MARKUS BRUNNERMEIER
Princeton University
ARVIND KRISHNAMURTHY
Stanford University

Corporate Debt Overhang and Credit Policy

ABSTRACT Many business sectors and households face an unprecedented loss of income in the current COVID-19 recession, triggering financial distress, separations, and bankruptcy. Rather than stimulating demand, government policy's main aim should be to provide insurance to firms and workers to avoid undue scarring that will hamper a recovery once the pandemic is past. We develop a corporate finance framework to guide interventions in credit markets to avoid such scarring. We emphasize three main results. First, policy should inject liquidity into small and medium-sized firms that are liquidity constrained and for which social costs of bankruptcy are high. Second, large firms for whom solvency is the dominant issue require a more nuanced approach. Debt overhang creates a distortion, leading these firms to fire workers, forgo expenditures that maintain enterprise value, and delay filing for a Chapter 11 bankruptcy longer than is socially efficient. Government resources toward reducing the legal and financial costs of bankruptcy are unambiguously beneficial. Policies that reduce funding costs are only socially desirable if the pandemic is expected to be short-lived and if bankruptcy costs are high. Last, transfers necessary to avoid bankruptcy allow borrowers to continue paying their mortgages or credit card bills and ultimately benefit owners of assets such as real estate or credit card receivables. Taxes to fund transfers should be raised from these asset owners.

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The recession of 2020 is unlike that of 2008. Although both the ongoing COVID-19 collapse and the global financial crisis have led to significant economic destruction and hardship, the nature of the collapse differs in fundamental ways. The recession in 2008 was preceded by an excessive buildup in housing and was triggered by the collapse in real estate prices. This resulted in losses to financial intermediaries, which reduced credit supply, and impaired household balance sheets, which reduced aggregate demand. Effective government credit policy worked to repair intermediary and household balance sheets, relaxing constraints, thus stimulating investment, spending, and hiring. As in most recessions, the 2008 recovery process involved creative destruction, dissolving some matches and forming others. In 2020, the pandemic has induced an economic pause of unknown length in what was otherwise a sound economy. With some exceptions, the January 2020 blueprint for the economy would still be applicable if a vaccine were to be discovered tomorrow. However, in this pause many business sectors and workers face an unprecedented loss of income. Coupled with their high debt burdens, many firms may not be able to service their debts and face financial distress. Separations between firms and workers, upstream and downstream firms, as well as corporate and personal bankruptcies, threaten to scar the economy long past the end of the pause. Even if the pandemic fades, the January 2020 blueprint may not be implementable because of these separations. Effective policy in this event does not stimulate current economic activity but instead provides insurance to avoid scarring and output losses once the pandemic is past.[1]

This paper analyzes the extent to which credit policy can reduce the scarring due to high debts and financial distress in firms. High debts lead firms to shift their focus to meeting debt obligations rather than pursuing new investment projects, keeping their workers, or maintaining their existing capital stock. High debts also push some firms into bankruptcy, which may result in excessive liquidation. It is critical to have a clear view of bankruptcy costs as well as the nature of the financial friction facing a firm in order to assess credit policy.

We distinguish between two cases: a large corporation that is run by a management team in the interest of outside equity shareholders and for

1. The typical recession calls for some reallocation of capital and labor from existing matches to new matches. This reallocation need is also likely present in the current recession as technology may change the nature of work; see Barrero, Bloom, and Davis (2020). Our perspective in this paper is that the COVID-19 collapse is atypical in that there is less of a need for reallocation and breaking matches.

which a Chapter 11 bankruptcy filing is the likely outcome, and a small owner-run enterprise facing liquidity constraints where a Chapter 7 liquidation is the likely bankruptcy outcome.[2] These two cases, the first of solvency concerns and the second of liquidity concerns, span the main macroeconomic concerns created by high levels of debt.

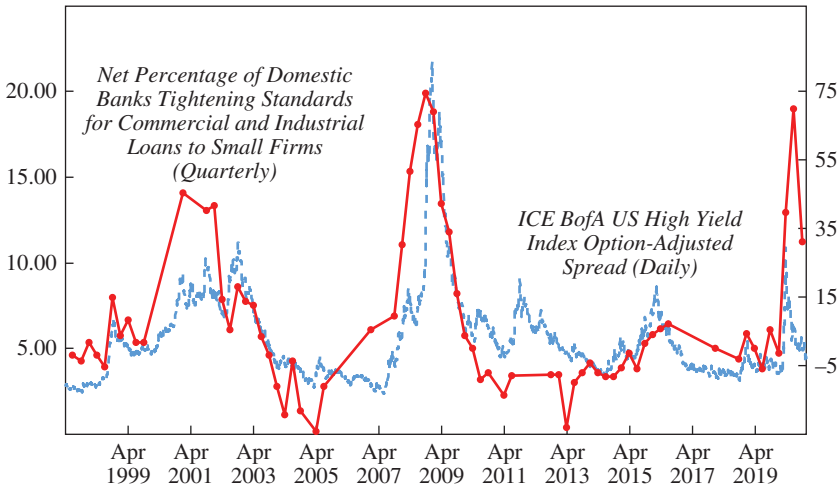
In the first case, high debt induces solvency problems and debt overhang à la Myers (1977). Having faced the negative COVID-19 shock, existing equity holders tend to delay restructuring, avoid issuing equity, cut back on maintenance investment, and lay off workers in order to meet their debt obligations. These socially harmful actions enable existing equity holders to stave off bankruptcy. A Chapter 11 filing allows the firm to restructure its debt, but it does so by wiping out existing equity holders and transferring control to creditors. Restructuring eliminates the debt overhang problem but can incur costs of bankruptcy.[3] Policies that reduce these costs are unambiguously beneficial. On the other hand, policies that subsidize continuation may or may not be beneficial. In a case where the social costs of bankruptcy are low or the recession is expected to last a considerable period, optimal policy does not subsidize credit. This is because doing so enables equity holders to delay a restructuring. Instead policy should induce restructuring to eliminate the debt overhang problem. We argue that currently in the United States, this is the relevant scenario for policy to consider for many large firms.

In the case of small firms, the second case, optimal policy subsidizes lending to firms. Chapter 11 restructuring is typically not a possibility for this firm, and the social cost of liquidation of the firm under Chapter 7 is high. In addition, the owners of these firms are likely cash-constrained and unable to inject equity into the firm. Thus, the most significant problem for small firms is that even solvent but temporarily illiquid firms may find it difficult to survive past the recession. For these reasons credit policy can have a significant positive impact. For small and medium-sized enterprises (SMEs) in 2020 one can draw similarities to high marginal propensity to consume (MPC) households that were underwater in 2008, and the policy

2. Chapter 7 of the US bankruptcy code governs the process of liquidation of a firm in bankruptcy. Firms also have the choice to file under Chapter 11 of the code, which governs the process of reorganization of a firm. In this case, a firm adopts a reorganization plan that must be approved by creditors. If a reorganization plan is not approved, then the firm is typically liquidated. See, for example, White (1989) on the corporate bankruptcy decision.

3. Restructuring of debt often also happens out of court, against the threat of entering formal bankruptcy proceedings. See Gertner and Scharfstein (1991) and Donaldson and others (2020).

Figure 1. Credit Terms for Small and Large Firms



Source: Federal Reserve.

goal of providing liquidity to these sectors remains the same (although the design and execution problems differ).[4]

Figure 1 illustrates the differential financial conditions faced by large and small firms. We plot the credit spread on publicly traded high-yield bonds, based on the Intercontinental Exchange Bank of America Index, and the net percentage of domestic banks tightening credit standards on loans to small firms, from the Federal Reserve's senior loan officer survey. The data begin in April 1997 and run through October 2020. While these two measures have tracked each other well historically, they diverge in the current recession. Credit conditions faced by the small firm sector are almost as tight as they were in the 2008 recession, while credit conditions in the corporate bond market are far looser.

In section I, we review additional asset market data on large and small firms to shed light on the nature of the two cases outlined before

4. Household liquidity constraints (Mian and Sufi 2009; Dynan 2012) were a key financial drag in the recovery from the 2008 recession. Government credit policies such as the Home Affordable Modification Program (HAMP), the Home Affordable Refinance Program (HARP), and mortgage-backed security quantitative easing all worked via easing these liquidity constraints (Eberly and Krishnamurthy 2014; DiMaggio, Kermani, and Palmer 2020).

turning in section II to an analysis of the corporate financing problems facing these firms.

We draw a few conclusions from the asset market data. First, the dramatic market reaction to the pandemic in March 2020 had little to do with the corporate finance issues outlined above. Instead, there was a dislocation in asset markets in March 2020 driven by reduced asset market liquidity and risk-bearing capacity similar to 2008. The dramatic movements in Treasury bond prices and investment-grade corporate bonds in particular underscore these observations. The Federal Reserve's interventions in March, which drew from the 2008 playbook of injecting liquidity and risk-bearing capacity into capital markets, have effectively restored market function. Moreover, while market expectations in March may have reflected a chance of the type of financial intermediary instability spiral of the 2008 financial crisis, this risk had largely faded by mid-April. There are too little data to say anything definitive, but our conjecture is that the Fed's actions on March 23 and April 9 indicated to investors that the Fed stood ready to defuse this sort of spiral and eliminated tail risk in markets. Second, the risk premium for bearing macroeconomic risk, as of early June 2020, was near the levels that it was in January 2020. We reach this conclusion principally from examining stock market valuations, which are sensitive to this risk premium.

Third, while macroeconomic risk premia are low, risk in the cross-section of firms is elevated. Corporate bond spreads in June 2020 are higher across the board. This higher spread reflects market expectations of higher default due to a combination of higher cash-flow risks and higher existing debt burdens. The corporate finance debt concerns are evident in the cross-section. The COVID-19 recession affects firms differentially. Firms with business models that are sensitive to the pandemic, particularly the retail and energy sectors, have high corporate bond spreads. Firms with high preexisting debt, which has been true of high-yield firms, have seen much higher spreads. These facts are drawn from data on the publicly traded firm sector. We have limited data on the SME sector as of this writing, but the forces at work in the large firm sector are likely even more pressing for SMEs, as indicated by figure 1. We proceed under this hypothesis.

Section II of the paper discusses the Federal Reserve's credit policy actions in the context of corporate finance models. We note at the outset that, absent corporate financing frictions, there is no role for credit policy. The operating decisions of a firm are influenced only by the path of the Fed's policy rate. For example, take a technology giant that is flush with cash and whose behavior approximates a hypothetical Modigliani-Miller firm.

The operating decisions of this firm are based on comparing the risk-adjusted return on an expenditure to the return on holding cash. Federal Reserve purchases of this firm's corporate bonds, driving down its bond yield, will have minimal impact on its operating decisions.

We present a model of a large public or private equity–backed firm that faces a solvency problem, as in the first case mentioned above. The firm has high existing debt, and decisions are made by management to maximize equity holders' value. The high debt induces a debt overhang problem à la Myers (1977) for this firm that results in underinvestment, a macroeconomic cost. Can the Federal Reserve credit policy alleviate this problem? An investment-grade corporate bond quantitative easing (QE) likely has small beneficial effects. Purchasing investment-grade corporate bonds may drive down investment-grade yields for portfolio balance reasons, as in Vayanos and Vila (forthcoming), but since investment-grade firms are not the firms that suffer debt overhang, this policy will have limited real effect. A high-yield corporate bond QE may have a more significant impact. But the effects here are nuanced.

