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How Does Monetary Policy Affect Prices of Corporate Loans?*

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Abstract

This paper studies the impact of unanticipated monetary policy news around FOMC announcements on secondary market corporate loan spreads. I find that the reaction of loan spreads to monetary policy news is weaker than that of bond spreads: following an unanticipated monetary policy tightening (easing) shock, loan spreads do not increase (decrease) as much as bond spreads do. Decomposition of the spreads into compensations for expected defaults and risk premiums shows that differential reactions of loan and bond risk premiums are the main driver of the differential spread reactions. This paper further finds that the weaker loan spread reactions to monetary policy shocks are more pronounced for riskier loans. Lastly, reactions of primary market loan spreads to monetary policy shocks are also muted. These findings highlight heterogeneous impacts of monetary policy across different types of corporate credit markets, possibly reflecting heterogeneous investor demand responses to monetary policy in those markets.

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1 Introduction

How are changes in monetary policy stance transmitted to corporate credit markets? Much research has been devoted to study how corporate bond prices react to monetary policy: for example, Gertler and Karadi (2015),Gilchrist *et al.* (2015), and Smolyansky and Suarez (2021) among many studies. However, an increasing share of corporate term debt issuance has been in the form of corporate loans, which may respond differently to monetary policy compared with corporate bonds.[1] Despite the increasing importance of corporate loans in the corporate term lending space, the effect of monetary policy on corporate loan markets has not been previously examined.

To fill this gap, this paper studies how monetary policy news affects secondary market corporate loan prices, particularly in a comparison with corporate bond prices. I find that loan spread reactions to monetary policy news are muted compared with those of bonds, and the weaker loan spread reaction is more pronounced for riskier loans. Furthermore, differential reactions in the risk premiums between loans and bonds mainly drive the weaker loan spread reaction to monetary policy. Lastly, the loan primary market spread reactions to monetary policy shocks are also muted. These findings contribute to discussions around impacts of monetary policy on financial markets and the broader economy, particularly its heterogeneous effects across different types of corporate credit markets.

To motivate a comparison between corporate loan and bond spread reactions to monetary policy, I start with principal component analyses (PCAs) on spread changes of a combined set of loan and bond portfolios that are sorted on instrument-level characteristics. The PCAs find a robust two-factor structure with the dominant first factor explaining more than 80% of the variations of portfolio spread changes across the sorts. Pervasive common

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[1] In the space of term lending for below-investment grade firms (so called "leveraged finance"), high-yield and unrated corporate bonds only account for 56% while corporate loans (so-called "institutional leveraged loans") — account for 44%. Those shares are computed based on the outstanding amounts provided in Table 1 of the Financial Stability Report (November 2021) published by the Federal Reserve Board of Governors: `https://www.federalreserve.gov/publications/financial-stability-report.htm`.

movements in spread across loans and bonds driven by the dominant first factor justify the comparison of loans and bonds. I show that the first factor, denoted by $(L+B)$, moves loan and bond spreads in the same direction, and the second factor, denoted by $(L-B)$, moves loan and bond spreads in the opposite direction. Major differences between loan and bond characteristics — including security (whether secured), callability, covenants, issuer characteristics, and floating-rate payments for loans — cannot explain the $(L-B)$ factor that differentiates loan and bond spread movements.

After adjusting for the $(L+B)$ factor exposures, I find that loan spread reactions to monetary policy shocks are weaker than those of bonds. To identify monetary policy shocks, this paper employs an event study methodology — high-frequency changes of 2-year Treasury yields around FOMC announcements are used as a proxy for monetary policy news, following Gürkaynak *et al.* (2005). To control for different exposures on the the $(L+B)$ factor between loans and bonds, I run a regression of weighted difference of aggregate loan and bond spread changes, where the weights are determined by their respective betas on the $(L+B)$ factor, on monetary policy shocks. The regression coefficient is negative and statistically significant, indicating that the loan spread responses to monetary policy are relatively weak. This relation is largely robust across different specifications and holds across different periods, with the exception of the zero lower bound (ZLB) period after the global financial crisis (GFC).[2]

Next I decompose the differential spread reactions between loans and bonds to monetary policy shocks into two components: the fundamental (compensation for expected defaults) component and the risk premium component. This paper largely follows Gilchrist and Zakrajšek (2012) to construct the excess loan premium (ELP) as the loan counterpart to the excess bond premium (EBP), in order to capture the risk premium component. I find that the differential reaction between loan and bond spreads to monetary policy shocks is mostly attributed to the differential reaction between the ELP and EBP. This result suggests that

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[2] The ZLB period after the GFC excludes the GFC period and is from 2009/07 through 2015/11.

monetary policy affects the differential spread changes between loans and bonds mainly through the risk premium channel.

Then I utilize the cross-sectional variation of spread changes around FOMC announcements and examine how loan and bond spreads respond to monetary policy news as their credit risk increases. This paper finds that loan spread reactions to monetary policy shocks become weaker as their credit risk increases, as opposed to stronger bond spread reactions for riskier bonds. Therefore, the weaker reaction of loan spreads to monetary policy is not uniform across their credit risk spectrum, but becomes more pronounced for riskier loans.

Next I turn to the primary market and investigate primary market loan spread reactions to monetary policy — this paper also finds that primary market loan spread reactions to monetary policy is muted. I consider loan and bond issuance before and after FOMC announcements and regress their issuance spreads on monetary policy shocks interacted with a dummy that indicates whether the issuance occurs after FOMC announcements. This paper finds that bond spreads react positively to monetary policy shocks while loan spread reactions are muted. Since this empirical design has limitations in addressing difference between issuance before and after FOMC announcements, this paper also employs an empirical strategy that utilizes loan syndication processes, typically taking a couple of weeks. I find that primary market loan spreads do not react to monetary policy shocks that occur within the syndication period.

Lastly, I investigate possible reasons for the differential spread reactions. Specifically, this paper asks whether the weaker reaction of loan spreads to monetary policy news could be driven by difference in investor flows. Consistent with this hypothesis, I find that loan mutual funds receive capital inflows and CLO issuance increases in months with tightening monetary policy shocks, while high-yield bond mutual funds do not receive capital inflows. This result is consistent with my finding that monetary policy affects differential loan and bond spread reactions mainly through the risk premium channel: the differential investor demand response lowers risk premium for loans compared with that for bonds. By contrast, I do not find evidence that liquidity difference drives the differential spread reactions to monetary policy between loans and bonds.

My findings on loan spread reactions to monetary policy shocks have several contributions. First, this paper documents a heterogeneity in response to monetary policy between corporate loan and bond markets. Second, the finding of the relatively muted loan spread reactions suggests that corporate credit cost responses to monetary policy may not be as large as those solely inferred from the corporate bond market. In particular, small and risky firms typically have better access to the loan market than to the bond market, and, hence, the weaker loan spread responses that are more pronounced for riskier loans are likely to be more relevant to financially constrained firms. Third, therefore, the transmission of monetary policy to the broad economy through corporate credit markets may be attenuated due to the heterogeneous impact of monetary policy on different credit markets.

2 Related Literature

While there is a large body of research on secondary market corporate bond prices, research into secondary market loan prices has been more limited. Altman *et al.* (2010) analyze secondary loan market prices and compare the informational efficiency of loan markets with bond markets. They find that secondary loan prices are more efficient than bond prices prior to loan default. Their framework is somewhat similar to this paper in that they focus on a comparison between loans and bonds. Beyhaghi and Ehsani (2016) is another relatively recent study that uses loan secondary market prices to examine the cross section of expected returns in the loan market from the asset pricing point of view. While they use bond pricing information when they obtain ”default beta”, they do not study co-movements between loan and bond prices.

There has been a substantial amount of research that is devoted to (secondary market) bond pricing. It is a daunting task to list even a subset of the literature, but Collin-Dufresne *et al.* (2001) is one of the most relevant early studies that shed light on the factor structure of bond prices. In particular, they document a strong one-factor structure in changes of credit spreads. Gilchrist and Zakrajšek (2012) is another study that shows the usefulness of bond prices in predicting future economic activities. They introduce the concept of the excess bond premium (EBP), which is a component of credit spreads that control for compensations for expected defaults.

Among studies that attempt to identify monetary policy surprises from high-frequency price changes of interest rate-sensitive instruments, Gürkaynak *et al.* (2005) is particularly relevant for this paper, while there are other studies such as Kuttner (2001) and Bernanke and Kuttner (2005). There has been ongoing debate about the nature of the high-frequency price changes in those instruments: some argue that they correctly identify information regarding monetary policy (e.g., Faust *et al.* (2004) and Bauer and Swanson (2020)), while others argue that those changes reflect the "Fed information effect" (e.g., Romer and Romer (2000) and Nakamura and Steinsson (2018)). More recently, studies such as Cieslak and Schrimpf (2019) and Jarociński and Karadi (2020) attempt to separate out the Fed information effect component of the high-frequency proxies of monetary policy news.

3 Data, Sample, and Summary Statistics

3.1 Data

I obtain corporate loan pricing data from the LSTA/LPC Mark-to-Market Pricing Service.[3] A joint venture of Loan Syndication and Trading Association (LSTA) and Refinitiv (formerly known as Loan Pricing Corporation) provides this data. The LSTA/LPC data provides (daily) indicative quotes for secondary market trading of corporate loans, where almost all

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[3] Refinitiv, LSTA/LPC Mark-to-Market Pricing and Euro Pricing Service (daily observations, delivered annually), `https://www.loanpricing.com/products/solutions-for-the-secondary-market/global-loan-pricing-services/lstalpc-mark-to-market-pricing-service/`.

of them are syndicated, since 1998.[4] To obtain loan characteristics, including maturity and coupon spread, I link the LSTA/LPC data to DealScan. In addition, to align loan cash flows closely to bond cash flows, this paper uses interest rate swap pricing data from Bloomberg.

For corporate bond pricing data, I use data from ICE BofAML Fixed Income Indices.[5] The data starts from 1997 and provides indicative quotes for corporate bonds.[6] I use this data instead of Trade Reporting and Compliance Engine (TRACE) data because 1) using indicative quotes for corporate bonds is more parallel to the loan pricing data, which is based on indicative quotes, and 2) the ICE data provides a longer history than TRACE, which starts from mid-2002. While the ICE data provides quite a few bond characteristics, including maturity, par, and coupon, I obtain other bond characteristics by linking the ICE data to Mergent Fixed Income Securities Database (FISD). In the later part of the paper, I use transaction price data to ensure that the results of this paper are not driven by the fact that the loan and bond pricing data are based on indicative quotes rather than actual transaction prices. Loan transaction price data is obtained from Moody's Analytics Global CLO data.[7] For bond transaction price data, I use the TRACE data.[8]

I obtain contemporaneous credit ratings for both loans and bonds from Moody's Rating Delivery Service (RDS) and S&P RatingsXpress. For the computation of the ELP as well as the EBP, I use a couple of additional databases. To compute the distance-to-default measure based on Merton's model or credit risk, both the loan and bond data are linked to Compustat and CRSP. I also obtain some firm level information (e.g., NAICS industry code) from Compustat. Roberts Dealscan-Compustat Linking Database is utilized for linking

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[4] They provide weekly data up to mid-1999 and start to provide daily data from 1999/07/09. The sample is limited to daily data from 1999/07/09.

[5] ICE Data Indices, LLC, used with permission.

[6] In particular, this data has indicative quotes for individual constituents of D0A0 (the domestic master index) and H0A0 (the high yield master index).

[7] Moody's Analytics, Inc., Global CLO data.

[8] Financial Industry Regulatory Authority, Bond Trade Dissemination System (BTDS) and Trade Reporting and Compliance Engine (TRACE), Wharton Research Data Services, `https://wrds-web.wharton.upenn.edu/wrds/`.

the loan data to Compustat.[9] Finally, I obtain monthly aggregate loan mutual fund flows and CLO issuance volume data from S&P Leveraged Commentary & Data (LCD). Monthly high yield bond mutual fund flows data is from Lipper U.S. Fund Flows Data provided by Refinitiv.

3.2 Sample and Summary Statistics

For the loan data, I apply several filters. First, I focus on term loans, as revolvers do not have a predetermined payment schedule. Second, I only consider loans that are denominated in U.S. dollars and those issued by U.S. nonfinancial firms. Third, I only keep loans that use LIBOR as their benchmark rate. Lastly, I filter out loans set to mature in less than a year or more than 30 years.

This paper applies similar filters to the bond data. First, I only consider bonds that are denominated in U.S. dollars and those issued by U.S. nonfinancial firms. Second, I filter out bonds with less than a year or with more than 30 years to maturity. Third, for the main sample, I only consider senior unsecured bonds that pay fixed-rate interests at the semi-annual frequency.

Since (almost all) corporate loans pay floating-rate coupons that are tied to a certain benchmark rate, predominantly LIBOR for the U.S. firms, comparing loan prices directly with bond prices is likely to capture such difference in cash flows. I use interest rate swaps (IRSs) to construct synthetic instruments with a fixed-rate payment schedule out of loans, in order to make their cash flows as similar as possible to bond cash flows. Figure 1 describes how to construct a synthetic fixed-payment instrument from a typical loan with quarterly coupon payments. After constructing the synthetic fixed-rate instruments, I compute loan spreads by taking the difference between the yield-to-maturity (YTM) of the synthetic instruments and the YTM of risk-free assets with the same payment schedule, following Gilchrist

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[9] Since they provide the linking database that cover only up to mid-2017, I use a name matching algorithm to augment the link between DealScan and Compustat for loans issued in 2017 and after.

and Zakrajšek (2012). I compute bond spreads in a similar way. Note that I filter out all observations with spreads below 5 basis points and greater than 3,500 basis points as in Gilchrist and Zakrajšek (2012).

Table 1 provides summary statistics for the loan and bond sample of daily observations.[10] There is some difference between corporate loans and bonds in the sample that is worth noting. First, the par value of corporate loans at issuance is smaller particularly for the bottom 50% of the distribution than that of corporate bonds. The difference between the mean and median is also larger for loans. Second, outstanding corporate loans have considerably shorter maturities than those of outstanding corporate bonds. Third, the average age of corporate loans is much shorter than that of corporate bonds — this is related to the fact that loans are typically issued with shorter maturity than that of bonds, and that loans generally have very limited call protections and are refinanced quite often. Fourth, credit quality is much worse for corporate loans than for bonds: loan spreads are larger than bond spreads across the entire distribution. Over 90% of rated loans are below-investment grade — so called "leveraged loans". By contrast, the majority of rated corporate bonds are investment grade.

One thing that is worth noting is that the loan sample coverage differs substantially, particularly along the time dimension, among different exercises in this paper. As shown in Figure 2, the loan sample from the LSTA/LPC data for the computation of loan spread (after applying filters mentioned above) well covers the entire sample period since mid-1999. However, the LSTA/LPC sample of loans that have an assigned CUSIP, which is the main identifier for linking the loan to ratings databases, does have a quite limited coverage before 2006 and the number of observations starts to stabilize in 2007. Therefore, exercises using the LSTA/LPC sample that involve ratings mostly covers the Global Financial Crisis (GFC) period and the post-GFC period. For the CLO transactions sample data, the coverage starts

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[10] Note that coupon spreads for loans and coupon rates for bonds are not directly comparable as loans in the sample pay those coupon spreads over LIBOR.

to become meaningful starting from 2013. The CLO transactions sample has an extremely poor coverage before 2012, and the number of loans in that sample starts to catch up that of the LSTA/LPC sample in 2013.

4 Results

4.1 Co-movements between Corporate Loan and Bond Spreads

Corporate loan and bond prices are known to be highly correlated in aggregate. Figure 4 shows the US Leveraged Loan Index Spread-to-Maturity (LLI STM, black line) published by S&P LCD along with the US High Yield Index Option-Adjusted Spread (HY OAS, red line) and US Corporate Index Option-Adjusted Spread (Corporate OAS, blue line, left axis) published by ICE BofA, all at monthly frequency. As shown in the table below the figure, the level correlation between the LLI STM and HY OAS is about 85%, and that between the LLI STM and Corporate OAS is about 91%. For changes, the correlation between the LLI STM and HY OAS is about 82%, which is also roughly the correlation betwen the LLI STM and Corporate OAS.[11] Given the high correlation between aggregate loan and bond spread changes, it is natural to compare loan spread reactions to monetary policy news with those of bonds.

To justify the comparison further, this paper investigates co-movements of changes in spreads in the cross section of loans and bonds — namely, how pervasive co-movements are across loans and bonds —, using the methodology of principal component analyses (PCAs). I sort loans and bonds, separately, on their characteristics — spread, maturity, coupon (coupon spread for loans), age (time from issuance), par amount outstanding, and industry — at monthly frequency and form 10 portfolios of loans and bonds, respectively, based on the sorting. Then, I compute the average spread changes across loans/bonds in each portfolio

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[11] Note that the level and change correlation are both higher between the HY OAS and Corporate OAS at about 93% and 87%, respectively, which is not surprising given the strong one-factor structure in (changes in) corporate bond spreads documented in Collin-Dufresne *et al.* (2001).

and obtain (monthly) spread changes for 10 loan portfolios and for 10 bond portfolios.[12] I perform PCAs on standardized average spread changes of those 20 portfolios of loans and bonds.[13]

I obtain a robust two-factor structure for loan and bond spread changes, regardless of the sorting variable, with the dominant first factor. The first factor is the weighted sum of the aggregate loan spread changes and the aggregate bond spread changes:

$$(L+B) \equiv \left(\Delta\overline{\text{Loan Spread}}\right) + \frac{S.D.\left(\Delta\overline{\text{Loan Spread}}\right)}{S.D.\left(\Delta\overline{\text{Bond Spread}}\right)}\left(\Delta\overline{\text{Bond Spread}}\right)\ , \tag{1}$$

where $S.D.$ stands for standard deviation.[14] Table 2 shows that the correlation between $(L+B)$ and the first principal components (PCs) based on different sorting is close to 100% and, therefore, the first PCs are essentially $(L+B)$. As shown in the same table, the first PCs explains roughly 85% of the variations of (standardized) portfolio spread changes.

The second factor is robust although it is not as dominant as the first factor. The second factor is the weighted difference of the aggregate loan spread changes and the aggregate bond spread changes:[15]

$$(L-B) \equiv \left(\Delta\overline{\text{Loan Spread}}\right) - \frac{S.D.\left(\Delta\overline{\text{Loan Spread}}\right)}{S.D.\left(\Delta\overline{\text{Bond Spread}}\right)}\left(\Delta\overline{\text{Bond Spread}}\right)\ . \tag{2}$$

The second factor, $(L-B)$, is essentially the second PCs based on different sorting, as shown by its high correlations with the second PCs in Table 2. This result shows that $(L-B)$ is

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[12] One exception is the industry portfolio. I use industry divisions based on the SIC code (10 divisions with additional "Non-classifiable" division, which I do not include). However, since there are divisions that have too few observations, I exclude divisions that have less than 5 observations at any point of time (for loans and bonds, respectively). This only leaves us 5 loan portfolios and 8 bond portfolios.

[13] I standardize the average spread changes to ensure that PCAs do not put larger weights on certain portfolios. In particular, since loans are generally of lesser credit quality, raw loan spread changes have higher volatility than those of bonds.

[14] Note that $(L+B)$ is proportional to the sum of the standardized aggregate loan spread changes and standardized aggregate bond spread changes.

[15] Similar to $(L+B)$, $(L-B)$ is proportional to the difference of the standardized aggregate loan spread changes and standardized aggregate bond spread changes. Note that $(L+B)$ and $(L-B)$ are orthogonal by construction.

a robust factor that survives across different sorting. Yet, as shown in the same table, the second PCs only explain roughly 6-8% of the variations of (standardized) portfolio spread changes.

The first factor $(L + B)$ moves loan and bond spreads in the same direction, and the second factor $(L - B)$ moves loan and bond spreads in the opposite direction. Table 3 documents the beta loading (exposure) of spread changes for each loan and bond portfolio, sorted by their characteristics. As shown in the table, loan and bond spread changes both have positive exposure to the $(L + B)$ factor. On the other hand, loan spreads have positive exposure to the $(L - B)$ factor, but bond spreads have negative exposure to the same factor. Those betas imply that both loan and bond spreads increase when $(L + B)$ increases, and loan spreads increase but bond spreads decrease when $(L - B)$ increases.

While the PCA results across different sorting shows that the two-factor structure is quite robust across loans and bonds, the $(L - B)$ factor might reflect differences in characteristics between loans and bonds. There are several major differences in characteristics between loans and bonds: 1) nearly all loans make floating-rate interest payments, while most bonds pay fixed-rate coupons, 2) loans are typically senior secured, while the vast majority of corporate bonds are senior unsecured, 3) nearly all loans are callable and have limited call protections, while bonds generally have stricter call protections (including non-callable bonds), and 4) loans are generally under stricter covenants than bonds.[16] In addition, loan issuers and bond issuers typically have different characteristics.

To address this concern, I consider a subset of bonds and loans that are closer to each other in their characteristics and compute the beta loading of spread changes for those subsets. If the differential systematic movement between loan and bond spreads are mainly driven by such difference in characteristics, I am expected to find the opposite beta loading on $(L - B)$. In other words, if that is the case, betas on $(L - B)$ for bonds that are similar to loans should be positive, and betas on $(L - B)$ for loans that are similar to bonds should

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[16] Floating-rate notes (FRNs) are bonds but pay floating-rate coupons.

be negative.

