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THE RESILIENCE OF THE U.S. CORPORATE BOND MARKET DURING FINANCIAL CRISES

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The Resilience of the U.S. Corporate Bond Market During Financial Crises
Bo Becker and Efraim Benmelech
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ABSTRACT

Corporate bond markets proved remarkably resilient against a sharp contraction caused by the 2020 Covid-19 pandemic. We document three important findings: (1) bond issuance increased immediately when the contraction hit, whereas, in contrast, syndicated loan issuance was low; (2) Federal Reserve interventions increased bond issuance, while loan issuance also increased, but to a lesser degree; and (3) bond issuance was concentrated in the investment-grade segment for large and profitable issuers. We compare these results to previous crises and recessions and document similar patterns. We conclude that the U.S. bond market is an important and resilient source of funding for corporations.

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While the common wisdom in finance and macroeconomics is that credit markets are highly procyclical, it is unclear how strongly procyclicality is driven by the demand for credit or its supply.[1] Moreover, less is known about the composition of credit and the differential behavior of different segments of credit markets over the business cycle. Are bank loan originations more cyclical than corporate bond issuance? If so, why? Is this cyclicality driven by market segmentation in which some borrowers cannot access certain parts of credit markets during financial crises and economic downturns? That is, do banks curtail credit during difficult times whereas flows into bonds are less cyclical? Last, are some policy interventions more effective in stabilizing and stimulating parts of the corporate credit market but not others? With a few exceptions—notably, Becker and Ivashina (2014)—the literature focuses on segments of the U.S. credit market, not on joint behavior. Yet the different components of credit markets are interconnected and work in tandem. To understand the cyclical behavior of credit to corporations and to obtain a panoramic view of credit markets, bonds and loans should be studied jointly.

We provide an empirical overview of the functioning of U.S. long-term corporate credit markets during several financial crises, including the Global Financial Crisis (GFC) of 2008–2009 and the crisis triggered in 2020 by the Covid-19 pandemic. The Covid-19 crisis provides an interesting setting for studying corporate credit markets during a financial crisis. In a traditional financial crisis and recession, the decline in credit may stem from shocks to both demand and supply. Obviously, Covid-19 affected both the demand and the supply of credit. Yet empirically, bond issuance increased significantly whereas loan origination did not. This suggests that the two markets play different roles in meeting corporate demand for financing in a crisis.

The U.S. corporate bond market proved remarkably resilient when the coronavirus pandemic first shook financial markets. Bond issuance increased substantially in the last week of March 2020 and peaked in the first week of April 2020: 64 bonds totaling $73 billion were issued. Bond issuance in April remained substantially above the average for 2009–2019. Issuance increased again in May, reaching the highest level—in numbers issued—in early May before declining and returning to normal levels by late May. By the end of June 2020, the cumulative number of bond issues was 630, compared to an

[1] See Becker and Ivashina (2014), Benmelech and Bergman (2017), Bernanke and Gertler (1989), and Holmström and Tirole (1997).

average of 422 during 2009–2019. In terms of aggregate issuance, between March and June 2020, $502 billion of corporate bonds were issued, compared to $151 billion in 2019, $204 billion in 2018, and $157 billion per year on average in 2009–2019. In contrast, during the same period, the origination of syndicated loans remained below the 2010–2019 average in both loan numbers and total loan amounts originated. We observe similar patterns during the Global Financial Crisis. By January 2009, the number of bonds issued reverted to the precrisis average, while the loan amounts issued increased significantly and remained high for the reminder of the crisis. In contrast, syndicated loan origination remained below average during the same period.

Why is the U.S. bond market more resilient than the syndicated loan market? We provide three congruent explanations. First, bond issuers are of higher credit quality than firms that tend to rely on bank funding. For example, 87% of bond issuers between 2009 and 2019 were rated as investment grade, whereas only 19% of syndicated loans were rated as investment grade. If noninvestment-grade firms become even riskier during financial crises while investment-grade firms are less affected, then it is not surprising that bond issuance is less countercyclical than loan origination. In fact, credit market segmentation may become more pronounced during a crisis. Indeed, in 2020 the share of investment-grade issuers in the bond market was 94%—an increase of 7 percentage points over 2009–2019. Similarly, the share of loans originated to investment-grade firms increased in 2020 to 24%, up 5 percentage points from 2009–2019.

A second explanation concerns the fundamental difference between commercial banks and bond investors such as insurance companies, mutual funds, and pension funds. During a crisis a balance-sheet shock stemming from nonperforming loans or other losses may create a debt overhang problem that prevents banks from originating new loans. In contrast, the bond market does not suffer from such a problem since institutional bond investors such as pension funds and insurance companies are long-term investors that are less sensitive to balance-sheet shocks. It is argued that banks can potentially alleviate the balance-sheet-induced debt overhang problem by syndicating loans or selling then to securitization conduits. However, during crises the structured finance market tends to freeze and collapse. Benmelech and Bergman (2017) provide evidence on the collapse of structured finance markets during the GFC. More recently, issuance of collateralized loan obligations (CLO)—the main financial structure used to package and securitize corporate

loans—declined significantly between February and May 2020 compared to their levels in 2019.[2]

A third explanation may be that credit and monetary interventions are more effective for bond markets than they are for loans originated by banks. In an ultra-low interest rate environment, the central bank may have difficulty in stimulating bank lending through traditional balance-sheet channels. Similarly, financially stressed banks may not respond to monetary policy (e.g., Stein (2012) and Jiménez et al. (2014)). In contrast, nonconventional polices—in particular, the Secondary Market Corporate Credit Facility (SMCCF) and the Primary Market Corporate Credit Facility (PMCCF), announced on March 23, 2020, and extended in size and scope on April 9, 2020—targeted bond markets directly, without going through financial intermediaries, and appear to have stimulated bond issuance significantly.[3]

Our regression results suggest that there is merit in all three explanations for the resilience of the bond market. In time-series regressions we find that the 10-year Treasury yield is negatively correlated with loan origination but is uncorrelated with bond issuance. Moreover, we find that the Aaa–Baa spread—a measure of credit risk price—affects loan origination much more than bond issuance. Together, these results suggest that that loans are more sensitive to the cost of debt—both the risk-free rate and the credit risk spread—than bonds are and that this differential effect is likely driven by the risk profile of firms that are bank dependent compared to firms that rely on bond financing.

Next, and consistent with the hypothesis that the fundamental difference between commercial banks and bond investors affects their behavior during crises, we find that flows into bond mutual funds are positively correlated with bond issuance but not with loan origination. Our measure of bond mutual fund flows likely captures "flight to safety"—the tendency of investors to sell assets perceived as risky and to purchase safe assets such as bonds—and may partly explain the resilience of bond markets during financial crises. We also find that the elasticity of loan origination to an aggregate measure of nonperforming loans is almost twice that of bonds issuance—suggesting that banks are

[2] See Kothari et al. (2020).
[3] The SMCCF was allowed to invest in exchange-traded funds, which in turn invested in corporate bonds. This is discussed in more detail below (see Table III).

more likely to suffer from contaminated balance sheets that diminish their ability to originate loans during financial crises and economic downturns.

Last, we find that unconventional monetary policy in the form of credit market interventions affect bond issuance to a greater degree than loan origination—a phenomenon that holds separately in both the GFC and the Covid-19 crisis.

Our paper is related to the literature on corporate finance in the Covid-19 period. Bond issuance during this period is studied by Halling, Yu, and Zechner (2020) and Darmouni and Siani (2021). Equity issuance contributed to funding corporations, according to Hotchkiss, Nini, and Smith (2020), as did reduced payout (Pettenuzzo, Sabbatucci, and Timmermann (2021)).[4] Several papers document that firms drew down revolving credit lines in the spring of 2020.[5] This finding appears to diminish our main finding that credit provision in the form of syndicated loans was low in the spring of 2020. However, credit lines are generally not used for long-term funding, and indeed both Acharya and Steffen (2020) and Hotchkiss, Nini, and Smith (2020) provide evidence that bond issuance replaced a large part of credit line drawdowns. In other words, the corporate funding provided by credit lines is different in nature from the long-term financing we focus on. Darmouni and Siani (2021) document that many credit lines remained untouched, presumably because the short-term funding they provide is of limited use. Our results on the role of different types of corporate credit therefore broadly agree with patterns on bond issuance documented elsewhere.

The resilience of corporate bond markets in the Covid-19 period is also consistent with earlier findings comparing loans and bonds (Kashyap, Stein and Wilcox (1993), Becker and Ivashina (2014)), and the results on the greater resilience of investment-grade issuance are consistent with the finding of Greenwood and Hanson (2013) on the cyclicality of the high yield share of bond issuance. Our results are also related to an

[4] A related possibility is that bond issuance was used to replace bonds that were maturing or redeemed. This probably took place, but not in levels exceeding earlier years. According to Mergent FISD data, there were 411 call of bonds all of 2020, representing $244 billion of par value, which is a little below prior years (e.g. 2019 had 433 bonds, $248 billion).

[5] See Acharya and Steffen (2020), Greenwald, Krainer, and Paul (2020), Hotchkiss, Nini, and Smith (2020), Darmouni and Siani (2021), and Li, Strahan, and Zhang (2020). Acharya and Steffen (2020) find that the overhang from credit lines depressed the share price of some banks.

emerging literature on the increasing importance of the U.S. bond market for nonfinancial firms (Benmelech, Kumar, and Rajan (2021), Crouzet (2020)).

The rest of this paper is organized as follows. Section I lists the different data sets used in the paper and describes variables construction. Section II presents an analysis of bond issuance and loan origination during the Covid-19 crisis. Section III analyzes the behavior of credit markets during the Great Financial Crisis. Section IV analyzes the determinants of bond issuance and loan origination. Section V concludes.

I. Data and Empirical Strategy

A. Dependent Variables

We use information from SDC and DealScan to construct the bond issuance and loan origination series which we use as our main dependent variables.

A.1. SDC Bond Data

We use data from SDC and Mergent on bonds issued between January 2002 and June 2020. We collect characteristics of bond issues such as issue date, maturity date, coupon yield and type (floating or fixed), principal amount, instrument credit rating from Moody's and S&P, and whether the issuer is publicly listed. We drop withdrawn issues, convertibles, non-U.S. issues, and bonds issued by the federal government, government agencies, and local governments. We also drop bonds issued by financial and utility firms. Financial firms are defined as issuers belonging to industries with SIC codes between 6000 and 6999, as well as any issuer where the SDC industry code contains the word "bank," "credit," "securities," or "finance." We drop duplicates (observations with the same SDC deal number). We classify bonds as investment grade (IG) if their S&P credit rating is BBB– (Moody's credit rating of Baa3) or higher and high yield (HY) if their S&P credit rating is BB+ (Moody's credit rating of Ba1) or lower. When we have a split rating—that is, when S&P and Moody's assign different ratings to a bond—we use the lower rating. The remaining bond data set contains 17,379 bonds. Panel A of Table I presents summary statistics of the SDC bond data. As the table shows, 57% of the bonds are rated as investment grade, 15% are rated as high yield, and 28% are unrated. Almost half of the bonds have a call feature, and 57% are issued by publicly listed firms. The median bond has a principal amount of $283 million and a maturity of 10 years at the time of issuance.

Several of our empirical tests focus on bond issuance patterns over time. We produce monthly time series of aggregate bond issuance volume (either number of bonds or total dollar value) for 2002–2020. We use these monthly data in our regression specifications. We also produce *weekly* bond issuance series, used in many of the figures in this paper. We use two separate subsamples of the weekly data, for (1) the GFC and (2) the Covid-19 crisis. For the GFC sample, we use weekly bonds issuance during 2002–2009. For the Covid-19 sample, we use weekly issuance for the first six months of every year, 2009–2020. We add up issuance volumes by week—sometimes after imposing filters based on credit ratings, bond time to maturity, or issuer industry. Summary statistics for the weekly time series bond issuance data are reported in Panel A (Covid-19) and Panel C (GFC) of Table II.

A.2. DealScan Loan Data

We collect data on syndicated loan origination from DealScan—the primary source for syndicated loans. We focus on term loans and drop credit lines, since these do not typically provide credit at issue.[6] We also exclude term loans made for acquisition or buyout purposes, since these do not provide corporations with funds.[7] We exclude non-U.S. borrowers. We do not count amendments as new loans, but we do include additional amounts added in amendments and assign the amounts to the amendment dates. The loan data contain 17,940 new term loans issued between January 2002 and June 2020. For reference, 27,415 new credit lines were issued in the same period. Also, 9,034 amendments with additional credit are included in the time series data. As with bonds, we classify loan issues as investment grade if rated Baa3/BBB– or better. High-yield loans are those with a lower credit rating. Panel B of Table I presents summary statistics on loan characteristics.

[6] Our results for the number of loans and bonds are qualitatively very similar if we include the granting of new credit lines as loans (including in amounts is less reasonable until they are drawn). Drawdowns of credit lines in the Covid-19 period are documented by Greenwald, Krainer, and Paul (2020). Li, Strahan, and Zhang (2020) show that large banks provided most drawdown credit. Acharya, Engle, and Steffen (2021) argue that drawdowns caused bank stock prices to fall, and Greenwald, Krainer, and Paul (2020) posit that drawdowns negatively affected term lending. Hotchkiss, Nini, and Smith (2020) show that many drawdowns were later replaced by capital raising, including from the bond market.

[7] We implement this by requiring the variable Primary Purpose to be one of "General Purpose," "General Purpose/Refinance," "Working Capital," "Capital Expenditure," and "Equipment Upgrade/Construction."

Unlike the bond market—in which the majority of the bonds are rated (Table I, Panel B)—only 25% of the loans are rated (Table I, Panel B). Also, whereas 79% of the rated bonds are investment grade, only 29% of the rated loans are classified as IG. About half of the loans are secured, and 20% have a sponsor (i.e., are used for a buyout). Syndicated loans are considerably smaller than bonds, with a principal amount of $95 million, and shorter in maturity, with a median of five years.

We also produce monthly time series of aggregate loan origination volume for 2002–2020, as well as *weekly* loan origination series. As with the SDC data, we use two separate subsamples of the weekly data, for (1) the GFC and (2) the Covid-19 crisis. For the GFC sample, we use weekly loan origination during 2002–2009. For the Covid-19 sample, we use weekly origination for the first six months in every year from 2010 to 2020. Summary statistics for the weekly time loan origination data are reported in Panel B (Covid-19) and Panel D (GFC) of Table II.

B. Explanatory Variables

We use several explanatory variables in our time series regressions. We obtain the yield on one- and 10-year Treasury bonds from the St. Louis Federal Reserve's data service, FRED. We also use the "ICE BofA BBB US Corporate Index Option-Adjusted Spread, Percent, Weekly, Not Seasonally Adjusted," here termed "Credit Spread," from FRED. These data series are monthly, and the units are percentage points.

We use net inflows into bond mutual funds, as a share of assets, from the Investment Company Institute (ICI).[8] The units are percentage points (i.e., if net inflows in a month are 1% of assets, the variable takes the value of 1). We exclude funds focused on government and municipal bonds. We collect quarterly data on "Nonperforming Commercial Loans (past due 90+ days plus nonaccrual) to Commercial Loans, Percent, Quarterly, Not Seasonally Adjusted" from FRED (here "Nonperforming Loans"). The units are percentage points (i.e., if 1% of loans are reported as past due, the variable takes the value of 1). The variable is calculated as total nonperforming loans divided by total

[8] For the flows into bond mutual funds, we add the fund categories "Investment-Grade Bond," "High-Yield Bond," and "Multi-Sector Bond" to capture flows into funds that invest in corporate bonds. All categories focusing on municipal bonds and Treasuries are excluded.

loans. Nonperforming loans are those loans that bank managers classify as 90 days or more past due or nonaccrual in the call report.

We look at aggregate bond market data from the U.S. Flow of Funds Table F.213, Corporate and Foreign Bonds, downloaded from FRED. Quarterly data are seasonally adjusted (nonadjusted data are not available; given low seasonality, this is likely not quantitatively important).

We also examine the impact of Federal Reserve asset purchase programs. Table III provides descriptive information for some of the key programs and their announcement dates.