The debt overhang problem arises in cases where debt cannot be restructured. If renegotiation is costless, the debt overhang problem disappears and economic efficiency is obtained. Chapter 11 of the bankruptcy code is a mechanism to coordinate creditor claims and restructure debt in a manner that is consistent with preserving the viability of the firm.

The decision to file for a Chapter 11 bankruptcy rests with the equity holders of the firm. As in Leland (1994), the equity holders will continue to service the firm's debts as long as the option value of retaining control of the firm exceeds the debt service payment. That is, the equity holders will prioritize using earnings to make debt payments as long as their call option on the firm enterprise has high value. A key point is that the private decision to file for bankruptcy is based on an option valuation trade-off and not a consideration of the deadweight cost of bankruptcy.

In this context, reducing refinancing costs for a high-yield firm allows the equity holders to delay a Chapter 11 filing. If the deadweight costs of bankruptcy are low, then the delay is socially inefficient. The firm operating under debt overhang distorts spending decisions in a manner that is socially costly. Likewise, if the recession is expected to last a long time, it is better to induce resolution quickly than to delay and incur the bankruptcy costs at a later date. Uncertainty over the length of the pandemic also affects optimal policy. As bankruptcy incurs irreversible social costs, the decision of policy to induce bankruptcy and resolution is a real option. During times of large uncertainty, optimal policy may involve waiting

before triggering bankruptcy. The key insight of our large firm model is that credit policy needs to balance the benefits of delay against the cost of inducing resolution.

We next consider a model of an entrepreneurial firm which is owner operated and subject to financing frictions, as in our second case above. We assume that the owner has limited personal assets, and what they have is tied up in the business. We also assume that the firm's borrowing capacity is a fraction of its capital. These two assumptions lead to a liquidity constraint that affects the firm's operating decisions. We also assume that the enterprise has significantly higher value if run and owned by this owner. That is, the social costs of bankruptcy are high for this firm.

The model is most applicable to SMEs. For example, consider a small auto parts supplier with an owner who is also the firm's principal employee. The firm has loans from a bank that are in part guaranteed by the owner against personal assets. Facing a temporary decrease in demand for automobiles and auto parts, this firm is unable to service its debts. The owner has pledged all of their personal assets to the firm previously and has no spare liquidity. As a result the firm files for bankruptcy. Typically, such a firm will enter a Chapter 7 liquidation, and in this case the owner may additionally file for personal bankruptcy. Even if the health crisis abates, this firm and its owner will only gradually scale back up to their pre-pandemic levels. Any loans required for restarting the business will require security of the owner's assets—which will be depleted as a result of the bankruptcy. This is where the liquidation scarring concern is most evident in the firm sector.

Effective government credit programs funnel liquidity to this entrepreneurial firm. This liquidity allows the firm to undertake expenditures that maintain its enterprise value as well as help stave off a socially costly bankruptcy. Programs such as the Main Street Lending Program (MSLP), the Paycheck Protection Program (PPP), as well as forbearance by banks, encouraged by the Federal Reserve, benefit these firms by easing liquidity constraints.[5] On the other hand, we argue that the MSLP would work better if it offered a lending subsidy that drove down the program's lending rate near zero. Doing so would allow borrowers to economize on scarce liquidity and would more closely resemble an insurance payment. The

5. The analogy of 2020 SME liquidity problems and 2008 household liquidity problems fails when it comes to capital market policy inventions. The structure of the mortgage market means that mortgage-backed security QE delivers liquidity benefits to households. No similar pipes exist via capital markets to SMEs.

current MSLP design requires that banks own a share of any MSLP loan. But as banks will only lend if the loan has positive net present value, this share requirement prevents passing on a lending subsidy. We also argue that the MSLP's leverage rules, restricting eligibility to low-leverage borrowers, excludes the firms with the greatest drag due to debt. Since the inception of the MSLP, the Federal Reserve has modified the program progressively in a manner that recognizes some of the issues we raise.

The Small Business Reorganization Act enacted by Congress in 2019 reduces the costs of small and medium-sized enterprises (SMEs) from filing for Chapter 11. This change in law can potentially be a game changer in terms of reducing scarring in the SME sector. However, there are concerns regarding the extent that SMEs will avail of this provision. Under the law, the business is required to propose a reorganization plan within 90 days of filing, which may prove challenging. Firms also have to obtain debtor-in-possession (DIP) financing to continue operating. Traditional DIP financiers focus on large firms. Repurposing the MSLP program to provide DIP loans will help the Chapter 11 process for SMEs and mitigate scarring.

We finally turn to household insurance. The government has insured workers against unemployment via both unemployment insurance and the PPP. In a counterfactual absent unemployment support for these workers, household budgets would have been squeezed to the point that they would be unable to cover fixed obligations such as rents, mortgage payments, or auto loan payments and would either fall delinquent or be forced into bankruptcy. Government insurance has aimed to forestall this outcome. While we do not review the efficacy of worker insurance programs in this paper, we draw out implications for these programs for financial asset prices. For example, currently the prices of securities backed by credit card receivables reflect relatively low expected rates of default.

In an Arrow-Debreu world, the insurance provided by the government's facilities would be unnecessary because it would have been arranged ex ante between private parties. Contracts would be written to reduce obligations such as interest, rent, and mortgage payments, in the event of a pandemic. Workers in pandemic-affected industries would receive insurance payments to cover their loss of income. The deadweight costs of separations and bankruptcies would thus be avoided via ex ante contracting. A useful way of seeing current government policy is that it has aimed, with varying degrees of success, to add contingency ex post to contracts and avoid deadweight costs.

Filling in the contingency ex post, even if done with surgical precision, is to a large extent a transfer to holders of capital assets. The holders of

debt to SMEs gain when the government offers the SME a loan to avoid default. The owners of credit card asset-backed securities gain when unemployment insurance provides households with resources to repay credit card debt. The lender in a mortgage or owner of an apartment building receives payment because the household receives insurance from the government.

With this in mind, consider the question of where the government should source the resources used to fill in the contingency. The Coronavirus Aid, Relief, and Economic Security (CARES) Act costs in excess of $2 trillion which must be repaid at some point. In an Arrow-Debreu ex ante allocation, the equity owners of SMEs as well as households would purchase insurance in advance against the pandemic event. For example, debt contracts may be indexed such that debt principal is written down by 25 percent in the event of a pandemic.[6] By filling in the contingency ex post, the government transfers 25 percent to the borrower, who then makes this payment to the lender. The lender gains 25 percent relative to the no-government-action counterfactual and the borrower has received insurance for free that would otherwise have cost a negligible amount.[7] If the government aimed to replicate the Arrow-Debreu allocation via its ex post actions while apportioning losses to borrowers and lenders in a manner consistent with the Arrow-Debreu allocation, then it should raise taxes in such a manner that the bulk of the resources comes from lenders, that is, asset owners rather than workers.

To summarize, the principal lessons of our analysis are:

1. If the social cost of bankruptcy is low, then policy should not aim to subsidize credit to firms, which induces inefficient firm continuation, but instead induce firms to restructure their debts. As a result, we suggest that the government consider putting in place lending programs to firms in a Chapter 11 bankruptcy. Such a policy lowers effective bankruptcy costs and incentivizes debt restructuring to reduce liquidation.

6. A number of scholars have signed on to a March 24, 2020, letter drafted by Jonathan Berk (2020) in favor of COVID-19 policies that do not bail out large corporations, as such policies are a bailout of the investors of these corporations. They argue instead for policies that provide insurance to the workers at these corporations. Our argument is related to but distinct from this point. We argue that ex post insurance to the corporate sector may be beneficial depending on the social costs of bankruptcy, but the incidence of the tax burden should align with the incidence of the benefits of the bailout (i.e., the investors).

7. If the ex ante likelihood of a pandemic is p, the debt would carry an extra interest cost of $p \times 25$ percent. The premium would compensate lenders for the loss of 25 percent that they would suffer in the event of the pandemic. For small p, which was likely the assessed probability before 2020, this premium is low.

2. If bankruptcy costs are high, as with SMEs, we additionally recommend providing subsidized credit to enable firm continuation. For credit programs addressing smaller firms, we suggest the Federal Reserve consider relaxing its credit eligibility rules as well as aiming to introduce an explicit subsidy into its lending programs.

3. Many government programs in this pandemic recession should be seen as implementing part of an Arrow-Debreu insurance arrangement ex post.

4. The insurance perspective also indicates where government resources should be sourced. We argue that the high government debt that is incurred in the present recession should be met with higher future taxes on current asset owners.

I. Assessing Financial Market Conditions

This section reviews data from financial markets to assess where we are currently. We conclude that, as of early June, there is a low risk premium for aggregate risk. However, the recession has increased dispersion in risk in the cross-section of firms. There was a significant dislocation in asset markets in mid-March that has some similarities to the events of 2008, but it appears that this dislocation has faded, in part due to the Federal Reserve's actions.

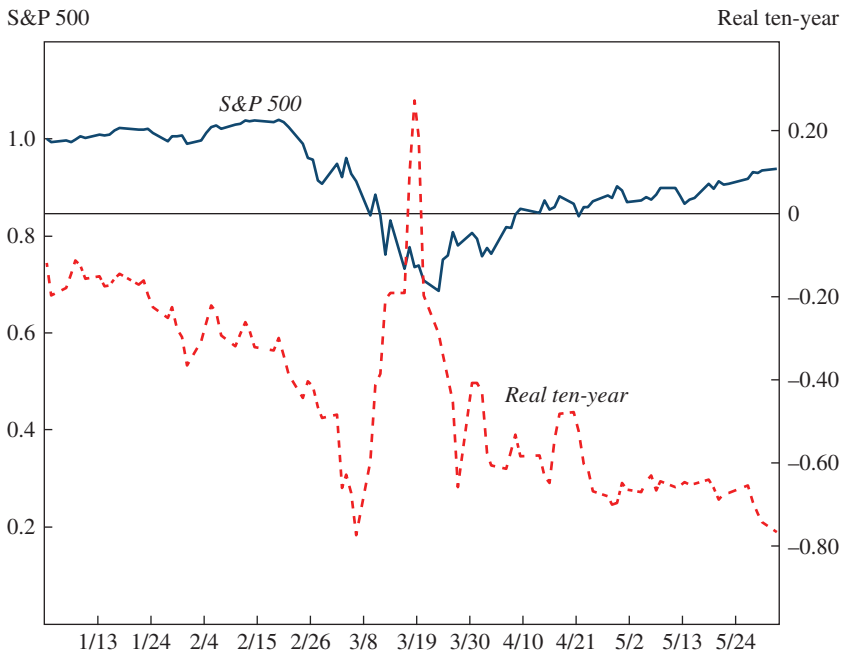
I.A. Equity Markets Reflect Low Risk Premia

We consider the valuation of the S&P 500 via the Gordon growth formula:

$$P = \frac{D_1}{r} + \frac{D_2}{r^2} + \cdots,$$

where D is dividends and r is the gross discount rate. The dividend yield on the S&P 500 has been around 2 percent for the last few years. Suppose that corporate earnings and dividends dip for the next two years and then revert to prepandemic levels. To get an idea of the extent of the dip, note that the S&P 500 dividend futures contract traded on the Chicago Mercantile Exchange for December 2021 was 29 percent lower on June 1 compared to January 2 (it was 38 percent lower on March 23 than on January 2). Suppose that dividends are lower by 30 percent for the next two years, with nothing else changed about growth prospects or discount rates. Then we would expect that the valuation of the market would fall

Figure 2. S&P 500 and Real Ten-Year Interest Rate



Source: Bloomberg.

by about 1.2 percent (= 2 × 0.3 × 2 percent). If dividends were low for five years, as may occur in "swoosh" recovery, the valuation of the market would fall by 3 percent. As these computations show, the valuation of the market is relatively insensitive to whether we have a shape like a *U*, a *V*, or a swoosh. Of course, these alternative scenarios can have a large impact on the path of the unemployment rate. That is, the stock market is not the job market.