However, I do not find such inversion of beta loading on $(L - B)$ for several subsets of loans and bonds that I consider. As Table 4 shows, I consider 1) senior secured bonds, 2) callable bonds, 3) callable bonds after their first call date, 4) covenant-light loans, 5) a matched sample of loans and bonds, i.e., those of firms that have both loans and bonds outstanding, and 6) floating-rate notes (FRNs).[17] Note that for FRNs (the last column of Table 4), I use the TRACE data since the ICE data only covers bonds with fixed-rate coupons.[18] For all of those subsets, I find the same sign of beta loading on $(L - B)$ as that of the beta loading of the average loans and bonds in the sample, i.e., the beta loadings on $(L - B)$ is positive for each subset of loans (sixth and seventh columns) and is negative for each subset of bonds (third, fourth, fifth,eighth, and ninth columns). In particular, the result for the matched sample shows that issuer difference between loans and bonds do not explain the $(L - B)$ factor. In addition, the result that FRNs have the same beta loading on $(L - B)$ as that of fixed-rate bonds indicates that the floating-rate nature of loans also does not explain the systematic difference between loan and bond pricing.

The robust two-factor structure for spread changes across loans and bonds has several implications for a comparison of loan and bond spread reactions to monetary policy. First, given the dominance of the $(L+B)$ factor, differential beta loadings between loans and bonds on that factor may partly drive the differential spread reactions to monetary policy. That component of the differential spread reactions does not reflect genuine difference between loan and bond spread reactions, since the $(L + B)$ factor represents common spread movements across loans and bonds. Therefore, I would want to control for beta loadings on the $(L + B)$ factor when comparing loan and bond spread reactions to monetary policy. Second, controlling for beta loadings on the $(L + B)$ factor, difference in loan and bond spread responses to monetary policy can be interpreted as driven by the $(L - B)$ factor, which

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[17] In Table 4, standard errors are two-way clustered in the year-month and instrument dimensions.

[18] This paper outlines how I process the TRACE data (including FRNs) in Section A.1.

systemically differentiates loan and bond spread movements. Third, to the extent which the $(L-B)$ factor is not driven by difference in loan and bond characteristics, differential spread reactions to monetary policy between loans and bonds are not driven by such difference in characteristics.

4.2 Baseline Results

As a first step to establish how monetary policy affects loan prices, I regress the aggregate changes of corporate loan spreads on changes of on-the-run 2-year Treasury yields around FOMC announcements.[19] For 2-year Treasury yields, I take 30-minute window changes around each announcement, from 10 minutes before through 20 minutes after the announcement, following Gürkaynak *et al.* (2005). For loan spreads, I take 11-day changes around each announcement, from 1 day before $(t-1)$ through 10 days after $(t+10)$ each announcement.[20] More specifically, I run the following regression:

$$\Delta\overline{Spread}_t = \alpha + \beta(MP\ Shock)_t + \epsilon_t \ , \tag{3}$$

where $(MP\ Shock)$ refers to high-frequency changes in 2-year Treasury yields and

$$\Delta\overline{Spread}_t = \frac{1}{N_t}\sum_i \Delta Spread_{i,t} \quad , \quad N_t \equiv (\text{Number of loans at } t) \ ,$$

where i indicates individual loans. Figure 3 (top left chart) shows the results of this regression.[21] The slope coefficient β of the regression 3 is close to zero and not statistically significant.

I run the same regression for corporate bond spread changes to benchmark this result for

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[19] I only consider announcements from scheduled FOMC meetings since 1999/07/09.

[20] Since the available pricing data is based on quotes, to capture possible lags in price response, I take a relatively long window for loan spread changes. I test how the length of the window affects my results in later part of this paper.

[21] Throughout this paper, unless otherwise noted, I take a Newey-West HAC covariance matrix (with Bartlett Kernel) for the computation of standard errors of regression coefficients. The optimal bandwidth is chosen following Newey and West (1994).

loan spread changes, as justified by the dominant $(L+B)$ factor driving common movements between loan and bond spread changes. Another justification is that corporate loans and bonds are both credit instruments for firms and oftentimes are considered as an alternative financing option to each other. One advantage of focusing on the differential impact of monetary policy on loan and bond spreads is that is to distinguish this paper's contribution from earlier studies: there has been quite a bit of research that studies the impact of monetary policy on bond prices.

Bond spreads respond positively to a tightening monetary policy shock, and the result is statistically significant, as shown in Figure 3. The aggregate changes of bond spreads (top right chart) increases following a tightening monetary policy shock, proxied by a high-frequency (30-minute) change in 2-year (on-the-run) Treasury yields. As shown in the bottom charts, spreads of investment-grade bonds (IG bonds, bottom left chart) and those of high-yield bonds (HY bonds, bottom right chart) both react positively to a tightening monetary policy shock.[22] However, the slope coefficient is much larger for high-yield bonds and is statistically more significant.

I take spread changes as the main dependent variable because the maturity profile of loans and that of bonds are starkly different in the sample, as shown in Table 1. Since bonds generally have much longer maturity, bond prices respond more sensitively to interest rate changes (so called "duration effects"), and so do prices of the benchmark risk-free bonds. To control for this difference and to separate out the impact of monetary policy on the risk-free component of (loan and bond) yields, I choose spread changes as the main dependent variable throughout this paper. In Section A.4, I also run similar regressions as regression (3) with returns and yield-to-maturities (YTMs) as the dependent variables. I largely obtain the same result that loan returns and YTMs do not respond as much to monetary policy shocks as those of bonds do.

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[22] I determine IG vs. HY based on the average rating among Moody's, S&P, and Fitch that is provided by the ICE Index.

To ensure that the regression results in Figure 3 are not driven by the choice of changes of 2-year Treasury yields as a proxy for monetary policy shocks, I run the same regression using changes of other proxies in the same 30-minute window around FOMC announcement.[23] The results are largely similar as for using 2-year Treasury yield changes — loan spread reactions are muted while bond spreads, both for IG and HY bonds, react positively to a tightening shock — as shown in the first four columns of Table 5.

While this naive comparison between loan and bond spread responses to monetary policy shocks indicates that their reactions to monetary policy differ, it is not very clear how to make a right comparison between reactions of loan spreads and bond spreads. To illustrate this point, the last three columns of Table 5 show regression coefficients of simple difference between loan and bond spread changes on proxies of monetary policy news. The slope coefficient for simple difference between loan and bond spread changes for the entire bond sample is positive and statistically significant, as well as that for HY bonds. Yet, the slope coefficient for simple difference between loan and IG bond spread changes is largely statistically insignificant across different proxies of monetary policy shocks.

As discussed in section 4.1, the differential spread reactions to monetary policy may be partly driven by difference in beta loadings on the $(L+B)$ factor between loans and bonds. This possibility indicates that the differential spread reactions may be partly due to common movements in loan and bond spreads with differential magnitudes. In the next section, I control for difference in beta loadings on the $(L+B)$ factor when making a comparison between loan and bond spread reactions to monetary policy news.

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[23] Those proxies include 1) changes in Fed fund futures rates in 1 month (FF1) and in 3 months (FF3), 2) changes in Eurodollar future rates in 2 quarters (ED2) and 4 quarters (ED4), 3) changes in 2-year on-the-run Treasury rates (ONRUN2), and 4) changes in expected policy rates inferred from Fed fund futures rates taking into account of that those future contracts are based on monthly average of Fed funds rate, following procedures described in Bernanke and Kuttner (2005), for 1-month (MP1) and 3-months (MP3).

4.3 Loan and Bond Reaction Comparison and Robustness Checks

In this section, I control for loan and bond exposures on the $(L+B)$ factor when comparing their spread responses to monetary policy news. I match the beta of loan spread changes on $(L+B)$ to that of bond spread changes by scaling the bond spread changes. The difference of those loan and (scaled) bond spread changes have zero exposure on the $(L+B)$ factor and, therefore, can be thought of as driven by the $(L-B)$ factor, which systematically differentiates loan and bond spread changes.

To be more specific, I first run monthly regressions of loan and bond spread changes, respectively, on the $(L+B)$ factor:

$$\Delta\overline{Spread}_t = \alpha + \beta(L+B)_t + \epsilon_t \ . \tag{4}$$

Then I take weighed difference between loan and bond spread changes around FOMC announcements:

$$\text{(Weighed Difference of Spread Changes)} \equiv \left(\Delta\overline{\text{Loan Spread}}\right) - \frac{\beta_{Loan}}{\beta_{Bond}}\left(\Delta\overline{\text{Bond Spread}}\right) \ , \tag{5}$$

where β_{Loan} and β_{Bond} are estimated beta loadings of loan and bond spread changes, respectively, on the $(L+B)$ factor from the monthly regression (4).

Differential spread responses to monetary policy shocks between loans and bonds are negative and statistically significant after controlling for exposures on the $(L+B)$ factor, as shown in the last three columns of Table 6. After controlling for beta loadings on the $(L+B)$ factor, even differential spread responses between loans and IG bonds to monetary policy shocks are statistically significant. Therefore, this analysis concludes that loan spread reactions to monetary policy shocks differ from those of bonds and are fundamentally weaker.

To ensure the robustness of the differential spread reaction to monetary policy between loans and bonds, I perform several robustness tests in panel a of Table 7. First, I again consider a matched sample of loans and bonds — those of firms that have both loans and bonds outstanding. The first and second columns of Table 7 show that, controlling for the common component, the differential spread reactions between loans and bonds of the matched sample are negative and statistically significant. In the third column of the table, motivated by Abdi and Wu (2018), which documents corporate bond market movements before FOMC announcements, I consider changes of spreads between $(t-5)$ and $(t+10)$ instead of $(t-1)$ and $(t+10)$. I still find a negative and statistically significant coefficient, but the magnitude is notably larger. In the fourth and fifth columns of the table, the sample is limited to loans and bonds with 3 to 4 years remaining to their maturities to explicitly control for difference in the maturity profile of loans and bonds (see Table 1). Controlling for the common component between them by taking a weighted difference, the regression coefficient for the differential spread reactions is negative and statistically significant for both columns (loan vs. all bonds and loan vs. HY bonds).

In panel b of Table 7, I consider an alternative monetary policy shock that is extracted from a structural VAR with sign restrictions: a shock that moves the interest rate (2-year Treasury yield) and the stock prices (S&P 500 index) in the opposite direction. Imposing such sign restrictions is to extract a component of monetary policy surprises that is not contaminated by the Fed Information effect documented in the literature.[24] My methodology is similar to Jarociński and Karadi (2020) and details of the methodology can be found in Section A.3. In the first column, loan spread reactions to the alternative monetary policy shock are not statistically significant as before but the magnitude is a bit larger than those to the high-frequency 2-year Treasury yield changes around FOMC announcements. In the second and third columns, (all/high yield) bond spread reactions are positive to the alternative monetary policy shocks and are statistically significant. In the fourth and fifth columns, the regression coefficient for the weighted difference of spread reactions between loans and (all/high yield) bonds is negative but statistically not significant. For the matched sample in the last column of panel b, the regression coefficient for differential spread reactions

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[24] Cieslak and Schrimpf (2019) and Jarociński and Karadi (2020) take this type of approach.

to the alternative monetary policy is negative and marginally significant. In sum, I find that loan spread reactions to the alternative monetary policy shocks are relatively muted compared with bond spread reactions, but the difference is not statistically significant (loans vs. all/HY bonds) or marginally significant (for the matched sample).

I also investigate how the relation between differential spread changes of loans and bonds and monetary policy shocks changes over different periods. Table 8 shows the regression coefficients of differential spread changes between loans and bonds on monetary policy shocks for different sub-periods. The dependent variable in panel a of the table is differential spread changes between loans and the entire sample of bonds and that in panel b is differential spread changes between loans and HY bonds. It is worth noting that I rely on only a small number of observations by splitting the sample into multiple sub-periods, and it is natural to expect the statistical significance of the regression coefficient to go down quite a bit.

With this caveat in mind, I find that the regression coefficient is negative and statistically significant for the pre-GFC period. I also find that the coefficient is much larger for the GFC period, but I prefer not to make much inference out of only 8 observations. For the post-GFC period, I find a substantially smaller in magnitude and statistically insignificant regression coefficient. This may reflect the fact that large part of the post-GFC period was subject to the zero lower bound (ZLB). During the ZLB, which often involves forward guidance, my proxy of monetary policy shocks — high-frequency changes in 2-year Treasury yields around FOMC announcements — is less likely to capture monetary policy news related to policy rate changes in the near term. Consistent with this reasoning, I find that the regression coefficient is close to zero and statistically insignificant during the ZLB period in the post-GFC period (July 2009 through November 2015). By contrast, the slope coefficient after the ZLB period (December 2015 through February 2020) is slight smaller in magnitude but not very different from that for the pre-GFC period.[25]

While it makes sense that the measure of monetary policy shocks may not be a good

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[25] The slope coefficient is not statistically significant, but this subsample only involves 34 observations.

proxy during the ZLB period, another possible interpretation of weaker differential reactions of loan and bond spreads during that period is LIBOR floors for loans. A LIBOR floor serves as the minimum rate that a loan needs to pay in addition to its LIBOR spread. Therefore, during the ZLB, loans with LIBOR floors make fixed-rate payments instead of floating-rate payments, making loans more similar to bonds in their payment schedule. The share of outstanding loans with (different) floors is plotted in Figure 5. As can be seen from the figure, LIBOR floors started to become popular as the U.S. experienced the ZLB for the first time due to the GFC. During the ZLB period, most loans were issued with non-zero (positive) floors. As the fed funds rate started to lift off from zero in late 2015, LIBOR floors started to lose their popularity among new issuance, but the trend reversed in early 2020 as the Federal Reserve cut the fed funds rate to zero again in response to the pandemic. Typical LIBOR floors are 75-125 basis points, but some loans have higher floors.

To test this hypothesis that LIBOR floors are the reason for the weaker differential reactions between loans and bonds during ZLB period, I only consider loans with no LIBOR floor in Table 9. The first three columns of this table show that the main regression results that loan spreads respond weaker to monetary policy shocks than bond spreads still hold. Therefore, this paper's main results are not driven by LIBOR floors. In the last two columns of the table, I find that the weaker differential reactions between loans and bonds during the ZLB period still hold for the subset of loans with no LIBOR floor. These results are not consistent with the interpretation that loans become more similar to bonds during the ZLB period due to LIBOR floors, and, therefore, react to monetary policy more similarly to bonds.

Next, I examine how the regression coefficient of the differential spread changes between loans and bonds on monetary policy shocks depends on the choice of time window for spread changes. Figure 7 shows how the slope coefficient changes as I adjust the estimation window for spread changes, i.e., from $t-1$ through $t+k$ with adjusting k. The figure shows that the slope coefficient of the differential spread changes slowly decreases as I increase the length of the estimation window up to $t+11$. Then, the slope coefficient stabilizes after that point. This result may reflect possible lags in adjusting quotes by dealers and partly justifies the choice of a long window for the estimation of spread changes.

Finally, I test whether loan and bond spreads react differently to positive and negative monetary policy shocks. The first two columns of Table 10 show the baseline results for (1) the weighted difference of loan and bond spread changes and (2) that of loan and high yield bond spread changes around FOMC announcements. For the rest columns, I add an interaction term between monetary policy shocks — high-frequency changes in 2-year Treasury yields around FOMC announcements — and a dummy for positive (tightening) monetary policy shocks as well as the dummy itself:

$$\begin{aligned} \Delta\overline{Spread}_t &= \alpha_1 + \beta_1 (\mathit{MP\ Shock})_t + \alpha_2(\{\mathit{MP\ Shock} > 0\}\ \mathit{Dummy})_t \\ &\quad + \beta_2(\mathit{MP\ Shock})_t \times (\{\mathit{MP\ Shock} > 0\}\ \mathit{Dummy})_t + \epsilon_t\ , \end{aligned} \tag{6}$$

The coefficient of interest regarding asymmetric spread reactions is β_2. Statistically significant β_2 implies that spread reactions to positive monetary policy shocks are different from those to negative monetary policy shocks. In the rest columns, I find that none of β_2 is statistically significant. Therefore, I do not find statistically meaningful asymmetric spread reactions to monetary policy shocks. While the magnitude of β_2 is not small in size for some columns in Table 10, those coefficients are not robust after removing outliers as discussed in Section A.5.

4.4 Decomposition of the Differential Spread Reactions to Monetary Policy

The standard asset pricing theory tells us that (loan or bond) spreads are comprised of two components: the fundamental component (compensation for expected default) and the risk premium component. The loan spread reactions to monetary policy may differ from those of bonds due to differential reactions in the fundamental component, or those in the risk premium component, or both.

In this section, I decompose loan and bond spreads into the fundamental component and the risk premium component. For this purpose, this paper follows Gilchrist and Zakrajšek (2012) and constructs the excess loan premium (ELP) similar to the excess bond premium (EBP).[26] Gilchrist and Zakrajšek (2012) runs a regression of (log) bond spreads on variables that are known to predict defaults, and take the (transformed) residual of this regression as the risk premium component. My detailed methodology for the computation of the ELP and EBP as well as the predictive regression results are presented in the Appendix in Section A.6.

Since the sample that is used for the ELP and EBP computations is a subset of the full sample that is used for Table 5 and 6, I first run a regression of loan and bond differential spread changes on monetary policy shocks. This regression is mainly to ensure that the differential spread reaction for the full sample exists for this subset of loans and bonds. The first and second columns of of Table 11 confirm that for this subset of loans and bonds, loan spreads do not react as much as bond spreads do to monetary policy shocks as for the full sample. In the third column, I also confirm that the regression coefficient for the weighted difference, controlling for the common component, is negative and statistically significant across the majority of proxies for monetary policy shocks. Yet, the differential spread reactions seem weaker for this subset of loans and bonds than those for the entire sample as in Table 5 and 6.

Then, I run the same regression for the ELP and EBP as well as their differences, as shown in the same table. I first find that the ELP and EBP themselves do not respond strongly to monetary policy shocks — particularly the EBP does not respond as much as bond spreads do. The simple difference and the weighted difference of the ELP and EBP react negatively to monetary policy shocks that are based on instruments maturing in 6 months and longer. For the weighted difference, the seventh column reports results for the loan and the entire

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[26] Saunders *et al.* (2021) is an earlier study that takes a similar methodology as for the EBP to compute the ELP.

bond sample, and the eighth column reports those for the loan and HY bond sample. In particular, I find that the regression coefficient for the weighted difference of reactions of the ELP and EBP for the HY bond sample is negative and statistically significant across almost all proxies for monetary policy shocks (except for the 1-month Fed fund futures rate change).

I also run the same regression for the fitted component (compensation for expected default) difference between loans and bonds. In the last two columns of the same table, I show that the regression coefficients are statistically insignificant and generally small.[27] Therefore, I conclude that the differential spread reactions between loans and bonds to monetary policy are mainly through the risk premium component, rather than through the fundamental (expected default) component.

In Table 12, I run additional regressions, largely similar to those in Table 7, which take spread changes as the main dependent variable, to check the robustness of the regression results for the ELP and EBP differential reactions. In panel a, I obtain largely similar results as those in panel a of Table 7: the regression coefficient on difference between the ELP and EBP reactions to monetary policy shocks is negative and statistically significant across different specifications. In panel b, I take the alternative monetary shocks that are used in panel b of Table 7 as the main regressor. In the first column, I find positive and marginally significant ELP reactions to the alternative monetary shocks, and this result is different from that in panel b of Table 7. In the second and third columns, I find positive and statistically significant EBP reactions for all/HY bonds in the sample, similar to the results in panel b of Table 7. In the rest columns for the differential ELP and EBP reactions, I find negative regression coefficients that are statistically significant, except for the fourth column for the differential ELP and EBP reactions for loans and all bonds. Therefore, I find that both the ELP and EBP respond to the alternative monetary policy shocks, but the ELP

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[27] One exception is that their coefficient on FF1, rate changes of Fed fund futures that mature in a month, is not small in magnitude, although the coefficient is not statistically significant.

reactions are weaker than the EBP reactions.

In Table 13, I run regressions for different subperiods, similar to those in Table 8. I find slightly different results for the differential ELP and EBP regressions from those for the differential loan and bond spread regressions. First, I do not find statistically significant differential ELP and EBP reactions for the pre-GFC and the GFC period when I consider the entire loan and bond sample (first and second columns of panel a). Yet, I do find a statistically significant negative regression coefficient for the pre-GFC and GFC period when I compare loans with HY bonds in the sample (first and second columns of panel b). Second, the differential ELP and EBP reactions for the non-ZLB period after the GFC are negative and statistically significant (last column of panel a and b) unlike that the differential loan and bond spread reactions for the same period are negative but not statistically significant in Table 8. Despite these differences, I find that the results for differential ELP and EBP reactions to monetary policy shocks are largely similar to those for differential loan and bond spread reactions. In particular, the differential reactions become weaker for the ZLB period.

Lastly, I examine how the choice of the estimation window for ELP and EBP changes around FOMC announcements affects my main regression result. As shown in Figure 8, the results are largely similar to those for spread changes as in Figure 7: the regression coefficient takes about 10 days after FOMC announcements to stabilize.

4.5 Tests Utilizing Cross Sectional Variations

So far, this paper's regressions of spread changes on monetary policy shocks only involve aggregate (average) spread changes. In this section, this paper considers tests that utilize cross sectional variations of spread reactions to monetary policy shocks.

First, I consider a regression at individual instrument level, a cross sectional version of the baseline regression:

$$\begin{aligned} \Delta Spread_{i,t} &= \alpha + \beta_1 (MP\ Shock)_t + \beta_2 (MP\ Shock)_t \times (LoanDummy)_i \\ &\quad + (Fixed\ Effects) + \epsilon_{i,t}\ , \end{aligned} \tag{7}$$

where a pooled sample of loans and bonds is used. The coefficient of interest is β_2. Table 14 reports the regression coefficients (panel a for loan and the entire bond sample, and panel b for loan and HY bond sample), where standard errors are two-way clustered in the meeting (time) and instrument dimensions.

In both panel a and b, β_2 are very close to β_1 with the opposite sign for all columns (with different fixed effects), indicating that there is not a sizable impact of monetary policy shocks on loan spread changes. This result is consistent with the previous results using aggregate spread changes. However, none of β_2's in panel a are statistically significant, while all of β_2's in panel b are statistically significant. This difference reflects the fact that by design the OLS regression involves simple difference rather than weighted difference. Therefore, the OLS regression does not (fully) control for the common component between loan and bond spread changes. Since loans in the sample (most of which are leveraged loans) are similar to high yield bonds in their nature, a comparison between loans and high yield bonds is likely to control for the common component better.