Last, we match Mergent bond issuance data to Compustat data using CUSIP numbers to obtain firm-level data, such as sales, assets, employees, EBITDA to sales, and book leverage (defined as debt over book assets).

II. Credit Markets During Covid-19

We begin our analysis by zooming into weekly data on bond issuance and loan origination before and during the Covid-19 pandemic.

A. Bond Issuance During the Covid-19 Months

Figure 1 displays weekly bond issuance between 2009 and 2020. To compare bond issuance during the Covid-19 pandemic to previous years we highlight bond issuance in 2020 (in red) relative to weekly bond issuance in previous years (in gray) and relative to the average weekly issuance during 2009–2019 (in black). Panel A of the figure displays issuance patterns based on the number of bond issues, while Panel B presents results based on the amount issued. The Covid-19 virus was first discussed in international news media in late 2019. The U.S. stock market did not react until mid-February 2020. The S&P 500 index reached an all-time high on February 6, 2020, before dropping in the following weeks. The index reached its lowest value for 2020 on March 23, a decline of more than 30% relative to the February peak. This day also saw the highest value for credit spreads (the BBB High Yield Index spread was 10.87%, the highest since 2009).

As Figure 1 illustrates, bond issuance declined slightly in February 2020 relative to the 2009–2019 average in both number (Panel A) and amount (Panel B). This decline

is likely driven by the uncertainty that resulted from the initial spread of Covid-19 in Asia. Bond issuance increased substantially in the last week of March and reached a peak in the first week of April 2020, with 64 bonds, amounting to $73 billion, issued.[9] Bond issuance declined relative to the peak for the following three weeks of April but remained above the weekly average of the years 2009–2019. Issuance increased again in May, reaching the highest level—in terms of the number issued—in early May before declining and returning to normal levels by late May. The pattern of very high issuance of new bonds agrees with data on firm balance sheets reported by Hotchkiss, Nini, and Smith (2020), on revolving lines of credit reported by Acharya and Steffen (2020) and by Greenwald, Krainer, and Paul (2020), and for bond issues in the beginning of 2020 reported by Halling, Yu, and Zechner (2020).

Having documented the increase in the weekly issuance of bonds, we next illustrate the increase in cumulative bond issuance during the Covid-19 crisis. Figure 2 plots the cumulative number of issues (Panel A) and the cumulative amount issued (Panel B). In each panel we plot the cumulative figures for 2020 (in red) along with each year, 2009–2019 (in gray), and the 2009–2019 average (in black). The cumulative issuance of bonds was comparable to earlier years before the events of March 2020—slightly high in January and then slightly low in February—and then accelerated rapidly to exceed any previous year by a wide margin by late spring. For example, as Panel A shows, the cumulative number of bonds issued by mid-March in 2020, 154, is comparable to the average cumulative number of bonds issued, 176.2, at the same time in the years 2009–2019. However, by the end of June 2020 the cumulative number of bond issues was 630, compared to an average of 422 during the 2009–2019 period. Panel B, which plots the cumulative principal amount of bonds issued, displays an even more striking pattern. The cumulative amount of bonds issued by mid-March 2020 was in line with the cumulative amounts issued by that calendar time in the previous 10 years. By the end of June 2020, however, the cumulative amount of bonds issued was $580 billion, more than double the average of $240 billion in 2009–2019. For the period between March and June 2020 (weeks 10 through 25), corporate bonds totaling $502 billion were issued. This can be compared to $151 billion in 2019, $204 billion in 2018, and $157 billion on average for 2009–2019.

[9] Monday, March 30–Friday, April 3, week 13 of 2020.

The plots in Figure 2, Panels A and B, suggest not only that the number of bonds issued increased substantially during the Covid-19 months but also that the average principal amount of these bonds was significantly larger than in previous years. Panel A of Table II, which presents summary statistics on weekly bond issuance, confirms this observation. The median principal amount of bonds issued in 2009–2019 was $400 million, compared to $750 million in 2020. Some of the bonds issued during the Covid-19 months were very large. For example, the 90th percentile bond principal amount was $1.75 billion, compared to a 90th percentile of $1.25 billion in 2009–2019. Figure 3 illustrates this point: the distribution of principal values during the Covid-19 months is clearly shifted to the right compared to earlier periods.

The boom in issuance during the Covid-19 months was not uniform across issuers of different credit quality. Bond issuance was concentrated in investment-grade bonds.[10] Investment-grade bond issuance was high because of both the number of bonds issued and their size. Median issues of investment-grade bonds increased by 40% (from 17 per week for the same period in prior years to 24 per week in 2020), and median size increased by 88% (from $400 million to $750 million). This implies that the aggregate mix coming to market shifted considerably: the median share of weekly issuance that was investment grade (by principal amount) was 97% in 2020, compared to 82% in 2009–2019. High-yield issuance in 2020 was very similar to prior years: a median of half a bond per week (see Table II, Panel A), with a median size of $500 million versus $410 million.

Figure 4 plots the cumulative number of investment-grade bonds (Panel A) and high-yield bonds (Panel B) issued in 2020 compared to 2009–2019. As the two panels illustrate, the growth in the number of bonds issued in 2020, documented in Figure 2, is driven by the issuance of highly rated investment-grade bonds. In fact, as Panel B illustrates, the issuance of high-yield bonds halted in March 2020 and began increasing only in mid-April—with the cumulative number of high-yield bonds staying below the 2009–2020 cumulative number through the end of June 2020.

B. Syndicated Loan Origination During the Covid-19 Months

[10] Investment grade is defined as a S&P credit rating of BBB− (Moody's credit rating of Baa3) or higher.

In the previous section we show that bond issuance increased significantly between mid-March and June 2020. We now analyze the origination of syndicated loans during the same period compared to the typical origination of such loans between 2009 and 2019.

Figure 5 displays weekly term loan origination between 2009 and 2020. To compare loan origination during the Covid-19 pandemic to previous years we highlight loan origination in 2020 (in blue) relative to both weekly loan origination in previous years (in gray) and average weekly origination in 2009–2019 (in black). Panel A shows issuance patterns based on the number of new term loan originations, and Panel B presents results based on the loan amounts. Unlike the patterns we document for bond issuance, there is no significant increase in the number of syndicated loan originations during the Covid-19 pandemic.

As Panel A of Figure 5 illustrates, except for the first week of April 2020, the number of syndicated loans was below the 2009–2019 average. Panel B shows that despite the lower number of loans originated in February 2020, the amount originated was larger than the 2009–2019 average and amounted to $60 billion in early February 2020, compared to an average of $20 billion in that month between 2009 and 2019. From the end of February and through August 2020, the origination of syndicated loans remained below the 2010–2019 average in terms of both the number of loans and the total amount originated. New revolving credit facilities issued were also either similar or slightly lower in 2020 to earlier years. This is illustrated in Panel C (number of lines of credit granted) and Panel D (amounts, i.e., total credit limit on newly granted lines of credit).

Panel B of Table II reports summary statistics on loan origination and confirms the patterns displayed in Figure 5. The median weekly number of term loan originations was 9 in 2020, less than the median (17) during 2010–2019. Total amounts were around half of the prior period median ($3.5 billion in 2020 versus $7.5 billion in 2009–2019). New credit lines were also below historical averages (15 versus 17 per week). Existing lines of credit provided at least temporary liquidity during the spring of 2020. However, as Acharya and Steffen (2020) point out, many companies subsequently replaced drawdowns with bond issues.

C. The Role of Federal Reserve Interventions During the Covid-19 Crisis

The Federal Reserve responded to disruptions in the credit market by announcing several programs of unconventional monetary policy. For corporate debt, the two most important were the Secondary Market Corporate Credit Facility (SMCCF) and the Primary Market Corporate Credit Facility (PMCCF), announced on March 23, 2020, and extended in size and scope on April 9, 2020. These programs for buying corporate bonds (and exchange traded funds that invest in corporate bonds), to be implemented in June 2020, had an immediate effect on the bond market (cf. O'Hara and Zhou (2020) and Gilchrist et al. (2020)). The programs are described in Table III.

A key question concerns the role that Federal Reserve interventions played for bond and loan issuance in the spring of 2020. We use a linear regression of weekly issuance for the whole 2009–2020 sample, with an indicator for the three weeks following the Fed announcements (weeks 12, 13, and 14 of 2020) and report the results in Table IV. The identifying assumption is that abnormal issuance volumes in this period reflect Fed policy. Panel A reports tests for bond issuance for the number of bonds (columns (1)–(2)) and the amount issued (columns (3)–(4)). Column (1) includes no controls. The coefficient on the Fed indicator is 1.19, meaning that weekly issuance was 229% higher than expected in this period. To address possible seasonality, we include fixed effects for each week (1, 2, 3, etc.), and to address long-term trends, we include year fixed effects. We also allow for first-order autocorrelation. Results for this specification are in column (2). The point estimate, taken at face value, implies that 100 bonds were issued that would not have been issued absent the Federal Reserve interventions.[11] Columns (3) and (4) show similarly large results for the log of total value of issuance per week. The value of bond issuance was elevated by 442%, as shown in column (4). This point estimate implies that aggregate issuance exceeded expected values by about $93 billion in these three weeks (in line with Figure 2). Panel B reports term loan issuance for the same period. The coefficient on the Fed indicator is significantly different from zero when fixed effects are included and autocorrelation is allowed (for loan issuance, unlike bonds, autocorrelation is very high). Magnitudes are about half as large as for bonds, indicating an increase of 50% by number and 150% by value. The results in Table IV

[11] Calculation using three weeks, "normal" issuance of 17 per week from Table 1, and 202% increase ($2.02 = e^{1.106} - 1$).

suggest that Fed announcements were very important for corporate bond issuance and positive but less so for syndicated loan issuance.

One reason bond and loan markets diverge in the Covid-19 crisis period is that the bond market is dominated by investment-grade issuers while the loan market is more focused on high-yield and unrated issuers. Figure 6 shows the distribution of credit ratings for 2009–2019 as well as for 2020. The ratings distributions for the two markets show a modest overlap. This dichotomy is true both before and during the crisis. The pattern suggests one possible reason for the strength of the corporate bond market: it serves a segment of corporate entities that are less affected by a crisis (Berg, Saunders, and Steffen (2020), Greenwood and Hanson (2013)).[12]

III. Credit Markets During the Global Financial Crisis

Next, we analyze bond issuance and loan origination during the Global Financial Crisis.

A. Bond Issuance During the Global Financial Crisis

Figure 7 displays weekly bond issuance between October 2002 and 2009. To compare bond issuance during the Global Financial Crisis to previous years we highlight bond issuance in the GFC (in red) relative to weekly bond issuance in previous years (in gray) and relative to the average weekly issuance during 2002–2008.[13] Panel A displays issuance patterns based on the number of bond issues, and Panel B presents results that are based on the amount issued. As Figure 7 illustrates, the issuance of bonds declined significantly between October 2008 and January 2009 relative to the 2002–2008 average in terms of both the number of bonds (Panel A) and the amount issued (Panel B).[14] By January 2009 the number of bonds issued reverted to its precrisis average, whereas the amount issued increased significantly and remained high for the reminder of the crisis period. For example, the median weekly number of bond issuance declined from 18 in the precrisis period to 14 in September 2008–October 2009 (Table II, Panel C). However, the

[12] Figure 6 excludes unrated loans and bonds. There are more unrated loans than bonds. See below (Figure 14) for more details on this.

[13] Lehman Brothers' bankruptcy filing on September 15, 2008, marks the beginning of the GFC.

[14] Capital markets largely froze around the Lehman bankruptcy (e.g., Benmelech and Bergman (2017), Krishnamurthy (2010), and He and Xiong (2012)). Bank lending fell rapidly in the United States and abroad (Ivashina and Scharfstein (2010), De Haas and Van Horen (2012)).

median principal of bonds issued between September 2008 and October 2009 was $395 million, compared to a median of $162 million in the precrisis period. The cumulative effects of bond issuance are depicted in Figure 8, which plots the cumulative number of issues (Panel A) and the cumulative amount issued (Panel B). In each panel we plot the cumulative figures for October 2008–September 2009 (in red) along with the each of the years from 2002 to 2008 (in gray) and the 2002–September 2008 average (in black). As Panels A and B demonstrate, the cumulative number of bonds issued was below the cumulative number of issues in the precrisis period—mostly due to the freezing of the bond market in the last three months of 2008. As Panel B shows, the cumulative amount of bonds issued increased dramatically starting in February 2009 and remained above its precrisis average through September 2009. By the end of September 2009, cumulative issuance amounted to $400 billion, compared to an average of $267 billion in 2002–2008. The plot in Panel B of Figure 8, as well as Figure 9—which compares the size of corporate bond issues during the GFC to the years before the crisis—suggests that, similar to the Covid-19 months, the average principal amount issued during the GFC was significantly larger compared to the precrisis period.

Similar to the Covid-19 crisis, bond issuance during the GFC was concentrated in investment-grade bonds. Figure 10 plots the cumulative number of investment-grade bonds (Panel A) and high-yield bonds (Panel B) issued in September 2008–August 2009 compared to September 2002–August 2008. Investment-grade bond issuance increased in January 2009 and returned to its precrisis average by April 2009. In contrast, issuance of high-yield bonds came to a halt in September 2008 and remained depressed until May 2009. Issuance began increasing only in the second half of 2009, but the cumulative number of high-yield bonds remained below the 2002–2008 cumulative number through October 2008.

B. Syndicated Loan Origination During the Global Financial Crisis

As in our analysis of credit markets during the Covid-19 crisis, we now analyze the origination of syndicated loans before and during the GFC. Figure 11 displays weekly term loan origination between 2002 and 2009. To compare loan origination during the GFC to the precrisis years, we highlight loan origination in the GFC (in blue) relative to both weekly loan origination in previous years (in gray) and to the average weekly origination in 2002–2008. Panel A displays issuance patterns based on the number of new term loan

originations, and Panel B presents results based on the loan amount. Unlike the patterns we document for bond issuance and similar to what we find for issuance during the Covid-19 crisis, there is no significant increase in syndicated loan origination during the GFC. In fact, loan origination in terms of both the number and the amount of loans were below their precrisis levels throughout most of 2009.

As Panel A of Figure 11 illustrates, from September 2008 to September 2009 syndicated loan origination remained below their 2002–2008 average, and regular end-of-quarter spikes were absent or diminished during the crisis year. Panel B shows that the amount of new loans spiked in the last week of December 2008 due to a single large loan to General Motors (part of the federal rescue for that company) but then remained below the average levels for most of 2009. These patterns of low issuance agree with what Ivashina and Scharfstein (2010) document for the crisis period. Figure 11 refers to term loans—the volume of new credit facilities granted was also low in this period (not reported).

Panel D of Table II reports summary statistics on loan origination and confirms the patterns displayed in Figure 11. The median weekly number of term loan originations was 10 during the GFC, less than the median (21) in 2002–2008. New credit lines were also below historical medians (11 versus 42 per week). Moreover, the median principal value of loans originated during the GFC was $1.2 billion, compared to $3.3 billion in 2002–2008.

C. The Role of Federal Reserve Interventions During the GFC

The Federal Reserve responded to the Covid-19 pandemic with several credit programs. The programs were based on the quantitative easing (QE) programs implemented after the Global Financial Crisis, with the difference that they included new asset classes, including corporate bonds. Of course, the QE interventions in 2009–2014 were also intended to affect the corporate bond market, but indirectly.[15] Unlike the 2020

[15] Analysis of the asset market impact of asset purchase programs is provided by Krishnamurthy and Vissing-Jørgensen (2012) for the QE programs following the Global Financial Crisis and by Gilchrist et al. (2020) and O'Hara and Zhou (2020) for the Covid-period programs.

experience, the announcement of QE policies at the end of November 2008 was not associated with increased bond or loan issuance.