Figure 2 graphs the S&P 500 stock market index and the real ten-year interest rate, measured as the ten-year nominal swap rate minus the ten-year inflation swap rate. The stock market movements are most informative about longer-term movements in dividend growth rates and risky discount rates:

$$P = \frac{D_1}{r} + \frac{D_2}{r^2} + \frac{1}{r^3} \times \frac{D_3}{r - g},$$

reflected in the last term in this valuation equation. If dividends fell by 30 percent for the next two years and then rose back to prepandemic levels, then to account for the roughly 6 percent fall in the stock market from January 2 to June 1, we need $r - g$ to rise by about 0.1 percent. Since the riskless rate has fallen by about 0.6 percent over this period, this computation indicates that either the risk premium has risen by 0.7 percent only or the growth rate of dividends has fallen by 0.7 percent. These are both small numbers relative to historic fluctuations in discount rates.

We conclude that aggregate market risk premia have not increased appreciably from the start of this year to the present (June 2020). This is in stark contrast to 2008, where risk premia on a variety of assets rose sharply in fall 2008 and remained elevated well into 2009.

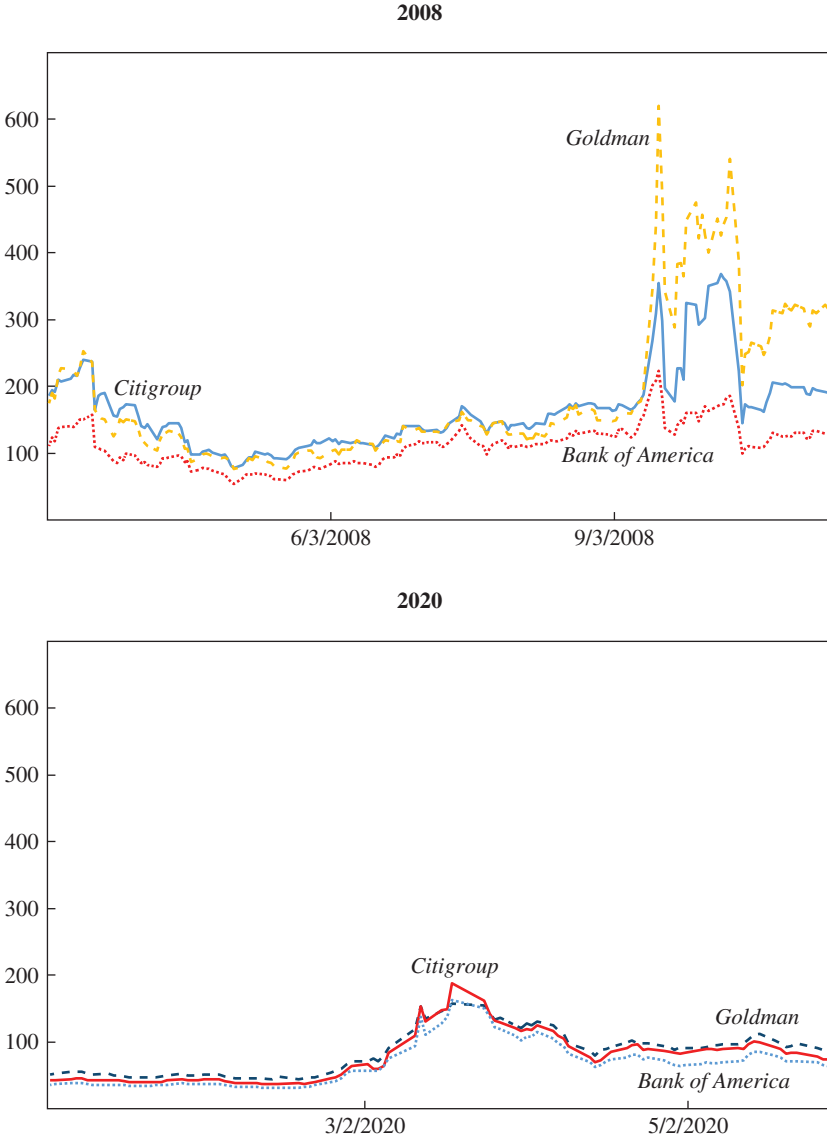
I.B. Financial Crisis Risk in 2020 Is Low Compared to 2008, as of Now

Figure 3 graphs five-year credit default swap (CDS) rates for Goldman Sachs, Citigroup, and Bank of America. The movements in these rates in 2008 are an order of magnitude larger than the movements in 2020. In 2008, the US economy suffered a financial crisis as has been documented extensively in the literature. Risk-bearing capacity across the financial intermediary sector was reduced, leading to high risk premia in a variety of asset markets.

At this point, as of June 2020, the United States is not suffering a financial crisis. The relatively small shift in the equity market risk premium is also a reflection of this observation. There is a significant branch of research in asset pricing which constructs mechanisms whereby small changes in dividends are amplified via endogenous shifts in the risk aversion of the marginal holder of risky assets, leading to large changes in equity prices. For example, in intermediary asset pricing theories, losses on intermediary held assets lead to endogenous reductions in the risk-bearing capacity of the intermediary sector which then raises the discount rate on intermediary held assets, leading to further reductions in asset prices, and so on (Brunnermeier and Pedersen 2009; He and Krishnamurthy 2013). This type of theory is useful to understand movements in asset prices in 2008. But at present, this type of amplification mechanism is not present. Asset price movements can be understood through the simple neoclassical lens of forecasting changes in future cash flows.

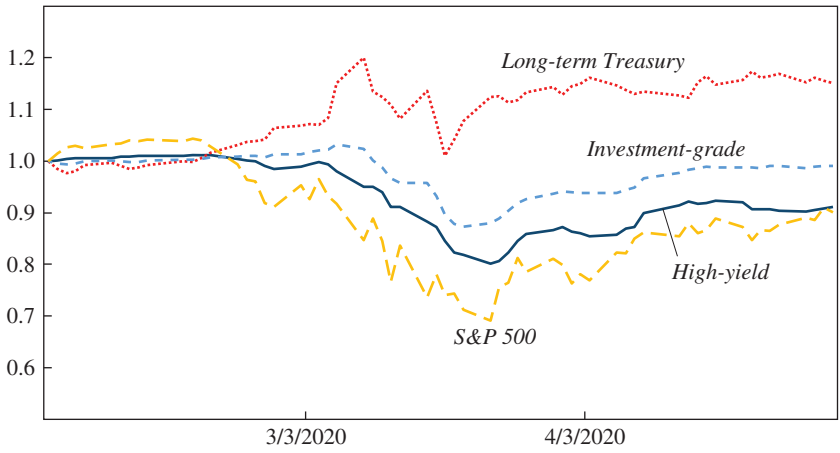
However, we note that the disabling of this amplification mechanism is likely the result of the expectations of Federal Reserve policy actions. We turn to this topic next.

Figure 3. Five-Year CDS Rates on Select Banks, 2008 versus 2020



Source: Bloomberg.

Figure 4. Treasury, Corporate, and Stock Returns



Sources: Bloomberg; Barclays indexes.

I.C. The March 2020 Dislocation and the Federal Reserve

There was a dislocation in asset markets in March 2020. This is apparent in the unusual movements in the ten-year real rate in figure 2. Figure 4 zooms in on this period. We plot the total return indexes for long-term Treasury bonds, investment-grade corporate bonds, high-yield corporate bonds, and the S&P 500. The first three of these are Barclays bond indexes. We normalize the indexes to one on February 3 and trace the index return through April 30.

At their low in mid-March, investment-grade corporate bonds were down about 13 percent relative to February 3. High-yield bonds were down 20 percent, and the S&P 500 was down 31 percent. While this ordering is in keeping with valuation norms, the beta on the investment-grade bond is much too high and is another indicator of a dislocation in valuations. Haddad, Moreira, and Muir (2020) make this point rigorously by comparing the beta-adjusted relative returns on these asset classes in 2020 versus 2008. Haddad, Moreira, and Muir (2020) show that the bond yields on a company's investment-grade bonds rise substantially relative to its CDS.[8] They argue that the behavior of asset prices in this period reflects

8. See also D'Amico, Kurakula, and Lee (2020) and Nozawa and Qiu (2020) for analysis of this episode.

fire sales and reduced risk-bearing capacity. Bond funds, fearing downgrades of investment-grade bonds, sell down their portfolios of bonds. Corporate bond dealers, because of balance sheet constraints and fears of further sales in anticipation of further downgrades, do not step in to absorb these sales and prices fall sharply.

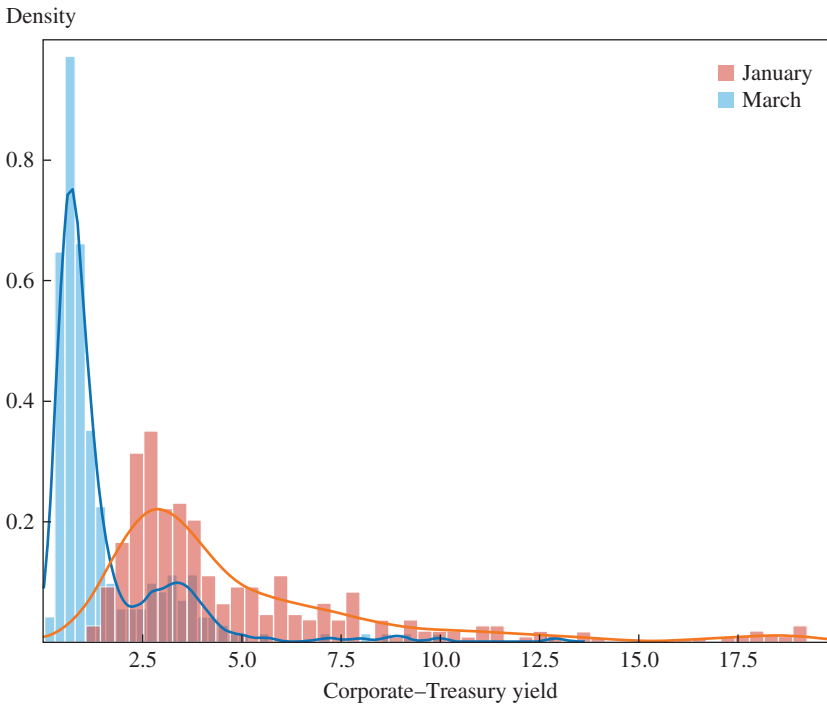
Treasury bonds also fell in value in mid-March, reflecting market illiquidity problems in the Treasury market. This is surprising and in contrast to the typical flight-to-safety pattern in crises. Duffie (2020) analyzes the Treasury market in this period and concludes that the volume of sales in the market overwhelmed the dealer-intermediation infrastructure, leading to large swings in Treasury bond prices. Less-liquid Treasury bonds (so-called off-the-run securities) see the largest price declines.