The above regression results basically confirm the previous results, using aggregate spread changes around FOMC announcement dates, that loan spread reactions to monetary policy shocks are relatively muted. Next, I test whether loan spread reactions to monetary policy shocks are also (relatively) muted as their credit risk increases. As can be seen in Table 5, bond spread reactions to monetary policy shock are stronger for HY bonds than IG bonds are — bond spread reactions to monetary policy increase as credit risk increases. I can use such cross-sectional variations in spread reactions to monetary policy to test whether loan spread reactions are *even weaker* than bond spread reactions are to monetary policy as credit risk increases. Establishing such a pattern would also strengthen my finding, which is largely based on aggregate time-series, that loan spread responses to monetary policy are weaker than those of bonds.

Specifically, I run the following regression for a pooled sample of loans and bonds:

$$\begin{aligned} \Delta Spread_{i,t} \quad = \quad & \alpha_{1,t} + \alpha_{2,t} \times (LoanDummy)_i + \beta_1 (MP\ Shock)_t \times (Credit\ Risk)_{i,t} \\ & + \beta_2 (MP\ Shock)_t \times (Credit\ Risk)_{i,t} \times (LoanDummy)_i \\ & + (Fixed\ Effects) + (Fixed\ Effects) \times (LoanDummy)_i + \epsilon_{i,t} \quad , \end{aligned} \tag{8}$$

where I use instrument ratings as the proxy for credit risk. I largely follow the empirical design of Smolyansky and Suarez (2021) for this exercise. For the fixed effects, I consider maturity, callability, and industry (grouped by 2-digit SIC code) times meeting (time) fixed effects. By adding the interaction term with $(LoanDummy)_i$ for fixed effects, I control for those fixed effects separately for loans and bonds.[28] Note that I control for a meeting (time) fixed effect $\alpha_{1,t}$, and this subsumes any time-varying aggregate variable — in this case $(MP\ Shock)_t$. Therefore, for the estimation, I rely on cross sectional variations of spread reactions around FOMC announcements rather than their variations over time.

In this regression, $\beta_2 = 0$ implies that the slope coefficient for the $(MP\ Shock)_t \times (Credit\ Risk)_{i,t}$ term is not different between loans and bonds, indicating that loan spread reactions to monetary policy shocks also become stronger as credit risk increases similarly to bond spread reactions do. On the other hand, $\beta_2 < 0$ implies that loan spread reactions to monetary policy shocks are even weaker than those of bonds for riskier loans. While $\beta_2 = 0$ does not contradict the previous findings, $\beta_2 < 0$ supports that loan spreads indeed respond weaker to monetary policy than bond spreads do across the spectrum of their credit risk — while bond spread reactions to monetary policy become stronger as credit risk increases, loan spread reactions do not become as stronger. Even further, if $\beta_2 < 0$ and the magnitude is larger than $\beta_1 > 0$, loan spread reactions to monetary policy shocks become *weaker* (or possibly become negative) as their credit risk increases, as opposed to bond spread reactions becoming *stronger* as credit risk increases. If this is the case, the qualitative reactions to monetary policy shocks are different between loans and bonds and, hence, strengthens my

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[28] For maturity, I classify loans and bonds into buckets for those with 1-2 year maturity, 2-3 year maturity, 3-4 year maturity, and so forth.

findings of weaker loan spread reactions to monetary policy.

Table 15 shows that β_1 is positive and statistically significant, and β_2 is negative and statistically significant regardless of fixed effects that I control for. The standard errors are two-way clustered in the meeting (time) and instrument dimensions. Furthermore, the magnitude of β_2 is larger than β_1, indicating that loan spread reactions to monetary policy shocks become weaker as credit risk increases. Therefore, the differential spread reactions between loans and bonds are more pronounced for riskier loans.

Table 16 reports the same regression result for different subperiods. Note that I do not separate the pre-GFC period as the loan sample with ratings has a quite limited coverage for the pre-GFC period, as discussed in Section 3.2. I find that, similar to what I find in the previous sections, except for the ZLB period, β_2 is negative and statistically significant. During the ZLB period, both β_1 and β_2 are small in magnitude and statistically not significant. In addition, except for the ZLB period, I find that the magnitude of β_2 is larger than that of β_1, supporting that loan spread reactions to monetary policy become weaker as credit risk increases.

4.6 Tests Utilizing Transaction Prices

So far, almost all of my results are based on indicative quotes mainly due to the absence of comprehensive data for loan transaction prices. One possible and legitimate criticism is that quotes may deviate meaningfully from actual transaction prices, and the gap might be driving the results of this paper. To alleviate this concern, I utilize Moody's Analytics Global CLO data that contains information regarding transactions of their assets (mostly leveraged loans), including transaction prices of those assets.[29] For corporate bonds, I rely on the TRACE data for transaction prices.

Compared with the TRACE data, which essentially captures most corporate bond trans-

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[29] Transactions in the Moody's CLO data are based on trustee reports that are prepared by the portfolio administrator. CLO Investors receive those reports regularly (typically monthly).

actions since mid-2002, the coverage of the Moody's CLO data for loan transactions is quite limited. First, as can be seen from Figure 2, the Moody's CLO data has an extremely poor coverage before 2012, and its coverage starts to improve rapidly in 2012. Second, as the name of the database suggests, the Moody's CLO data only covers purchases and sales of loans by CLOs and, as a result, does not cover transactions of loans among other types of entities.[30] Third and relatedly, CLO holdings of loans are not representative of outstanding (leveraged) loans because CLOs are subject to various tests, failures of which typically harm the value of CLO equities, regarding characteristics of CLOs' assets.

With these caveats in mind, I first compare loan summary statistics of the transaction data sample with those of the quote data sample (i.e., Moody's CLO vs. LSTA/LPC) for the same period. As shown in Table 17, loans in the Moody's CLO data (panel b) are larger in size and better in credit quality than those in the LSTA/LPC data (panel a). The par value at issuance is larger, the coupon spreads (LIBOR spread) is lower, and the spread is lower for the entire distribution in the table for loans in the Moody's CLO data. Moody's ratings are higher except for the 90th percentile for loans in the Moody's CLO data.[31]

A similar comparison for corporate bonds (TRACE vs. ICE) shows that bonds in the transaction data sample are largely similar to those in the quote sample data. As shown in Table 18, all characteristics in the table are quite similar between bonds in the TRACE data and those in the ICE data across the entire distribution. One exception is that bonds in the TRACE data tend to be larger in size than those in the ICE data.

Next I compare the average spread of loans and bonds based on transaction prices with those based on indicative quotes. Figure 6 shows that the average loan spread from transaction prices is notably lower than that from quotes (left figure), but the average bond spread from transaction prices is similar to that from indicative quotes (right figure). These results

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[30] The fact that CLOs held the vast majority of outstanding leveraged loans in the past decade relieves this limitation to some extent.

[31] S&P ratings are not higher for the entire distribution for the Moody's CLO data: they are higher for the 10th and and 25th percentile but lower for the 75th percentile.

are consistent with the above comparisons that loans in the Moody's CLO data are better in credit quality than those in the LSTA/LPC data, and bonds in the TRACE data are largely similar to those in the ICE data. As can be seem in tables below Figure 6, the average spread from the transaction data is highly correlated with that from the quote data. In particular, the correlation of (monthly) average spread changes between the transaction and quote data is 94.5% for loans and 98.3% for bonds. These high correlations relieve concerns that transaction prices may deviate meaningfully from indicative quotes and my results may be driven by such deviations.

To further alleviate concerns regarding difference between transaction prices and indicative quotes, I perform the same tests in the previous sections using transaction prices. Since the Moody's CLO data provides a meaningful coverage beginning 2013, I do not have a sufficient number of aggregate observations to perform time-series tests as in Section 4.2 and 4.3.[32] Therefore, I focus on tests using cross-sectional variations in spread changes as in Section 4.5.

When computing spread changes around FOMC announcements using transaction prices, I take a slightly different approach from simply computing spread changes from $(t-1)$ to $(t+10)$. Compared with bonds in TRACE, loans tend to trade less frequently in the Moody's CLO data — typically not traded every (business) day.[33] Therefore, only considering loans that have spreads at $(t-1)$ and $(t+10)$ reduces the loan sample size quite a bit. To overcome this issue, I take difference between the average spread for $[t+1,\, t+10]$ and the average spread for $[t-5,\, t-1]$ as spread changes around FOMC announcements. This approach guarantees that I capture loans that have spreads at least once for $[t-5,\, t-1]$ and at least once for $[t+1,\, t+10]$.

Using spreads based on transaction prices from the Moody's CLO data for loans and

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[32] In addition, results in Table 8 show that the differential reactions of loan and bond spreads to monetary policy do not hold for the ZLB period. Roughly a half of the period since 2013 is the ZLB period.

[33] In the LSTA/LPC data, quotes are generally available for every business day during the loan's life.

the TRACE data for bonds, in Table 19 I run the same regression as in regression (7). In panel a, I obtain largely the same results, but β_2 of regression (7) in this table is statistically significant for all columns unlike β_2 in Table 14 is statistically not significant for all columns. In panel b, I obtain regression coefficients that are a bit smaller in magnitude than those in Table 14. Still, β_2 in all columns are statistically significant. Note that I add ratings-fixed effects in the last column since I have ratings information for most loans and bonds in the transaction sample.[34]

Similarly in Table 20, I run the same regression as in regression (8) using transaction prices. I obtain a negative and statistically significant β_2 using the transaction data as in Table 20. The coefficient β_2 remains largely the same and statistically significant as I limit the loan and bond sample to the non-ZLB period (2015/12 through 2020/02) after the GFC. Note that since the Moody's CLO data starts to have a meaningful coverage since 2013, I only focus on the non-ZLB period for robustness checks. Furthermore, the magnitude of β_2 is larger than that of β_1, again supporting that loan spread reactions to monetary policy shocks become weaker as credit risk increases.

Therefore, using transaction prices instead of indicative quotes, I confirm that loan spreads do not react to monetary policy shocks as much as bond spreads do, and differential spread reactions to monetary policy shocks become larger in magnitude for riskier loans and bonds. These results further alleviate the concerns regarding using indicative quotes for most of the previous results.

4.7 Primary Market Spread Reactions to Monetary Policy

So far, this paper has investigated secondary market loan spread reactions to monetary policy news in comparison with those of bonds. An important question for monetary policy transmission to the broader economy through corporate credit markets is whether the rel-

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[34] The LSTA/LPC data for indicative quotes does not have ratings, and I utilize CUSIP to link the data to ratings data. Since CUSIP is largely missing for loans in the pre-GFC period (see Figure 2), I do not consider ratings-fixed effects in Table 14 to preserve the loan sample.

atively muted secondary market loan spread reactions to monetary policy news transmit through the primary market. Since primary market spreads are key to corporate debt financing costs, the reaction of those spreads to monetary policy is an important element of monetary transmission to the corporate sector.

As a baseline approach, I look into issuance spreads before and after FOMC announcements.[35] To be specific, loan and bond issuance before FOMC announcements are defined by those which close between $(t-15)$ and $(t-1)$, where t is the FOMC announcement date. Similarly, issuance after FOMC announcements are defined by those which close between $(t+1)$ and $(t+15)$.[36] Then I run the following regression at instrument level i:

$$Spread_{i,t} = \alpha + \beta_1 (MP\ Shock)_t + \beta_1 (MP\ Shock)_t + \beta_2 (MP\ Shock)_t \times (After\ FOMC\ Flag) + \epsilon_{i,t}\ ,$$

where (*After FOMC Flag*) is a dummy whether the issuance occurred after the corresponding FOMC announcement. The coefficient of interest is β_2: positive and statistically significant β_2 indicates that primary market spreads increase after a tightening monetary policy shock.

As can be seen in Table 21, I find similar results as for secondary market spread reactions to monetary policy shocks: primary market loan spread reactions to monetary policy shocks are muted (panel a), and primary market bond spreads increase following a tightening shock (panel b). While these results largely support my findings for secondary market loan and bond spread reactions, this empirical design has weaknesses as issuance before and after FOMC announcements might be very different in nature. Although I add several controls to mitigate difference in characteristics between issuance before and after FOMC announcements, the empirical setup is far from ideal.

To address this concern, at least for the loan primary market, I employ an empirical

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[35] Issuance spreads are similarly computed as the secondary market spreads by taking their price after original issuance discounts (OIDs) at issuance.

[36] Note that I use calendar days instead of business days here. Also, I choose those windows to retain as many instruments as possible while preventing any overlaps between issuance before and after FOMC announcements.

design that utilizes loan syndication processes — I investigate how loan spreads change (so called "flexed") over loan syndication period with respect to monetary policy shocks that occur within the syndication window. For this purpose, I utilize the S&P LCD pipeline data as in Meisenzahl *et al.* (2021).[37] Since the S&P LCD data does not provide loan close dates as opposed to the Refinitiv Dealscan, I try two different approaches to identify loans whose syndication periods include FOMC announcements. First, since a loan syndication process takes roughly two weeks from its launch to close, as documented in Bruche *et al.* (2020), I consider loans that launch between $(t-7)$ and $(t-1)$. Second, since the S&P LCD data provides "break dates", which are the first date when the loan is traded in the secondary market, I consider loans where FOMC announcements occur between their launch date and break date.[38] Panel a of Table 22 shows results for the first approach, and panel b of the same table shows results for the second approach.

I find that loan primary market spread reactions to monetary policy news are muted, consistent with my findings for loan secondary market spread reactions. The dependent variable is the "flex" variable that takes into account loan coupon spread changes as well as their original issue discount (OID) changes over the syndication period. Therefore, the flex variable reflects full spread changes of the loan under syndication. I find that the regression coefficient of the flex variable on monetary policy shocks, proxied by high-frequency 2-year on-the-run Treasury yield changes around FOMC announcements, is small and statistically not significant.

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[37] I only consider closed ("done") deals for U.S. firms. I also filter out loans that are part of a cross-boarder deal.

[38] Since loans cannot be traded until their terms are fully determined, break dates are on or after the close dates.

5 What Drives the Differential Spread Reactions to Monetary Policy?

It is extremely difficult to pin down what drives systematic asset price changes. For example, in the stock market, there are well-known size and value factors (Fama and French (1992) and Fama and French (1993)), but there has not been a consensus on what drives those two factors. Without fully understanding what drives the differential movements between loan and bond spreads, it is almost impossible to answer what drives the differential spread reactions to monetary policy shocks between loans and bonds.

Therefore, in this section this paper does not attempt to answer what drives the differential spread reactions between loans and bonds to monetary policy. Instead, I provide a suggestive evidence that is consistent with relatively muted reaction of loan spreads to monetary policy shocks compared with that of bond spreads.

One possible explanation for the relatively muted loan spread reactions to monetary policy shocks is liquidity. Corporate loans are generally less liquid than corporate bonds, and prices of illiquid assets tend to react less to shocks than those of liquid assets. To test this hypothesis, I sort loans on their available liquidity measures and compare their reactions to monetary policy shocks. The LSTA/LPC data provides two variables that can be used as loan liquidity measures: 1) number of quotes — number of dealers which make quotes on a certain loan — and 2) mean bid-ask spread.[39] Table 23 shows that the spread reactions of relatively liquid loans (large number of quotes or low mean bid-ask spread) to monetary policy shocks are also muted — the regression coefficient is not statistically significant. Therefore, I do not find evidence that supports a narrative that illiquidity of corporate loans drives the differential spread reactions to monetary policy between loans and bonds.

Another possible explanation is that the investor base is different between the loan and

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[39] Technically, the LSTA/LPC data provides mean bid price and mean ask price, but it is straightforward to compute the mean bid-ask spread.

bond market and, therefore, difference in the dynamics of investor demand for loans and bonds may drive the differential spread reactions to monetary policy. Consistent with this hypothesis, I show that loan mutual funds receive capital inflows and CLO issuance increases in months with tightening monetary policy shocks. By contrast, high-yield bond fund flows do not react as much to monetary policy shocks. Table 24 reports the regression coefficient of monthly aggregate fund flows and CLO issuance on 2-year Treasury yield changes around FOMC announcements in the corresponding month. The coefficient is positive and statistically significant for loan fund flows and CLO issuance although that for CLO issuance is only marginally significant. Figure 9 plots the relation between those credit flows and monetary policy shocks.

This result is consistent with a narrative that investor demand for loans increases following a tightening monetary policy shock, and the increased demand lowers risk premium that investors require for holding loans. The results in Section 4.4 are also consistent with this narrative as the differential spread reactions between loans and bonds is largely driven by the differential risk premium component.

It is important to note that this is merely a correlation even under this paper's identification assumption that the high-frequency change of 2-year Treasury yields around FOMC announcements is an exogenous proxy for monetary policy shocks. Under that assumption, the regression result establishes a causal relation between monetary policy shocks and credit flows to institutions that hold loans. However, this does not have much to say about a link between those credit flows and the differential spread reactions.

6 Conclusions

This paper documents that in the secondary market, the reaction of corporate loan spreads to monetary policy news is weaker than that of bond spreads: following an unanticipated monetary policy tightening (easing) shock, loan spreads do not increase (decrease) as much as corporate bond spreads do. Further decomposition shows that differential reactions of loan and bond risk premiums are the main driver of the differential spread reactions. The weaker loan spread reactions to monetary policy shocks become more pronounced for riskier loans. Furthermore, this paper finds that the muted loan spread reactions to monetary policy news are also present in the primary market. These results are consistent with a narrative that investor demand for loans increases during policy tightening cycles. The findings of this paper suggest that the impact of monetary policy to broad economy through business credit markets might be attenuated due to heterogeneity in the impact on different credit markets.

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Tables[40]

Table 1: Summary Statistics

(a) Corporate Loan Characteristics

Statistic	Mean	St. Dev.	P10	P25	Median	P75	P90
Par value at issue ($mil.)	453.3	647.1	76.2	137.3	263.4	502.0	1,006.8
Coupon spread (bps.)	414.6	193.7	225.0	275.0	375.0	500.0	725.0
Years to Maturity (yrs.)	4.6	1.6	2.4	3.5	4.7	5.8	6.6
Age (yrs.)	1.9	1.4	0.3	0.7	1.5	2.7	3.9
Spread (percentage pts.)	6.3	4.6	2.9	3.7	4.9	7.4	10.8
Moody's rating†	—	—	Caa1	B3	B2	Ba3	Ba2
S&P rating‡	—	—	CCC+	B-	B	BB-	BB

Note: Sample period is from 1999/07/09 through 2021/06/30. Observations=6,225,582 and number of loans = 10,742. Par value at issuance is adjusted for inflation in 2012 dollars using the quarterly GDP deflator from BEA. Coupon spread refers to spread rate that loans pay over LIBOR.

†Observations=2,678,463

‡Observations=2,685,757

(b) Corporate Bond Characteristics

Statistic	Mean	St. Dev.	P10	P25	Median	P75	P90
Par value at issue ($mil.)	573.4	475.7	233.6	289.2	441.1	672.6	1,064.7
Coupon rate (bps.)	590.0	204.6	325.0	440.0	595.0	725.0	850.0
Years to Maturity (yrs.)	10.0	8.3	2.4	4.1	6.8	12.7	25.4
Age (yrs.)	4.3	3.9	0.6	1.4	3.2	5.9	8.8
Spread (percentage pts.)	2.7	3.1	0.6	1.0	1.7	3.2	5.6
Moody's rating†	—	—	B2	Ba1	Baa2	A3	A1
S&P rating‡	—	—	B	BB+	BBB	A-	A+

Note: Sample period is from 1999/07/09 through 2021/06/30. Observations=17,489,014 and number of bonds = 17,814. Par value at issuance is adjusted for inflation in 2012 dollars using the quarterly GDP deflator from BEA.

†Observations=16,173,043

‡Observations=14,407,890

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[40] For regression coefficients, * indicates that the p-value is less than 0.1, ** indicates that the p-value is less than 0.05, and *** indicates that the p-value is less than 0.01.

Table 2: Principal Component Analyses for Portfolio Spread Changes Sorted on Loan and Bond Characteristics

	Spread	Maturity	Coupon	Age	Par	Industry
PC1 correlation with (L+B)	99.3%	100.0%	99.9%	100.0%	100.0%	99.6%
PC2 correlation with (L-B)	97.2%	99.6%	98.9%	100.0%	97.9%	97.5%
Variance explained by PC1	85.4%	86.6%	86.1%	86.5%	84.3%	82.8%
Variance explained by PC2	6.1%	7.8%	7.5%	7.5%	9.1%	6.2%

Note: Sample period is from 1999/07 through 2021/06. For each variable except for industry, I sort loans and bonds, respectively, on the corresponding variable as of the previous month end. Then for each sort, I form 10 portfolios of loans and bonds, respectively, and perform the principal component analysis (PCA) on the (standardized) average monthly spread changes (from the previous month end to the current month end) for the combined 20 portfolios. PC1 and PC2 refer to the first and second principal components of those PCAs. For the industry sort, I use industry divisions based on the SIC code (10 divisions with additional ”Non-classifiable” division, which I do not include). I exclude divisions that have less than 5 observations at any point of time (for loans and bonds, respectively). This only leaves us 5 loan portfolios and 8 bond portfolios for the industry sort, and I perform the PCA on those 13 portfolios. (L+B) refers to the weighted sum of the average monthly loan and bond spread changes as in equation (1). Similarly, (L-B) refers to the weighted difference of the average monthly loan and bond spread changes as in equation (2).