How did the credit quality of bond and loan issuers behave during the GFC? Figure 12 shows the distribution for the two groups of issuers both before the crisis and during the crisis. As with the Covid-19 period (Figure 6), ratings distributions are relatively stable: the crisis does not move the ratings distribution of issuers much. However, the sharp separation between investment-grade bond issuers and high-yield loan issuers that is seen both before and during the Covid-19 crisis is less clear in the GFC. Bond issuers are of much higher quality on average before and during the crisis. However, during the crisis, many loan issuers had investment-grade ratings (usually BBB–, barely investment grade). This lower segmentation suggests an explanation for the divergence of different corporate credit markets in the Covid-19 crisis: this time stronger firms largely focused on the bond market for their funding needs. It is also possible that ratings standards have evolved and that some of the 2008 BBB– firms would be high yield in 2020 (see, e.g., Alp (2013)).

IV. What Drives Aggregate Bonds Issuance and Loan Origination?

In Sections II and III we demonstrate that the bond market has shown more resiliency than the syndicated loans market during and after financial crises. During the GFC both the bond and loan markets froze during the last quarter of 2008, but issuance of bonds increased in 2009 and exceeded the average amount issued in each of the years leading to the GFC. Starting in March 2020, issuance of bonds surpassed that of previous years, and even though the number of confirmed cases of Covid-19 in the United States grew rapidly and the economy ground to a halt, the corporate bond market was booming. In contrast, the syndicated loans market did not follow the same pattern. During the GFC, the syndicated loan market froze in September 2008 and remained below its precrisis average through most of 2009. Likewise, in the Covid-19 crisis, the number of new term loan originations remained below its 2009–2019 average for most of 2020. Why is the U.S. corporate bond market more resilient to crises than the syndicated loan market? We attempt to answer this question using a multivariate analysis of the determinants of bond issuance and loan origination over time.

A. The Determinants of Aggregate Bond Issuance and Loan Origination

We use the log of total weekly issuance amount of bonds in U.S. market as our dependent variable for the bond regression. Likewise, we use the log of total weekly syndicated loan originations value as our dependent variable for the loan regression. We also calculate the share of bonds in new issues as the face value of new bonds divided by the sum of the face value of new bonds and term loan amounts. The table spans about 900 weekly observations for the years 2003–2020 (the bond sample ends in mid-2020). The mean log weekly bond amount is 8.60, with a standard deviation of 1.05. Loan weekly amounts are similar in size, with a mean log weekly loan of 8.36 and a standard deviation of 1.01 (average weekly bond issuance is $8.2 billion, and loan issuance is $6.7 billion).

As explanatory variables we use the yields on the one-year and 10-year Treasuries (in percentage points), the Moody's Aaa–Baa credit spread (in percentage points), net bond mutual fund flow, the share of nonperforming loans as well as indicator variables for the GFC, the dates of the announcements of the Federal Reserve unconventional monetary policy interventions between 2008 and 2013, the Covid-19 crisis, and the announcement dates of the Federal Reserve unconventional monetary interventions in 2020.[16] Sources and variable definitions are described in Appendix A. For each independent variable, Appendix A reports sample standard deviations.

We report regression results in Table V, for bonds (column (1)), loans (column (2)), and bond share (columns (3) and (4)). Because the issuance of bonds and especially loans is highly autocorrelated at the weekly frequency, we use a generalized least squares (GLS) specification. The specification allows first-order serial correlation of the error terms and employs the Stata command "prais."[17] We also report a regression for the bond share in aggregate issuance (i.e., bond issuance divided by the sum of bond and loan issuance).

Although we do not find a statistically significant effects of the one-year Treasury yield on either bonds or loans, the 10-year Treasury yield is negatively correlated with loan origination, though uncorrelated with bond issuance. The coefficient on the 10-year Treasury yield is −0.123 (s.e. 0.076) in the bond amount regression, compared to a statistically significant −0.198 (s.e. 0.092) in the loan origination regression. The

[16] We can also use the five-year Treasury rate, either together with or instead of the 10-year rate (the two are correlated). In general, results are similar (the five-year rate tends to have slightly better power and slightly more significant coefficient estimates than the 10-year rate).
[17] Regressions without serial correlation adjustments (i.e., OLS) give similar results but with larger t-stats.

coefficient estimate in column (2) implies that a percentage point increase in the 10-year Treasury yield is associated with an 18% decline in syndicated loan origination.[18] Next, we find that the Aaa–Baa spread affects loans more than bonds. The coefficient on credit spread is −0.042 (s.e. 0.063) in the bond amount regression, compared to a statistically significant −0.381 (s.e. 0.080) in the loan origination regression. The coefficient estimate in the loan regression (column (2)) implies that a one standard deviation increase in the Aaa–Baa spread is associated with a 32% decline in syndicated loan origination.

Taken together, the coefficients on the 10-year Treasury yield and the credit spread suggest that loan origination is more sensitive to the cost of debt—both the risk-free rate and the credit risk spread—than bonds are. The differential effect of interest rates and credit spreads on loan volumes may be driven by the fact that loans tend to be issued by risky firms, those that are either nonrated or at the lower end of the credit rating distribution (see Figures 6, 12). Since credit spreads are related to economic conditions, it is possible that weaker firms may be more affected by economic downturns, reducing their demand for financing at such times. Moreover, because the credit spread is also likely to capture overall financial risk in the economy (Gilchrist and Zakrajšek (2012)), an increase in that risk is likely to affect credit origination to riskier borrowers (Greenwood and Hanson (2013)).

Our next explanatory variable is net bond mutual flow and is designed to capture flight to safety—the tendency of investors to sell assets perceived as risky and to purchase safe assets such as bonds (Baele et al. (2019)). We conjecture that one reason for bond market resiliency during financial crises stems from such flights to safety. Table V confirms the conjecture that flows into bond investing play an important role: the coefficient on *Net Bond Mutual Fund Flow* is 0.218 (s.e. 0.063) and is significant both economically and statistically in explaining bond issuance. For example, a one standard deviation increase in *Net Bond Mutual Fund Flow* is associated with a 9% increase in bond issuance. In contrast, the effect of *Net Bond Mutual Fund Flow* on syndicated loan origination is zero (a −0.024 coefficient with a s.e. of 0.069).

As Table V demonstrates, both bond issuance and syndicated loan origination are negatively correlated with the percentage of nonperforming loans. However, the elasticity

[18] The dependent variable is in logs: the effect is $1 - e^{-0.198} = 0.18$.

of loan origination to the nonperforming loan variable is almost twice that of bonds. For example, the coefficient on *Nonperforming Loans* is −0.361 and is statistically significant at the 1% level (column (2)) compared to −0.146 (significant at the 10% level) in column (1). The bond share of new issues is increasing nonperforming loans. This pattern is consistent with the hypothesis that one source of strength for bond markets in crises is that they are less dependent on commercial bank financial health than loans.

Last, we investigate the effect of the timing of financial crises and unconventional monetary policy interventions on bond issuance and syndicated loan origination. Our regression estimates suggest that bond issuance increased during the GFC (coefficient: 0.373, s.e. 0.185), while the coefficient on loan origination is positive but statistically insignificant. Moreover, the Federal Reserve's announcements of nonconventional monetary policy programs between 2008 and 2014 (QE1, QE2, and QE3) had positive and statistically significant effects on bond issuance with a coefficient of 0.368 (s.e. 0.186), implying that bond issuance increased by 44% during these announcement periods. In contrast, we find no significant effect on syndicated loan origination. Similar to our findings in Figures 1, 2, and 4 and in Table IV, column (1) of Table V shows that bond issuance increased dramatically during the Covid-19 crisis (the coefficient on *Covid Crisis* is 0.904 (s.e. 0.291) in the bond issuance regression). In contrast, and consistent with Figure 5 and Table IV, column (2) of Table V shows a significant decline of syndicated loan origination of 69% (i.e., $1 - e^{-1.140} = 0.69$) during the Covid-19 period. Thus, although we find that the Federal Reserve's unconventional monetary policies led to increases in both bond issuance and loan origination, the effect on bonds was twice as high as it was on loans.

Column (3) of Table V reports the effect of each explanatory variable on the share of bond financing in total credit, and column (4) shows results for the effect of the crisis and intervention dummies alone (to simplify interpretation of coefficients). As column (3) demonstrates, increases in the 10-year Treasury yield, credit, and credit spreads led to an increase in the bond share. Likewise, increases in flows into bond mutual funds and in nonperforming loans led to an increase in bond share. The coefficient on the Covid-19 indicator is positive and significant in both specifications (columns (3) and (4)). The GFC indicator has a (weakly significant) negative coefficient in column (3) and a positive (and significant) coefficient in column (4). The difference is that column (3) controls for

spreads, yields, fund flows, and nonperforming loans, whereas column (4) does not. One interpretation is that the bond share was high during the Great Financial Crisis, but not unexpectedly high given the low yields, high spreads, and strong mutual fund flows. Apparently, these variables do not fully explain the strong bond issuance in the Covid-19 crisis.

B. Characteristics of Bond Issuers over Time

Table V and the associated figures clearly document that bond issuance is robust in crises and that a large share of corporate debt issuance in crises consists of bonds. Specifically, Table V shows that bond issuance is less sensitive than loan origination to credit spreads. One potential contributing factor to this strong pattern is the relative strength of typical bond issuers. Notably, bond issuers are generally investment-grade firms, whereas syndicated loan issuers tend to have lower credit ratings. To better understand the role of issuer characteristics, we next study the composition of bond (Table VI) and loan (Table VII) issuers over time. We use measures of firm size, leverage, and profitability from Compustat and report the results in Table VI. For this test, we can use the long time series available from both Compustat and Mergent. We capture three downturns and use indicators for NBER recessions to identify periods of economic and financial market strain. The results in Table VI show that bond issuers *in recessions*, compared to other periods, are large in terms of sales, assets, and employees (columns (1)–(3)). The effects are sizable: the typical issuer is about 30–50% larger in recessions. The pattern appears similar across the three sample recessions but is most pronounced in the GFC. Table VI further shows that issuers do not differ in terms of leverage between recessions and normal times (column (4)) and that profitability (EBITDA to sales) is higher in two of the three recessions (column (5)). These results confirm the strength of those firms that issue bonds in recessions: these are large, profitable firms, even beyond the pattern for bond issuers in normal times, and thus they may be one factor that makes the U.S. bond market more resilient during financial crises and economic downturns. The last two columns show that rated issuers are not more common in recessions (they always dominate) but that more bond issues were rated as investment grade in the two earlier recessions. This further supports the idea that bond issuers are healthy firms.

Table VII repeats the same set of tests for loan issuers that appear in both DealScan and Compustat. Here the general pattern is that differences across periods, in terms of

issuer size, profitability, or rating status, are small and statistically insignificant. Taken together, Tables VI and VII indicate that the relative stability of the bond market in part reflects the creditworthiness of a subset of large, stable firms that tend to favor bonds.

A related question is the ability of new issuers to enter the bond market. If the bond market caters to large, established firms, perhaps new issuers are rare, especially in bad times. We examine this by dividing bond issuers into those with and without prior bond issues. Quarterly shares are presented in Figure 13. New issuers are subdivided into investment-grade, high-yield, and unrated categories. Repeat issuers are separated by number of prior issues (since 2001), 1–5 and 6 or more. In all quarters of 2005:Q1–2020:Q2, new issuers appear in the market. The low point is 2008:Q4, when a handful of new issuers reached the market, but this is also by far the lowest issuance quarter in the 15-year period. New issuers with investment-grade ratings are common in 2020, highlighting the strength of this segment in this crisis. Overall, Figure 13 suggests that the bond market remains open for new issuers in all times, as long as they are of sufficient quality. This suggests an important caveat to the traditional understanding of the bank-borrower relationship as a mechanism for increasing access to financing for firms (Petersen and Rajan (1994), Berger and Udell (1995), Houston and James (1996)): when banks have limited ability to lend, relationships may not help those who need it the most, and arm's-length lending (where credit ratings play a role) instead becomes more important.

We provide further information on issue properties in Figure 14, which reports the quarterly share of rated issuers in our loan and bond samples, respectively. Several empirical patterns stand out. First, the rated share is always high in the bond market and low in the loan market. The bond market relies heavily on credit ratings (especially the investment-grade category, as Figure 6 demonstrates). In contrast, less than a third of loans are rated in most of the sample quarters. Second, there is a positive trend in the loan market, perhaps related to the increasing share of institutional loans, for which the market relies on credit ratings. Last, the first two quarters of 2020 saw record shares of rated assets in both markets, with as much as half of new loans and almost all bonds being rated.

C. Credit Supply—Who Buys Corporate Bonds?

Our regression results in Table V show that flows into bond mutual funds are a strong determinant of bond issuance. This result suggests that an important credit supply factor affects bond issuance during financial crises and economic downturns. The notion that the development of institutional investors can contribute the development of capital markets has been formulated by Scharfstein (2018), who develops a model that endogenizes the extent to which savings are intermediated through banks or capital markets. Scharfstein (2018) also presents suggestive evidence on the link between pension savings and bond and equity market development. Similarly, Niggemann and Rocholl (2010) show that reforms intended to increase pension fund assets lead to increases in stock and bond issuance.

We argue that the tendency of investors to sell assets perceived as risky in favor of purchasing safe assets (flight to safety) provides an effective hedge to bond issuance. The main point is that the typical investors in bonds (bond mutual funds, insurance companies, and pension funds) are crisis and recession resilient—especially when compared to commercial banks. The resiliency of those large bond investors reflects several patterns. First, important bond investors tend to pass through gains and losses to shareholders or policyholders. This avoids a dependence on equity cushions.[19] Second, these institutions invest in liquid assets and, compared to commercial banks, have balance sheets that do not become contaminated with nonperforming assets. As a result, bond investors keep the bond market open at the same time that bank lending grinds to a halt.

Figure 15 displays quarterly flows in the bond market during the Covid-19 period, with the preceding period averages as a benchmark. Panel A displays aggregate net bond issuance, while Panel B presents net bonds investment. Clearly, for the bond market to clear, aggregate net issuance should equal aggregate investment. The purpose of Figure 15 is to identify those investors that stepped in during the Covid-19 crisis and fulfilled the demand for credit. These flow of funds data include financial issuers (which we do not include in other tests), including structured assets such as mortgage-backed securities and foreign bond issuers in the U.S. market. Panel A illustrates the major role that

[19] Mutual funds, ETFs, and pension funds are accurately described as equity free. Insurance companies *do* have equity, and they can be distressed (see, e.g., Becker and Ivashina (2015) and Koijen and Yogo (2015)). However, a large part of insurance asset portfolios derives from pass-through policies, where inflows are closely connected with asset purchases.

nonfinancial corporate entities played in the 2020 bond issuance peak. Panel B shows that both households and domestic institutions such as mutual funds, pension funds, and insurance companies contributed to the issuance peak as net buyers. U.S. banks (included in "Other Domestic" together with the public sector and a few other categories) did not play an important role in purchasing bonds issued during the Covid-19 period. This small role of banks may reflect regulatory changes that discourage banks from holding bonds (Bessembinder et al. 2018) or, more generally, the slowing of intermediating activities by banks during economic downturns and financial crises. Direct bond holdings of households declined in 2020:Q3, but the net for the year approaches zero. However, large inflows from households likely account for a large share of the expansion of mutual fund and ETF bond holdings. That is, it is likely that household investment in bonds—either directly or indirectly through mutual funds and ETFs—played a key role in the Covid-19 issuance boom.

Bond purchases by foreign investors ("Rest of the World") also played a large role in funding net issuance. This may reflect the relative safety of securities available in U.S. capital markets (e.g., Caballero, Farhi, and Gourinchas (2017)) or of the currency itself (Farhi and Gabaix (2016), Corsetti and Marin (2020)).

V. Conclusions

Financial markets can contribute to the development and propagation of recessions and crises. One important channel is limited access to funding for corporations: diminished access to funding can force companies to reduce employment and investment.

Given the central role of debt markets in funding corporations, disruption in the flow of new debt is an important concern. In this paper, we examine the behavior of corporate debt in the context of the Covid-19 pandemic in 2020 and compare it to recent periods, including the Global Financial Crisis of 2008–2009. We collect comprehensive issuance data for U.S. corporations in key debt markets: corporate bonds and leveraged (syndicated) loans. Descriptive statistics on loan and bond issuance at the weekly frequency show that bond issuance was more than twice as high in the Covid-19 period as in previous years. This abnormal issuance exceeded $300 billion in the first half of 2020. In contrast, loan issuance was moderate or low.

