitments”, *Journal of Banking & Finance*, 11, 449–471.
- BOSSHARDT, J. AND A. KAKHBOD (2021): “Why did firms draw down their credit lines during the covid-19 shutdown?” *Available at SSRN 3696981*.
- BROWN, J. R., M. T. GUSTAFSON, AND I. T. IVANOV (2021): “Weathering cash flow shocks”, *The Journal of Finance*, 76, 1731–1772.
- CAGLIO, C., J. DLUGOSZ, AND M. REZENDE (2023): “Flight to Safety in the Regional Bank Crisis of 2023”, Working Paper.
- CAMPBELL, T. S. (1978): “A Model of the Market for Lines of Credit”, *The Journal of Finance*, 33, 231–244.
- CAMPELLO, M., E. GIAMBONA, J. R. GRAHAM, AND C. R. HARVEY (2011): “Liquidity management and corporate investment during a financial crisis”, *The review of financial studies*, 24, 1944–1979.
- (2012): “Access to liquidity and corporate investment in Europe during the financial crisis”, *Review of Finance*, 16, 323–346.
- CAMPELLO, M., J. R. GRAHAM, AND C. R. HARVEY (2010): “The real effects of financial constraints: Evidence from a financial crisis”, *Journal of financial Economics*, 97, 470–487.
- CHODOROW-REICH, G., O. DARMOUNI, S. LUCK, AND M. PLOSSER (2022): “Bank liquidity provision across the firm size distribution”, *Journal of Financial Economics*, 144, 908–932.
- CHOI, J. (2022): “Credit Lines and Bank Risk”, .
- COOPERMAN, H. R., D. DUFFIE, S. LUCK, Z. Z. WANG, AND Y. YANG (2023): “Bank funding risk, reference rates, and credit supply”, Tech. rep., National Bureau of Economic Research.

- CORNETT, M. M., J. J. MCNUTT, P. E. STRAHAN, AND H. TEHRANIAN (2011): “Liquidity risk management and credit supply in the financial crisis”, *Journal of financial economics*, 101, 297–312.
- DISATNIK, D., R. DUCHIN, AND B. SCHMIDT (2014): “Cash flow hedging and liquidity choices”, *Review of Finance*, 18, 715–748.
- FAHLENBRACH, R., K. RAGETH, AND R. M. STULZ (2021): “How valuable is financial flexibility when revenue stops? Evidence from the COVID-19 crisis”, *The Review of Financial Studies*, 34, 5474–5521.
- FAZZARI, S., R. G. HUBBARD, AND B. C. PETERSEN (1988): “Financing constraints and corporate investment”, .
- GATEV, E., T. SCHUERMANN, AND P. STRAHAN (2007): “How do banks manage liquidity risk? Evidence from the equity and deposit markets in the Fall of 1998”, in *The risks of financial institutions*, University of Chicago Press, 105–132.
- GATEV, E. AND P. E. STRAHAN (2006): “Banks’ advantage in hedging liquidity risk: Theory and evidence from the commercial paper market”, *The Journal of Finance*, 61, 867–892.
- GREENWALD, D. L., J. KRAINER, AND P. PAUL (2023): “The credit line channel”, Working Paper.
- HANSON, S. G., A. SHLEIFER, J. C. STEIN, AND R. W. VISHNY (2015): “Banks as patient fixed-income investors”, *Journal of Financial Economics*, 117, 449–469.
- IPPOLITO, F., J.-L. PEYDRÓ, A. POLO, AND E. SETTE (2016): “Double bank runs and liquidity risk management”, *Journal of Financial Economics*, 122, 135–154.
- IVASHINA, V. AND D. SCHARFSTEIN (2010): “Bank lending during the financial crisis of 2008”, *Journal of Financial economics*, 97, 319–338.
- JIMÉNEZ, G., J. A. LOPEZ, AND J. SAURINA (2009): “Empirical analysis of corporate credit lines”, *The Review of Financial Studies*, 22, 5069–5098.