Table 3: Betas of Portfolio Spread Changes on the (L+B) and (L-B) Factors

Sorting Variable: Spread

Loan	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
(L+B) Beta	0.23	0.31	0.38	0.41	0.45	0.48	0.54	0.63	0.71	0.89
(L-B) Beta	0.2	0.21	0.33	0.39	0.41	0.51	0.56	0.73	0.85	0.81

Bond	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
(L+B) Beta	0.14	0.17	0.2	0.21	0.24	0.27	0.38	0.49	0.65	1.21
(L-B) Beta	-0.05	-0.06	-0.09	-0.11	-0.13	-0.16	-0.3	-0.58	-0.9	-1.47

Sorting Variable: Maturity

Loan	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
(L+B) Beta	0.63	0.58	0.51	0.48	0.5	0.48	0.48	0.47	0.47	0.42
(L-B) Beta	0.65	0.67	0.55	0.49	0.5	0.47	0.51	0.42	0.38	0.37

Bond	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
(L+B) Beta	0.46	0.48	0.43	0.49	0.52	0.44	0.33	0.28	0.26	0.2
(L-B) Beta	-0.36	-0.38	-0.43	-0.43	-0.54	-0.48	-0.36	-0.34	-0.27	-0.28

Sorting Variable: Coupon

Loan	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
(L+B) Beta	0.35	0.5	0.58	0.52	0.55	0.46	0.43	0.47	0.58	0.57
(L-B) Beta	0.19	0.3	0.42	0.45	0.51	0.58	0.47	0.56	0.67	0.87

Bond	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
(L+B) Beta	0.25	0.27	0.27	0.28	0.32	0.34	0.4	0.47	0.54	0.76
(L-B) Beta	-0.19	-0.26	-0.25	-0.25	-0.28	-0.34	-0.45	-0.47	-0.59	-0.78

Sorting Variable: Age

Loan	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
(L+B) Beta	0.42	0.41	0.47	0.51	0.54	0.53	0.51	0.52	0.54	0.57
(L-B) Beta	0.27	0.36	0.42	0.48	0.45	0.59	0.51	0.57	0.67	0.7

Bond	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
(L+B) Beta	0.35	0.36	0.42	0.42	0.41	0.45	0.42	0.36	0.37	0.32
(L-B) Beta	-0.37	-0.44	-0.45	-0.42	-0.43	-0.46	-0.37	-0.33	-0.29	-0.29

Sorting Variable: Par

Loan	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
(L+B) Beta	0.35	0.44	0.46	0.54	0.52	0.53	0.58	0.55	0.52	0.51
(L-B) Beta	0.65	0.7	0.69	0.66	0.58	0.6	0.54	0.36	0.23	0.01

Bond	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
(L+B) Beta	0.56	0.36	0.36	0.38	0.39	0.41	0.39	0.38	0.35	0.3
(L-B) Beta	-0.4	-0.23	-0.26	-0.3	-0.29	-0.37	-0.45	-0.49	-0.48	-0.59

Note: Sample period is from 1999/07 through 2021/06. For each variable, I sort loans and bonds, respectively, on the corresponding variable as of the previous month end. Then for each sort, I form 10 portfolios of loans and bonds, respectively, and regress the average (non-standardized) monthly spread changes on the (L+B) and (L-B) factors. The (L+B) and (L-B) factors are the weighted sum and difference, respectively, of the average monthly loan and bond spread changes as in equation (1) and (2).

Table 4: Betas of Spreads for a Subset of Bonds and Loans with Certain Characteristics on (L+B) and (L-B) Factors

	Full sample: loans	Full sample: bonds	Senior secured bonds	Callable bonds	Callable bonds after first call date	Covenant-lite loans	Matched sample: loans	Matched sample: bonds	FRNs (TRACE)
(L+B)	0.5 ***	0.387 ***	0.347 ***	0.39 ***	0.803 ***	0.495 ***	0.449 ***	0.63 ***	0.312 ***
	(0.004)	(0.003)	(0.013)	(0.004)	(0.054)	(0.008)	(0.022)	(0.041)	(0.058)
(L-B)	0.5 ***	-0.387 ***	-0.394 ***	-0.401 ***	-0.851 ***	0.568 ***	0.118 *	-0.862 ***	-0.197 *
	(0.005)	(0.005)	(0.037)	(0.007)	(0.082)	(0.023)	(0.06)	(0.084)	(0.104)
N	289,334	826,846	100,427	728,580	8,616	198,578	37,261	70,513	9,243
Adj-R^2	0.174	0.172	0.134	0.186	0.196	0.183	0.204	0.215	0.125

Note: Sample period is from 1999/07 through 2021/06 except for the floating-rate notes (FRNs) in the last column (2002/07-2021/06) from the TRACE data. I take monthly spread changes for each instrument in each subset and run regressions on the (L+B) and (L-B) factors at the instrument level. The (L+B) and (L-B) factors are the weighted sum and difference, respectively, of the average monthly loan and bond spread changes as in equation (1) and (2). Standard errors are two-way clustered in the year-month and instrument dimensions.

Table 5: Regression of Loan and Bond Spread Changes on Proxies of Monetary Policy Shocks

Dependent Variable: Aggregate Changes in Spread around FOMC Meetings

Proxy for MP shock	Loan	Bond	IG Bond	HY Bond	Simple difference: Loan - Bond	Simple difference: Loan - IG	Simple difference: Loan - HY
MP1	-0.036	1.078 **	0.563 **	2.488 **	-1.114 **	-0.599 *	-2.524 **
	(0.656)	(0.545)	(0.258)	(1.24)	(0.538)	(0.329)	(1.111)
MP3	-0.074	1.238 **	0.667 ***	2.682 **	-1.312 ***	-0.741 **	-2.756 ***
	(0.509)	(0.508)	(0.236)	(1.048)	(0.389)	(0.312)	(0.922)
FF1	0.601	2.661 ***	1.32 ***	6.17 ***	-2.06 **	-0.719	-5.569 ***
	(0.968)	(0.705)	(0.377)	(1.65)	(0.995)	(0.952)	(1.793)
FF3	0.066	1.338 **	0.761 ***	2.808 **	-1.272 **	-0.695 *	-2.742 **
	(0.857)	(0.586)	(0.291)	(1.357)	(0.509)	(0.417)	(1.347)
ED2	0.007	1.069 ***	0.516 ***	2.441 ***	-1.062 ***	-0.509 *	-2.435 ***
	(0.331)	(0.331)	(0.162)	(0.757)	(0.348)	(0.268)	(0.732)
ED4	-0.22	0.713 ***	0.326 ***	1.651 ***	-0.933 ***	-0.546 *	-1.872 ***
	(0.17)	(0.214)	(0.122)	(0.486)	(0.346)	(0.287)	(0.626)
ONRUN2	-0.073	0.787 ***	0.346 **	1.87 ***	-0.86 ***	-0.419	-1.943 ***
	(0.287)	(0.269)	(0.147)	(0.695)	(0.306)	(0.254)	(0.657)
N	175	175	175	175	175	175	175

Note: Sample period is from 1999/07/09 through 2021/06/30. FF1 and FF3 are changes in 1-month and 3-month Fed fund futures rates, respectively. ED2 and ED4 are changes in 2-quarter and 4-quarter Eurodollar future rates, respectively. ONRUN2 is changes in 2-year on-the-run Treasury rates. MP1 and MP3 are changes in expected policy rates inferred from Fed fund futures rates following procedures described in Bernanke and Kuttner (2005), for 1 month and 3 months, respectively. Proxies of monetary policy shocks are changes from 10 minutes before through 20 minutes after FOMC announcements. Spread changes are from 1-day before through 10 days after FOMC announcement dates. IG refers to investment grade bonds and HY refers to high yield bonds. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

Table 6: Regression of Spread Changes on Proxies of Monetary Policy Shocks

Dependent Variable: Changes in Spread around FOMC meetings

Proxy for MP shock	Weighted sum: (L+B)	Weighted difference: (L-B)	Weighted difference: Loan - IG	Weighted difference: Loan - HY
MP1	1.357	-1.429 **	-1.205 ***	-1.782 **
	(1.201)	(0.61)	(0.39)	(0.83)
MP3	1.527	-1.675 ***	-1.461 ***	-1.956 ***
	(1.169)	(0.46)	(0.351)	(0.584)
FF1	4.04 ***	-2.838 **	-2.142 **	-3.73 ***
	(1.457)	(1.092)	(0.895)	(1.414)
FF3	1.795	-1.663 **	-1.516 ***	-1.905 **
	(1.581)	(0.679)	(0.395)	(0.96)
ED2	1.388 *	-1.375 ***	-1.065 ***	-1.707 ***
	(0.713)	(0.412)	(0.363)	(0.51)
ED4	0.701 ***	-1.142 ***	-0.898 **	-1.379 ***
	(0.165)	(0.423)	(0.381)	(0.476)
ONRUN2	0.943 *	-1.09 ***	-0.791 **	-1.386 ***
	(0.495)	(0.37)	(0.33)	(0.474)
N	175	175	175	175

Note: Sample period is from 1999/07/09 through 2021/06/30. FF1 and FF3 are changes in 1-month and 3-month Fed fund futures rates, respectively. ED2 and ED4 are changes in 2-quarter and 4-quarter Eurodollar future rates, respectively. ONRUN2 is changes in 2-year on-the-run Treasury rates. MP1 and MP3 are changes in expected policy rates inferred from Fed fund futures rates following procedures described in Bernanke and Kuttner (2005), for 1 month and 3 months, respectively. Proxies of monetary policy shocks are changes from 10 minutes before through 20 minutes after FOMC announcements. Spread changes are from 1-day before through 10 days after FOMC announcement dates. The (L+B) and (L-B) factors are the weighted sum and difference, respectively, of the average monthly loan and bond spread changes as in equation (1) and (2). IG refers to investment grade bonds and HY refers to high yield bonds. In the third and fourth columns, the weighted difference is computed based on equation (5). Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

Table 7: Robustness Checks for Loan vs. Bond Spread Reactions to Monetary Policy Shocks

Panel a: Different Specifications

Dependent Variable: Changes in Spread around FOMC meetings

	Matched sample: simple difference Loan - Bond	Matched sample: weighted difference Loan - Bond	Change from t-5: weighted difference Loan - Bond	3 to 4 years to maturity: weighted difference Loan - Bond	3 to 4 years to maturity: weighted difference Loan - HY
MP shock	-1.307 ***	-0.772 **	-1.562 ***	-1.091 ***	-1.568 ***
	(0.417)	(0.337)	(0.546)	(0.363)	(0.513)
N	175	175	175	175	175
Adj-R^2	0.037	0.023	0.076	0.041	0.063

Note: Sample period is from 1999/07/09 through 2021/06/30. Spread changes except for the third column are from 1-day before through 10 days after FOMC announcement dates. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. The matched sample refers to those issued by firms that have both loans and bonds outstanding. Changes from $t-5$ refer to spread changes from 5 days before through 10 days after FOMC announcement dates. 3 to 4 years to maturity refer to the sample of loans and bonds with 3 to 4 years remaining to maturity. HY refers to high yield bonds. Weighted difference is computed based on equation (5). Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

Panel b: MP Shocks from Sign Restriction VAR

Dependent Variable: Changes in Spread around FOMC meetings

	Loan	Bond	HY Bond	Weighted difference: Loan - Bond	Weighted difference: Loan - HY	Matched sample: weighted difference Loan - Bond
MP shock from sign restriction VAR	0.762	1.303 ***	3.004 ***	-0.923	-1.347	-0.856 *
	(0.464)	(0.464)	(1.141)	(0.764)	(0.875)	(0.51)
N	175	175	175	175	175	175
Adj-R^2	0.009	0.062	0.064	0.015	0.024	0.013

Note: Sample period is from 1999/07/09 through 2021/06/30. Spread changes are from 1 day before through 10 days after FOMC announcement dates. MP shocks from sign restrictions are constructed as described in Section A.3. HY refers to high yield bonds. The matched sample refers to those issued by firms that have both loans and bonds outstanding. Weighted difference is computed based on equation (5). Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

Table 8: Subperiods: Loan vs. Bond Spread Reactions to Monetary Policy Shocks

Panel a: Weighted difference of loan and bond spread changes for the entire bond sample

Dependent Variable: Changes in (L-B) around FOMC meetings

	Pre-GFC (-2008/06)	GFC (2008/07-2009/06)	Post-GFC (2009/07-)	ZLB period (2009/07-2015/11)	After ZLB (2015/12-2020/02)
MP shock	-1.065 ***	-3.294 **	-0.176	0.192	-0.716
	(0.353)	(1.073)	(0.668)	(1.12)	(0.526)
N	72	8	95	51	34
Adj-R^2	0.046	0.115	-0.009	-0.019	0.015

Note: Sample period is from 1999/07/09 through 2021/06/30. Spread changes are from 1-day before through 10 days after FOMC announcement dates. (L-B) refers to weighted difference of the average loan and bond spread changes, where the weights are determined as in equation (2) based on monthly spread changes. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. GFC refers to Global Financial Crisis, and ZLB refers to zero lower bound. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

Panel b: Weighted difference of loan and high yield bond spread changes

Dependent Variable: Changes in Spread around FOMC meetings

	Pre-GFC (-2008/06)	GFC (2008/07-2009/06)	Post-GFC (2009/07-)	ZLB period (2009/07-2015/11)	After ZLB (2015/12-2020/02)
MP shock	-1.326 ***	-4.228 ***	-0.296	0.06	-0.961
	(0.444)	(1.129)	(0.822)	(1.339)	(0.693)
N	72	8	95	51	34
Adj-R^2	0.047	0.279	-0.008	-0.02	0.016

Note: Sample period is from 1999/07/09 through 2021/06/30. Spread changes are from 1-day before through 10 days after FOMC announcement dates. The dependent variable is weighted difference of the average loan and high yield bond spread changes, where the weights are determined as in equation (5) based on monthly spread changes. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. GFC refers to Global Financial Crisis, and ZLB refers to zero lower bound. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

Table 9: Spread Reactions to Monetary Policy Shocks: Loans with No LIBOR Floor

Dependent Variable: Changes in Spread around FOMC meetings

	Loan: No Floor	Weighted difference: Loan - Bond	Weighted difference: Loan - HY	Loan - Bond ZLB period (2009/07-2015/11)	Loan - HY ZLB period (2009/07-2015/11)
MP shock	-0.022	-1.041 ***	-1.337 ***	0.407	0.275
	(0.272)	(0.398)	(0.492)	(1.414)	(1.634)
N	175	175	175	51	51
Adj-R^2	-0.006	0.038	0.045	-0.015	-0.019

Note: Sample period is from 1999/07/09 through 2021/06/30. Spread changes are from 1-day before through 10 days after FOMC announcement dates. Loans that are used in this table are limited to those which do not have LIBOR floor. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. ZLB refers to zero lower bound, and HY refers to high yield bonds. The dependent variable for all columns except for the first column is weighted difference of the average loan (with no LIBOR floor) and (all/high yield) bond spread changes, where the weights are determined as in equation (5) based on monthly spread changes. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

Table 10: Spread Reactions to Monetary Policy Shocks: Asymmetry in Reactions

Dependent Variable: Changes in Spread around FOMC meetings

	Weighted difference: Loan - Bond	Weighted difference: Loan - HY	Loan	Bond	HY Bond	Weighted difference: Loan - Bond	Weighted difference: Loan - HY
MP shock	-1.09 ***	-1.386 ***	-0.74	0.969 *	2.355 *	-1.992 **	-2.393 **
	(0.37)	(0.474)	(0.496)	(0.583)	(1.318)	(0.831)	(1.02)
(MP shock>0) dummy			0.003	-0.035	-0.089	0.047	0.065
			(0.039)	(0.037)	(0.087)	(0.033)	(0.045)
MP shock			1.603	0.152	0.345	1.407	1.361
*(MP shock>0) dummy			(1.092)	(0.824)	(1.747)	(1.039)	(1.201)
N	175	175	175	175	175	175	175
Adj-R^2	0.048	0.053	-0.001	0.033	0.039	0.058	0.061

Note: Sample period is from 1999/07/09 through 2021/06/30. Spread changes are from 1-day before through 10 days after FOMC announcement dates. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. HY refers to high yield bonds. The dependent variable for the first two columns and for the last two columns is weighted difference of the average loan and (all/high yield) bond spread changes, where the weights are determined as in equation (5) based on monthly spread changes. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

Table 11: Regression of ELP and EBP Changes on Proxies of Monetary Policy Shocks

Dependent Variable: Changes around FOMC meetings

Proxy for MP shock	Loan spread	Bond spread	Weighted difference: Loan spread-Bond spread	ELP	EBP	Simple difference: ELP - EBP	Weighted difference: ELP - EBP	Weighted difference: ELP-EBP for HY	Simple difference: Fitted Loan-Fitted Bond	Weighted difference: Fitted Loan-Fitted Bond
MP1	0.334	1.043 **	-0.958	-0.444	0.409	-0.853	-0.951	-1.406 **	0.144	-0.007
	(0.836)	(0.498)	(0.689)	(1.355)	(0.601)	(0.826)	(0.732)	(0.701)	(0.852)	(0.736)
MP3	0.43	1.14 **	-0.982 **	-0.294	0.572	-0.866	-1.003	-1.29 **	0.156	0.02
	(0.85)	(0.454)	(0.446)	(1.04)	(0.467)	(0.731)	(0.61)	(0.52)	(0.697)	(0.611)
FF1	1.331	2.513 ***	-1.783	1.367	1.824 *	-0.457	-0.893	-1.908	-0.725	-0.89
	(1.234)	(0.643)	(1.123)	(2.489)	(0.953)	(1.686)	(1.522)	(1.512)	(1.674)	(1.476)
FF3	0.697	1.224 **	-0.82	-0.51	0.424	-0.934	-1.035	-1.292 *	0.406	0.215
	(1.099)	(0.54)	(0.832)	(1.251)	(0.562)	(0.969)	(0.83)	(0.685)	(0.971)	(0.849)
ED2	0.446	0.981 ***	-0.769 **	-0.335	0.539	-0.875 **	-1.004 ***	-1.313 ***	0.34	0.234
	(0.513)	(0.307)	(0.296)	(0.692)	(0.379)	(0.358)	(0.301)	(0.256)	(0.47)	(0.407)
ED4	0.154	0.638 ***	-0.636 ***	-0.245	0.45 *	-0.695 **	-0.802 ***	-1.016 ***	0.211	0.166
	(0.149)	(0.196)	(0.227)	(0.458)	(0.242)	(0.274)	(0.244)	(0.279)	(0.334)	(0.31)
ONRUN2	0.32	0.731 ***	-0.585 **	0.337	0.839 **	-0.502 *	-0.703 ***	-0.985 ***	0.092	0.118
	(0.376)	(0.255)	(0.241)	(0.559)	(0.349)	(0.258)	(0.218)	(0.238)	(0.4)	(0.371)
N	175	175	175	175	175	175	175	175	175	175

Note: Sample period is from 1999/07/09 through 2021/06/30. FF1 and FF3 are changes in 1-month and 3-month Fed fund futures rates, respectively. ED2 and ED4 are changes in 2-quarter and 4-quarter Eurodollar future rates, respectively. ONRUN2 is changes in 2-year on-the-run Treasury rates. MP1 and MP3 are changes in expected policy rates inferred from Fed fund futures rates following procedures described in Bernanke and Kuttner (2005), for 1 month and 3 months, respectively. Proxies of monetary policy shocks are changes from 10 minutes before through 20 minutes after FOMC announcements. ELP and EBP changes are from 1-day before through 10 days after FOMC announcement dates. HY refers to high yield bonds. Weighted difference is between the average ELP and EBP changes, where the weights are determined as in equation (5) based on monthly spread changes. Fitted Loan refers to the difference of loan spread and the ELP, and Fitted Bond refers the difference of bond spread and the EBP. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

Table 12: Robustness Checks for ELP vs. EBP Reactions to Monetary Policy Shocks

Panel a: Different Specifications

Dependent Variable: Changes around FOMC meetings

	Matched sample: simple difference ELP-EBP	Matched sample: weighted difference ELP-EBP	Change from t-5: weighted difference ELP-EBP	3 to 4 years to maturity: weighted difference ELP-EBP	3 to 4 years to maturity: weighted difference ELP-EBP for HY
MP shock	-1.162 ***	-0.775 ***	-0.967 **	-0.651 ***	-0.863 ***
	(0.25)	(0.142)	(0.484)	(0.155)	(0.166)
N	175	175	175	175	175
Adj-R^2	0.038	0.02	0.028	0.005	0.012

Note: Sample period is from 1999/07/09 through 2021/06/30. ELP and EBP changes except for the third column are from 1-day before through 10 days after FOMC announcement dates. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. The matched sample refers to those issued by firms that have both loans and bonds outstanding. Changes from $t-5$ refer to ELP and EBP changes from 5 days before through 10 days after FOMC announcement dates. 3 to 4 years to maturity refer to the sample of loans and bonds with 3 to 4 years remaining to maturity. HY refers to high yield bonds. Weighted difference is between the average ELP and EBP changes, where the weights are determined as in equation (5) based on monthly spread changes. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

Panel b: MP Shocks from Sign Restriction VAR

Dependent Variable: Changes around FOMC meetings

	ELP	EBP	EBP for HY	Weighted difference: ELP-EBP	Weighted difference: ELP-EBP for HY	Matched sample: weighted difference ELP-EBP
MP shock from sign restriction VAR	1.827 * (0.982)	1.798 *** (0.627)	4.101 ** (1.577)	-0.4 (0.456)	-0.829 ** (0.355)	-0.841 ** (0.368)
N	175	175	175	175	175	175
Adj-R^2	0.014	0.055	0.061	-0.002	0.009	0.011

Note: Sample period is from 1999/07/09 through 2021/06/30. ELP and EBP changes are from 1 day before through 10 days after FOMC announcement dates. MP shocks from sign restrictions are constructed as described in Section A.3. HY refers to high yield bonds. The matched sample refers to those issued by firms that have both loans and bonds outstanding. Weighted difference is between the average ELP and EBP changes, where the weights are determined as in equation (5) based on monthly spread changes. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

Table 13: Subperiods: ELP vs. EBP Spread Reactions to Monetary Policy Shocks

Panel a: Weighted difference between ELP and EBP for the entire bond sample

Dependent Var: Changes in weighted ELP - EBP around FOMC meetings

	Pre-GFC (-2008/06)	GFC (2008/07-2009/06)	Post-GFC (2009/07-)	ZLB period (2009/07-2015/11)	After ZLB (2015/12-2020/02)
MP shock	-0.491	-1.679	-0.745 *	-0.467	-1.201 ***
	(0.316)	(0.946)	(0.444)	(0.702)	(0.177)
N	72	8	95	51	34
Adj-R^2	-0.003	-0.05	0.017	-0.008	0.047

Note: Sample period is from 1999/07/09 through 2021/06/30. ELP and EBP changes are from 1-day before through 10 days after FOMC announcement dates. Weighted difference is between the average ELP and EBP changes, where the weights are determined as in equation (5) based on monthly spread changes. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. GFC refers to Global Financial Crisis, and ZLB refers to zero lower bound. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

Panel b: Weighted difference between ELP and EBP for the high yield bond sample

Dependent Var: Changes in weighted ELP - EBP around FOMC meetings

	Pre-GFC (-2008/06)	GFC (2008/07-2009/06)	Post-GFC (2009/07-)	ZLB period (2009/07-2015/11)	After ZLB (2015/12-2020/02)
MP shock	-0.723 ***	-2.908 **	-0.719	-0.451	-1.273 ***
	(0.249)	(1.074)	(0.518)	(0.883)	(0.203)
N	72	8	95	51	34
Adj-R^2	0.007	0.147	0.011	-0.011	0.062

Note: Sample period is from 1999/07/09 through 2021/06/30. ELP and EBP changes are from 1-day before through 10 days after FOMC announcement dates. Weighted difference is between the average ELP and EBP changes, where the weights are determined as in equation (5) based on monthly spread changes. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. GFC refers to Global Financial Crisis, and ZLB refers to zero lower bound. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

Table 14: Regression of Individual Instrument Spread Changes on Monetary Policy Shocks

Panel a: Full loan and bond sample

Dependent Variable: Changes in Spread around FOMC meetings

MP shock	0.664 **	0.664 **	0.664 **	0.664 **	0.65 **
	(0.303)	(0.303)	(0.303)	(0.303)	(0.3)
MP shock*LoanDummy	-0.751	-0.755	-0.755	-0.749	-0.652
	(0.458)	(0.459)	(0.459)	(0.459)	(0.463)
Fixed Effects					
LoanDummy	Yes				
LoanDummy*Maturity	No	Yes	Yes	Yes	Yes
LoanDummy*CallDummy	No	No	Yes	Yes	
LoanDummy*Industry	No	No	No	Yes	
Instrument	No	No	No	No	Yes
N	741079	741079	741079	741079	741079
N of loans	194037	194037	194037	194037	194037
Adj-R^2	0.002	0.002	0.002	0.003	0.013

Note: Sample period is from 1999/07/09 through 2021/06/30. Loans and bonds in the sample are pooled. Spread changes are from 1-day before through 10 days after FOMC announcement dates. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. LoanDummy is a dummy whether the instrument is a loan. For maturity-fixed effects, loans and bonds are classified into buckets for those with 1-2 year maturity, 2-3 year maturity, 3-4 year maturity, and so forth. CallDummay is a dummy whether the instrument is callable. Industry-fixed effects are based on the 2-digit SIC code. Standard errors are two-way clustered in the meeting (time) and instrument dimensions.