The resilience of bond markets, especially relative to loan markets, may reflect several factors. First, bond issuers are on average much larger and of better credit quality than loan issuers. These firms may be more resilient in crises. Supporting evidence for this hypothesis includes depressed high-yield bond issuance in periods of crisis.

Second, frictions in the banking system have a greater impact on loan issuance than on bond issuance. In particular, leveraged financial institutions such as banks—subject to bank runs and debt overhang—are more important to loans than to bonds. In line with this institutional explanation, we document that inflows into bond mutual funds are associated with more bond issuance and, on the flip side, that stress in bank balance sheets predict lower loan issuance.

Last, unconventional monetary policy and credit interventions may also play a role in the relative performance of corporate debt markets. Asset purchase programs may have a more direct effect on asset markets than on corporate lending, where the impact has to transfer through financial institutions, in which the interest rate environment, debt overhang, and other circumstances may reduce pass-through.

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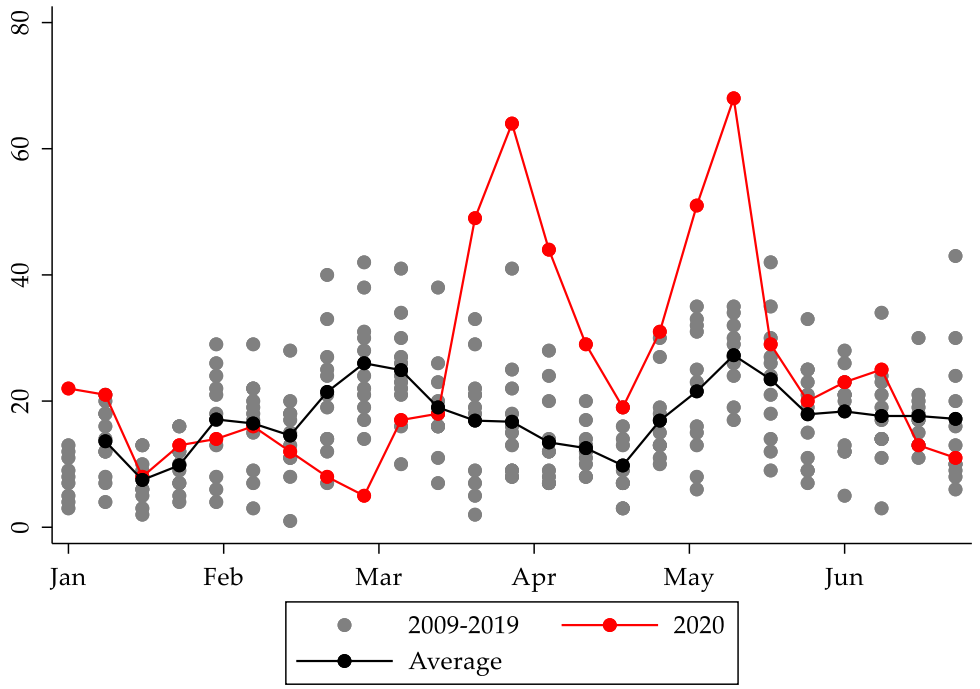
Panel A: Number of issues



Panel B: Amounts issued

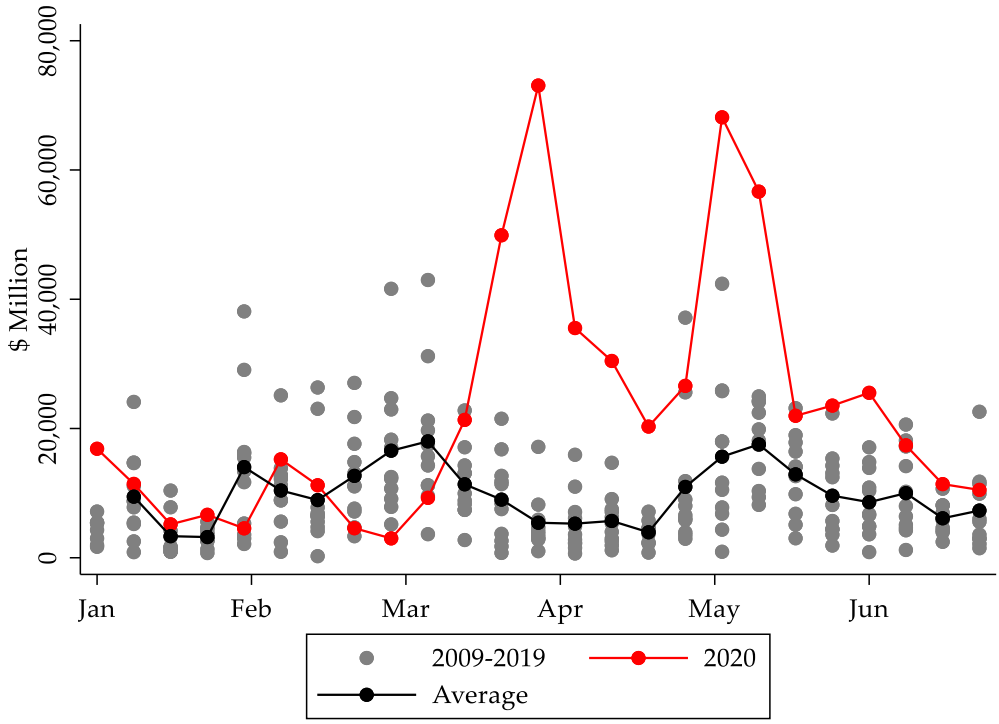
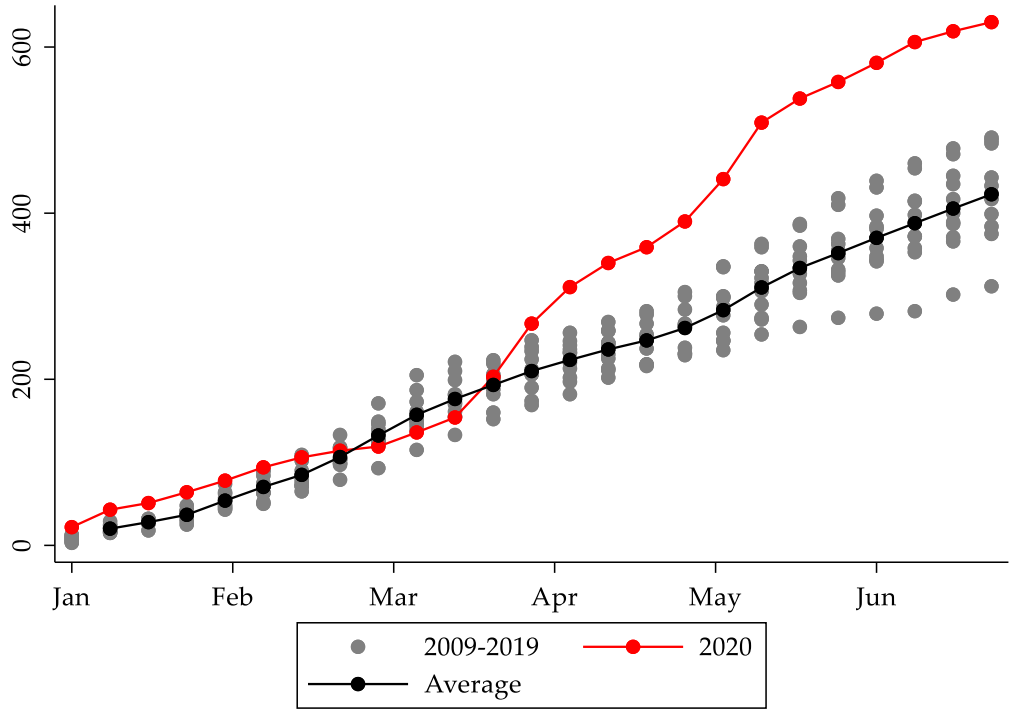


Figure 1. Flow of bond issues, 2020. This figure compares weekly bond issuance 2020 (in red) with earlier years (gray) and the average for 2009–2019 (black). The data are described in Table I.

Panel A: Number of issues



Panel B: Amounts issued

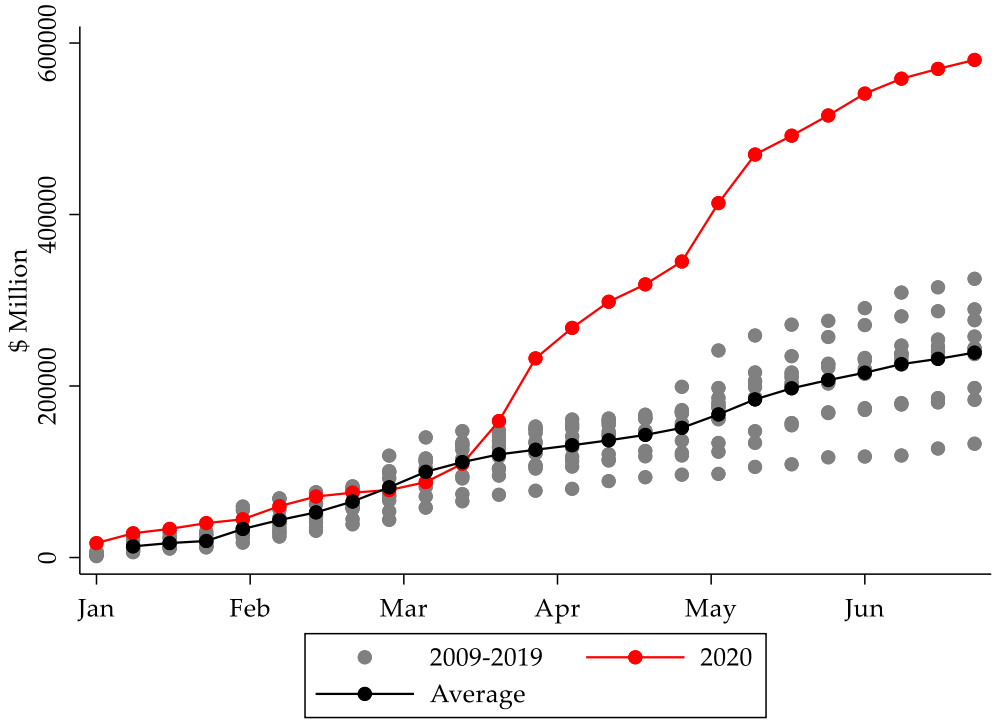


Figure 2. Cumulative bond issues, 2020. This figure compares cumulative weekly bond issuance 2020 (in red) with earlier years (gray) and the average for 2009–2019 (black). The data are described in Table I.

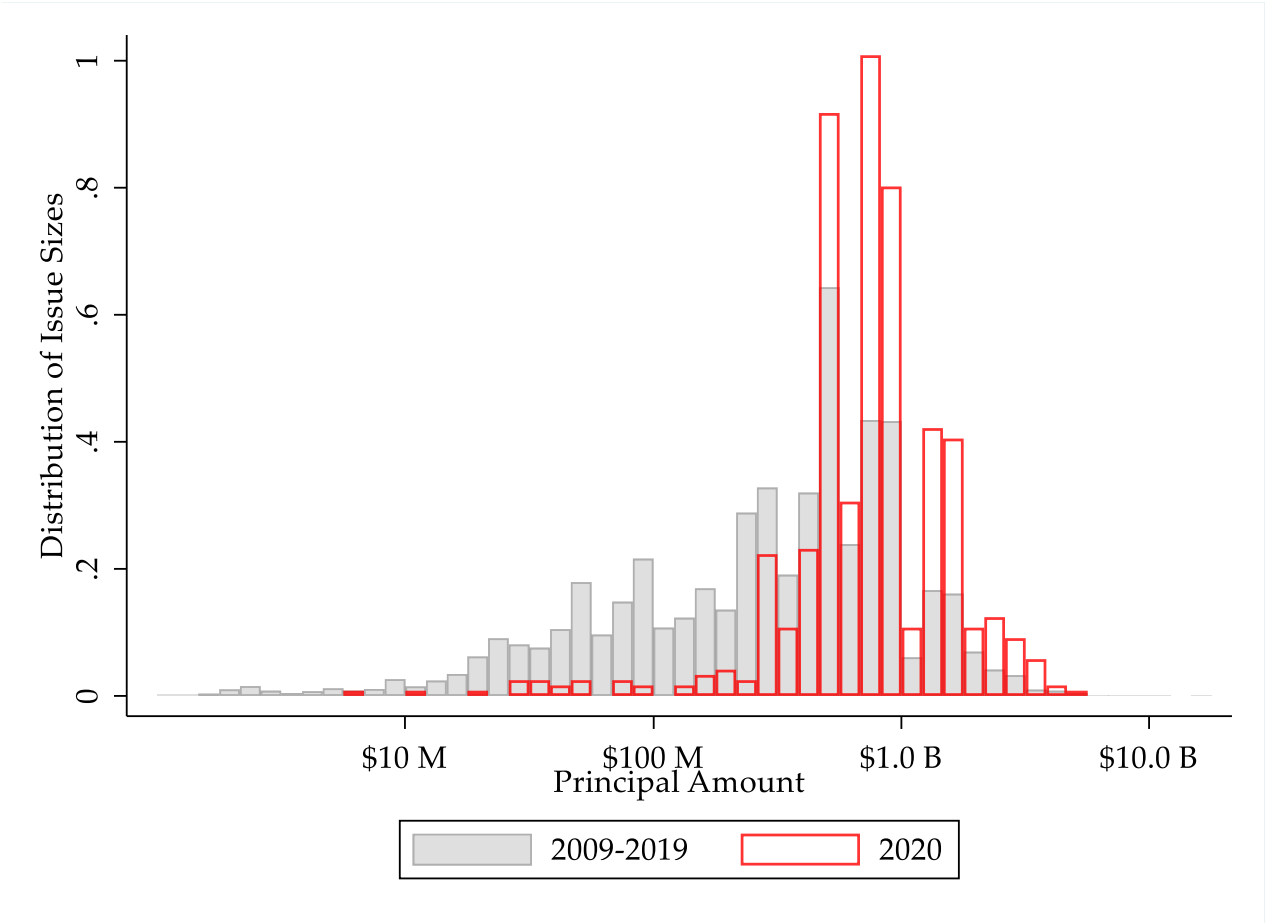
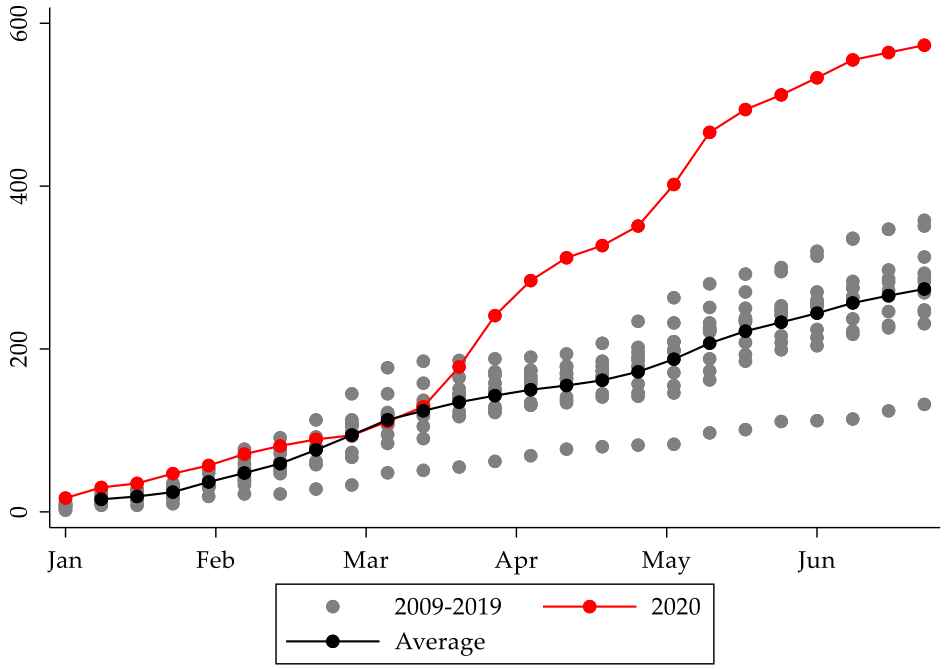


Figure 3. The size of individual corporate bond issues, 2020. This figure compares the principal amount of individual bond issues in 2020 (in red) with the distribution for 2009–2019 (gray). The data are described in Table I.