The Federal Reserve's actions on March 23 and April 9, which drew from the 2008 playbook of liquidity provision and expansion of risk-bearing capacity, eased the dislocations.[9] The Fed's security lending programs and targeted purchases of the less-liquid segment of the Treasury market eased the liquidity issues in the Treasury market. Treasury prices rose substantially after this intervention.

The Federal Reserve's commitment to purchase investment grade corporate bonds on March 23, which was then expanded on April 9 to include fallen angels (high-yield bonds that were formerly investment grade), substantially reduced risk premia in corporate bonds. As Haddad, Moreira, and Muir (2020) note, the easing of the corporate bond dislocation stemmed from an announcement of future promised purchases, not current purchases. That is, what appears important in these interventions is the commitment of the Fed to inject its risk-bearing capacity in the market, if needed. The April 9 announcement in particular appears to have substantially reduced risk premia across the board in asset markets. It is too soon—as of this writing in June—to definitively characterize the impact of the April 9 announcement on market expectations. Our conjecture is that the Fed's announcement has been viewed by the market as a "whatever it takes" moment. That is, the commitment to act aggressively in the high-yield bond market has been taken as a signal of the Fed's willingness to defuse future episodes of financial instability in the broad credit market. This commitment has removed a bad equilibrium and reduced market tail risk. If our conjecture is correct, then the Fed does not currently need to

9. The Federal Reserve's *Financial Stability Report May 2020* provides more details and analysis of this episode.

Figure 5. Credit Spread Histogram, January and March



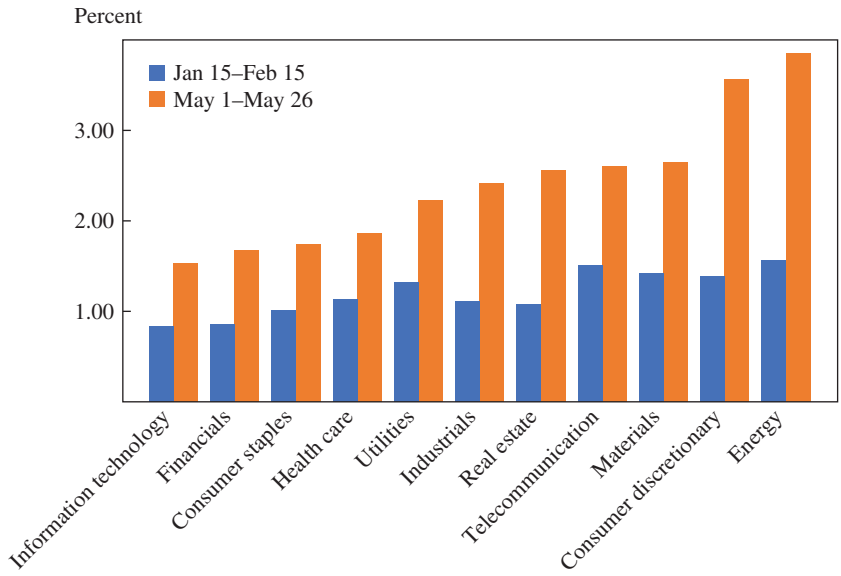
Source: TRACE.

make good on its promise and activate the corporate bond purchase program at this point in time. The important aspect of the Fed's announcements has been the signal of its willingness to act if dislocations arise, and reinforcing this commitment is all that is needed at present.

I.D. Increased Cross-Sectional Firm Risk

Figure 5 measures dispersion in credit risk in the cross-section. We use bond price data from the Trade Reporting and Compliance Engine (TRACE) and compute the yield spread, relative to Treasuries, on bullet bonds with approximately five-year maturities. We compute this at the company level and plot the density of these spreads across companies. The January histogram (darker) corresponds to dates from January 20 to January 31, while the March histogram (lighter) corresponds to dates from March 16 to March 31. Clearly there is an increase both in the mean spread and the right tail of spreads.

Figure 6. Industry Average Credit Spreads

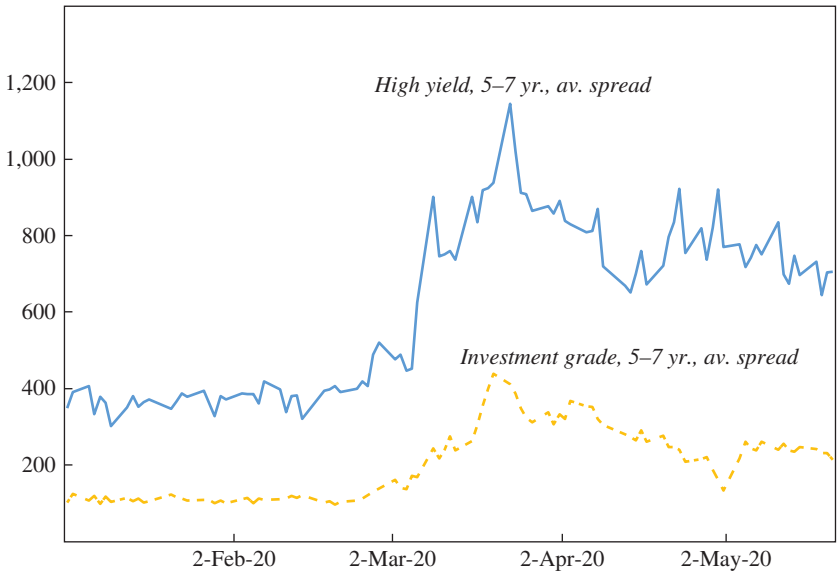


Source: S&P 500 bond indexes.

In figure 6, we consider dispersion at the industry level. We plot credit spreads on firm debts of roughly seven-year maturity. We plot these spreads pre-COVID-19, averaging observations from January 15, 2020, to February 15, 2020. We also plot these spreads in the present recession, averaging spreads from May 1, 2020, to May 26, 2020. We can see from the figure that spreads have increased across the board, indicating that investors' perception of repayment risks (i.e., cash flow risk relative to debt liabilities) has risen. Additionally, spreads in the energy sector, which has been facing reduced oil demand, and the consumer discretionary sector, where retail has been falling, have been particularly affected. The figure indicates a rise in expected cash flow risk at the firm level. We noted earlier that aggregate risk premia appear low, thus the correct way to think about these data are that they reflect a risk in idiosyncratic firm risk.

Figure 7 plots corporate bond spreads for investment-grade and high-yield bond issuers, to provide a sense of the changes in risk in the cross-section. There is a substantial increase in default risk across both classes of bonds. High-yield spreads in particular have roughly doubled since the start of the year.

Figure 7. High-Yield and Investment-Grade Corporate Bond Spreads

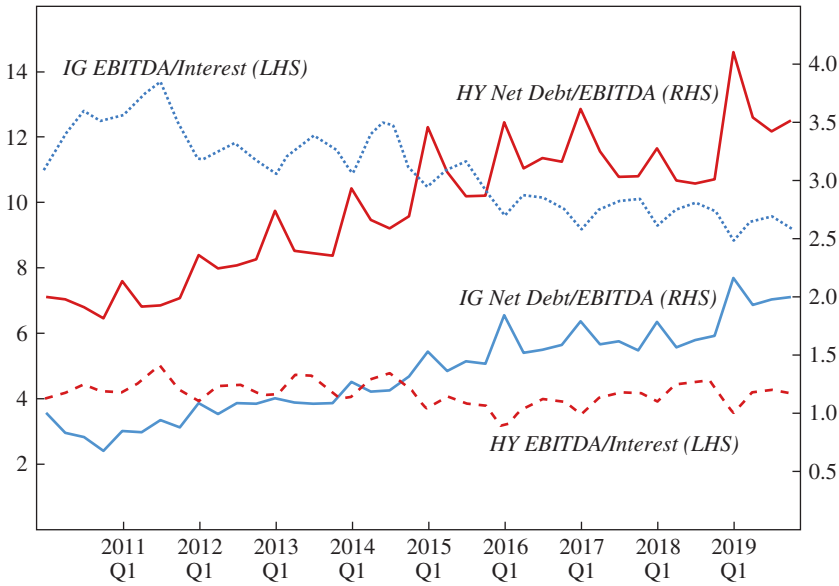


Source: JPMorgan.

The corporate sector enters this recession with higher debt burdens, making it more vulnerable to a downturn. Figure 8 plots the net debt (debt minus holdings of cash) of high-yield (HY) and investment-grade (IG) firms relative to earnings before interest, taxes, depreciation, and amortization (EBITDA). We fix the set of high-yield and investment-grade firms as of 2016. These net debt series are shown with solid lines. Debt burdens have increased for both types of firms, with a greater rise in the high-yield sector. With dashed lines, we plot the interest coverage ratio (EBITDA to interest expense) for both types of firms. There has been an erosion in this measure particularly for investment-grade firms. The Federal Reserve's *Financial Stability Report May 2020* offers further details on the buildup of leverage in the corporate sector.

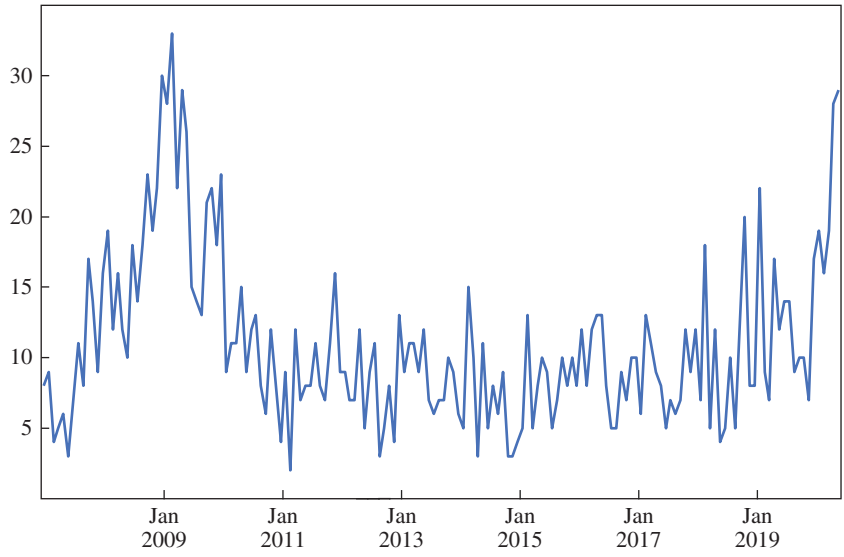
The expansion in corporate leverage in the high-yield sector has led to increases in corporate default risk, as indicated by the rise in spreads. However, bankruptcies are just beginning to hit the economy. Bloomberg tracks large corporate filings. Figure 9 gives a count of the number of filings per month. Filings, as of June 2020, were approaching the levels of the 2008 financial crisis.