Table 14: Regression of Individual Instrument Spread Changes on Monetary Policy Shocks (Continued)

Panel b: Full loan sample and high yield bond sample

Dependent Variable: Changes in Spread around FOMC meetings

MP shock	1.513 **	1.512 **	1.512 **	1.509 **	1.504 **
	(0.683)	(0.683)	(0.683)	(0.683)	(0.678)
MP shock*LoanDummy	-1.6 **	-1.603 **	-1.603 **	-1.594 **	-1.506 **
	(0.682)	(0.682)	(0.682)	(0.682)	(0.668)
Fixed Effects					
LoanDummy	Yes				
LoanDummy*Maturity	No	Yes	Yes	Yes	Yes
LoanDummy*CallDummy	No	No	Yes	Yes	
LoanDummy*Industry	No	No	No	Yes	
Instrument	No	No	No	No	Yes
N	354148	354148	354148	354148	354148
N of loans	194037	194037	194037	194037	194037
Adj-R^2	0.003	0.003	0.003	0.004	0.005

Note: Sample period is from 1999/07/09 through 2021/06/30. Loans and bonds in the sample are pooled. Spread changes are from 1-day before through 10 days after FOMC announcement dates. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. LoanDummy is a dummy whether the instrument is a loan. For maturity-fixed effects, loans and bonds are classified into buckets for those with 1-2 year maturity, 2-3 year maturity, 3-4 year maturity, and so forth. CallDummay is a dummy whether the instrument is callable. Industry-fixed effects are based on the 2-digit SIC code. Standard errors are two-way clustered in the meeting (time) and instrument dimensions.

Table 15: Credit Risk and Reaction of Loan vs. Bond Spreads to Monetary Policy Shocks

Dependent Variable: Changes in Spread around FOMC meetings

Credit Risk	0.005 *	0.006 *	0.005 *	0.006 **
	(0.003)	(0.003)	(0.003)	(0.003)
MP shock*Credit Risk	0.151 **	0.157 **	0.157 **	0.159 **
	(0.069)	(0.067)	(0.067)	(0.067)
Credit Risk*LoanDummy	-0.004	-0.004	-0.004	-0.005
	(0.004)	(0.004)	(0.004)	(0.004)
MP shock*Credit Risk	-0.312 **	-0.323 **	-0.323 **	-0.318 **
*LoanDummy	(0.134)	(0.138)	(0.138)	(0.128)
Fixed Effects				
Meeting*LoanDummy	Yes			
Meeting*Maturity *LoanDummy	No	Yes	Yes	Yes
Meeting*CallDummy *LoanDummy	No	No	Yes	Yes
Meeting*Industry *LoanDummy	No	No	No	Yes
N	626928	626928	626928	626928
N of loans	93525	93525	93525	93525
Adj-R^2	0.098	0.108	0.109	0.191

Note: Sample period is from 1999/07/09 through 2021/06/30. Loans and bonds in the sample are pooled. Spread changes are from 1-day before through 10 days after FOMC announcement dates. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. For credit risk, I take the lower rating between Moody's and S&P ratings of an instrument and convert it to a number (Aaa=AAA=1, Aa1=AA+=2, and so forth). LoanDummy is a dummy whether the instrument is a loan. For maturity-fixed effects, loans and bonds are classified into buckets for those with 1-2 year maturity, 2-3 year maturity, 3-4 year maturity, and so forth. CallDummay is a dummy whether the instrument is callable. Industry-fixed effects are based on the 2-digit SIC code. Standard errors are two-way clustered in the meeting (time) and instrument dimensions.

Table 16: Robustness Checks for Different Sample Period: Credit Risk and Reaction of Loan vs. Bond Spreads to Monetary Policy Shocks

Dependent Variable: Changes in Spread around FOMC meetings

	Full Sample	GFC (2008/07-2009/06)	Ex. GFC	Ex. GFC & ZLB	Ex. GFC & Ex. ZLB
Credit Risk	0.006 **	-0.002	0.006 **	0.002	0.009 **
	(0.003)	(0.04)	(0.003)	(0.004)	(0.004)
MP shock*Credit Risk	0.159 **	0.588	0.123 *	-0.02	0.166 ***
	(0.067)	(0.398)	(0.063)	(0.186)	(0.061)
Credit Risk*LoanDummy	-0.005	0.025	-0.006	-0.011 **	0.003
	(0.004)	(0.033)	(0.004)	(0.006)	(0.005)
MP shock*Credit Risk	-0.318 **	-1.691 **	-0.14	0.094	-0.187 **
*LoanDummy	(0.128)	(0.489)	(0.103)	(0.24)	(0.082)
Fixed Effects					
Meeting*Maturity *LoanDummy	Yes	Yes	Yes	Yes	Yes
Meeting*CallDummy *LoanDummy	Yes	Yes	Yes	Yes	Yes
Meeting*Industry *LoanDummy	Yes	Yes	Yes	Yes	Yes
N	626928	22265	604663	266089	338574
N of loans	93525	3739	89786	46658	43128
Adj-R^2	0.191	0.245	0.173	0.18	0.17

Note: Sample period is from 1999/07/09 through 2021/06/30. Loans and bonds in the sample are pooled. Spread changes are from 1-day before through 10 days after FOMC announcement dates. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. For credit risk, I take the lower rating between Moody's and S&P ratings of an instrument and convert it to a number (Aaa=AAA=1, Aa1=AA+=2, and so forth). LoanDummy is a dummy whether the instrument is a loan. For maturity-fixed effects, loans and bonds are classified into buckets for those with 1-2 year maturity, 2-3 year maturity, 3-4 year maturity, and so forth. CallDummay is a dummy whether the instrument is callable. Industry-fixed effects are based on the 2-digit SIC code. GFC refers to Global Financial Crisis, and ZLB refers to zero lower bound. The ZLB period excluding GFC (fourth column) is from 2009/07 to 2015/11 and from 2020/03. The last column of the table excludes data from 2008/07 to 2015/11 and that from 2020/03. Standard errors are two-way clustered in the meeting (time) and instrument dimensions.

Table 17: Comparison of Loan Summary Statistics - Quote vs. Transaction

(a) Corporate Loan Characteristics - Quote Sample (2012/05/01 to 2021/06/30)

Statistic	Mean	St. Dev.	P10	P25	Median	P75	P90
Par value at issue ($mil.)	515.4	648.9	96.2	176.5	317.5	586.9	1,165.7
Coupon spread (bps.)	466.7	200.4	250.0	325.0	425.0	550.0	800.0
Years to Maturity (yrs.)	4.6	1.6	2.4	3.5	4.7	5.8	6.6
Spread (percentage pts.)	6.0	4.0	2.9	3.6	4.9	7.3	9.9
Moody's rating†	—	—	Caa2	B3	B2	B1	Ba2
S&P rating‡	—	—	CCC+	B-	B	BB-	BB

Note: Data from LSTA/LPC Mark-to-Market Pricing Service. Observations=3,388,655 and number of loans = 6,848. Par value at issuance is adjusted for inflation in 2012 dollars using the quarterly GDP deflator from BEA. Coupon spread refers to spread rate that loans pay over LIBOR.

†Observations=2,122,042

‡Observations=2,087,008

(b) Corporate Loan Characteristics - Transaction Sample (2012/05/01 to 2021/06/30)

Statistic	Mean	St. Dev.	P10	P25	Median	P75	P90
Par value at issue ($mil.)	1,141.7	1,004.8	284.6	460.8	821.4	1,514.6	2,373.8
Coupon spread (bps.)	368	127	225	275	350	425	525
Years to Maturity (yrs.)	5.2	1.4	3.1	4.2	5.3	6.3	6.9
Spread (percentage pts.)	4.3	2.2	2.5	3.1	3.8	4.8	6.7
Moody's rating†	—	—	B3	B2	B1	Ba3	Ba2
S&P rating‡	—	—	B-	B	B	B+	BB

Note: Data from Moody's Analytics Global CLO. Observations=469,702 and number of loans = 11,757. Par value at issuance is adjusted for inflation in 2012 dollars using the quarterly GDP deflator from BEA. Coupon spread refers to spread rate that loans pay over LIBOR.

†Observations=457,974

‡Observations=455,347

Table 18: Comparison of Bond Summary Statistics - Quote vs. Transaction

(a) Corporate Bond Characteristics - Quote Sample (2002/07/01 to 2021/06/30)

Statistic	Mean	St. Dev.	P10	P25	Median	P75	P90
Par value at issue ($mil.)	589.5	482.8	238.3	298.1	452.1	695.1	1,097.6
Coupon rate (bps.)	573.4	202.7	312.5	425.0	575.0	700.0	825.0
Years to Maturity (yrs.)	9.9	8.3	2.4	4.1	6.8	12.1	25.2
Spread (percentage pts.)	2.6	3.1	0.6	1.0	1.6	3.2	5.6
Moody's rating†	—	—	B2	Ba1	Baa2	A3	A2
S&P rating‡	—	—	B	BB+	BBB	A-	A+

Note: Data from ICE BofAML Fixed Income Indices. Observations=15,939,324 and number of bonds = 16,611. Par value at issuance is adjusted for inflation in 2012 dollars using the quarterly GDP deflator from BEA.

†Observations=14,768,819

‡Observations=14,261,843

(b) Corporate Bond Characteristics - Transaction Sample (2002/07/01 to 2021/06/30)

Statistic	Mean	St. Dev.	P10	P25	Median	P75	P90
Par value at issue ($mil.)	689.9	627.2	231.3	326.0	516.3	873.8	1,317.1
Coupon rate (bps.)	543.1	201.9	280.0	390.0	545.0	687.5	795.0
Years to Maturity (yrs.)	9.4	8.1	2.2	3.8	6.4	10.1	24.8
Spread (percentage pts.)	2.5	3.2	0.5	0.9	1.5	3.0	5.3
Moody's rating†	—	—	B2	Ba1	Baa2	A3	A1
S&P rating‡	—	—	B+	BBB-	BBB	A-	A+

Note: Data from Enhanced TRACE. Observations=10,389,035 and number of bonds = 17,591. Par value at issuance is adjusted for inflation in 2012 dollars using the quarterly GDP deflator from BEA.

†Observations=9,758,881

‡Observations=9,334,562

Table 19: Transaction Data: Regression of Individual Instrument Spread Changes on Monetary Policy Shocks

Panel a: Full loan and bond sample

Dependent Variable: Changes in Spread around FOMC meetings

MP shock	0.521 *	0.522 *	0.523 *	0.523 *	0.525 *	0.527 *
	(0.311)	(0.311)	(0.311)	(0.311)	(0.308)	(0.308)
MP shock*LoanDummy	-0.616 *	-0.618 *	-0.619 *	-0.615 *	-0.605 *	-0.585 *
	(0.335)	(0.334)	(0.334)	(0.334)	(0.337)	(0.338)
Fixed Effects						
LoanDummy	Yes					
LoanDummy*Maturity	No	Yes	Yes	Yes	Yes	Yes
LoanDummy*CallDummy	No	No	Yes	Yes		
LoanDummy*Industry	No	No	No	Yes		
Instrument	No	No	No	No	Yes	Yes
LoanDummy*Rating	No	No	No	No	No	Yes
N	481540	481540	481540	481540	481540	481540
N of loans	32257	32257	32257	32257	32257	32257
Adj-R^2	0.002	0.002	0.002	0.003	0.055	0.058

Note: Sample period is from 2002/07/01 through 2021/06/30. Loans and bonds in the sample are pooled. Spread changes are difference between the average spread for $[t+1,\ t+10]$ and the average spread for $[t-5,\ t-1]$, where t is the corresponding FOMC announcement date. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. LoanDummy is a dummy whether the instrument is a loan. For maturity-fixed effects, loans and bonds are classified into buckets for those with 1-2 year maturity, 2-3 year maturity, 3-4 year maturity, and so forth. CallDummay is a dummy whether the instrument is callable. Industry-fixed effects are based on the 2-digit SIC code for bonds and are based on Moody's 35 industry categories for loans. Rating-fixed effects are based on the lower rating between Moody's and S&P ratings of an instrument. Standard errors are two-way clustered in the meeting (time) and instrument dimensions.

Table 19: Transaction Data: Regression of Individual Instrument Spread Changes on Monetary Policy Shocks (Continued)

Panel b: Full loan sample and high yield bond sample

Dependent Variable: Changes in Spread around FOMC meetings

MP shock	0.947 *	0.948 *	0.95 *	0.951 *	0.948	0.965 *
	(0.572)	(0.572)	(0.572)	(0.573)	(0.58)	(0.58)
MP shock*LoanDummy	-1.044 *	-1.046 *	-1.048 *	-1.045 *	-1.028 *	-1.025 *
	(0.533)	(0.533)	(0.533)	(0.533)	(0.559)	(0.56)
Fixed Effects						
LoanDummy	Yes					
LoanDummy*Maturity	No	Yes	Yes	Yes	Yes	Yes
LoanDummy*CallDummy	No	No	Yes	Yes		
LoanDummy*Industry	No	No	No	Yes		
Instrument	No	No	No	No	Yes	Yes
LoanDummy*Rating	No	No	No	No	No	Yes
N	151495	151495	151495	151495	151495	151495
N of loans	32111	32111	32111	32111	32111	32111
Adj-R^2	0.003	0.003	0.003	0.003	0.036	0.04

Note: Sample period is from 2002/07/01 through 2021/06/30. Loans and bonds in the sample are pooled. High yield bonds are those ratings of which are below-investment grade, where ratings are the lower rating between Moody's and S&P bond ratings. Spread changes are difference between the average spread for $[t+1,\ t+10]$ and the average spread for $[t-5,\ t-1]$, where t is the corresponding FOMC announcement date. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. LoanDummy is a dummy whether the instrument is a loan. For maturity-fixed effects, loans and bonds are classified into buckets for those with 1-2 year maturity, 2-3 year maturity, 3-4 year maturity, and so forth. CallDummay is a dummy whether the instrument is callable. Industry-fixed effects are based on the 2-digit SIC code for bonds and are based on Moody's 35 industry categories for loans. Rating-fixed effects are based on the lower rating between Moody's and S&P ratings of an instrument. Standard errors are two-way clustered in the meeting (time) and instrument dimensions.

Table 20: Transaction Data: Credit Risk and Reaction of Loan vs. Bond Spreads to Monetary Policy Shocks

Dependent Variable: Changes in Spread around FOMC meetings

	Full Sample				Ex. ZLB post GFC (2015/12-2020/02)
Credit Risk	0.002	0.002	0.002	0.002	0.008 *
	(0.003)	(0.003)	(0.003)	(0.002)	(0.004)
MP shock*Credit Risk	0.086	0.09 *	0.088	0.088 *	0.163
	(0.054)	(0.053)	(0.054)	(0.051)	(0.109)
Credit Risk*LoanDummy	-0.011 **	-0.011 **	-0.011 **	-0.01 **	-0.01 **
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
MP shock*Credit Risk	-0.238 *	-0.221 *	-0.219 *	-0.249 **	-0.239 *
*LoanDummy	(0.121)	(0.118)	(0.118)	(0.125)	(0.123)
Fixed Effects					
Meeting*LoanDummy	Yes				
Meeting*Maturity *LoanDummy	No	Yes	Yes	Yes	Yes
Meeting*CallDummy *LoanDummy	No	No	Yes	Yes	Yes
Meeting*Industry *LoanDummy	No	No	No	Yes	Yes
N	481540	481540	481540	481540	154165
N of loans	32257	32257	32257	32257	18816
Adj-R^2	0.084	0.097	0.099	0.173	0.146

Note: Sample period is from 2002/07/01 through 2021/06/30. Loans and bonds in the sample are pooled. Spread changes are difference between the average spread for $[t+1,\, t+10]$ and the average spread for $[t-5,\, t-1]$, where t is the corresponding FOMC announcement date. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. For credit risk, I take the lower rating between Moody's and S&P ratings of an instrument and convert it to a number (Aaa=AAA=1, Aa1=AA+=2, and so forth). LoanDummy is a dummy whether the instrument is a loan. For maturity-fixed effects, loans and bonds are classified into buckets for those with 1-2 year maturity, 2-3 year maturity, 3-4 year maturity, and so forth. CallDummay is a dummy whether the instrument is callable. Industry-fixed effects are based on the 2-digit SIC code for bonds and are based on Moody's 35 industry categories for loans. GFC refers to Global Financial Crisis, and ZLB refers to zero lower bound. Standard errors are two-way clustered in the meeting (time) and instrument dimensions.

Table 21: Primary Market Spread Reactions to Monetary Policy Shocks

Panel a: Primary Market Loan Spread Reactions

Dependent Variable: Loan Spreads at Issuance

MP shock	0.28	-0.338	-0.226	-0.566	-0.216
	(1.409)	(1.396)	(1.306)	(1.425)	(1.357)
MP shock	-0.308	0.036	-0.017	0.126	-0.093
*After FOMC dummy	(0.918)	(0.897)	(0.868)	(0.854)	(0.789)
Fixed Effects					
After FOMC dummy	Yes	Yes	Yes	Yes	Yes
Maturity	No	Yes	Yes	Yes	Yes
Industry	No	No	Yes	Yes	Yes
SecuredDummy	No	No	No	Yes	Yes
CovliteDummy	No	No	No	No	Yes
N	13662	13662	13662	13662	13662
Adj-R^2	0	0.073	0.127	0.168	0.196

Note: Sample period is from 1999/07/09 through 2021/06/30. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. After FOMC dummies are 1 if the loan issuance is closed in $[t+1, t+15]$ and are 0 if the loan issuance is closed in $[t-1, t-15]$ in calendar days, where t is the corresponding FOMC announcement date. Issuance outside those two ranges is discarded. For maturity-fixed effects, loans are classified into buckets for those with 1-2 year maturity, 2-3 year maturity, 3-4 year maturity, and so forth. Industry-fixed effects are based on the 2-digit SIC code. SecuredDummy is a dummy whether the loan is secured. CovliteDummy is a dummy whether the loan is covenant-light. Standard errors are two-way clustered in the meeting (time) and firm dimensions.