Panel A: Number of IG issues



Panel B: Number of HY issues

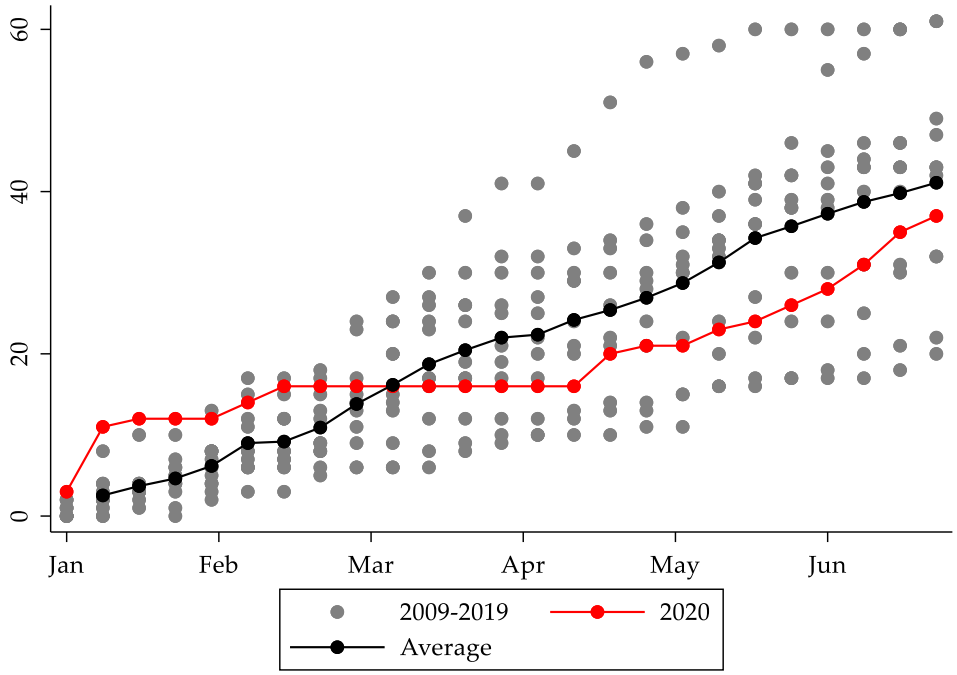
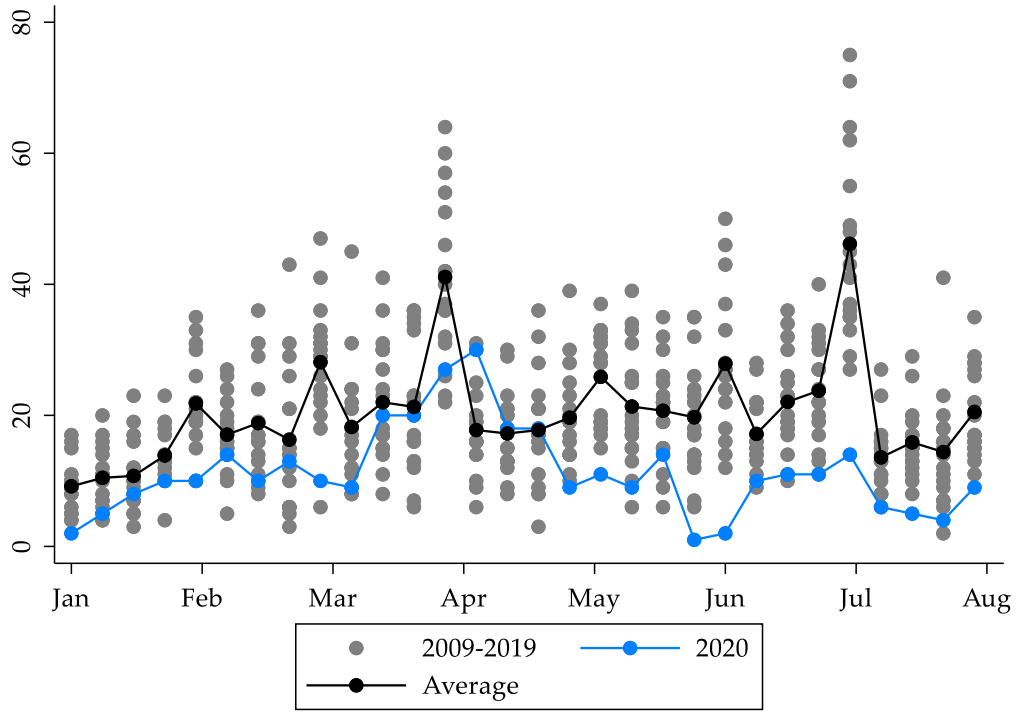


Figure 4. Flow of bond issues 2020 by credit quality. This figure compares cumulative weekly bond issuance 2020 (in red) with earlier years (gray) and the average for 2009–2019 (black), as in Figure 2, but separately by credit rating. IG refers to bonds rated BBB– or better by S&P, and HY refers to those with lower credit ratings. The data are described in Table I.

Panel A: Number of new term loans



Panel B: Amounts of new term loans

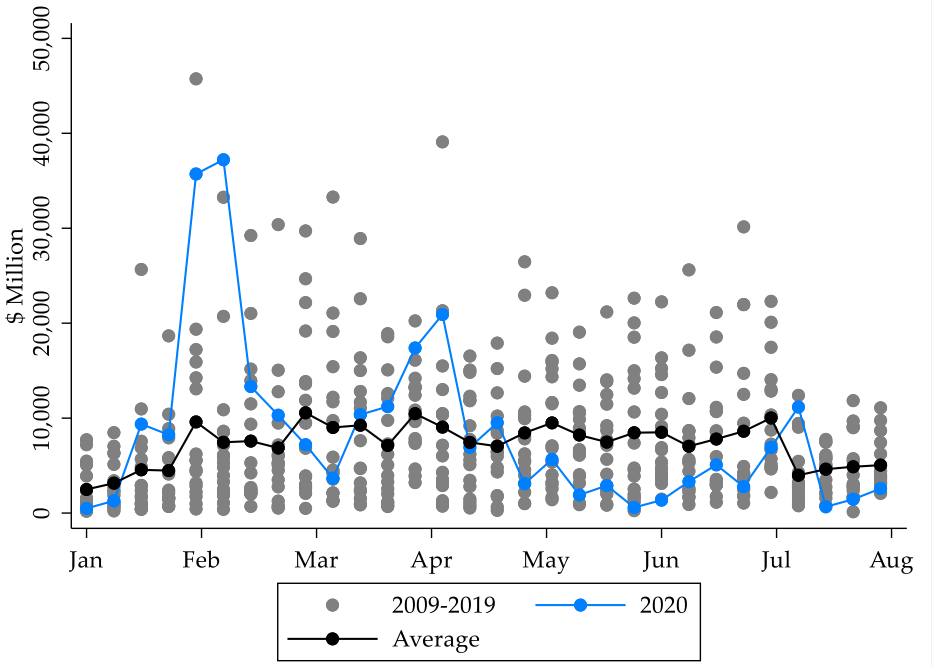


Figure 5. Flow of loans, 2020: term loans. This figure compares weekly issuance 2020 (in blue) with earlier years (gray) and the average for 2009–2019 (black). The data on weekly issuance are described in Table I.

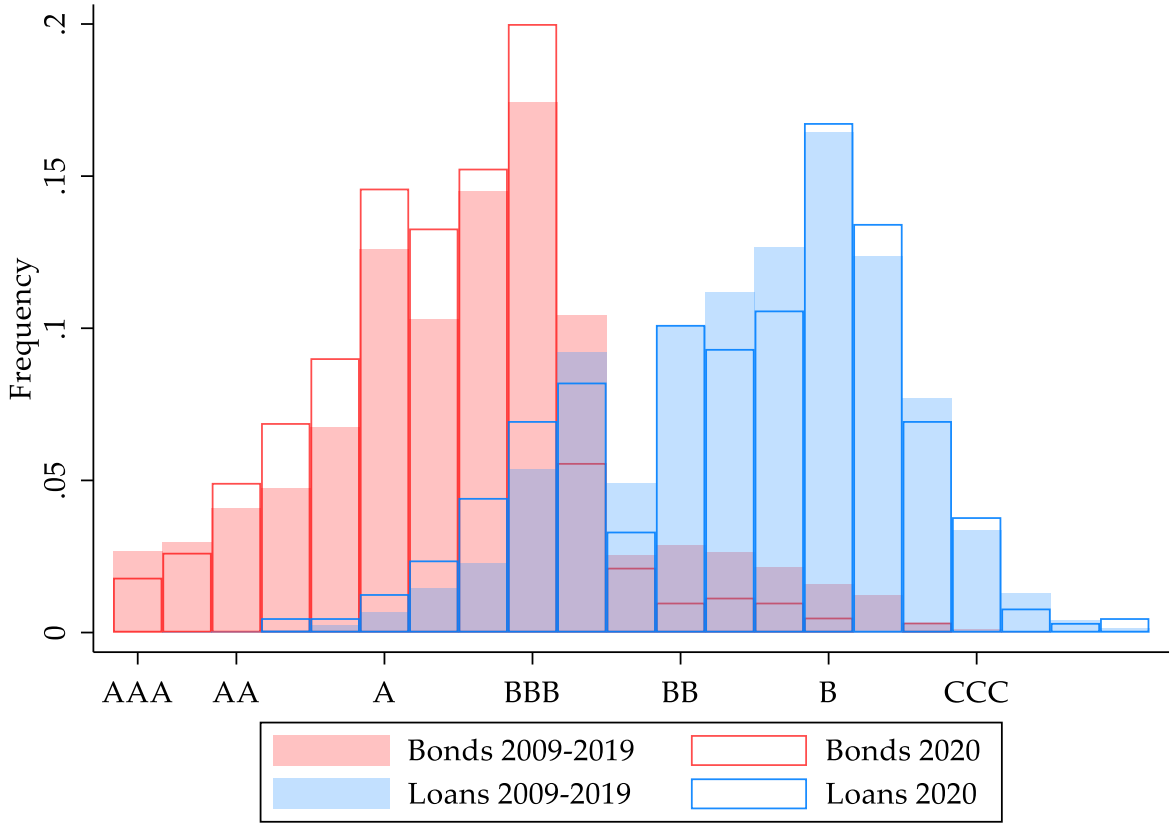
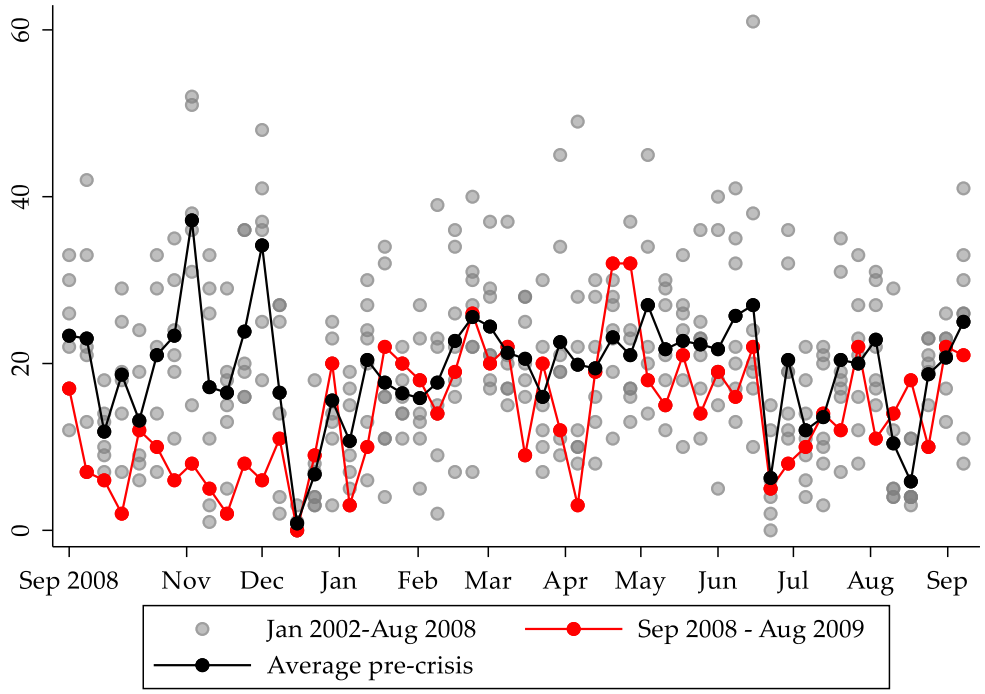


Figure 6. Credit rating distribution of bonds and loans, 2020. This figure plots the credit rating distribution of bonds (in red) and loans (in blue) for the years 2009–2019 and 2020. Unrated loans and bonds are excluded from the sample. Full bars represent the earlier period, and outline bars represent the later period. The data are described in Table I.

Panel A: Number of issues



Panel B: Amounts issued

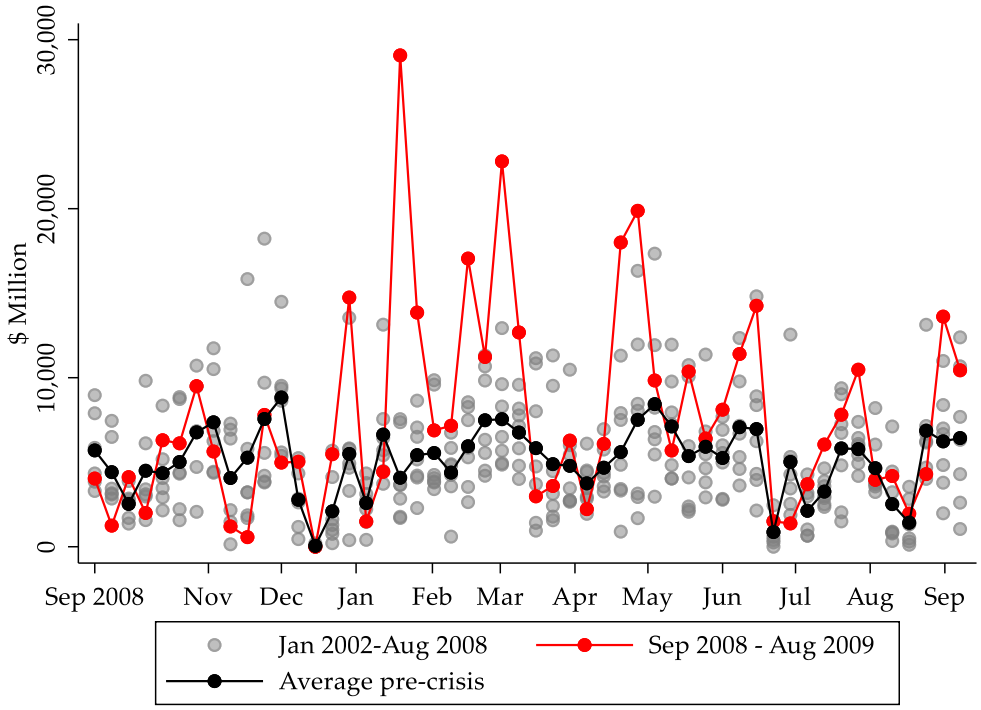
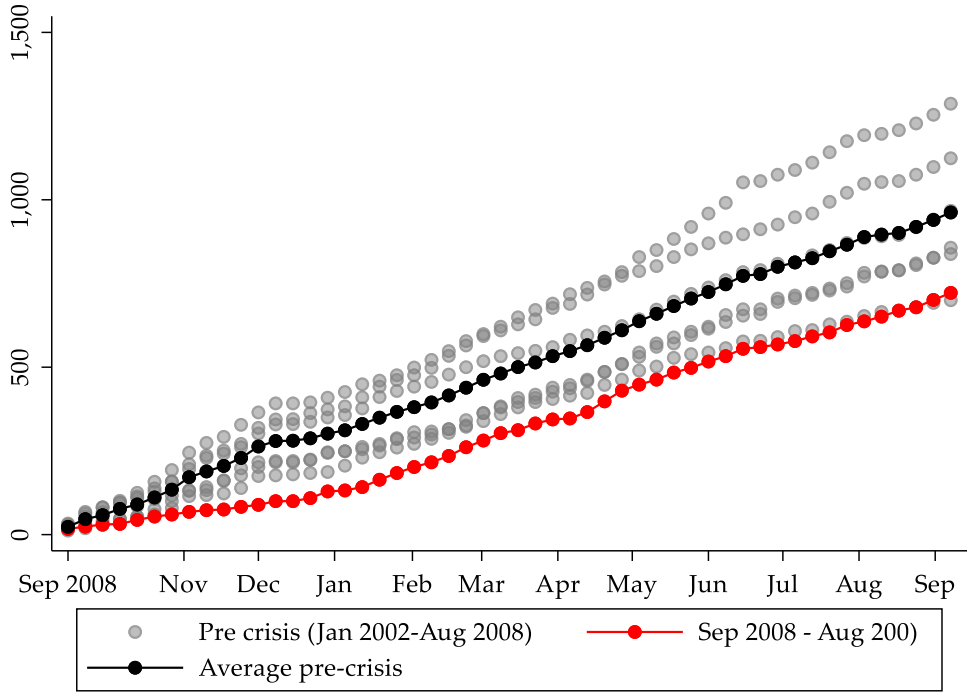


Figure 7. Flow of bond issues in the Global Financial Crisis. This figure compares weekly bond issuance, September 2008–September 2009 (in red), with the preceding period of 2002–August 2008 (gray) and the average for the preceding period (black). The data are described in Table I.