- KANATAS, G. (1987): “Commercial paper, bank reserve requirements, and the informational role of loan commitments”, *Journal of Banking & Finance*, 11, 425–448.
- KAPAN, T. AND C. MINOIU (2021): “Liquidity insurance vs. credit provision: Evidence from the COVID-19 crisis”, *Credit Provision: Evidence from the COVID-19 Crisis (September 30, 2021)*.
- KASHYAP, A. (2020): “The march 2020 episode of market turmoil and lessons for future financial stability”, *Peterson Institute for International Economics*.
- KASHYAP, A. K., R. RAJAN, AND J. C. STEIN (2002): “Banks as liquidity providers: An explanation for the coexistence of lending and deposit-taking”, *The Journal of finance*, 57, 33–73.
- LELAND, H. E. AND D. H. PYLE (1977): “Informational asymmetries, financial structure, and financial intermediation”, *The journal of Finance*, 32, 371–387.
- LEVINE, R., C. LIN, M. TAI, AND W. XIE (2021): “How did depositors respond to COVID-19?” *The Review of Financial Studies*, 34, 5438–5473.
- LI, L., P. E. STRAHAN, AND S. ZHANG (2020): “Banks as lenders of first resort: Evidence from the COVID-19 crisis”, *The Review of Corporate Finance Studies*, 9, 472–500.
- LINS, K. V., H. SERVAES, AND P. TUFANO (2010): “What drives corporate liquidity? An international survey of cash holdings and lines of credit”, *Journal of financial economics*, 98, 160–176.
- MABILLE, P. AND O. WANG (2022): “Intermediary-Based Loan Pricing”, .
- MARTIN, J. S. AND A. M. SANTOMERO (1997): “Investment opportunities and corporate demand for lines of credit”, *Journal of Banking & Finance*, 21, 1331–1350.
- MELNIK, A. AND S. PLAUT (1986): “Loan commitment contracts, terms of lending, and credit allocation”, *The Journal of Finance*, 41, 425–435.
- MORGAN, D. P. (1994): “Bank credit commitments, credit rationing, and monetary policy”, *Journal of Money, Credit and Banking*, 26, 87–101.

- MYERS, S. C. (1977): “Determinants of corporate borrowing”, *Journal of financial economics*, 5, 147–175.
- NORDEN, L. AND M. WEBER (2010): “Credit line usage, checking account activity, and default risk of bank borrowers”, *The Review of Financial Studies*, 23, 3665–3699.
- OPLER, T., L. PINKOWITZ, R. STULZ, AND R. WILLIAMSON (1999): “The determinants and implications of corporate cash holdings”, *Journal of financial economics*, 52, 3–46.
- PENNACCHI, G. (2006): “Deposit insurance, bank regulation, and financial system risks”, *Journal of Monetary Economics*, 53, 1–30.
- SANTOS, J. A. (2012): “Combining deposit taking with credit line provision and the risk of concurrent runs by depositors and firms”, *Available at SSRN 2187993*.
- SCHUMACHER, L. B. (1998): “Information and Currency Run in a System Without a Safety Net: Argentina and the ‘Tequila’ Shock”, IMF Working Paper.
- SHOCKLEY, R. L. AND A. V. THAKOR (1997): “Bank loan commitment contracts: Data, theory, and tests”, *Journal of Money, Credit, and Banking*, 517–534.
- SUFI, A. (2009): “Bank lines of credit in corporate finance: An empirical analysis”, *The Review of Financial Studies*, 22, 1057–1088.
- THAKOR, A. V. (1982): “Toward a theory of bank loan commitments”, *Journal of Banking & Finance*, 6, 55–83.
- THAKOR, A. V. AND G. F. UDELL (1987): “An economic rationale for the pricing structure of bank loan commitments”, *Journal of Banking & Finance*, 11, 271–289.
- YANKOV, V. (2020): “The liquidity coverage ratio and corporate liquidity management”, *FEDS Notes*.