Table 21: Primary Market Spread Reactions to Monetary Policy Shocks (Continued)

Panel b: Primary Market Bond Spread Reactions

Dependent Variable: Bond Spreads at Issuance

MP shock	-1.619 **	-2.02 **	-1.986 **	-2.139 **
	(0.811)	(0.84)	(0.838)	(0.905)
MP shock	1.219 **	1.267 ***	1.238 **	1.149 **
*After FOMC dummy	(0.55)	(0.481)	(0.475)	(0.471)
Fixed Effects				
After FOMC dummy	Yes	Yes	Yes	Yes
Maturity	No	Yes	Yes	Yes
CallDummy	No	No	Yes	Yes
Industry	No	No	No	Yes
N	55339	55339	55339	55339
Adj-R^2	0.002	0.203	0.207	0.495

Note: Sample period is from 1999/07/09 through 2021/06/30. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. After FOMC dummies are 1 if the bond offering date is in $[t+1, t+15]$ and are 0 if the bond offering date is in $[t-1, t-15]$ in calendar days, where t is the corresponding FOMC announcement date. Issuance outside those two ranges is discarded. For maturity-fixed effects, bonds are classified into buckets for those with 1-2 year maturity, 2-3 year maturity, 3-4 year maturity, and so forth. Industry-fixed effects are based on the 2-digit SIC code. CallDummy is a dummy whether the bond is callable. Standard errors are two-way clustered in the meeting (time) and firm dimensions.

Table 22: Syndicated Loan Market Flex Reactions to Monetary Policy Shocks

Panel a: Loans Launch between $(t-7)$ and $(t-1)$

Dependent Variable: Loan Flex

MP Shock	0.107 (0.237)	0.119 (0.244)	0.146 (0.252)	0.14 (0.252)	0.163 (0.266)
Fixed Effects					
Rating Category	No	Yes	Yes	Yes	Yes
Industry	No	No	Yes	Yes	Yes
Asset Security	No	No	No	Yes	Yes
CovliteDummy	No	No	No	No	Yes
N	1942	1942	1942	1942	1942
Adj-R^2	0	0.009	0.014	0.014	0.02

Note: Sample period is from 2000/01/01 through 2021/06/30. Loan Flex is the flex variable that takes into account original issuance discount (OID) and is provided by LCD. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. All the fixed effects are based on variables that LCD provides ("Rating Category", "Industry Type", "Asset Security", and "Cov-lite"). Standard errors are two-way clustered in the meeting (time) and firm dimensions.

Panel b: Loans Launch before t and Break after t

Dependent Variable: Loan Flex

MP Shock	0.124 (0.419)	0.142 (0.417)	0.169 (0.418)	0.147 (0.406)	0.229 (0.411)
Fixed Effects					
Rating Category	No	Yes	Yes	Yes	Yes
Industry	No	No	Yes	Yes	Yes
Asset Security	No	No	No	Yes	Yes
CovliteDummy	No	No	No	No	Yes
N	2354	2354	2354	2354	2354
Adj-R^2	0	0.011	0.014	0.026	0.034

Note: Sample period is from 2004/06/01 through 2021/06/30. Loan Flex is the flex variable that takes into account original issuance discount (OID) and is provided by LCD. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. All the fixed effects are based on variables that LCD provides ("Rating Category", "Industry Type", "Asset Security", and "Cov-lite"). Standard errors are two-way clustered in the meeting (time) and firm dimensions.

Table 23: Loan Spread Reaction to Monetary Policy Shocks: Portfolios Sorted on Liquidity Measures

Panel a: Number of Quotes

	1 (Low)	2	3	4 or 5	More than 5 (High)	H-L
MP Shock	-0.341	-0.193	0.052	0.526	0.764	1.105
	(0.246)	(0.375)	(0.484)	(0.502)	(0.695)	(0.735)
N	175	175	175	175	175	175
Adj-R^2	0.001	-0.004	-0.006	0.002	0.008	0.036

Note: Sample period is from 1999/07/09 through 2021/06/30. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. I form portfolios of loans based on the number of quotes, i.e., the number of dealers which provide quotes for the loan, on $(t-1)$, where t is the corresponding FOMC announcement date. The name of each column indicates the number of quotes for loans in each portfolio. Spread changes are from 1-day before through 10 days after FOMC announcement dates. The dependent variable is the average spread changes of each portfolio. H-L refers to simple difference of the fifth column and first column.

Panel b: Bid-Ask Spread

	Low	2	3	4	High	H-L
MP Shock	0.2	-0.122	-0.01	-0.103	-0.346	-0.546
	(0.313)	(0.311)	(0.355)	(0.246)	(0.519)	(0.553)
N	175	175	175	175	175	175
Adj-R^2	-0.003	-0.005	-0.006	-0.005	-0.003	0.004

Note: Sample period is from 1999/07/09 through 2021/06/30. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. Loans are sorted based on their bid-ask spread (difference between mean bid and mean ask prices) on $(t-1)$, where t is the corresponding FOMC announcement date. Then I form portfolios of each quintile of the sorted loans on the bid-ask spread. Spread changes are from 1-day before through 10 days after FOMC announcement dates. The dependent variable is the average spread changes of each portfolio. H-L refers to simple difference of the fifth column and first column.

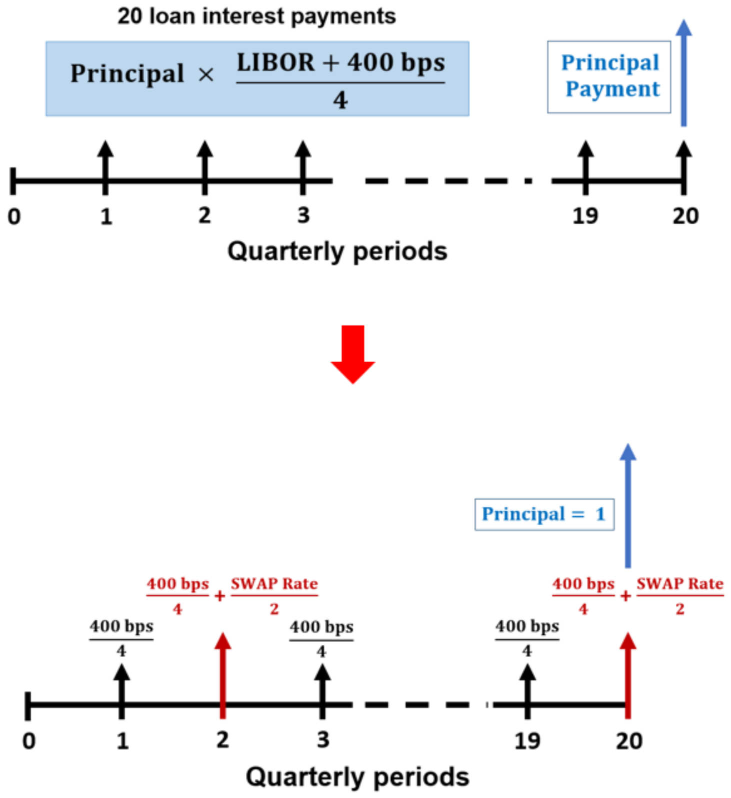
Table 24: Credit Flow Reactions to Monetary Policy Shocks

	Dependent Variable (unit: %)		
	Loan fund flows	CLO issuance	HY bond fund flows
MP shock	1.327 ***	1.605 *	-0.163
	(0.451)	(0.967)	(0.439)
N	163	163	163
Adj-R^2	0.015	0.004	-0.006

Note: Sample period is from 2001/01 through 2021/06. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. Loan fund flows and CLO issuance are monthly numbers provided by LCD and are scaled by the volume of the outstanding leveraged loans (also provided by LCD). High yield (HY) bond fund flows are provided by Lipper and are scaled by the volume of the outstanding (nonfinancial) high yield bonds computed from FISD. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

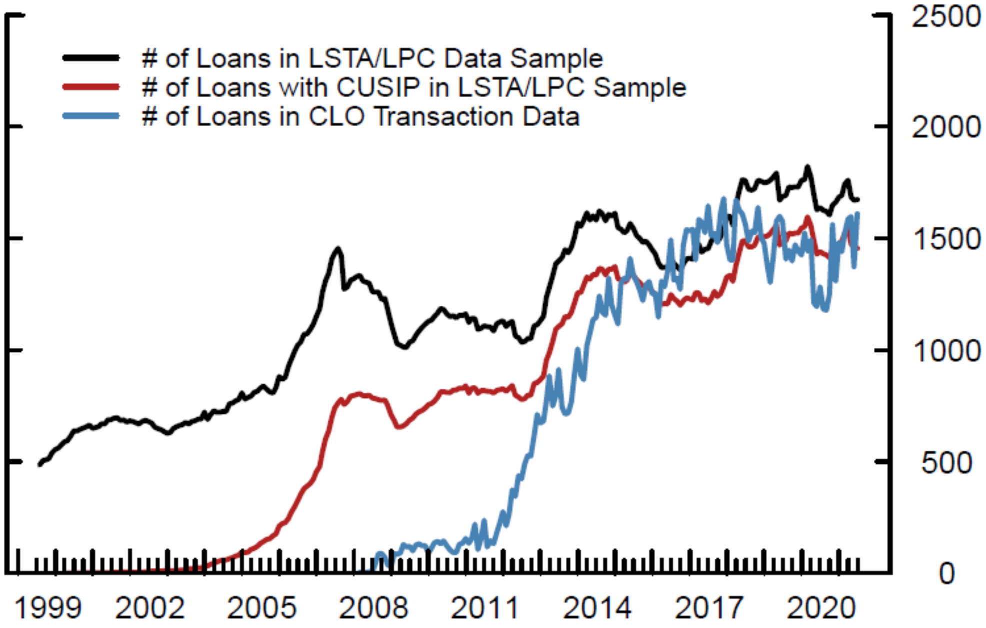
Figures

Figure 1: Example – Payment Schedule for a Typical Institutional Term Loan and That for the Synthetic Fixed-rate Instrument Constructed from the Loan



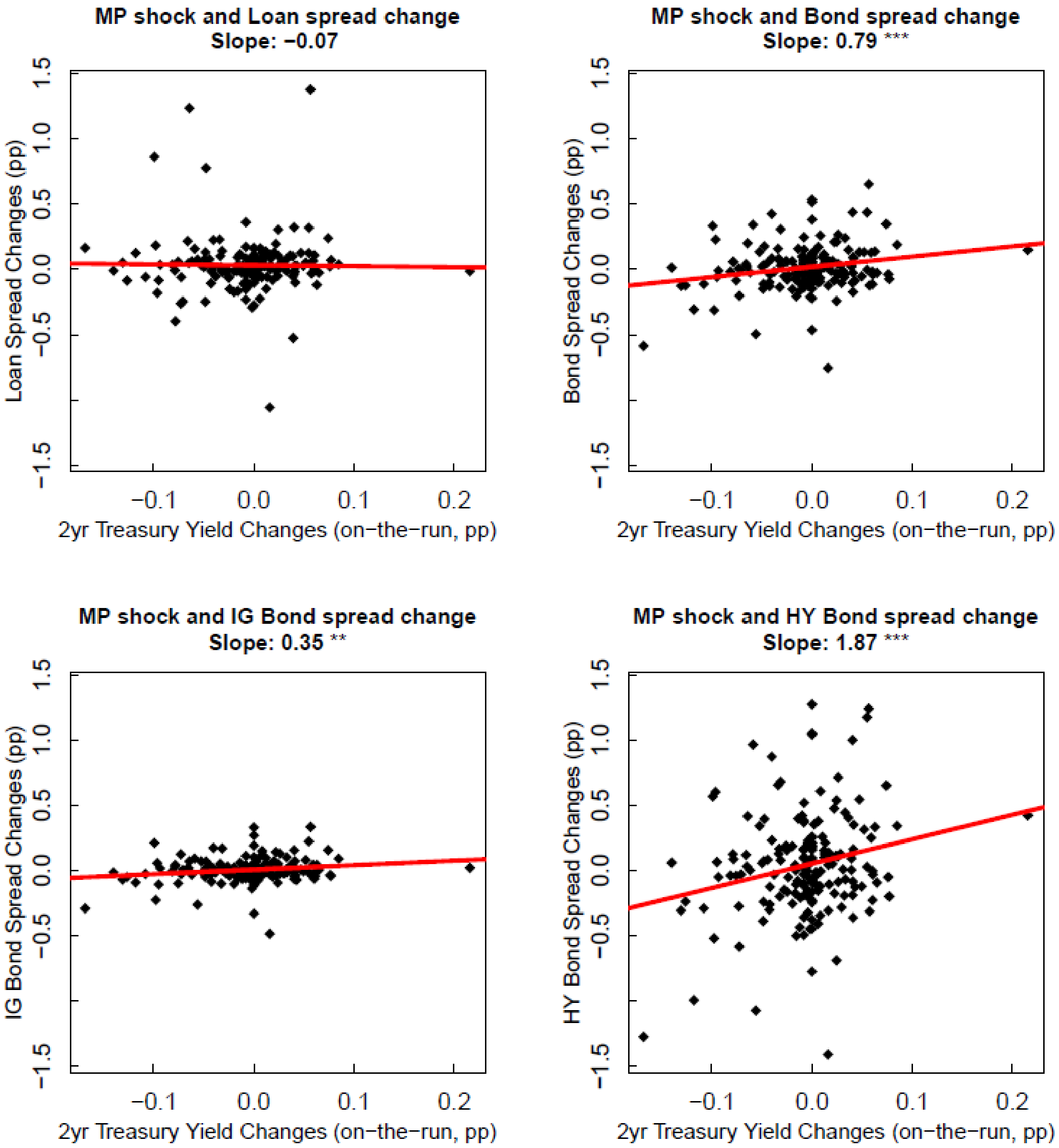
Note: The upper part of the figure describes the payment schedule of a hypothetical institutional bullet term loan that make 20 payments (20 quarters/5 years remaining to maturity) with the coupon of (LIBOR + 400 basis points). The lower part of the figure describes the payment schedule of a synthetic fixed-rate instrument constructed from the loan in the upper part using an interest rate swap (with LIBOR as the floating leg). The principal value of the loan is normalized to 1 in the lower part.

Figure 2: Number of Loans in the Sample



Source: Refinitiv, LSTA/LPC Mark-to-Market Pricing and Euro Pricing Service; Moody's Analytics, Inc., Global CLO data.
Note: The figure plots the number of unique loans (identified by LIN in the LSTA/LPC data and by LoanX in the Moody's CLO data) in each year-month. The black line plots the number of unique loans in the entire LSTA/LPC data sample, the red line plots the number of unique loans that have CUSIP in the LSTA/LPC data sample, and the blue line plots the number of unique loans in the transactions table of the Moody's CLO data. Sample period is from 1999/07 through 2021/06.

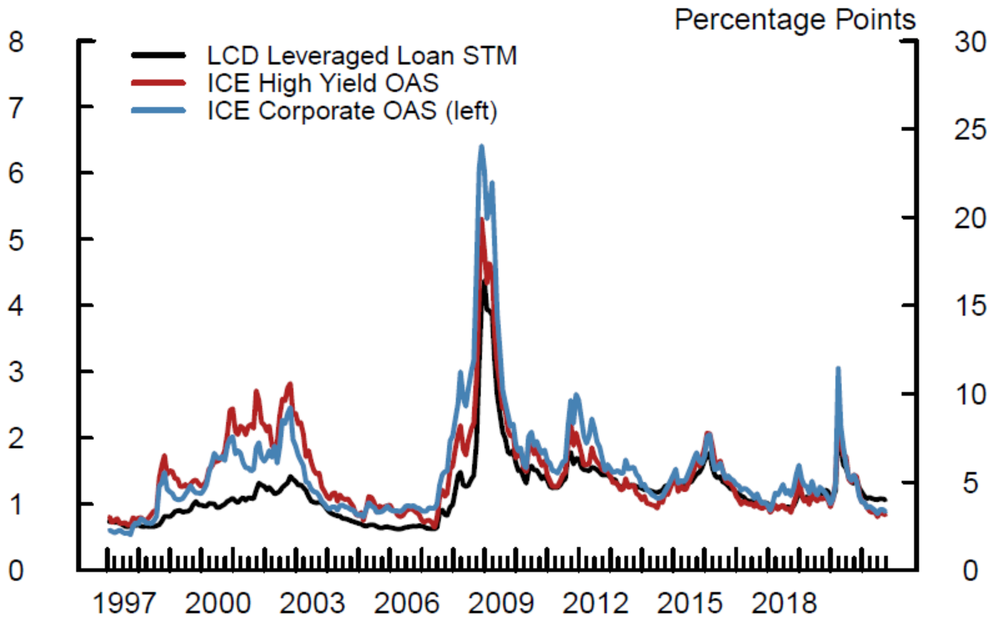
Figure 3: Monetary Policy Shock vs. Loan and Bond Spread Changes



Source: Refinitiv, LSTA/LPC Mark-to-Market Pricing and Euro Pricing Service; ICE Data Indices, LLC, used with permission.

Note: The figure plots changes of spreads from 1 day before through 10 days after FOMC announcements vs. changes of the 2-year on-the-run Treasury yields from 10 minutes before through 20 minutes after FOMC announcements. The red lines are fitted lines based on the OLS regression. The regression coefficients and their statistical significance are noted above each subfigure. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994). IG refers to investment grade bonds and HY refers to high yield bonds. Sample period is from 1999/07 through 2021/06.

Figure 4: Comparison between Loan and Bond Index Spreads



Source: S&P LCD; ICE Data Indices.

Note: The figure plots month-end values of US Leveraged Loan Index Spread-to-Maturity (published by S&P LCD), US High Yield Index Option-Adjusted Spread, and US Corporate Index Option-Adjusted Spread (both published by ICE). Sample period is from 1997/01 through 2021/09.

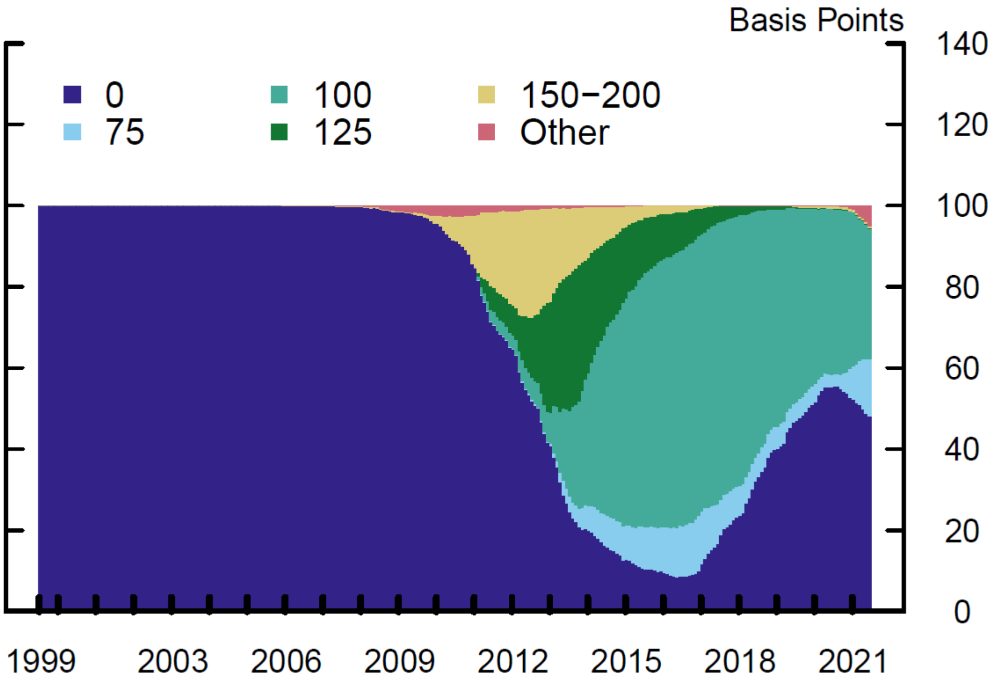
(a) Level Correlations

Cor(LL STM,HY OAS)	Cor(LL STM,OAS)	Cor(HY OAS,OAS)
0.851	0.914	0.929

(b) Change Correlations

Cor(LL STM,HY OAS)	Cor(LL STM,OAS)	Cor(HY OAS,OAS)
0.822	0.818	0.868

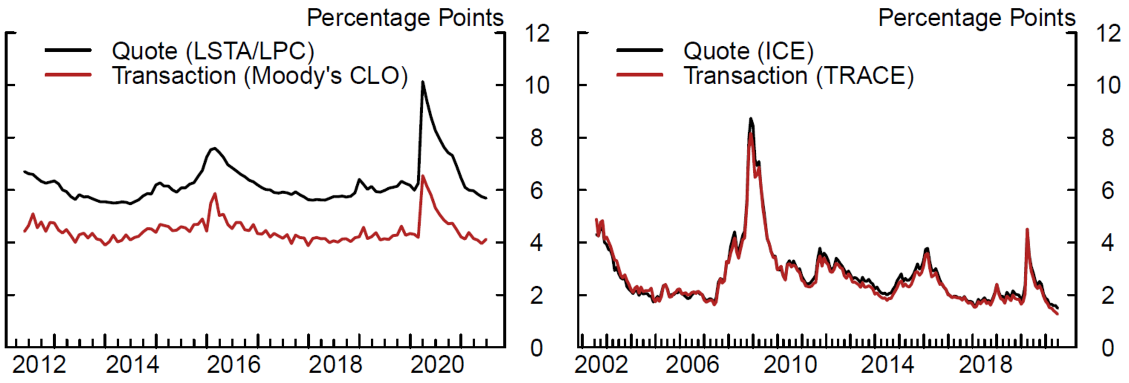
Figure 5: Distribution of LIBOR Floor for the Loan Sample



Source: Refinitiv, LSTA/LPC Mark-to-Market Pricing and Euro Pricing Service; Refinitiv, DealScan.

Note: The figure plots the share of each LIBOR floor for the outstanding loans in the LSTA/LPC data sample at each month end. Sample period is from 1999/07 through 2021/06.

Figure 6: Comparison of Spreads from Quotes and from Transaction Prices



(a) Loan Spread (b) Bond Spread

Source: Refinitiv, LSTA/LPC Mark-to-Market Pricing and Euro Pricing Service; Moody's Analytics, Inc., Global CLO data (Left Figure). ICE Data Indices, LLC, used with permission; Financial Industry Regulatory Authority, Bond Trade Dissemination System (BTDS) and Trade Reporting and Compliance Engine (TRACE), Wharton Research Data Services (Right Figure).
Note: The left figure plots the monthly (month-end) average loan spread for the quote data sample (LSTA/LPC) and the transaction data sample (Moody's CLO). The right figure plots the monthly (month-end) average bond spread for the quote data sample (ICE) and the transaction data sample (TRACE). For the transaction data sample, I take the average of spreads on the last 5 days of the month, i.e. the average of spreads on $[t-4, t]$ where t is the month-end business day. Sample period is from 2012/05 through 2021/06 for the left figure and is from 2002/07 through 2021/06 for the right figure.