Panel A: Number of issues



Panel B: Amounts issued

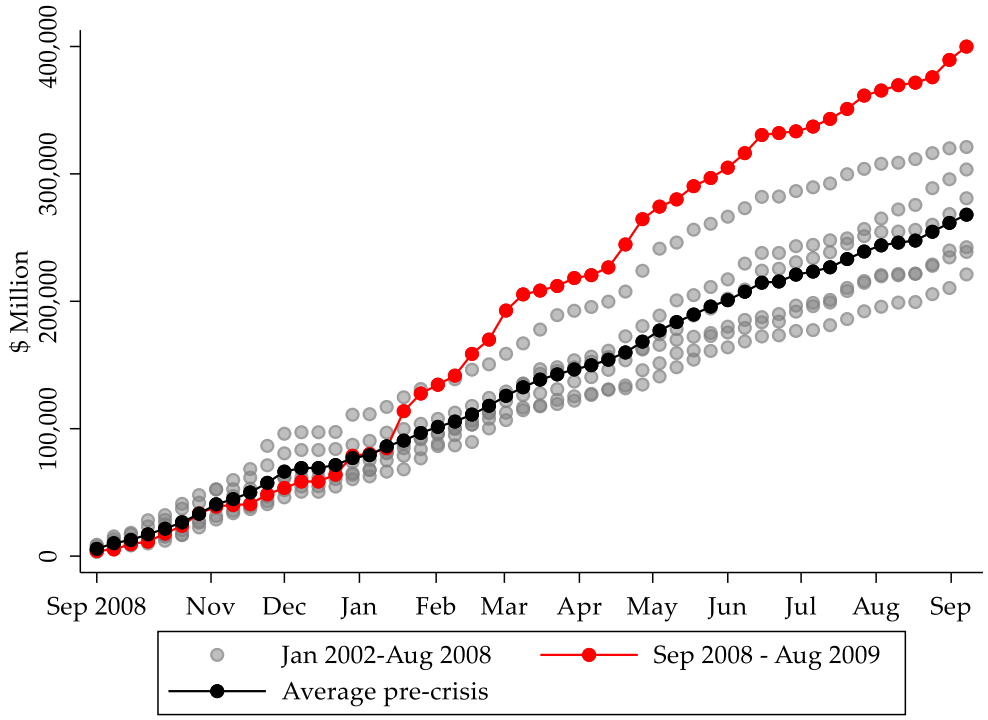


Figure 8. Cumulative bond issues in the Global Financial Crisis. This figure compares cumulative weekly bond issuance, September 2008–September 2009 (in red), with earlier years (gray) and with the average for 2002–August 2008 (black). The data are described in Table I.

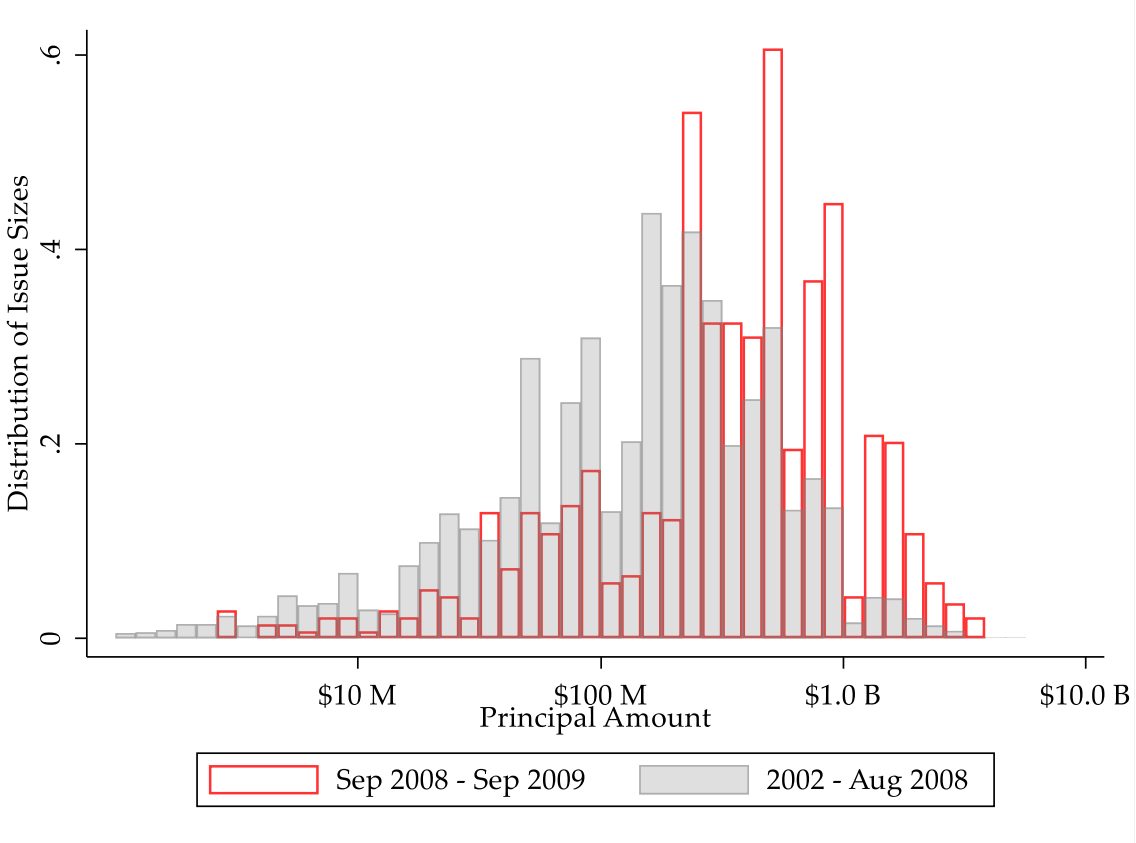
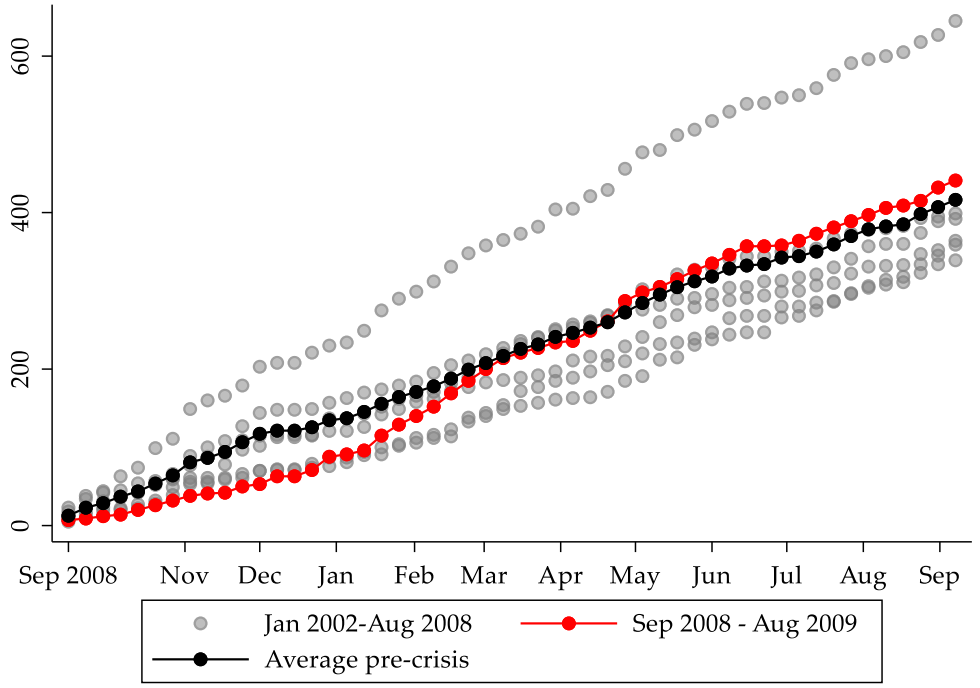


Figure 9. The size of corporate bond issues in the Global Financial Crisis. This figure compares the principal amount of individual bond issues, September 2008–September 2009 (in red), to the preceding period of 2002–August 2008 (gray). The data are described in Table I.

Panel A: Number of IG issues



Panel B: Number of HY issues

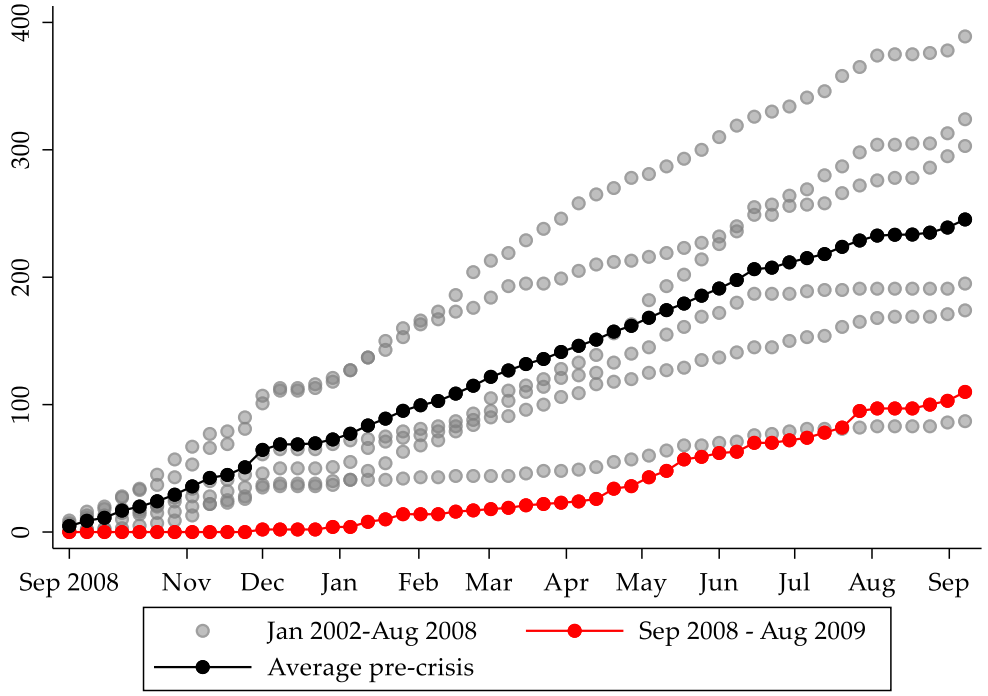
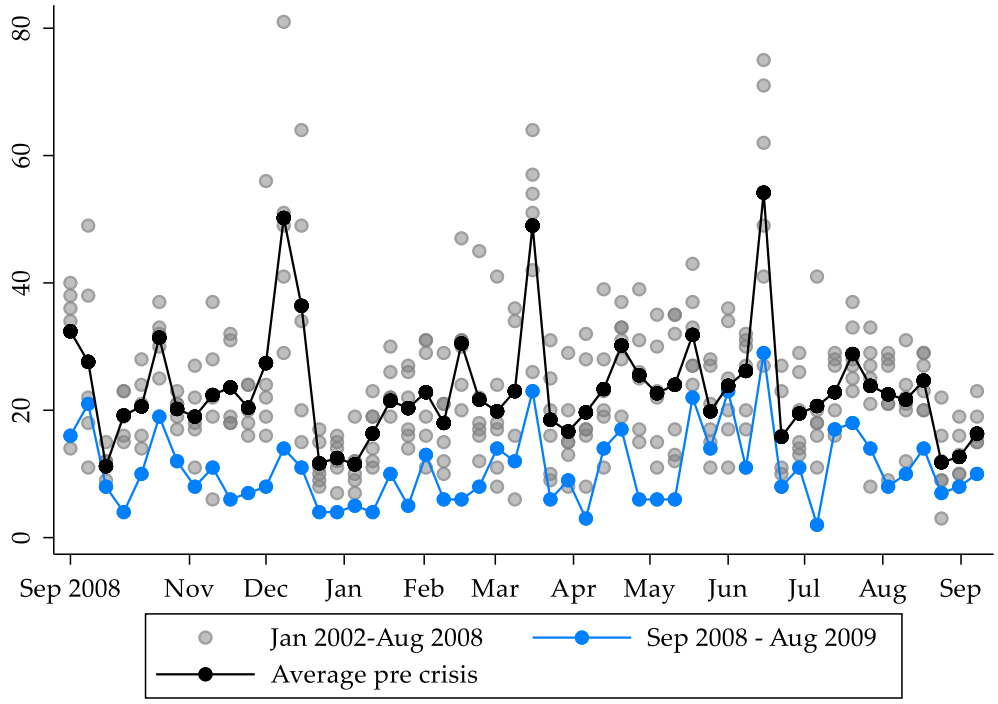


Figure 10. Flow of bond issues in the Global Financial Crisis by credit quality. This figure compares cumulative weekly bond issuance during the GFC (in red) with 2002–September 2008 (gray) and the average for 2002–September 2008 (black), separately by credit rating. IG refers to bonds rated BBB– or better by S&P, and HY refers to those with lower credit ratings. The data are described in Table I.

Panel A: Number of new term loans



Panel B: Amounts issued

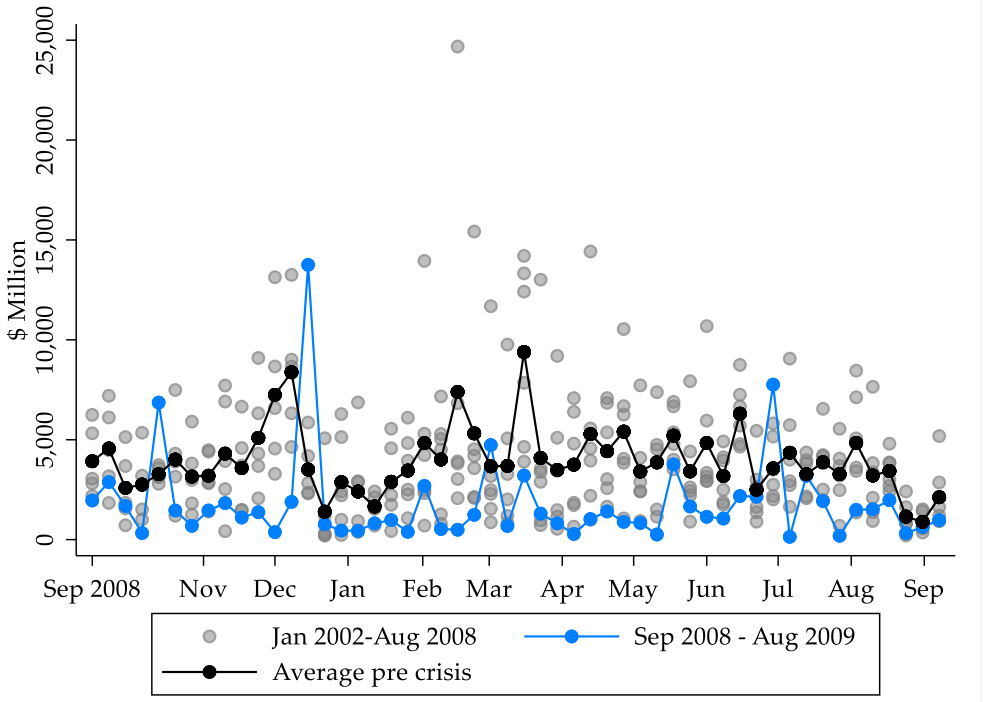


Figure 11. Flow of loans in the Global Financial Crisis. This figure compares weekly issuance in 2020 (in blue) with earlier years (gray) and the average for 2009–2019 (black). The data on weekly issuance are described in Table I.