Figure 8. Corporate Leverage, 2010–2020, for High-Yield and Investment-Grade Firms as of 2016



Sources: Compustat; Mergent.

Figure 9. Bankruptcy Filings Monthly Count, January 2007 to June 2020



Source: Bloomberg BCY.

Table 1. Corporate Bankruptcy Filings as of June 1, 2020

Sector	*%*	*$ billion*
Consumer discretionary	40.82	52.25
Energy	16.33	20.90
Financials	10.2	13.06
Health care	9.18	11.75
Communications	5.1	6.53
Consumer staples	4.08	5.22
Industrials	4.08	5.22
Technology	4.08	5.22

Source: Bloomberg.

The breakdown of filings across industries, provided in table 1, is revealing. The bulk of bankruptcy filings are in the consumer discretionary sector, consistent with the high-profile filings by many large department stores. Energy is a close second, driven by the substantial fall in energy prices.

I.E. Small and Medium-Sized Firm Credit Risk

We expect that the patterns documented for large firms are present, and likely more pressing, for small firms. That is, we expect that credit risk has grown substantially since the start of the pandemic and that dispersion in the cross-section of firms has also widened. However, we have limited up-to-date information on small and medium-sized business credit risk.

Data from PayNet, which tracks credit risk in firms with employment largely in the 1–49 range and revenues under $2.5 million, indicate an increase in loan delinquencies.[10] PayNet's 31–90 day small business delinquency index was 2.39 percent in May 2020, compared to 1.6 percent in January 2020 and a high of 3.39 percent in August 2009. Bartik and others (2020) conducted a survey of 5,800 small businesses during the week of March 28, 2020. They report that the median firm has one to two months of cash on hand to meet expenses, giving a sense of the liquidity crunch facing these firms, absent a government credit program. Table 3 of the paper presents data on the cross-section of firms. While on average 44.6 percent of their sampled firms were closed (largely reflecting temporary closure) as of the sample date, there is wide dispersion in this measure. Banking and finance and professional services report closure rates of around 20 percent while arts and entertainment, personal services, and tourism and lodging report rates between 60 and 87 percent.

10. See Small Business Delinquency Index, PayNet, https://sbinsights.paynetonline.com/loan-performance/.

I.F. Household Credit Risk and Government Insurance

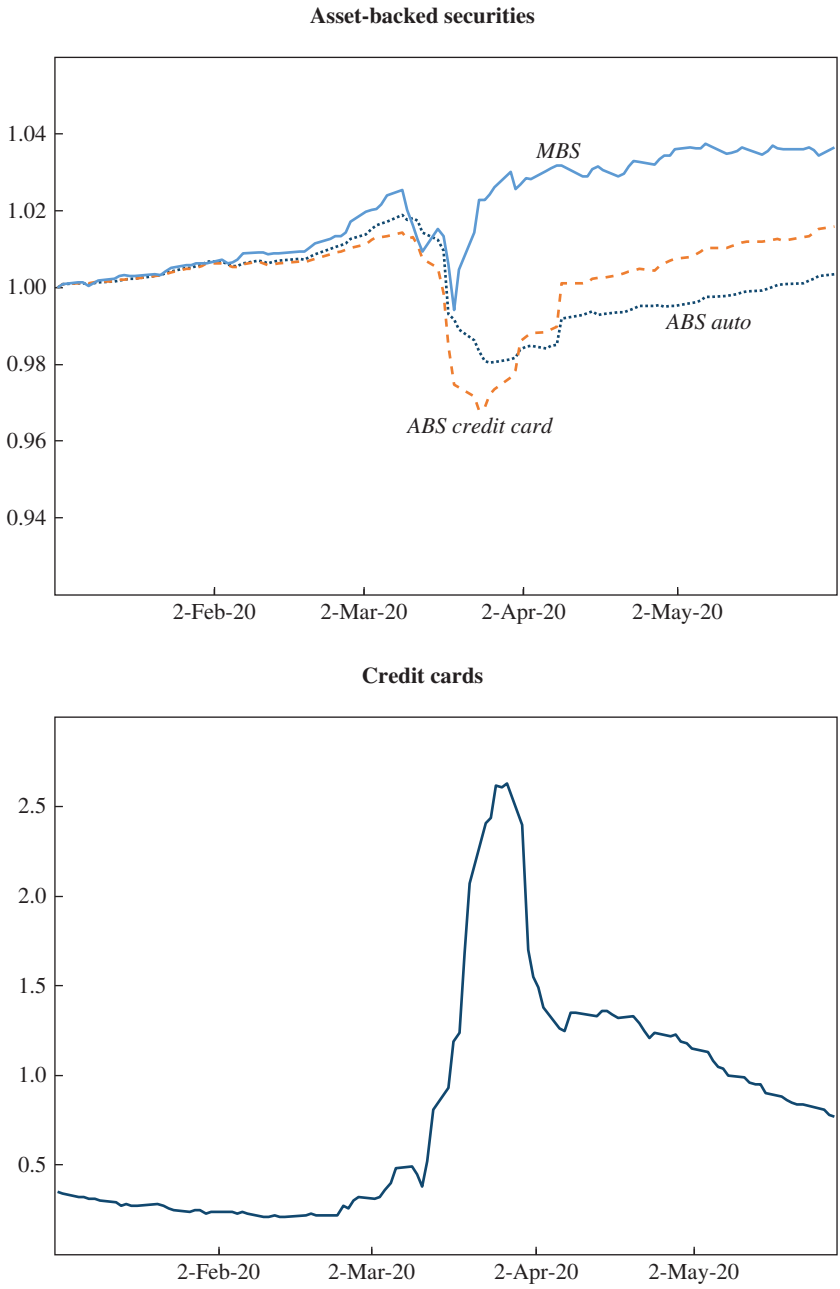
Figure 10 (top panel) plots the return on three household credit assets: auto loans, credit cards, and mortgages. We track the return on an index, as compiled by JPMorgan, on asset-backed securities linked to these underlying loans. We normalize the value of the index to be one on January 2, 2020, and track the index value relative to this date. We see that all of these assets suffered losses in March but currently (as of June 1) reflect valuations that are at least as high as the start of the year. In the case of mortgage-backed securities, this is likely due to a mix of the Federal Reserve's decision to purchase mortgage-backed securities and the Federal Housing Finance Agency's (FHFA) decision to allow households to defer payments at no penalty. In the case of credit cards and auto loans, an important factor is likely the expansion of unemployment benefits and the stimulus checks in the CARES act. Baker and others (2020) observe that about one-third of the 2020 stimulus checks have been spent toward financial payments such as credit card, rent, and mortgage payments. In addition, spending is depressed due to the lockdown, resulting in high liquid asset holdings by households (Cox and others 2020). Thus government insurance to households has maintained the value of these financial securities.

Figure 10 (bottom panel) graphs the yield spread, relative to Treasury bonds, on a credit card asset-backed securities index. The underlying bond maturity of this index is roughly one and a half years. We note that the pre-COVID-19 recession spreads are around 30 basis points, indicating relatively low default probabilities and losses given default. These spreads rose in March substantially but were down to 77 basis points by the end of May. Risk has clearly risen, but the increase in risk is still modest relative to the dramatic increase in unemployment rates. Government insurance to households has likely played an important role in the behavior of this spread.

II. Government Credit Policy

This section discusses the government's credit policies enacted in the COVID-19 crisis. We begin by reviewing these policies. Then we lay out two corporate financing models, one of a hypothetical large firm facing solvency issues and a debt overhang problem, and one of a hypothetical entrepreneurial firm facing liquidity constraints. We use these models to discuss the merit of the credit programs. Our models capture many but not all salient corporate financing considerations. As a result, we do not attempt to discuss all aspects of the design of the government's credit programs.

Figure 10. Asset-Backed Securities Cumulative Returns and Credit Card ABS Spreads



Sources: JPMorgan; Bloomberg.

II.A. Government Programs

Table 2 lists the government programs that address credit markets. These programs cover the bulk of the firm sector in the United States. The Primary Market Corporate Credit Facility (PMCCF) was introduced on March 23. It has the Federal Reserve purchasing corporate bonds in the primary markets. The Secondary Market Corporate Credit Facility (SMCCF) has the Federal Reserve purchasing corporate bonds in the secondary market. These two programs are designed for large corporations that finance themselves in public debt markets and had ratings of at least BBB-/Baa3 on March 22, 2020; that is, the firm universe is comprised of investment-grade corporations and fallen angels. The Commercial Paper Funding Facility (CPFF) addresses short-term public borrowing. There is overlap among the firms eligible for these facilities. To give a sense of the magnitudes involved, we compute the universe of firms eligible for the SMCCF and show the results in table 2. The SMCCF covers firms with total revenues of $14.3 trillion and equity market capitalization of $24.7 trillion.

The Federal Reserve's Main Street Lending Program (MSLP) addresses credit in medium-sized firms with fewer than 15,000 employees or up to $5 billion in annual revenue. By our count, the total revenues across the universe of MSLP firms that fall into this category is $23.8 trillion. However, the MSLP imposes credit limits that restrict borrowers to a maximum debt ranging from four times to six times their 2019 EBITDA. The MSLP also requires that borrowers have been in "sound financial condition" before the COVID-19 recession. We have not factored these restrictions into the computation.

Finally the Paycheck Protection Program (PPP), run by the Small Business Administration, addresses credit problems in the small firm sector. The mean revenue of a firm eligible for the program is $2 million, and the universe of eligible firms totals $11.8 trillion.

II.B. Solvency Problems and Corporate Debt Overhang

In this section, we develop a model to analyze how credit easing policies can have a beneficial impact on firms. The model in this section is applicable to a large corporation run by professional management, with publicly traded equity, the holders of which are the formal owners of the corporation. The model is also applicable to a private equity–backed large firm, where the management team runs the firm in the interest of the private equity holders. These private equity–backed firms are among those with high leverage, typically funded in the leveraged loan market.