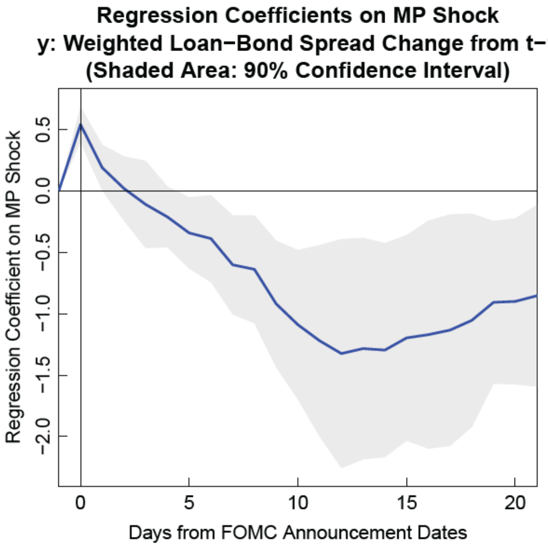
(a) Level Correlations

Loan Spread Quote vs. Transaction	Bond Spread Quote vs. Transaction
0.900	0.990

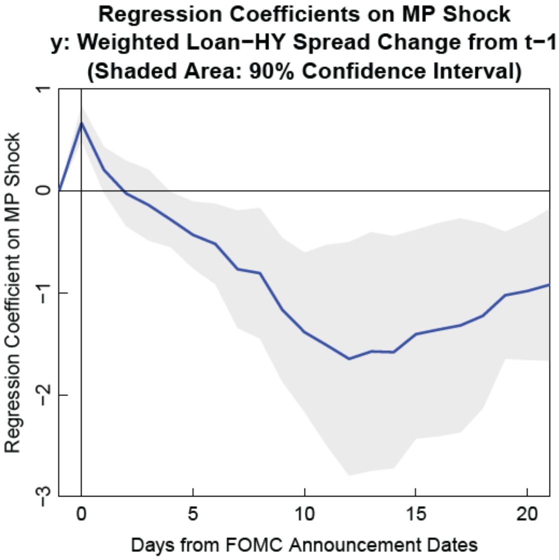
(b) Change Correlations

Loan Spread Quote vs. Transaction	Bond Spread Quote vs. Transaction
0.945	0.983

Figure 7: Regression Coefficients of Differential Spreads on Monetary Policy Shock


Regression Coefficients on MP Shock
y: Weighted Loan−Bond Spread Change from t−1
(Shaded Area: 90% Confidence Interval)

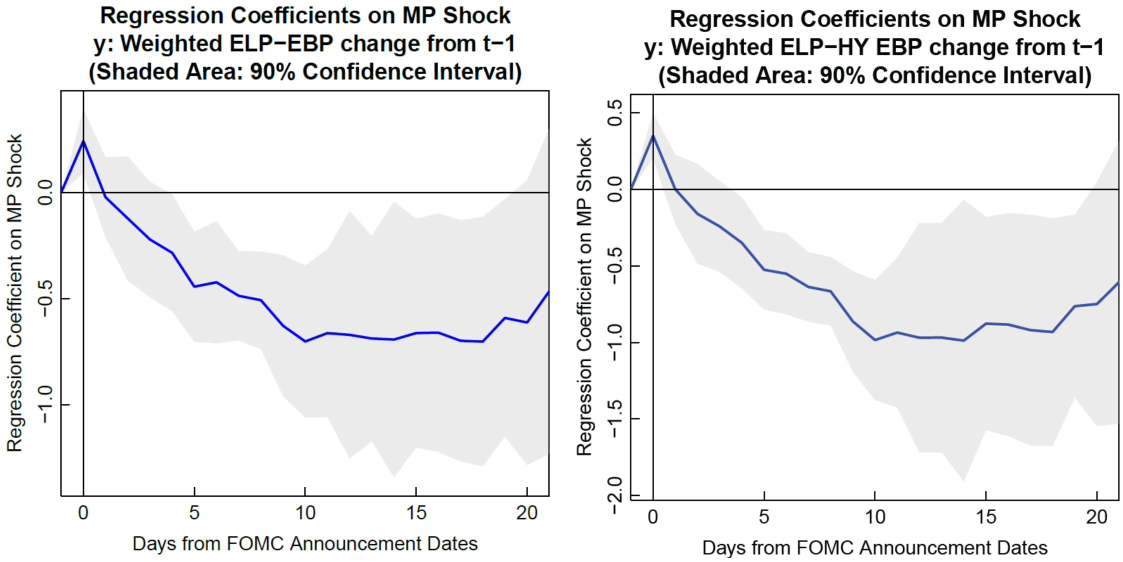
(a) Loan and full bond sample


Regression Coefficients on MP Shock
y: Weighted Loan−HY Spread Change from t−1
(Shaded Area: 90% Confidence Interval)

(b) Loan and HY bond sample

Source: Refinitiv, LSTA/LPC Mark-to-Market Pricing and Euro Pricing Service; ICE Data Indices, LLC, used with permission.
Note: The figure plots the regression coefficients of the weighted difference of loan and bond spread changes around FOMC announcements on monetary policy shocks for different estimation windows. The left figure uses the entire loan and bond spread sample, and the right figure uses the full loan spread sample and the bond spread sample for high yield bonds. Monetary policy shocks are proxied by changes of the 2-year on-the-run Treasury yields from 10 minutes before through 20 minutes after FOMC announcements. The estimation windows for the weighted difference of loan and bond spread changes are from $t-1$ through $t+k$ (inclusive) for different k's from 0 to 21 (business) days, where t is the corresponding FOMC announcement date. The weights for the weighted difference are determined as in equation (5) based on monthly spread changes. The regression is an OLS regression, and the standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994). The shaded area indicates the confidence interval for [5%,95%] for each regression (for different k's). Sample period is from 1999/07 through 2021/06.

Figure 8: Regression Coefficients of ELP - EBP on Monetary Policy Shock



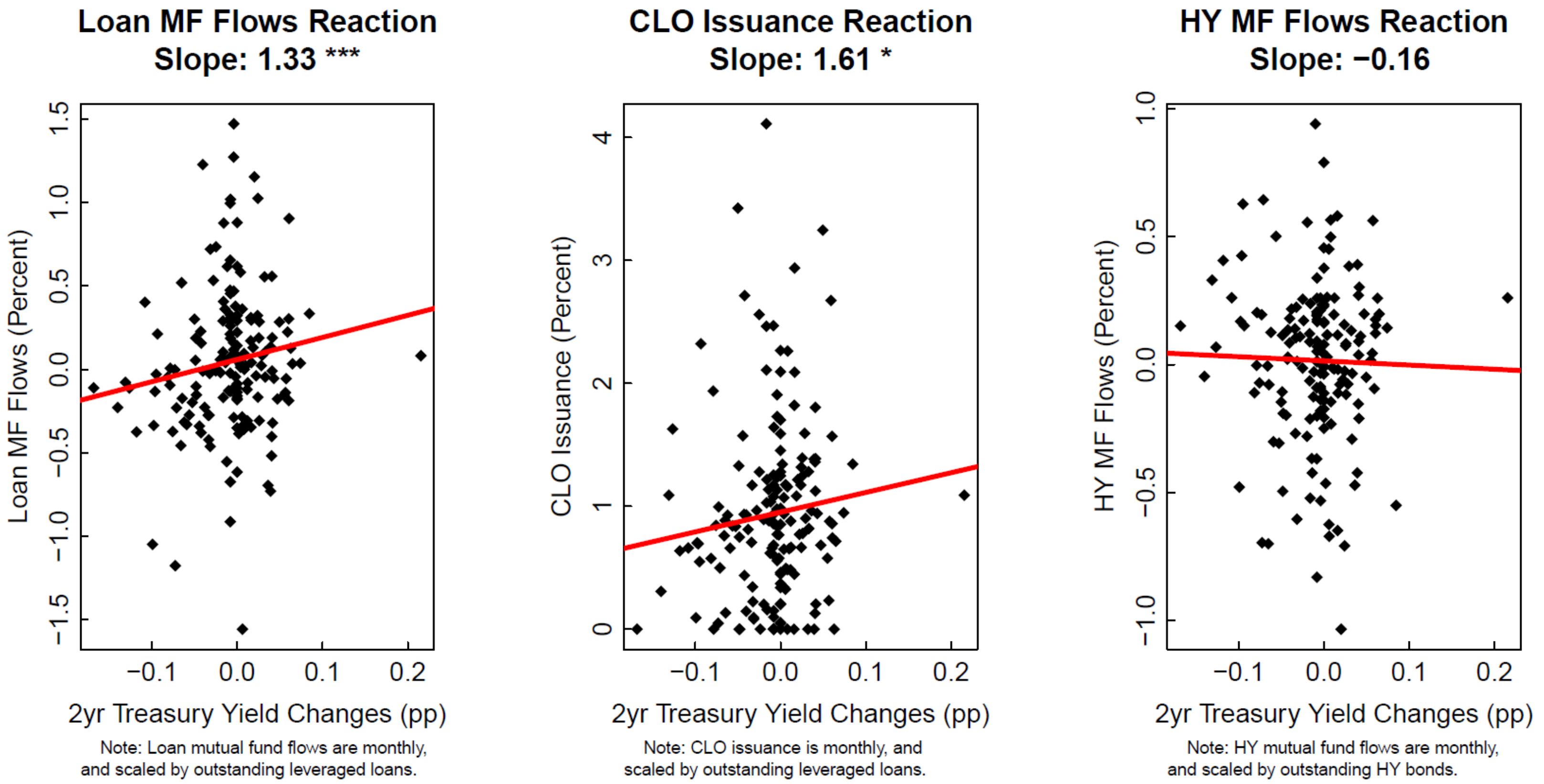
(a) Loan and full bond sample

(b) Loan and HY bond sample

Source: Refinitiv, LSTA/LPC Mark-to-Market Pricing and Euro Pricing Service; ICE Data Indices, LLC, used with permission.

Note: The figure plots the regression coefficients of the weighted difference of ELP and EBP changes around FOMC announcements on monetary policy shocks for different estimation windows. The left figure uses the entire ELP and EBP sample, and the right figure uses the full ELP sample and the EBP sample for high yield bonds. Monetary policy shocks are proxied by changes of the 2-year on-the-run Treasury yields from 10 minutes before through 20 minutes after FOMC announcements. The estimation windows for the weighted difference of ELP and EBP changes are from $t-1$ through $t+k$ (inclusive) for different k's from 0 to 21 (business) days, where t is the corresponding FOMC announcement date. The weights for the weighted difference are determined as in equation (5) based on monthly spread changes. The regression is an OLS regression, and the standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994). The shaded area indicates the confidence interval for [5%,95%] for each regression (for different k's). Sample period is from 1999/07 through 2021/06.

Figure 9: Monetary Policy Shock vs. Credit Flows



Note: Loan mutual fund flows are monthly, and scaled by outstanding leveraged loans.

Note: CLO issuance is monthly, and scaled by outstanding leveraged loans.

Note: HY mutual fund flows are monthly, and scaled by outstanding HY bonds.

Source: S&P LCD, Refinitiv Lipper U.S. Fund Flows, Mergent FISD.
Note: The figure plots monthly credit flow vs. monetary policy shocks from FOMC announcements of the month. Monetary policy shocks are proxied by changes of the 2-year on-the-run Treasury yields from 10 minutes before through 20 minutes after FOMC announcements. The left figure plots loan mutual fund flows vs. monetary policy shocks, the middle figure plots CLO issuance vs. monetary policy shocks, and the right figure plots high yield mutual fund flows vs. monetary policy shocks. The loan mutual fund flows and CLO issuance are scaled by the volume of the outstanding leveraged loans provided by LCD. The high yield mutual fund flows are scaled by the volume of the outstanding nonfinancial high yield bonds from FISD. The red lines are fitted lines based on the OLS regression for each subfigure. The regression coefficients and their statistical significance are noted above each subfigure. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994). Sample period is from 2001/01 through 2021/06.

Appendix A Appendix

A.1 Transaction Data Processing

For corporate loan transactions data, I use the Moody's Analytics Global CLO data. Transaction information in the Moody's CLO data is mostly from trustee reports that are prepared by the portfolio administrator of each CLO, and trustee reports do not have a unified format and sometimes have errors or stale information. Therefore, I need quite a bit of cleaning of this dataset before using it. Different from the LSTA/LPC data, which uses "LIN" as the main identifier, the main identifier for loans in this dataset is "LoanX", which is assigned by IHS Markit. Since there is no comprehensive linking database between "LIN" and "LoanX", I mostly rely on the Moody's CLO data itself for loan-level information and do not attempt to link the data to other datasets such as DealScan.[41] In the transactions table of the Moody's CLO data, I first filter out observations that do not have LoanX, which leaves us with roughly 86% of the observations in the raw table. Then, I also filter out observations that do not have transaction dates, prices, maturity dates, and coupon formula. 62% of observations that have LoanX remain in the sample after applying these filters.

Next, I only consider loans that are denominated in U.S. dollars. To minimize the impact of possible data errors, I only take loans (identified by LoanX) observations of which have their currency as U.S. dollars for more than 90% of the observations. Similarly, I only take loans observations of which have their benchmark rate as LIBOR for over 90% of the observations and, therefore, only consider LIBOR-based loans. After applying these filters, in order to remove data errors, I filter out observations that have maturity dates that are not consistent with maturity dates of other observations of the same loan. More explicitly, I remove observations of a loan with a certain maturity date if the number of those observations is less than 5% of the number of the entire observations of the same loan. I apply the same

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[41] Note that DealScan provides a linking database between their loan identifier ("LPC tranche ID") and "LIN".

filter for the coupon (LIBOR) spread, i.e., remove observations if a certain LIBOR spread only applies to less than 5% of the entire observations of the loan.[42] Lastly, I filter out loans with less than a year or with more than 30 years to maturity.

For corporate bond transactions data, I rely on the enhanced TRACE. I clean the TRACE data following Dick-Nielsen (2014) to filter out errors — corrections and cancelations, reversals, and agency transactions. I also apply all the additional filters that the code in the paper has, e.g., deleting when issued (WI) trades, trades not in secondary markets, and trades under special circumstances. Then, in addition to those filters, I filter on trades that occur between 8am and 5pm (so called "core trading hours").

After finishing the basic cleaning of the TRACE data, I apply similar filters as I did for the ICE data. I link the TRACE data to the FISD data, and use information in the FISD data to filter bonds. First, I only consider bonds that are denominated in U.S. dollars and those issued by U.S. nonfinancial firms. Second, I filter out bonds with less than a year or with more than 30 years to maturity. Third, I only consider senior unsecured bonds that pay fixed-rate interests at the semi-annual frequency. These filters are identical to what I used for the ICE data.

For floating-rate notes (FRNs) in the TRACE data, I apply some of the same filters above but not all. First, I only consider bonds that are denominated in U.S. dollars and those issued by U.S. firms, but I do not filter out nonfinancial firms. This is because the vast majority of FRNs are issued by financial firms. Second, I filter out bonds with less than a year or with more than 30 years to maturity, which is the same filter as above. Third, additionally I only consider FRNs with LIBOR as their benchmark rates. Since over 97% of LIBOR-based FRNs use either 1-month LIBOR or 3-month LIBOR as their benchmark rates, I also subset on those two benchmark rates. The sample of FRNs that pass all these filters is used for the last column of Table 4.

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[42] I do not attempt to match a single maturity or coupon to a loan because amendments of loans often involve changes of the maturity date and/or coupon.

For spread computations, I first compute a spread for each observation in the sample, and then I filter out all observations with spreads below 5 basis points and greater than 3,500 basis points as in Gilchrist and Zakrajšek (2012). Then, if there are multiple observations in a day for a loan, I take the average of the spreads to make them daily. For loan ratings, I take Moody's and S&P loan ratings reported in the trustee reports for the Moody's CLO data. When doing so, since a non-negligible portion of self-reported ratings are erroneous or stale, I take the most frequently appearing ratings (for Moody's and S&P ratings separately) within the year-month for each loan as its ratings. For bond ratings, I match the TRACE data with the Moody's and S&P ratings data (Moody's RDS and S&P RatingsXpress) and obtain ratings from them.

A.2 Betas on $(L + B)$ factor

In order to compute weighted difference of spread changes as in Equation (5), I need to compute the beta of (aggregate) spread changes on the $(L+B)$ factor, defined as in Equation (1), by running a regression as in Equation (4). I provide those betas on the $(L + B)$ factor based on monthly regressions in Table A1.

In Table A1, I show betas of the (monthly) average spread changes of different subsets of loans and bonds on the the $(L + B)$ factor. The loan and bond sample I use for the ELP/EBP computation is substantially smaller than the full loan and bond sample, particularly for loans, because for the ELP/EBP computation I match the sample to Compustat. Therefore, in the first column, I report subsets of loans and bonds that are not matched with Compustat and in the second column, I report subsets of loans and bonds after matching with Compustat.

In the first two rows of the first column, I find $\beta = 0.5$ for the entire loans and $\beta = 0.387$ for the entire bonds. This result is given by construction as I define the $(L + B)$ as in Equation (1). Since the variance of the two terms in Equation (1) are equal, computing β

by

$$\beta = \frac{Cov\{\text{Spread Changes}, (L+B)\}}{Var\{(L+B)\}}$$

provides $\beta = 0.5$ for the average loan spread changes and $\beta = \frac{1}{2}\frac{S.D.\left(\Delta\overline{\text{Bond Spread}}\right)}{S.D.\left(\Delta\overline{\text{Loan Spread}}\right)} = 0.387$ for the average bond spread changes.

In the third and fourth rows of the first column, the beta for IG bonds are smaller than the average bonds, and that for HY bonds are larger than the average bonds. Since those betas can be thought of as their exposure to the common credit risk, these results are quite intuitive. In the fifth and sixth rows of the first column, I focus on the matched sample of loans and bonds, i.e., those issued by firms that have both loans and bonds outstanding. I find a slightly smaller beta for loans in the matched sample than that for loans in the full sample but a substantially larger beta for bonds in the matched sample (than that for bonds in the full sample). These results are consistent with the fact that loans in my sample are mostly leveraged loans, which are issued by below-investment grade firms, and bonds are junior to loans in the capital structure of the firms (hence riskier than loans issued by the same firms). In the seventh,eighth, and ninth rows of the first column, I subset on loans and bonds that have 3 to 4 years remaining to their maturities. I find that the betas are somewhat larger for both those loans and bonds (and HY bonds) compared with the full sample, but particularly so for bonds (and HY bonds). For loans with no LIBOR floor in the tenth row of the first column, I find their beta is slightly smaller than that of the full sample of loans.

For the ELP/EBP sample in the second column of the same table, I generally find similar betas compared with those in the first column (the larger sample without matching to Compustat). Yet, I find those betas are generally smaller except for the ninth row (HY bonds with 3 to 4 years to maturity). I do not compute a beta for loans with no LIBOR floor for the ELP/EBP sample as such a restriction leaves us only a small number of loans in 2015-2016.

A.3 Monetary Policy from a Structural VAR with Sign Restrictions

I extract alternative monetary policy shocks from a structural VAR with sign restrictions. I take the standard high-frequency identification (HFI) and sign restrictions that are similar to Jarociński and Karadi (2020). To be more explicit, the HFI assumes that FOMC announcement surprises are only affected by two structural shocks — "monetary policy shock" and "Fed information shock" — and not by other shocks. Sign restrictions assume that the monetary policy shock has a positive impact on the interest rate but a negative impact on stock prices, and the Fed information shock has positive impacts on both the interest rate and stock prices. As the proxy of the interest rate and stock prices, I take the 2-year Treasury yield and S&P 500 index, respectively. To satisfy the HFI assumption, similar to what I do for the rest of the paper, I take a 30-minute window around FOMC announcements for changes of those proxies.

Under those assumptions, I take 30-minute changes of the 2-year Treasury yield and those of S&P 500 index around FOMC announcements as the reduced form shocks in the structural VAR. I denote a vector of the two reduced form shocks as u_t. Then, the structural VAR imposes the following structure:

$$u_t = Ae_t \quad , \quad \text{where } Var(e_t) = I_2 \equiv \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} .$$

Without any restrictions, the identification of A is based on the variance of u_t:

$$\Sigma \equiv Var(u_t) = AVar(e_t)A' = AA'.$$

A typical issue in the structural VAR is that there are infinitely many numbers of possible A's. For any Q that satisfies $QQ' = I_2$, $\bar{A} = AQ$ satisfies the same relation:

$$\Sigma = AVar(e_t)A' = \bar{A}Var(e_t)\bar{A}' = \bar{A}\bar{A}' = AQQ'A' = I_2 .$$

The indefiniteness of A can be formally written as

$$A \sim QA \quad , \quad Q \in O(2) \ .$$

In general, a structural VAR imposes restrictions that exactly identify the structural shocks (or some of the structural shocks). Sign restrictions do not exactly identify structural shocks but rather restrict the possible set of structural shocks. To see this more explicitly, let us rewrite the reduced form shock u_t as

$$u_t \equiv \begin{pmatrix} u_{1,t} \\ u_{2,t} \end{pmatrix} = \begin{pmatrix} (\text{2-year Treasury Yield Change})_t \\ (\text{S\&P 500 Change})_t \end{pmatrix} \ .$$

Similarly, the structural shock e_t can be written as

$$e_t \equiv \begin{pmatrix} e_{1,t} \\ e_{2,t} \end{pmatrix} = \begin{pmatrix} (\text{Structural monetary policy shock})_t \\ (\text{Structural Fed information shock})_t \end{pmatrix} \ .$$

Therefore, the sign restrictions imply

$$A_{11} > 0 \quad , \quad A_{12} > 0 \quad , \quad A_{21} < 0 \quad , \quad A_{22} > 0 \quad , \quad \text{where } A \equiv \begin{pmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{pmatrix} \ .$$

I take a Bayesian approach for the VAR parameter Σ belonging to the Normal-Wishart family (as in Uhlig (2005)) with the uninformative prior. More explicitly, the posterior distribution of Σ^{-1} follows

$$\Sigma^{-1} \sim \mathcal{W}_2(\hat{\Sigma}^{-1}/T, T) \ ,$$

where $\mathcal{W}_2$ is a Wishart distribution.