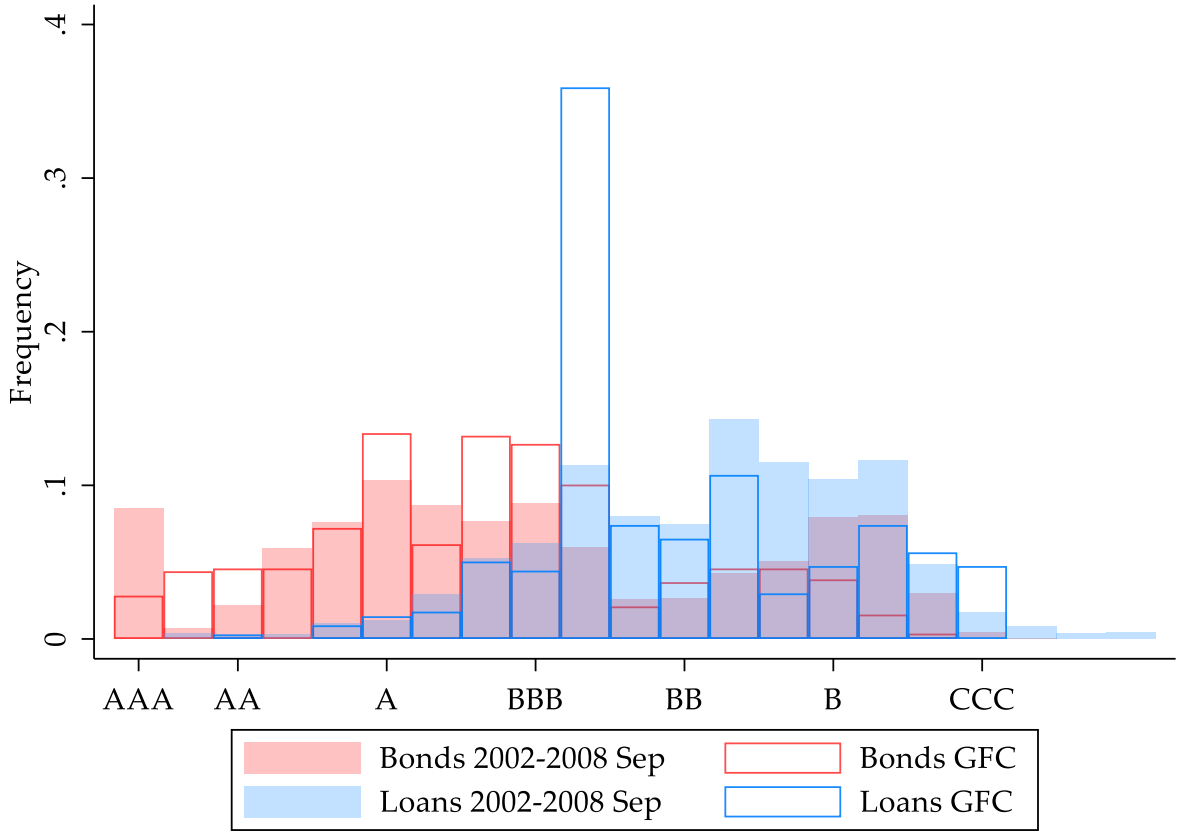


Figure 12. Credit rating distribution of bonds and loans in the Global Financial Crisis. This figure plots the credit rating distribution of bonds (in red) and loans (in blue) for the period 2002–September 2008 and for the period October 2008–September 2009. Full bars represent the earlier period, and outline bars represent the later period. Unrated loans and bonds are excluded from the sample.

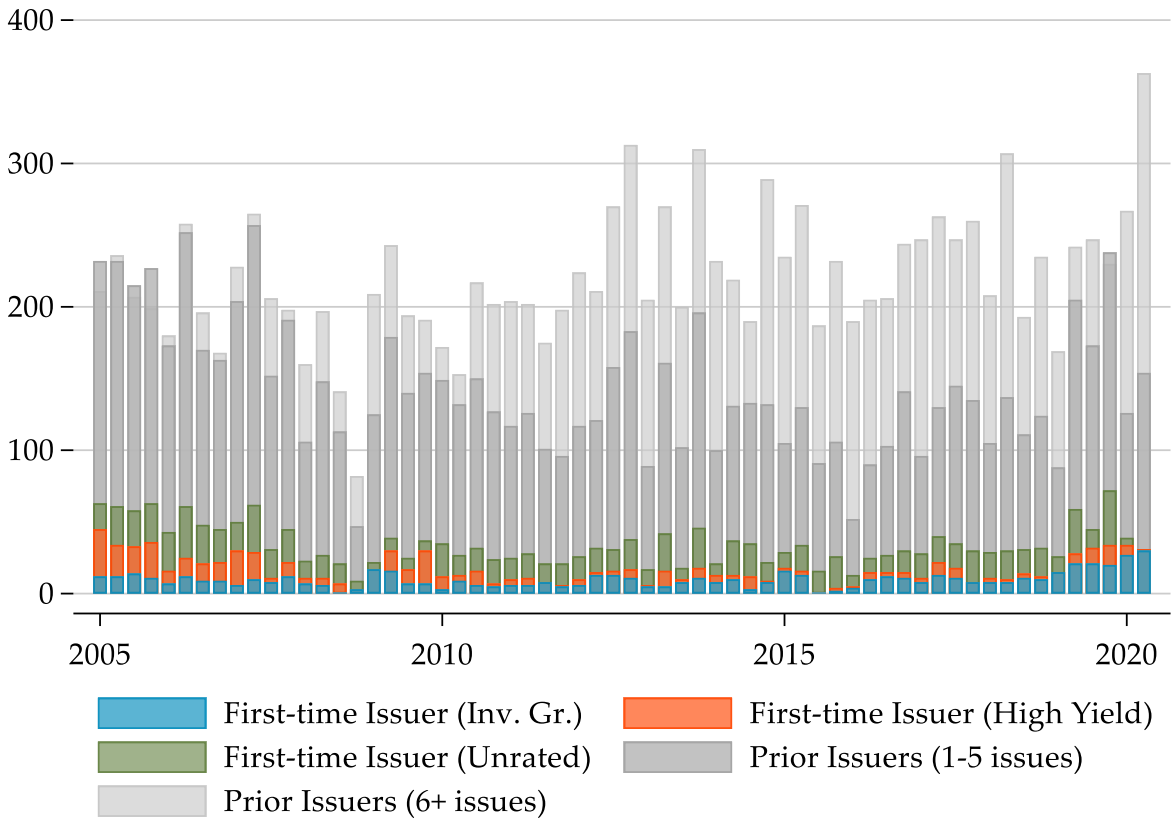
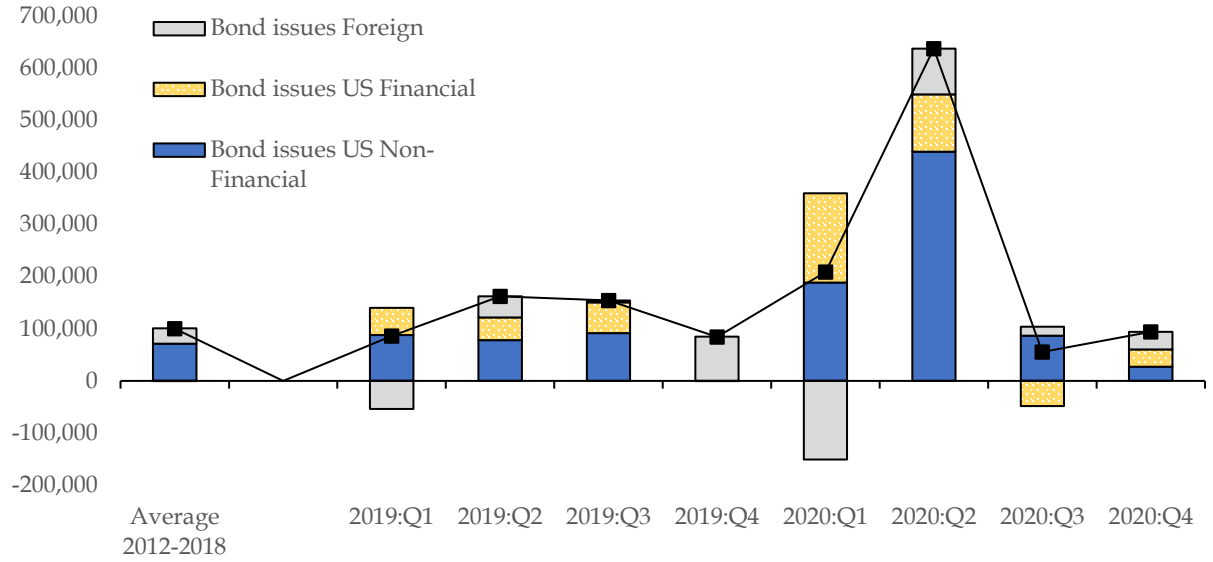


Figure 13. Bond issuer composition. This figure plots the split of issuers in five groups: first-time bond issuers with investment-grade ratings (blue, bottom), first-time issuers with high-yield ratings (orange, second from bottom), first-time issuers without ratings (green, third from bottom), repeat issuers with up to five prior issues since 2001 (dark gray, second from top), and prior issuers with more than five prior issues since 2001 (light gray, top). The data are described in Table I.

Figure 14. The frequency of rated and unrated issues. This figure shows the fraction of newly issued bonds and loans that have a credit rating each quarter. The sample runs 2003Q1 to 2020Q2. Loans (blue) include term loans. Bonds (red) excludes convertible bonds. See Table I for summary statistics.

Panel A: Aggregate Issuance



Panel B: Aggregate Investment

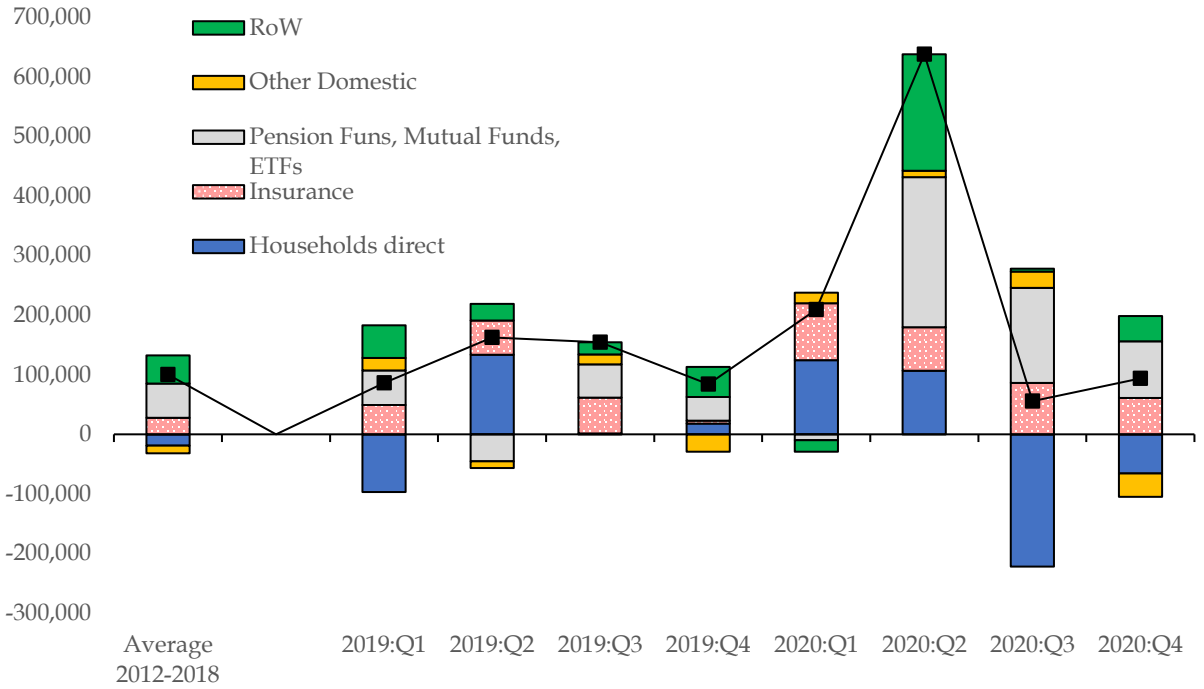


Figure 15. Aggregate Bond Market flows, 2012–2020. This figure shows flow of funds data for "Corporate and Foreign Bonds," based on Table F.213 in the US Flow of Funds accounts. Net quarterly flows, seasonally adjusted, are reported by issuer type (Panel A) and by investor category (Panel B). The scale is millions of dollars. Averages for the 2012:Q1–2018:Q4 period are reported, along with quarterly data for 2019 and 2020.

Table I

Summary Statistics: Individual Bonds and Loans

This table presents summary statistics for a data set of corporate bond and syndicated loans issued between 2002 and 2020. Bond data are from SDC, and loan data are from DealScan. Amounts are in billions of dollars. Investment grade (IG) refers to bonds whose issue ratings are Baa3/BBB– or better. Panel A summarizes data on individual bonds. Panel B summarizes data on individual loans.

Panel A: Bonds

Number of issues	17,379	
Rated	12,521	(72% of issues)
Investment Grade	9,906	(79% of rated)
High Yield	2,615	(21% of rated)
Callable	7,528	(44% of issues)
Publicly listed issuer	9,924	(57% of issues)

	10th Percentile	Median	90th Percentile	Standard deviation
Principal (M$)	30	283	1,000	537
Maturity (years)	3.5	10.0	30.0	9.3

Panel B: Loans

Number of issues	17,940	
Rated	4,500	(25% of issues)
Investment Grade	1,292	(29% of rated)
High Yield	3,208	(71% of rated)
PE borrower	3,504	(20% of issues)
Secured	9,222	(51% of issues)

	10th Percentile	Median	90th Percentile	Standard deviation
Principal (M$)	30	95	640	497
Maturity (years)	3.5	5.0	7.0	2.0

Table II

Summary Statistics: Weekly Data Sets

This table presents summary statistics for a time series data set of weekly corporate loan and bond issuance, based on the individual issues presented in Table II. The Global Financial Crisis (GFC) subsample covers each week from September 2003 to August 2009, and the Covid-19 crisis subsample covers January to June of each year from 2009 to 2020. Panel A summarizes data on individual bonds. Panel B summarizes data on individual loans.