Table 2. Lending Programs and Targets

Federal Reserve facility	*No. of private firms*	*No. of public firms*	*Total no. of firms*	*Variable*	*Units*	*Aggregate*	*Mean*	*p10*	*p25*	*p50*	*p75*	*p90*
1 Primary Market Corporate Credit Facility (PMCCF)[a]	71	463	534	Assets[b]	$US bn	38,293	79.8	4.8	8.8	22.7	58.7	162.3
				Market Cap.[c]	$US bn	22,370	48.4	2.8	5.2	15.0	43.4	107.7
				Revenue[4d]	$US bn	11,760	23.4	1.3	3.5	8.6	21.1	60.1
2 Secondary Market Corporate Credit Facility (SMCCF)[a]	707	1,019	1,726	Assets[b]	$US bn	42,427	39.7	1.2	2.6	6.8	23.3	70.5
				Market Cap.[c]	$US bn	24,728	24.3	0.3	1.2	3.8	15.1	52.1
				Revenue[d]	$US bn	14,313	11.2	0.3	0.9	2.8	8.7	22.4
3 Commercial Paper Funding Facility (CPFF)[a]	12	72	84	Assets[b]	$US bn	9,418	122.3	13.2	23.7	62.1	152.2	294.0
				Market Cap.[c]	$US bn	12,455	173.0	20.6	29.7	66.7	191.7	351.0
				Revenue[d]	$US bn	4,512	56.4	4.1	11.6	28.0	65.9	146.3
4 Paycheck Protection Program Liquidity Facility (PPPLF)[e]	—	—	5,976,761	Payroll[f]	$US mm	2,711,537	0.5	—	—	—	—	—
				Employment[g]	—	60,556,080	10	—	—	—	—	—
				Receipts[h]	$US mm	11,816,839	2.0	—	—	—	—	—
5 Main Street Lending Program[e] Main Street Priority Loan Facility (MSPLF) Main Street New Loan Facility (MSNLF) Main Street Expanded Loan Facility (MSELF)	—	—	5,996,386	Payroll[f]	$US mm	5,034,489	0.8	—	—	—	—	—
				Employment[g]	—	99,073,784	16.5	—	—	—	—	—
				Receipts[h]	$US mm	23,801,346	4.0	—	—	—	—	—

Source: Capital IQ and 2017 (latest) Statistics of US Businesses (SUSB), US Census Bureau annual data set.

a. Assets, market capitalization, and revenue statistics are calculated mainly on public firm data; private firm disclosure of these figures is scant.

b. Asset figures are latest annual.

c. Market capitalization figures are latest available.

d. Revenue figures are latest annual.

e. Since Statistics of US Businesses (SUSB) only provides aggregate figures across firms by employee-size bucket, the mean is computed by first computing the mean for each employee-size bucket and taking the weighted average of these means, weighting by the number of firms in each employee-size bucket.

f. Payroll figures are annual.

g. Measured in number of people per firm.

h. Receipts are defined as annual operating revenue for goods produced or services provided. Receipts are taken from the 2012 SUSB, latest SUSB that reports firm receipts; receipts are only recorded for years ending in 2 or 7, and final figures on 2017 receipts have not yet been made available.

In section II.F we consider a model of entrepreneurial finance applicable to a small firm.

The model has two dates, $t = 1$ and $t = 2$. We denote the gross riskless interest rate as r. A firm needs cash to maintain an ongoing relationship that will generate some surplus in the future, at $t = 2$. The spending needed is ϵ, which we take to be near zero to keep the algebra simple. If the firm spends, then future surplus is ϵR, with $R > r$. Think of the spending as a decision to retain a worker or maintain facilities, and the assumption we make is that at the margin this spending is positive net present value.

If the firm does not spend, its assets at $t = 2$ will have a stochastic value of $\tilde{A}$. We assume that the firm has current debt outstanding of D. The probability that $\tilde{A} < D$ is denoted with ϕ_B; that is, ϕ_B is the default probability. In addition, we denote $\overline{A} = E[A|\tilde{A} > \mathrm{D}]$ and $\underline{A} = E[A|\tilde{A} < \mathrm{D}]$. This firm is subject to a classic debt overhang problem, as discussed in Myers (1977).

Suppose that the firm issues a corporate bond to undertake this spending. Investors charge the firm a gross interest rate of $\gamma \geq r$ to purchase the bond. If the firm issues the bond and spends, the value of the firm's equity is:

$$V_E = \frac{1}{r}(1 - \phi_B)\left(\overline{A} - D + \epsilon(R - \gamma)\right).$$

Assume that the management of the firm takes actions to maximize the value of equity. That is, either implicit or explicit schemes align the manager's incentives with those of the shareholders. Then clearly the spending is undertaken as long as $R > \gamma$.

In order to raise the funds, the firm issues a bond with the face value of $\gamma\epsilon$. We assume the new bond issue is pari passu with the existing debt. The zero-profit condition for investors is:

$$(1 - \phi_B)\gamma\epsilon + \phi_B \frac{\gamma\epsilon}{D + \gamma\epsilon}(\underline{A} + \epsilon R) - \epsilon r = 0,$$

or, taking ϵ to zero, rewritten as:

$$\gamma = \frac{r}{(1 - \phi_B) + \phi_B \frac{\underline{A}}{D}}.$$

Note that $\gamma - r$ is the credit spread on the firm's bonds. A firm with no default risk ($\phi_B = 0$) has a zero credit spread.

The firm undertakes the spending as long as:

$$R > \frac{r}{(1-\phi_B) + \phi_B \frac{A}{D}}.$$

Debt overhang distorts this investment decision by raising the right-hand side of this expression leading firms to forgo investments that increase the entire firm value.

In the present recession, the corporate sector has been affected heterogeneously. Firms with high existing debts (low $E[A]/D$) and low profits face significantly more default risk and higher spreads. For these firms, spending decisions will not be aligned with efficiency. Firms will choose enterprise value–reducing actions, such as laying off employees, selling assets piecemeal, and forgoing maintenance investments in this case.

Debt overhang also gives rise to an incentive to pay out firm earnings as dividends. Suppose a firm has ϵ of earnings today. The shareholder can take these earnings as dividends today to receive ϵ. Alternatively, the earnings can be used to undertake investment in which case equity value rises by $\frac{\epsilon R(1-\phi_B)}{r}$. Thus the firm will choose to pay out a dividend as long as:

$$\frac{1}{1-\phi_B} > \frac{R}{r}.$$

As solvency concerns rise and the distribution of firm leverage shifts higher, as indicated in our empirical analysis, debt overhang will lead firms to prioritize payouts to shareholders over real operating expenditures. DeMarzo and He (2016) develop a dynamic model of debt overhang where a leverage ratchet effect arises: as solvency falls, firms continue to issue debt at higher spreads and use the proceeds to pay dividends and forgo positive surplus real investments.

II.C. Federal Reserve Corporate Bond Purchases

Can the Federal Reserve's actions ameliorate the debt overhang issue? By reducing r, the Fed reduces the corporate borrowing rate and boosts

spending. This is a standard channel that is independent of the debt overhang concerned outlined above.

More salient to this overhang problem is the Federal Reserve's corporate bond purchase program. We first note that credit easing via Fed bond purchases only works if there is an underlying debt overhang problem. A Fed-induced credit subsidy to a firm like Apple that has a large cash hoard in excess of its outstanding debt will have a limited impact on Apple's real decisions. If it is optimal for Apple to downsize in the face of reduced demand for its product, Apple will do so, and credit easing will have no impact on its operating decision. This section clarifies the domain where credit easing programs can deliver economic benefits.

There are two ways of looking at the Federal Reserve's corporate bond purchase program. First, by purchasing investment-grade corporate bonds, as in the SMCCF or PMCCF, the Fed reduces the refinancing rate on existing debt. If a fraction of debt is due at any time, then reducing the refinancing rate reduces the debt burdens gradually and the debt overhang problem is somewhat reduced. However, note that this effect is likely small. Replacing debt paying 5 percent with debt paying 4 percent reduces D on the order of 1 percent per year of debt maturity. This is a flow reduction in debt accumulation, whereas the debt overhang problem is at heart a problem of high stock.

Second, by purchasing (or committing to purchase) corporate bonds the Federal Reserve takes bond risk onto its balance sheet and effectively increases the market's risk-bearing capacity and hence reduces the market price of credit risk (Vayanos and Vila forthcoming). To be more precise:

$$\phi_B = p_B \eta_B,$$

where p_B is the true (physical) probability of default and $\eta_B > 1$ is a market's risk price for bearing credit risk as in standard models of corporate bond pricing (Duffie and Singleton 1999). Then, the Federal Reserve's bond purchase programs reduce η_B and hence reduce the debt overhang problem. Note that this analysis clarifies a limit on the effectiveness of bond purchase programs. For firms with low p_B, the benefits will be small simply because a firm with a low credit spread cannot have its spread driven down further.

We reach three main conclusions from this analysis. First, bond purchase policies produce the most bang for the buck when targeted toward high default-risk firms. If the Federal Reserve's objective is to reduce the drag from debt overhang, then the Fed should target high-yield rather than

investment-grade bonds. However, the Fed's corporate bond facilities target investment-grade firms and fallen angels.

Second, the policy works best in an environment where risk premia are large. If risk premia are low, as they currently (June) appear to be, then bond purchases will not have much effect. That is, while the Federal Reserve's interventions were valuable in mid-March when markets were dislocated, they are not an effective policy in an environment where markets are operating more smoothly. Krishnamurthy and Vissing-Jorgensen (2011) make this point in the context of the Fed's quantitative easing strategy in the global financial crisis. The first round of quantitative easing was more effective than subsequent rounds.

Third, any policy that subsidizes debt and allows firms to finance current operations via debt inevitably increases a future debt overhang problem. Dynamically, the longer the recession lasts, the more the distribution of firm leverage shifts toward higher values, worsening the aggregate debt overhang problem and worsening the aggregate underinvestment distortion.

II.D. The Chapter 11 Bankruptcy Option

The debt overhang problem is solved by renegotiating or restructuring existing debt. A version of the Coase theorem applies: if both equity and debt holders could renegotiate, then all positive net present value investments will be undertaken. The assumption of the debt overhang analysis is that the debt is sufficiently dispersed that it is not possible to achieve this negotiation.

The bankruptcy code offers Chapter 11 as a mechanism to deal with the drag from high debt and restructure existing debts. Upon a Chapter 11 filing, an automatic stay on payments to pre-bankruptcy debts comes into immediate effect, and current management becomes the debtor in possession controlling the firm. The firm's equity holders lose control and as part of the Chapter 11 restructuring also substantially reduce their claims on the firm's future cash flows. The firm can continue operations while the bankruptcy process determines whether the firm should remain a going concern or be liquidated. In an environment where high debt is the only drag on firm viability, the bankruptcy process allows for creditors to renegotiate their claims, allowing the firm to exit bankruptcy as a viable business. Typically, some creditors receive equity interests in the new post–Chapter 11 firm. For a fuller description of the bankruptcy process, see White (1989).

It is crucial to note that the decision to file for Chapter 11 rests with the equity holders. As in the analysis of Leland (1994), the equity holders control the firm and own an option on the firm's underlying assets. The coupon payments on debt are the option premia that the equity holders pay to retain their option. In the Leland analysis, the equity holder is a deep-pocketed investor whose opportunity cost of cash is r, the riskless discount rate. Then the equity holder weighs the cost of giving up cash at opportunity cost r to making a coupon payment and retaining control of the firm. When $E[A] - D$ is high, and the firm's solvency is not in question, the equity holder finds it optimal to make the option payment, and as in the analysis above, the investment decision is not distorted. As $E[A] - D$ falls, debt overhang begins to distort investment. For some value where $E[A] = \underline{D} < D$, the equity holder's option is sufficiently out of the money that it becomes optimal to not make the debt payment and trigger bankruptcy. If the underlying asset volatility is higher, as is the case currently, the default threshold $\underline{D}$ is lower for standard option valuation logic. If the cost of cash for the equity holder r is higher, then the default threshold $\underline{D}$ is higher.