Panel A: Weekly Bond Issuance During the Covid-19 Crisis

	2020, March–June			2009–2019, March–June		
	10th Perc.	Median	90th Perc.	10th Perc.	Median	90th Perc.
Number of bonds	8	24	64	6	17	31
Number: IG	8	21.5	63	2	9	22
Number: HY	0	0.5	4	0	1	4
Number: unrated	0	0	2	0	4	11
Total amount (B$)	4.6	22.8	68.2	1.6	7.0	20.0
IG share of issues	0.79	0.97	1.00	0.37	0.82	0.98
Principal value ($M) of individual bonds	400	750	1,750	40	400	1,250
IG bonds	400	750	1,750	188	500	1,500
HY bonds	300	500	1,750	300	410	1,000
Unrated bonds	550	900	1,250	14	74	258

Panel B: Weekly Loan Issuance During the Covid-19 Crisis

	2020			2010–2019		
	10th	Median	90th	10th	Median	90th
Number of term loans	1	9	20	7	17	32
Total amount (B$)	0.6	3.5	11.2	1.7	7.5	18.9
Secured share of loans	36%	51%	69%	44%	59%	74%
Number of lines of credit	10	15	23	9	17	31

Panel C: Weekly Bond Issuance During the GFC

	September 2008—September 2009			2002—August 2008		
	10th Perc.	Median	90th Perc.	10th Perc.	Median	90th Perc.
Number of bonds	5	14	22	5	18	32
Number: IG	2	8	16	2	7	16
Number: HY	0	1	7	0	4	11
Number: unrated	0	2	8	1	5	12
IG share of issues	0.42	0.85	0.98	0.17	0.58	0.91

Principal value ($M) of individual bonds	50	395	1,250	22	162	600
IG bonds	250	500	1,500	15	250	800
HY bonds	190	375	1,000	100	200	500
Unrated bonds	17	62	225	19	65	200

Panel D: Weekly Loan Issuance During the GFC

	September 2008—September 2009			2002—August 2008		
	10th	Median	90th	10th	Median	90th
Number of term loans	4	10	21	11	21	37
Total amount (B$)	0.3	1.2	3.2	0.9	3.3	7.3
Secured share of loans	29%	57%	71%	48%	68%	83%
Number of lines of credit	11	20	36	23.5	42	68.5

Table III

Summary of Federal Reserve Programs

This table presents a summary of notable Federal Reserve programs launched during the Global Financial Crisis and during the Covid-19 pandemic. Sources: Vissing-Jørgensen and Krishnamurthy (2012), Kuttner (2018), and Ma, Xiao, and Zheng (2020).

Program	First Large-Scale Asset Purchases	Second Large-Scale Asset Purchases	Third Large-Scale Asset Purchases	Various[20]	Secondary Market Corporate Credit Facility	Primary Market Corporate Credit Facility
Acronym	QE1	QE2	QE3		SMCCF	PMCCF
Announcement date	November 25, 2008	November 3, 2010	September 13, 2012	March 15–19, 2020	March 23, 2020	Mar 23, 2020
Adjustment date	March 18, 2009	-	Dec. 12, 2012	-	April 9, 2020	-
Maximum amount ($ billion)	1,650	600	-	200 (Agency Debt) and 500 (Treasuries)	500 (initial) 850 (adjusted)	750
Target assets class	Agency Debt and MBS	Longer-dated Treasuries	MBS	Agency Debt and Treasuries	Corporate bonds and ETFs	Corporate bonds and syndicated loans
Credit rating range	-	-	-	-	BBB– or better at purchase or BB- or better and BBB– or better as of March 22	BBB– or better at purchase or BB- or better and BBB– or better as of March 22
Maturity at purchase	-	-	-	-	Max. 5 years	Max. 4 years
Industry	-	-	-	-	Not bank	Not bank
Purchases commence	November 2008	November 2010	September 2012	-	June 15, 2020	June 29, 2020

[20] Including the Commercial Paper Funding Facility (CPFF), the Primary Dealer Credit Facility (PDCF), and the Money Market Mutual Fund Liquidity Facility (MMLF).

Table IV

Bond and Loan Issuance Volume by Week

This table presents regression results for the number of bonds and loans issued in the United States by week from 2009 to June 2020. The data are described in Table I. The variable "Federal Reserve 2020 Interventions" is an indicator that takes the value of 1 for weeks 12, 13, and 14 in 2020, based on Federal Reserve announcement dates of the SMCCF and PMCCF programs, and 0 at all other times (see Table III). Standard errors are robust and, when indicated, allow first-order autocorrelation. * denotes significance at the 10% level, ** at 5%, and *** at 1%.

Panel A. Bond Issuance

	(1)	(2)	(3)	(4)
Sample	2009–2020	2009–2020	2009–2020	2009–2020
Dependent variable	Bond number	Bond number	Bond value	Bond value
Dependent variable mean	2.820	2.820	8.829	8.829
Regression	OLS	GLS	OLS	GLS
Federal Reserve 2020 Interventions	**1.191*** **	**1.106*** **	**2.084*** **	**1.692*** **
	(0.351)	(0.143)	(0.600)	(0.281)
Week number F.E.	No	Yes	No	Yes
Year F.E.	No	Yes	No	Yes
Observations	587	587	587	587
Autocorrelation	-	0.01	-	0.01
R-squared	0.019	0.427	0.020	0.500
Clusters	Week	Week	Week	Week

Panel B. Term Loan Issuance

	(1)	(2)	(3)	(4)
Sample	2009–2020	2009–2020	2009–2020	2009–2020
Dependent variable	Loan number	Loan number	Loan value	Loan value
Dependent variable mean	2.776	2.776	8.911	8.911
Regression	OLS	GLS	OLS	GLS
Federal Reserve 2020 Interventions	**0.532**	**0.402** **	**1.077** *	**0.919*** **
	(0.447)	(0.187)	(0.601)	(0.235)
Week number F.E.	No	Yes	Yes	Yes
Year F.E.	No	Yes	Yes	Yes
Observations	587	587	587	587
Autocorrelation	-	0.682	-	0.287
R-squared	0.002	0.466	0.006	0.488
Clusters	Week	Week	Week	Week

Table V

Time Series of Bond and Loan Issues

This table presents regression results for features of bonds issued in the U.S. corporate credit market, 2003–2020. Each observation is a calendar week. The model is a generalized least squares regression with robust errors and serial correlation. The dependent variables are the log of the total value of either loans or bonds issued in the week or the share of bonds in weekly total volume. There are three period indicators. The Global Financial Crisis variable is an indicator for bonds issued between September 15, 2008, and September 30, 2009; the Covid Crisis refers to February 17, 2020, until the end of the sample (June 2020). The Federal Reserve Intervention variables cover months with announcements of purchases (see Table III). Treasury rates and credit spreads are weekly averages. The credit spread refers to BBB spreads. Net Bond Mutual Fund Flow refers to net inflows as a fraction of assets for taxable bond funds (from ICI), times 100. NPLs are from Federal Reserve data on the fraction of loans 90 days or more overdue. Independent variables except indicators and Treasury yields are lagged. * denotes significance at the 10% level, ** at 5%, and *** at 1%. Standard deviations are reported to the right.

	(1)	(2)	(3)	(4)	Variable std. dev.
Sample	Full	Full	Full	Full	
Dependent variable	Bond amount	Loan amount	Bond share	Bond share	
Mean	8.599	8.366	0.61	0.61	
Treasury bond yield, 1yr	**-0.071**	**-0.121****	**-0.008**	**-**	**1.50**
	(0.054)	(0.060)	(0.015)		
Treasury bond yield, 10yr	**-0.127***	**-0.197****	**0.074*****	**-**	**3.06**
	(0.075)	(0.090)	(0.022)		
Credit Spread	**-0.029**	**-0.391*****	**0.068*****	**-**	**2.10**
	(0.063)	(0.080)	(0.016)		
Net Bond Mutual Fund Flow	**0.217*****	**-0.025**	**0.052*****	**-**	**0.40**
	(0.066)	(0.070)	(0.016)		
Nonperforming Loans	**-0.161***	**-0.367*****	**0.032**	**-**	**1.26**
	(0.083)	(0.091)	(0.022)		
Global Financial Crisis	**0.148**	**0.500**	**-0.148****	**0.184*****	**0.06**
	(0.264)	(0.366)	(0.075)	(0.050)	
Federal Reserve 2008–2013 Interventions	**0.356***	**0.130**	**0.090***	**0.136****	**0.03**
	(0.186)	(0.350)	(0.055)	(0.058)	
Covid Crisis	**0.857*****	**-1.051*****	**0.281*****	**0.145****	**0.02**
	(0.288)	(0.315)	(0.073)	(0.071)	
Federal Reserve 2020 Interventions	**2.015*****	**1.526****	**0.159**	**0.001**	**0.00**
	(0.453)	(0.630)	(0.111)	(0.085)	
Observations	893	921	893	893	
R-squared	0.095	0.165	0.130	0.045	
Autocorrelation	0.167	0.391	0.268	0.365	
Clusters	Issuer	Issuer	Issuer	Issuer	

Table VI

Characteristics of Bond Issuers

This table presents regression results for bond issuers. Bond data from Mergent is matched to firm data from Compustat using CUSIP numbers. The panel covers nonfinancial issuers, 2000–2020. Recession dates are based on NBER data (March 2001–November 2001; December 2007–June 2009; February 2020–end of sample). Book leverage refers to debt over book assets. Each observation is one bond. Investment Grade issue refers to BBB–/Baa3 or better, and Rated issue refers to a nonmissing rating. Fixed effects are included for each Fama-French industry (12). * denotes significance at the 10% level, ** at 5% and *** at 1%. Standard deviations are reported to the right.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable	Sales (log)	Assets (log)	Employees (log)	Book leverage	EBITDA to sales	Inv. Grade issue	Rated issue
Mean	8.633	9.147	1.884	0.503	0.147	0.810	0.878
2001 Recession	**0.360****	**0.369****	**-0.062**	**-0.008**	**0.020****	**0.096****	**0.018**
	(0.151)	(0.153)	(0.250)	(0.23)	(0.008)	(0.045)	(0.044)
GFC Recession	**0.573*****	**0.481*****	**0.554*****	**-0.012**	**0.031****	**0.153*****	**-0.045**
	(0.121)	(0.112)	(0.132)	(0.020)	(0.007)	(0.026)	(0.034)
Covid Recession	**0.381*****	**0.257****	**0.456***	**-0.042**	**-0.013**	**-0.016**	**-0.040**
	(0.142)	(0.130)	(0.245)	(0.038)	(0.009)	(0.028)	(0.026)
Linear time trend	**0.122*****	**0.116*****	**0.052**	**-0.020*****	**0.000**	**0.012**	**-0.011**
	(0.030)	(0.029)	(0.036)	(0.005)	(0.002)	(0.008)	(0.007)
Quadratic time trend	**-0.002**	**-0.001**	**-0.000**	**0.001*****	**0.000**	**0.000**	**0.001**
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	4,739	4,743	4,477	4,743	4,729	4,158	4,743
R-squared	0.191	0.192	0.245	0.122	0.038	0.118	0.025
Fixed effects	FF12	FF12	FF12	FF12	FF12	FF12	FF12
Clusters	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer

Table VII

Characteristics of Loan Issuers

This table presents regression results for bond issuers. Loan data from DealScan are matched to firm data from Compustat using CUSIP numbers. The panel covers nonfinancial issuers, 1995–2020. Recession dates are based on NBER data (March–November 2001; December 2007–June 2009; February 2020–end of sample). Book leverage refers to debt over book assets. Each observation is one loan. Investment Grade issue refers to BBB–/Baa3 or better, and Rated issue refers to a nonmissing rating. Fixed effects are included for each Fama-French industry (12). * denotes significance at the 10% level, ** at 5%, and *** at 1%. Standard deviations are reported to the right.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable	Sales (log)	Assets (log)	Employees (log)	Book Leverage	EBITDA to sales	Inv. Grade issue	Rated issue
Mean	6.631	6.904	0.856	0.462	0.109	0.470	0.308
2001 Recession	**0.198**	**0.481**	**0.882**	**0.051**	**0.071**	**0.461*** **	**0.085**
	(0.578)	(0.490)	(0.603)	(0.085)	(0.113)	(0.192)	(0.100)
GFC Recession	**0.503***	**0.501***	**0.294**	**-0.052**	**0.043** **	**-0.190***	**0.009**
	(0.294)	(0.281)	(0.300)	(0.048)	(0.018)	(0.103)	(0.098)
Covid-19 Recession	**0.210**	**0.256**	**0.282**	**0.072**	**0.048**	**-0.238**	**-0.093**
	(0.322)	(0.325)	(0.308)	(0.064)	(0.039)	(0.198)	(0.080)
Linear time trend	**0.110**	**0.115**	**0.135**	**0.013**	**0.024**	**0.065***	**0.028**
	(0.071)	(0.070)	(0.083)	(0.013)	(0.023)	(0.034)	(0.019)
Quadratic time trend	**-0.000**	**-0.000**	**-0.003**	**-0.000**	**-0.000***	**-0.003***	**-0.002**
	(0.001)	(0.000)	(0.004)	(0.001)	(0.000)	(0.002)	(0.001)
Observations	2,295	2,301	2,210	2,301	2.299	709	2,301
R-squared	0.263	0.281	0.261	0.070	0.106	0.162	0.085
Fixed effects	FF12	FF12	FF12	FF12	FF12	FF12	FF12
Clusters	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer	Issuer

Appendix A

This table lists the variables used in tables and figures of "The Resilience of the U.S. Corporate Bond Market During Financial Crises." FRED refers to St. Louis Federal Reserve's data service, accessed at https://fred.stlouisfed.org/.

Variable	Data Source	Definition	Comment
Bond number	SDC	Bonds issued each week; we drop withdrawn issues, convertibles, non-U.S. issues and bonds issued by the federal government, government agencies and local governments, and bonds issued by financial and utility firms	Weekly
Bond value	SDC	(see Bond number)	Weekly
Investment-Grade (IG) Bond	SDC	S&P and Moody's rating of BBB– or Baa1 or above; we use the lower of two ratings	Weekly number and value of issues calculated as above.
High-Yield (HY) Bond	SDC	Bonds with at least one credit rating that are not Investment Grade.	Weekly number and value of issues calculated as above.
Loan number	DealScan	Accessed via Refinitiv. New Term loans to U.S. borrowers. Deal purpose must be "General Purpose", "General Purpose/Refinance", "Working capital", "Capital Expenditure", or "Equipment Upgrade/Construction".	Weekly
Loan value	DealScan	See previous. Amount of new term loans plus changes in amount from amended term loans.	Weekly
Investment-Grade (IG) Loan	DealScan	S&P and Moody's rating of BBB– or Baa1 or above. We use the lower of two ratings.	Weekly number and value of issues calculated as above.
High-Yield (HY) Loan	DealScan	Bonds with at least one credit rating, which are not Investment Grade.	Weekly number and value of issues calculated as above.
Treasury bond yield, 1yr	FRED	Yield to maturity of constant-maturity one-year Treasurys.	Weekly
Treasury bond yield, 10yr	FRED	Yield to maturity of constant-maturity 10-year Treasurys.	Weekly
Credit Spread	FRED	ICE BofA BBB US Corporate Index Option-Adjusted Spread, Percent, Weekly, Not Seasonally Adjusted	Weekly
Net Bond Mutual Fund Flow	ICI	Net flow into ETFs and mutual funds in the categories "IG bonds," "HY bonds," and "Mixed bonds," relative to the value of such funds and ETFs	Monthly
Nonperforming Loans	FRED	Nonperforming Commercial Loans (past due 90+ days plus nonaccrual) to Commercial Loans, Percent, Quarterly, Not Seasonally Adjusted	Quarterly
Global Financial Crisis	Table III	September 15, 2008–September 30, 2009	Indicator variable
Federal Reserve 2008–2013 Interventions	Table III	Weeks with QE policy announcements	Indicator variable
COVID crisis	Table III	February 17, 2020–end of sample	Indicator variable

Federal Reserve 2020 Interventions	Table III	Weeks with QE policy announcements	Indicator variable
2001 Recession	NBER	March–November 2001	Indicator variable
GFC Recession	NBER	December 2007–June 2009	Indicator variable
Covid Recession	NBER	February 2020–end of sample	Indicator variable
Sales (log)	Compustat	Sales, logarithm	Matched to issuers using CUSIP, lagged one year
Assets (log)	Compustat	Assets, logarithm	
Employees (log)	Compustat	Emp, logarithm	
Book Leverage	Compustat	(dlc+dltt)/at	
EBITDA to sales	Compustat	oibdp/sales	
Inv. Grade issuer	Compustat	Baa3/BBB– or better issue credit rating	Indicator variable
Rated issuer	Compustat	Nonmissing issue rating	Indicator variable