Next consider the bankruptcy decision from a social perspective. There are two social costs associated with bankruptcy: inefficient liquidation of economically viable firms and inefficient continuation of firms whose business models may be permanently unprofitable. In an economic pause like the COVID-19 crisis, the first concern is likely to be much more significant than the second.

Consider a case where the inefficient liquidation problem is small and the social costs of bankruptcy are likewise small. That is, consider a case where, if the firm defaults, the creditors of the firm take control as its new owners, they retain the management of the firm, and they operate the firm efficiently, with no debt overhang distortion. In this case, the socially optimal decision is to have the firm file for Chapter 11 as soon as debt overhang leads to underinvestment.

The effects of the bond purchase program interact with a firm's decision to file for a Chapter 11 reorganization. Because the decision to file for a Chapter 11 is privately costly to shareholders—their claims are substantially reduced in value—bankruptcy is only triggered when the existing shareholders deem it too costly to retain control of the firm. If the social costs of bankruptcy are low for large firms, the equity holders may not undertake positive net present value investments and allow value to erode for longer than is efficient, hoping for a recovery. Lower corporate

borrowing rates, as induced by the Federal Reserve's bond purchase program, increase this incentive.[11] There is a delicate balance that policy has to maneuver here. Facilitating firm continuation erodes firm value but avoids another cost, which is the deadweight cost of bankruptcy.

We conclude that if deadweight costs of bankruptcy are low, then reducing refinancing costs for a financially distressed firm and enabling the equity holders to delay a Chapter 11 filing is socially inefficient. The firm operating under debt overhang distorts spending decisions in a manner that is socially costly. Likewise, if the recession is expected to last a long period, it is better to induce resolution quickly than to delay and incur the bankruptcy costs at a later date. Uncertainty over the length of the pandemic also affects optimal policy. As bankruptcy incurs irreversible social costs, the decision of policy to induce bankruptcy and resolution is a real option. During times of large uncertainty, optimal policy may involve waiting before triggering bankruptcy.[12] Balancing these considerations provides an answer to the question, How long is too long?

II.E. The Costs of Bankruptcy and a Policy Proposal

Optimal policy depends on assessing the social costs of bankruptcy. The literature has documented costs associated with both financial distress and bankruptcy. There is considerable evidence that firms in distress, but pre-bankruptcy, take actions to erode firm value. This is the conclusion of Asquith, Gertner, and Scharfstein (1994), studying a sample of financially distressed firms who had issued junk bonds. Andrade and Kaplan (1998) document losses of around 10 percent of firm value via these actions of firms in financial distress. In terms of our model analysis, this evidence indicates that firms suffering debt overhang take actions that erode value in order for equity holders to retain their option on the firm's assets.

A Chapter 11 bankruptcy incurs costs that can reduce firm value. Administrative costs of bankruptcy stem from the fees paid to lawyers,

11. DeMarzo and He's (2016) dynamic debt overhang model indicates a further cost of subsidizing firm continuation. In their model, subsidizing the borrowing rate of a high debt firm will lead the firm to borrow and use the proceeds to pay dividends rather than undertake real expenditures such as retaining employees. As a result, the enterprise value of the firm can erode faster when debt is subsidized. Their analysis indicates the importance of placing restrictions on financial payouts (dividends or share repurchases) when accessing a government credit facility. The Federal Reserve's MSLP facility does impose such a restriction.

12. Stein (2020) proposes that the government should act as a venture capitalist, offering financing in stages to deal with these uncertainty concerns. This viewpoint aligns with the option logic we have outlined.

accountants, and so on. Bris, Welch, and Zhu (2006) provide median estimates of around 1.9 percent of firm value but also report heterogeneity in these estimates, with the estimates for the third quartile of 6.7 percent. Indirect costs of bankruptcy include possible reductions in value due to asset fire sales and conflicts among stakeholders leading to inefficient operating decisions. Davydenko, Strebulaev, and Zhao (2012) document median costs incurred both in distress and during bankruptcy of around 22.1 percent of firm value.

A Chapter 11 bankruptcy can also have effects on other stakeholders of a firm that enter as social costs. Banks and trade creditors will suffer direct losses on any loans to the firm. We return to this issue in section III in the context of bank capital levels. Additionally, employees may find long-term compensation contracts renegotiated in bankruptcy (Benmelech, Bergman, and Enriquez 2012) and thus suffer losses. Finally, other firms in the industry may suffer reductions in debt capacity if the bankrupt firm's assets are sold in a fire sale in a bankruptcy, thereby reducing industrywide collateral values (Shleifer and Vishny 1992).

At present, given the Chapter 11 filings we have witnessed (in retail, energy, and transportation), the bankruptcy process seems to be working smoothly. But it is worth flagging potential concerns that may lead to higher bankruptcy costs. First, as argued by Skeel (2020), the infrastructure of the bankruptcy process may be stretched in a recession where many firms file for Chapter 11. At this point, filings have proceeded at a pace that is in keeping with historical norms, as indicated by the data in table 1. But if the economic crisis persists and worsens, it is likely that we will see a wave of Chapter 11 filings. In this case, the process may lead to increased errors of the two types noted in section II.D. That is, the deadweight costs of bankruptcy may rise. Skeel (2020) offers proposals to reduce these types of costs. The Bankruptcy and COVID-19 Working Group, a large group of bankruptcy scholars, also offers suggestions to ready the infrastructure of the bankruptcy system in preparation for a large wave of bankruptcies.[13]

Second, under Chapter 11 the firm's operations are continued via debtor-in-possession (DIP) financing from a specialized lender. Although currently there is capacity among DIP lenders, a wave of bankruptcies can

13. Large Corporate Committee of Bankruptcy Scholars, Letter to Congress, May 7, 2020, https://www.dropbox.com/s/sf2daqrh8lr52we/Large%20Corporate%20Committee%20of%20Bankruptcy%20Scholars%20Letter%20to%20Congress%205.7.20.pdf?dl=0.

also overwhelm the financial infrastructure of bankruptcy.[14] In an environment of economic uncertainty and scarce DIP financing, the bankruptcy process may lead DIP financiers to require an elevated return on their capital. DIP financiers are often the senior creditor of a firm, who may act to liquidate assets to ensure repayment of their claims even if such actions destroy the value of the firm as an ongoing enterprise. Thus, scarce DIP financing could lead to an elevated cost of borrowing in bankruptcy, eroding enterprise value and leading to socially inefficient liquidations. Both of these create another deadweight cost of bankruptcy.

The preceding discussion indicates that Chapter 11 provides ex post debt contingency but incurs costs. It should be apparent that any government policy that reduces these costs and facilitates the contingency will yield benefits. Moreover, these benefits do not depend on what constitutes "too long" (unlike the case of reducing the corporate bond yields of distressed firms) since the policy reduces the social costs of bankruptcy. That is, the policy is unambiguously beneficial. Furthermore, there is an interaction between policies at work: if the government spends resources reducing the social costs of bankruptcy, it can spend fewer resources on reducing the financing costs of distressed firms.

DeMarzo, Krishnamurthy, and Rauh (2020) offer one proposal to this end. Their proposal involves subsidizing the Chapter 11 restructuring process. In particular, they propose a debtor-in-possession financing facility (DIPFF) under which the government would offer DIP financing at an interest rate equal to the Federal Reserve discount rate.[15] The macro benefits of such a proposal are twofold. First, this policy targets the lending subsidy to a firm operating without debt overhang and therefore avoids some of the erosion of value concerns raised in section II.D. Second, by subsidizing DIP financing Chapter 7 liquidation becomes less attractive relative to reorganization, and hence the government incentivizes restructuring of

14. Ganz and Smith (2020) present computations suggesting that the worry regarding scarcity of DIP financing is currently not an issue. They estimate that DIP financing needs in this recession will be around $80 billion, which lenders will be able to provide with little difficulty. Skeel (2020) argues that while this may be true for large firms, medium-sized firms may still find it difficult to obtain DIP financing. Furthermore, Eckbo, Li, and Wang (2019) document that DIP lenders charge rates well in excess of risk-adjusted returns on their DIP loans, likely due to their monopoly position with the borrower. These high interest rates will lead to scarring.

15. The rate on this loan, set at the discount rate, is subsidized in part to induce firms to restructure debts under Chapter 11 and so that the bankruptcy court recognizes that a reorganization under the DIPFF maximizes the enterprise value of the firm.

debt.[16] There are also benefits that accrue pre-bankruptcy. As Donaldson and others (2020) show, pre-bankruptcy restructurings become more likely when the bankruptcy process has lower costs. Additionally, since a DIP financing policy is debtor-friendly, it reduces the delay in Chapter 11 filings by equity holders.

Under the DeMarzo, Krishnamurthy, and Rauh (2020) proposal, firms that obtain financing from the DIP facility would be restricted from restructuring some contracts that lead to negative spillovers of bankruptcy, such as labor contracts, pension obligations, and trade credit. DIP financing is senior to all other pre-bankruptcy unsecured claims. Moreover, the loan can be structured so that it is nearly default-free. They propose that DIPFF loans be fully collateralized by the firm when the firm has sufficient unencumbered collateral. If the firm's collateral is already fully encumbered, then the facility could not lend unless the bankruptcy court allows the DIPFF loan to be a priming lien, ensuring that the DIPFF loan is senior or equal to liens already attached to the firm's collateral as necessary to ensure that the DIPFF loan is fully secured. Financing would be structured to cover only anticipated operating costs over the term. The goal of the program would be to supply ample capital for firms at a subsidized rate to survive the pause period. At the conclusion of the term, many firms would hopefully return to economic viability, repaying DIP financing and emerging from bankruptcy. Alternatively, those firms facing longer-term challenges post-crisis would continue through normal bankruptcy proceedings.[17]

II.F. Liquidity Constraints in Small Firms

We next consider the corporate financing considerations of a small owner-managed firm. The owner is essential to the operation of the firm

16. The bankruptcy process in general has two aims: first, to close businesses that are economically not viable, allowing resources to flow to more productive uses, and second, to restructure the debts of firms that are economically viable to ensure that they are financially viable. Our perspective is that in the COVID-19 recession, relative to the typical recession, the primary policy concern should be that economically viable firms will be liquidated due to financial distress. The principal beneficial role of bankruptcy is restructuring, and policies that enable debt restructuring are beneficial.

17. One potential issue with the DIPFF is that current legislation under Dodd-Frank and the CARES Act places a high bar on government lending to an insolvent firm, even if the underlying loan is nearly default-free, as under the DIPFF proposal. DeMarzo, Krishnamurthy, and Rauh (2020) describe an alternative implementation that deals with this concern and is related to the "good bank/bad bank" model for resolving financial institutions' bankruptcy. In their proposal, a firm that enters financial distress can opt in to a prescribed bankruptcy lending facility. The rules under the bankruptcy lending facility are that a distressed firm is

and is the equity owner of the firm. There is no separation between ownership and control of this firm, unlike the case of the large firm analyzed in section II.B. Thus one key difference relative to the prior model is that we assume that if the owner files for bankruptcy, there is zero residual value of the enterprise, so that the social costs of bankruptcy are high.

The owner also cannot raise outside equity, either because of adverse selection or moral hazard concerns. Thus, the second key difference relative to the prior model is that the owner has no outside cash, or alternatively, the opportunity cost of cash is ∞ rather than r.

In practice firms are distributed in a manner that mixes the considerations raised in section II.B and those we outline in this section.

We first describe the steady-state valuation of this firm. Suppose that the owner-manager of the firm has personal assets of A and runs a firm with scale K and earnings in steady state of RK. The firm has debt of D at a gross interest rate of $\gamma > r$, which is secured by the capital of K. This capital can be liquidated to give proceeds of θK in the event of firm default. The firm takes on debt of $D \leq \theta K$ and its budget constraint is

$$K = A + D.$$

Suppose the firm borrows as much as possible and runs at full scale, then

$$K = \frac{A}{1 - \theta}$$

In a steady-state where the firm is able to run at this scale forever, the (private) value of the firm to the owner-manager is

$$V_E = A\frac{R}{r(1 - \theta)},$$

where r is the gross discount rate.

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split into a subordinate and a parent. The assets of the enterprise are transferred to the subordinate. Additionally, certain contracts such as labor contracts, pension obligations, trade credit, and collateralized debt are moved to the subordinate. This latter stipulation reduces some of the negative spillovers of bankruptcy. The parent enters bankruptcy retaining all other firm liabilities, which are restructured under the Chapter 11 process to ensure firm viability. The only asset of the parent firm is the equity of the subordinate. As a result of this restructuring, the subordinate is a solvent entity and the position of the stakeholders in the parent company is unaltered. DeMarzo, Krishnamurthy, and Rauh (2020) propose that the government lend to the subordinate firm under the facility at a subsidized rate.

Consider next what happens in bankruptcy to this firm. Suppose that in this recession the firm's cash flows are uncertain and may fall below R. In particular the cash flows are R_1 with corresponding CDF $F(R_1)$. If $R_1 < \gamma D$, the firm is unable to make its debt payment of γD and will default and be liquidated under Chapter 7 (as is typically the case for small firms). Note that our assumption that the owner-manager has no outside resources here plays an important role. In the more general case where the cost of cash for the owner-manager is high (above r) but finite, the intuition that this firm will default for a wider set of outcomes still carries over.

The owner-manager's assets post-liquidation are $A' = 0$, and the bank receives the capital of the firm that is liquidated to receive θK. The firm would be better operated in the hands of the owner-manager, but since $A' = 0$, the owner manager cannot restart the firm in a manner that generates the previous value of $V_E = A\dfrac{R}{r(1-\theta)}$.

Thus, in this model, the firm cannot restart, and the deadweight social cost of bankruptcy is equal to the loss of $V_E - \theta K$. In the event that a vaccine is discovered, in order for the economy to restart and scale back to its prepandemic levels, firms such as this will need to operate again. However, if $A' = 0$, the owner-manager will not have the resources to restart the firm. While our model is stark, it illustrates the economic challenge in a restart. The aggregate pool of SME owner assets (capital) is a key factor in a restart. This is less of a concern for the large firm sector because equity capital comes from a widely diversified set of investors and not just the owner-managers of the firms.

Consider next the owner-manager's operating decisions in this recession. We show that the value of liquidity for this firm is high and the owner-manager will use any available resources to avoid liquidation. Suppose that the firm can lay off workers to reduce costs today by ϵ and hence raise R_1 by ϵ. Assume that this action reduces its post-recession revenues for one period so that R_2 falls by ϵ, but $R_t = R$ for $t > 2$. Then this action reduces the probability of bankruptcy by $f(\gamma D)\epsilon$ resulting in a gain to the owner-manager of just under $V_E f(\gamma D)\epsilon$, which is the present value of avoiding the deadweight cost of bankruptcy. The cost of this action is the lost revenue at $t = 2$ with present value of loss of $\dfrac{\epsilon}{r}(1 - F(\gamma D))$. The key point to note here is that the gain is in terms of a stock while the cost is in terms of a flow. The marginal value of liquidity for this firm is on the order of the stock valuation and is likely high, well above the interest rate r.

The operating decisions of this firm will be taken based on this high marginal value of liquidity.

We have noted that dispersion in firm risk in SMEs has risen in the COVID-19 recession. As a result it is likely that there is a substantial mass of firms facing the liquidity constraints highlighted above.

The liquidity constraint faced by this firm will lead to underinvestment, just as in the debt overhang model of the firm of section II.B. As the firm's revenues fall, the liquidity constraint tightens, and the firm will hit a point where it will be unable to service its debts and have to file for bankruptcy. Given our assumption of a high social cost of bankruptcy, this firm is also liquidated too quickly relative to the societal optimum.

A second consideration that looms large for this small firm is increased idiosyncratic risk. The owner-manager is a nondiversified equity owner of this firm. Faced with higher idiosyncratic risk, the owner-manager will take defensive actions such as conserving cash and laying off workers. Note this consideration applies even for a firm that is not facing an impending liquidity default. Thus while aggregate risk premia appear low, idiosyncratic risk looms large in this recession and can have a negative impact on the operations of small firms.

II.G. Government Policy for SMEs

The government has designed two facilities that are relevant to the model of the firm described here, the Main Street Lending Program (MSLP) and the Small Business Administration's Paycheck Protection Program.

The MSLP is designed for medium-sized firms with up to 15,000 employees or up to $5 billion in revenues, and with a maximum debt-to-EBITDA ratio of four times or six times, depending on the facility. These firms reflect a mix of the considerations of the entrepreneurial model and the large firm model. The Small Business Reorganization Act enacted by Congress in 2019 reduces the costs of small and medium-sized business filing for Chapter 11 so that many of these firms will file for Chapter 11 in the event of bankruptcy. Thus, some of the same considerations that we discuss in the context of the debt overhang model apply here. Subsidizing lending to these firms has to balance the consideration of keeping firms alive while eroding value against facilitating a restructuring under Chapter 11. One valuable design feature of the MSLP relative to the bond purchase program is that the Federal Reserve's eligibility criterion explicitly rules out the use of MSLP loans to pay dividends, which as noted earlier is a source of leakage in any corporate bond QE problem.

Skeel (2020) expresses concerns that while the Small Business Reorganization Act of 2019 enables small and medium-sized firms to file for Chapter 11, practical challenges remain. Under the law, the small business is required to propose a reorganization plan within 90 days of filing. It also has to obtain DIP financing to continue operating, while traditional DIP financiers focus on large firms, a concern that can be addressed with credit policy. Expanding the MSLP, in line with the DIPFF proposal, to provide DIP loans will help the Chapter 11 process for SMEs and mitigate scarring.

The MSLP is structured in a manner to minimize credit risk to the government. If the economy primarily faced capital market liquidity problems, as in 2008, such a design may be warranted. Indeed, many of the government's lending facilities in 2008 made money. However, the financing problems of 2020 involve significant solvency issues, so that some losses should be expected on government lending. The eligibility restrictions under MSLP thus work against the effectiveness of the program. We have noted that the MSLP imposes a restriction on leverage. The MSLP also requires that a bank coinvest with the Federal Reserve at a loan rate equal to the London Inter-Bank Offered Rate (LIBOR) plus 3 percent. This skin-in-the-game constraint helps to ensure that banks screen borrowers in a manner that will ensure they be repaid. However, this same consideration implies that the eligible borrowers are likely financially healthy and unlikely to be the ones facing the greatest debt distortion.

Liquidity constraints, as in the model in section II.F, among some of these firms add a further consideration. Reducing payments today has high benefits when there are liquidity constraints. Thus, if the bank's existing loan can be refinanced into a rate lower than γ, the liquidity need of $R_1 - \gamma D$ is reduced. In Brunnermeier and Krishnamurthy (2020) we argue that for firms with liquidity constraints the Federal Reserve should expect to lose money on its lending program. We propose that bank loans to liquidity-constrained firms under the MSLP be eligible collateral at the discount window at an advantaged rate of X percent below the primary credit discount window rate. By doing so, the bank's zero profit condition is shifted down, and the facility can make loans at a rate of LIBOR + 3 – X percent. Given that LIBOR is currently between 0.25 percent and 0.5 percent, setting X near 3.25 percent will ensure that the refinancing rate is near zero, thus alleviating the firm's liquidity problem.[18] Liquidity constraints also

18. An alternative proposal, similar in spirit, is for the government to provide a large fee to banks that originate MSLP loans. If the fee is structured correctly, banks can be induced to make the loan at a low rate. See English and Liang (2020) for an analysis of structuring alternatives for the MSLP program.

call for longer repayment schedules. The MSLP currently requires a repayment of one-third of principal in each of year two through four. Even if the pandemic is past by year one, any restart of a liquidity-constrained firm will track growth in its own earnings relative to debt repayment. The relatively short repayment schedule of the MSLP will lead to a slower restart.

The PPP, run by the Small Business Administration, is designed explicitly as a subsidy program with incentives to retain workers and with eligibility criteria that rule out using funds for dividends. The PPP-eligible firms also most closely match the model in section II.F. Although there have been implementation challenges in the PPP rollout, the subsidy aspect aligns well with our analysis. The Federal Reserve currently allows PPP loans to be pledged as collateral under its Paycheck Program Liquidity Facility (PPPLF) at a rate of 0.35 percent, which is 10 basis points above the primary credit discount window rate. An additional subsidy to this program can be introduced by the Federal Reserve were it to reduce the PPPLF rate below the primary credit rate.

III. Conclusion

So far, 2020 is not 2008. The policy lessons of 2008 carry over imperfectly to 2020. In 2008, liquidity and capital problems in banks and asset markets were front and center. The Federal Reserve's facilities provided liquidity and risk-bearing capacity to banks and markets, in line with Bagehot's principles, and stemmed the crisis. In 2020, solvency and liquidity problems in the firm sector are front and center. Our paper analyzes how credit programs should be designed in light of the corporate financing frictions faced by the firm sector. For a liquidity-constrained firm, such as a small firm, the priority should be to provide subsidized credit to ensure the firm remains a viable enterprise once the pandemic is past. Large firms for whom solvency is an issue require a more nuanced approach. Saving every firm is not the right strategy. Optimal policy needs to weigh the benefits of subsidizing the continuation of distressed firms against the benefits of resolving these firms in a Chapter 11 bankruptcy. For a long-duration downturn, which is the current projection of the Federal Reserve, inducing resolution among some firms is optimal. Reducing the costs of a bankruptcy, on the other hand, is unambiguously beneficial.

While 2020 is not 2008, economic conditions could yet deteriorate and trigger a financial crisis like the one in 2008. If there is a second wave, or a slower than expected recovery of economic activity from the current wave, then defaults and delinquencies will begin to occur both in the

household and corporate sector. The losses on loans to these sectors will reduce capital levels in the financial sector. For sufficiently large losses, the economic crisis may become a financial crisis. There is no need to wait for that crisis to happen to act. We should think about the lessons learned from 2008 and implement policies now that benefit from the 2008 experience. The Federal Reserve should consider preemptive actions such as barring capital distributions by banks and triggering the countercyclical capital buffer to encourage equity issuance, while equity markets remain buoyant, to shore up bank capital levels.

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