To implement the estimation procedure, I draw a sufficient number of Σ^{-1} from the Wishart distribution above: I randomly draw Σ^{-1} $1,000$ times. Then, for the estimation of the set of possible A, I also randomly draw Q $1,000$ times from the uniform distribution on $\mathbb{S}^2$: the 2-sphere. Therefore, for each draw of the Σ^{-1}, I compute 1,000 different sets of A and corresponding e_t. Then, I take the average of those $N = 1,000 \times 1,000$ simulations as follows:

$$\text{(Alternative) MP Shock} = \frac{1}{N}\sum_{b,k} A_{11}^{b,k} e_{1,t}^{b,k} \ ,$$

where b is the index for the Bayesian draws, and k is the index for Q draws. Note that I multiply $A_{11}^{b,k}$ to scale the structural shock $e_{1,t}^{b,k}$ so that the product can be interpreted as a component of the 2-year Treasury yield changes. This scaling guarantees that

$$\text{(2-year Treasury Yield Change)} = (\text{(Alternative) MP Shock}) + \text{(Fed Information Shock)} \ ,$$

where

$$\text{Fed Information Shock} = \frac{1}{N}\sum_{b,k} A_{12}^{b,k} e_{2,t}^{b,k} \ .$$

Therefore, the alternative monetary policy shocks can be thought of as a component of the high-frequency 2-year Treasury yield changes around FOMC announcements that moves stock prices in the opposite direction.

A.4 Returns and YTM Changes as Dependent Variables

In this section, I run similar regressions as in Figure 3 taking returns and YTMs as the dependent variable. First, I use aggregate (equal-weighted) loan and bond returns around FOMC announcements, i.e., returns from $(t-1)$ to $(t+10)$, as the main dependent variable. In Figure A1, the top left figure plots raw loan returns vs. 30-minute changes of 2-year Treasury yields around FOMC announcements. The top right figure plots swapped loan returns, i.e., returns of a synthetic fixed-payment instrument constructed from the underlying loan as described in Figure 1, vs. 2-year Treasury yield changes around FOMC announcements. The bottom two figures plot raw IG and HY bond returns, respectively, vs. 2-year Treasury yield changes around FOMC announcements. Consistent with results of the rest of the paper, (both raw and swapped) loan returns do not react to high-frequency 2-year Treasury yield changes around FOMC announcements as much as (both IG and HY) bond returns do.

In Figure A2, I use excess returns, defined by raw returns in excess of returns of the risk-free asset with the same cash flows, as the dependent variable. Since loans do not have a fixed payment schedule, I am only able to compute excess returns for a synthetic fixed-payment instrument constructed from the underlying loan. The top left figure in Figure A2 plots excess returns for swapped loans vs. 2-year Treasury yield changes around FOMC announcements. The rest figures in Figure A2 plot bond excess returns for all bonds, IG bonds, and HY bonds, respectively, vs. 2-year Treasury yield changes around FOMC announcements. Similar to other results of the paper, loan excess returns do not respond to monetary policy shocks, proxied by high-frequency 2-year Treasury yield changes around FOMC announcements, as much as bond excess returns do.

In Figure A3, I use yield-to-maturities (YTMs) as the dependent variable. As in Figure A1 and A2, I find that loan YTMs do not react to monetary policy shocks as much as bond YTMs do Note that for all of returns, excess returns, and YTMs, loan reactions to monetary policy shocks are not as large as bond reactions. These results confirm that my conclusion of relatively muted loan price reactions to monetary policy shocks hold regardless of what price variable I take as the dependent variable.

A.5 Asymmetry of Spread Reactions to Monetary Policy: Removing Outliers

In Table 10, I find that β_2 in regression (6) is not statistically significant for all columns. However, the magnitude of β_2 is not small in size, particularly compared to that of β_1, for some columns in Table 10. Since my tests are based on a small number of observations from aggregate time series, the coefficient β_2 not being statistically significant may not be sufficient to show that there are no meaningful asymmetric spread reactions to monetary policy shocks. In fact, for loan spread reactions (third column), β_2 is more than twice larger in magnitude than β_1 with the opposite sign. Similarly with the opposite sign, β_2 for (weighted) difference of loan and bond spread reactions (sixth column) is roughly three fourths of their β_1, and β_2 for (weighted) difference of loan and high yield bond spread reactions (seventh column) is roughly a half of their β_1. These β_2's are comparable in size to β's in the first two columns, i.,e., the size of differential spread reactions between loans and (all/high yield) bonds. If I take those values at their face value ignoring their statistical (in-)significance, loan spreads react very differently for negative and positive monetary policy shocks, and the differential spread reactions between loans and bonds are not as large to positive monetary policy shocks compared with those to negative monetary policy shocks.

To alleviate these concerns a bit, I test whether the magnitude of β_2 stays large and comparable to that of β_1 after removing outliers. I remove 5 outliers (in both positive and negative directions) for each dependent variable and the same regression as regression (6) in Table A4.[43] The first two columns show that the size of differential spread reactions between loans and bonds become smaller after removing outliers but still statistically significant. However, in the third column, the size of β_2 becomes much smaller as well as that of β_1, confirming that loan spreads do not react much to monetary policy shocks, both to positive and negative shocks. Similarly in the sixth and seventh column, the size of β_2 decreases quite a bit (sixth column) or even changes its sign (seventh column). Therefore, I conclude that there is no robust asymmetry of spread reactions to positive and negative monetary policy shocks.[44]

A.6 ELP and EBP Construction

In this section, I discuss how I construct the excess loan premium (ELP) and excess bond premium (EBP). I largely follow Gilchrist and Zakrajšek (2012) in constructing both measures. To be more specific, separately for loans and bonds, I run the following regression:

$$\log(Spread)_{i,t} = \beta(-DD_{k,t}) + \gamma' Z_{i,t} + \epsilon_{i,t} \ , \tag{9}$$

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[43] Out of 175 observations, I remove 10 observations, which are roughly 5.7%. Those outliers are in either the dot-com burst period or the GFC period.

[44] In the fourth and fifth column, I see that β_2's increase quite a bit compared with those in Table 10. I take this as additional evidence for non-robustness of asymmetric spread reactions to positive and negative monetary policy shocks.

where i represents instruments and k represents firms that issue the corresponding instruments. $DD_{k,t}$ is distance-to-default measure for firm k based on Merton's model (Merton (1974)) of credit risk, and $Z_{i,t}$ is a vector of loan characteristics. I also add rating- and industry-fixed effects as in Gilchrist and Zakrajšek (2012). For loans, I use entity-level ratings from S&P instead of loan-level ratings to maximize the time span of loan data used for the above regression. As discussed in Section 3.2, CUSIPs in loan data are readily available only after 2006, so using loan-level rating substantially decrease the time span of loan data. For bonds, I use loan-level ratings following Gilchrist and Zakrajšek (2012). While other variables are quite straightforward to obtain, the distance-to-default measure involves quite a bit of computations.

I closely follow procedures described in Gilchrist and Zakrajšek (2012) for the computation of the distance-to-default measure. The Merton's model assumes that the value V of a firm follows a geometric Brownian motion:

$$dV = \mu_V V dt + \sigma_V V dW \ , \tag{10}$$

where dW is the standard Brownian motion. The Merton's model makes another assumption that the firm have a single debt in the amount D that will mature at time T. In this framework, equity can be thought of as a call option with the underlying asset being the entire firm and the strike price being the face value of the debt. Under an assumption that the firm defaults when the firm value V becomes smaller than the face value D of the debt, the distance-to-default is defined as

$$DD \equiv \frac{\log\left(\frac{V}{D}\right) + \left(\mu_V - \frac{1}{2}\sigma_V^2\right) T}{\sigma_V \sqrt{T}} \ , \tag{11}$$

and the probability of default in this framework is $\Phi(-DD)$ where $\Phi(\cdot)$ is the cumulative standard normal distribution. To compute the distance-to-default measure, I need the firm value V, debt face value D, mean parameter μ_V, and volatility parameter σ_V. I take the sum of the firm's current liabilities and one-half of its long-term liabilities as the value of D, following Gilchrist and Zakrajšek (2012). However, the remaining variables are not directly observable and can only be indirectly inferred.

To obtain those variables, I follow an iterative procedure proposed by Bharath and Shumway (2008), as Gilchrist and Zakrajšek (2012) does. I compute DD in one-year horizon ($T = 1$). The procedure start with an initial guess for V (.e.g., $V = E + D$) for the past year (rolling 252-day window), and then

1. Compute σ_V for the same period using $\log(V)$ and the following relation, which is equivalent to Equation (10):

$$d\log(V) = \left(\mu_V - \frac{1}{2}\sigma_V^2\right) dt + \sigma_V dW \ .$$

2. Using the computed σ_V, re-compute V for the past year by solving the following equation:

$$E = V\Phi(\delta_1) - e^{-r}D\Phi(\delta_2) \quad , \quad \delta_1 = \frac{\log\left(\frac{V}{D}\right) + \left(r + \frac{1}{2}\sigma_V^2\right)}{\sigma_V} \quad , \quad \delta_2 = \delta_1 - \sigma_V \ ,$$

   where r is the risk-free rate for the corresponding horizon (1-year).[45]

3. Go back to the first step and repeat until convergence. Use the converged value of V to compute μ_V.

With the computed values of μ_V, σ_V, and V, it is straightforward to compute DD from Equation 11. Note that I trim observations with DD lower than -2 or higher than 20, in line with Gilchrist and Zakrajšek (2012), in order to prevent outliers in DD from distorting regression results.

Regression results for Equation 9 are shown in Table A2 and A3. Since I use the ELP and EBP around FOMC announcement, I need daily data and run daily regressions. However,

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[45] Note that this equation does not involve μ_V thanks to risk-neutral pricing.

since Gilchrist and Zakrajšek (2012) runs a monthly regression for the EBP, I show monthly regression results, which only use month-end values, next to the daily regression results.[46] Those two results are very similar, and the resulting ELPs (EBPs) have 99.96% (99.98%) correlations and, therefore, I am not too much concerned about running those regressions at daily frequency.

I compute the predicted level of the spread as follows:

$$(\widehat{Spread})_{i,t} = \exp\left[\hat{\beta}(-DD_{k,t}) + \hat{\gamma}' Z_{i,t} + \frac{\hat{\sigma}^2}{2}\right] ,$$

where $\hat{\beta}$ and $\hat{\gamma}$ denote the regression (OLS) estimates, and $\hat{\sigma}^2$ is the estimated variance of the error term $\epsilon_{i,t}$ — the regression residual — in Equation 9. Then, the instrument-level ELP and EBP are computed by

$$(\textit{Excess Loan/Bond Premium}) \equiv (Spread)_{i,t} - (\widehat{Spread})_{i,t} .$$

The predicted component $(\widehat{Spread})_{i,t}$ is denoted as "Fitted Loan" and "Fitted Bond" for loans and bonds, respectively, in Table 11.

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[46] Note that my sample period is quite different from that of Gilchrist and Zakrajšek (2012).

Appendix Tables[47]

Table A1: Betas on $(L + B)$ for Different Subsets of Loans and Bonds

	Full Sample (w/o Compustat Match)	ELP/EBP Sample (with Compustat Match)
Full Loan	0.5	0.445
Full Bond	0.387	0.348
IG Bond	0.241	0.231
HY Bond	0.712	0.665
Matched Sample - Loan	0.449	0.414
Matched Sample - Bond	0.647	0.541
Loan - 3 to 4 Years to Maturity	0.537	0.494
Bond - 3 to 4 Years to Maturity	0.453	0.421
HY Bond - 3 to 4 Years to Maturity	0.824	0.831
Loan - No LIBOR Floor	0.467	—

Note: Sample period is from 1999/07 through 2021/06. The (L+B) factor is the weighted sum of the average monthly loan and bond spread changes as in equation (1). The (monthly) average spread changes of each subset are regressed on the (L+B) factor, and the regression coefficients are displayed in the table. IG refers to investment-grade bonds, and HY refers to high yield bonds. The matched sample refers to those issued by firms that have both loans and bonds outstanding. 3 to 4 years to maturity refer to the sample of loans and bonds with 3 to 4 years remaining to maturity.

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[47] For regression coefficients, * indicates that the p-value is less than 0.1, ** indicates that the p-value is less than 0.05, and *** indicates that the p-value is less than 0.01.

Table A2: ELP regresssion

Dependent Variable: log(Spread)

	Daily		Monthly	
-DD	0.045 ***	(0.008)	0.043 ***	(0.008)
Secured	-0.083	(0.057)	-0.08	(0.056)
Cov-lite	-0.04 *	(0.021)	-0.032	(0.021)
-$DD\times$ Secured	-0.005	(0.008)	-0.004	(0.008)
-$DD\times$ Cov-lite	-0.011 ***	(0.003)	-0.01 ***	(0.003)
log(Duration)	-0.08 ***	(0.018)	-0.082 ***	(0.018)
log(Par)	-0.031 ***	(0.008)	-0.029 ***	(0.008)
log(Coupon spread)	0.591 ***	(0.029)	0.596 ***	(0.029)
log(Age)	0.054 ***	(0.005)	0.052 ***	(0.004)
Level	0	(0.003)	0	(0.003)
Slope	0.028 ***	(0.006)	0.024 ***	(0.007)
Curvature	-0.091 ***	(0.028)	-0.097 ***	(0.031)
Volatility	0.099 ***	(0.02)	0.112 ***	(0.026)
N	1,588,633		76,649	
Adj-R^2	0.621		0.627	

Note: Sample period is from 1999/07/09 - 2021/06/30. Daily regression uses the full sample of daily observations, and monthly regression uses only month-end observations. Industry- and rating- fixed effects are included. Level, Slope, and Curvature correspond to, respectively, the first three principal components of nominal Treasury yields at 3-month, 6-month, and 1-, 2-, 5-, 7-, 10-, 15-, and 30-year maturities. Volatility is the (annualized) realized monthly (rolling window) volatility of the daily 10-year Treasury yield. Standard errors are two-way clustered in the year-month and firm dimensions.

Table A3: EBP Regression

Dependent Variable: log(Spread)

	Daily		Monthly	
-DD	0.065 ***	(0.005)	0.065 ***	(0.005)
log(Duration)	0.196 ***	(0.027)	0.197 ***	(0.026)
log(Par)	0.009	(0.02)	0.007	(0.02)
log(Coupon)	0.385 ***	(0.043)	0.393 ***	(0.042)
log(Age)	0.027 *	(0.014)	0.024 *	(0.014)
Callable	0.272	(0.19)	0.254	(0.192)
-DD×Callable	-0.021 ***	(0.004)	-0.021 ***	(0.004)
log(Duration) × Callable	0.103 ***	(0.024)	0.102 ***	(0.024)
log(Par) × Callable	-0.076 ***	(0.019)	-0.075 ***	(0.02)
log(Coupon) × Callable	0.105 **	(0.047)	0.099 **	(0.047)
log(Age) × Callable	-0.027 *	(0.015)	-0.024 *	(0.015)
Level × Callable	0.024 ***	(0.004)	0.023 ***	(0.004)
Slope × Callable	0.004	(0.008)	0.001	(0.009)
Curvature × Callable	-0.034	(0.032)	-0.02	(0.035)
Volatility × Callable	0.117 ***	(0.021)	0.12 ***	(0.029)
N	11,077,887		535,528	
Adj-R^2	0.789		0.79	

Note: Sample period is from 1999/07/09 - 2021/06/30. Daily regression uses the full sample of daily observations, and monthly regression uses only month-end observations. Industry- and rating- fixed effects are included. Level, Slope, and Curvature correspond to, respectively, the first three principal components of nominal Treasury yields at 3-month, 6-month, and 1-, 2-, 5-, 7-, 10-, 15-, and 30-year maturities. Volatility is the (annualized) realized monthly (rolling window) volatility of the daily 10-year Treasury yield. Standard errors are two-way clustered in the year-month and firm dimensions.

Table A4: Spread Reactions to Monetary Policy Shocks: Asymmetry in Reactions (Excluding Outliers)

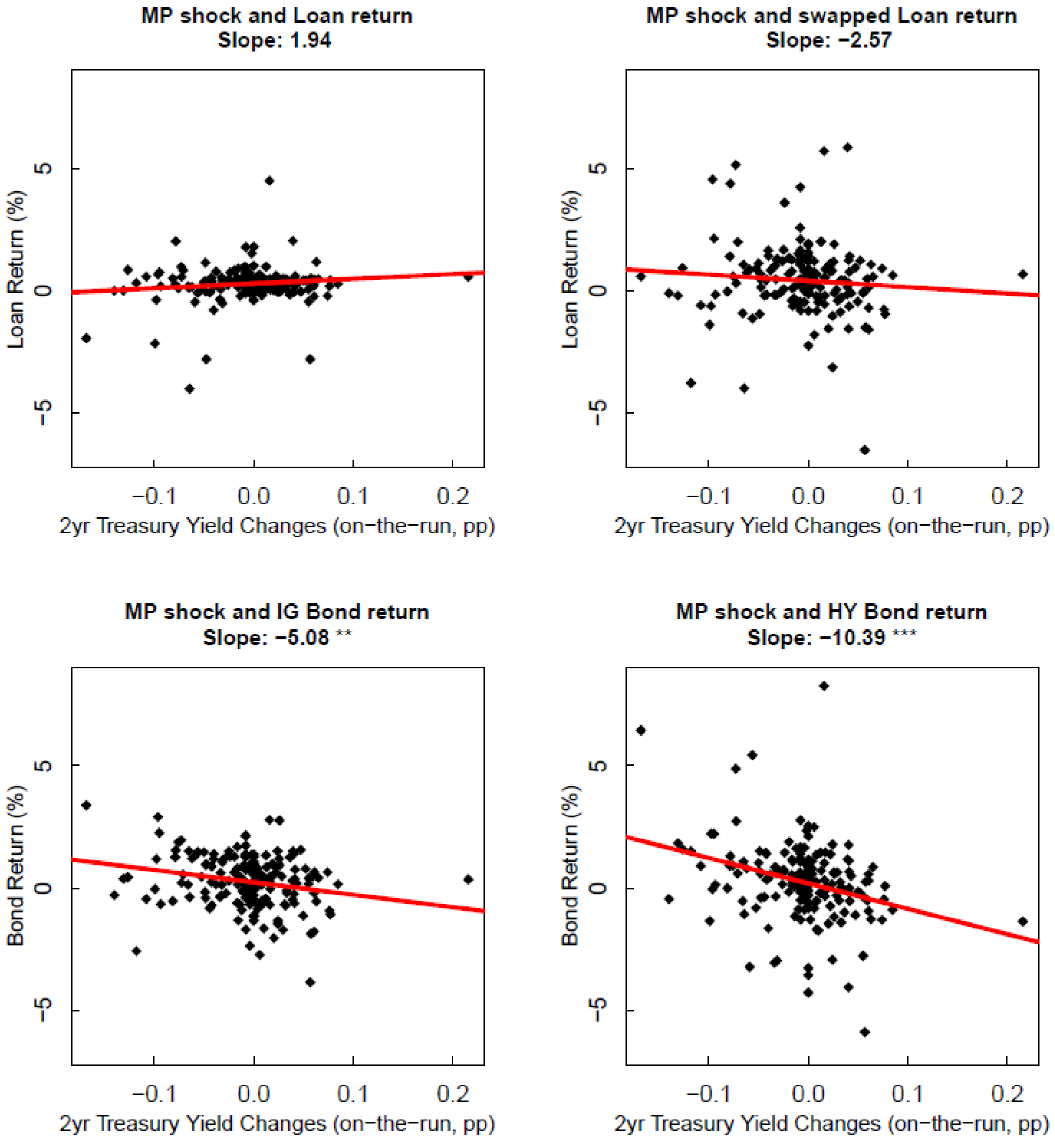
Dependent Variable: Changes in Spread around FOMC meetings

	Weighted difference: Loan - Bond	Weighted difference: Loan - HY	Loan	Bond	HY Bond	Weighted difference: Loan - Bond	Weighted difference: Loan - HY
MP shock	-0.597 **	-0.665 *	-0.062	0.078	-0.226	-0.887 *	-0.55
	(0.302)	(0.357)	(0.213)	(0.438)	(0.662)	(0.526)	(0.558)
(MP shock>0) dummy			0.032	-0.002	0.015	0.012	0.003
			(0.021)	(0.025)	(0.057)	(0.026)	(0.03)
MP shock *(MP shock>0) dummy			0.18	0.436	1.764	0.444	-0.308
			(0.42)	(0.585)	(1.224)	(0.639)	(0.736)
N	165	165	165	165	165	165	165
Adj-R^2	0.021	0.016	0.01	-0.007	0.002	0.013	0.004

Note: Sample period is from 1999/07/09 through 2021/06/30. Observations with the largest 5 dependent variable and with the smallest 5 dependent variable are removed in each column. Spread changes are from 1-day before through 10 days after FOMC announcement dates. MP shocks are changes of the 2-year Treasury yield from 10 minutes before through 20 minutes after FOMC announcements. HY refers to high yield bonds. The dependent variable for the first two columns and for the last two columns is weighted difference of the average loan and (all/high yield) bond spread changes, where the weights are determined as in equation (5) based on monthly spread changes. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994).

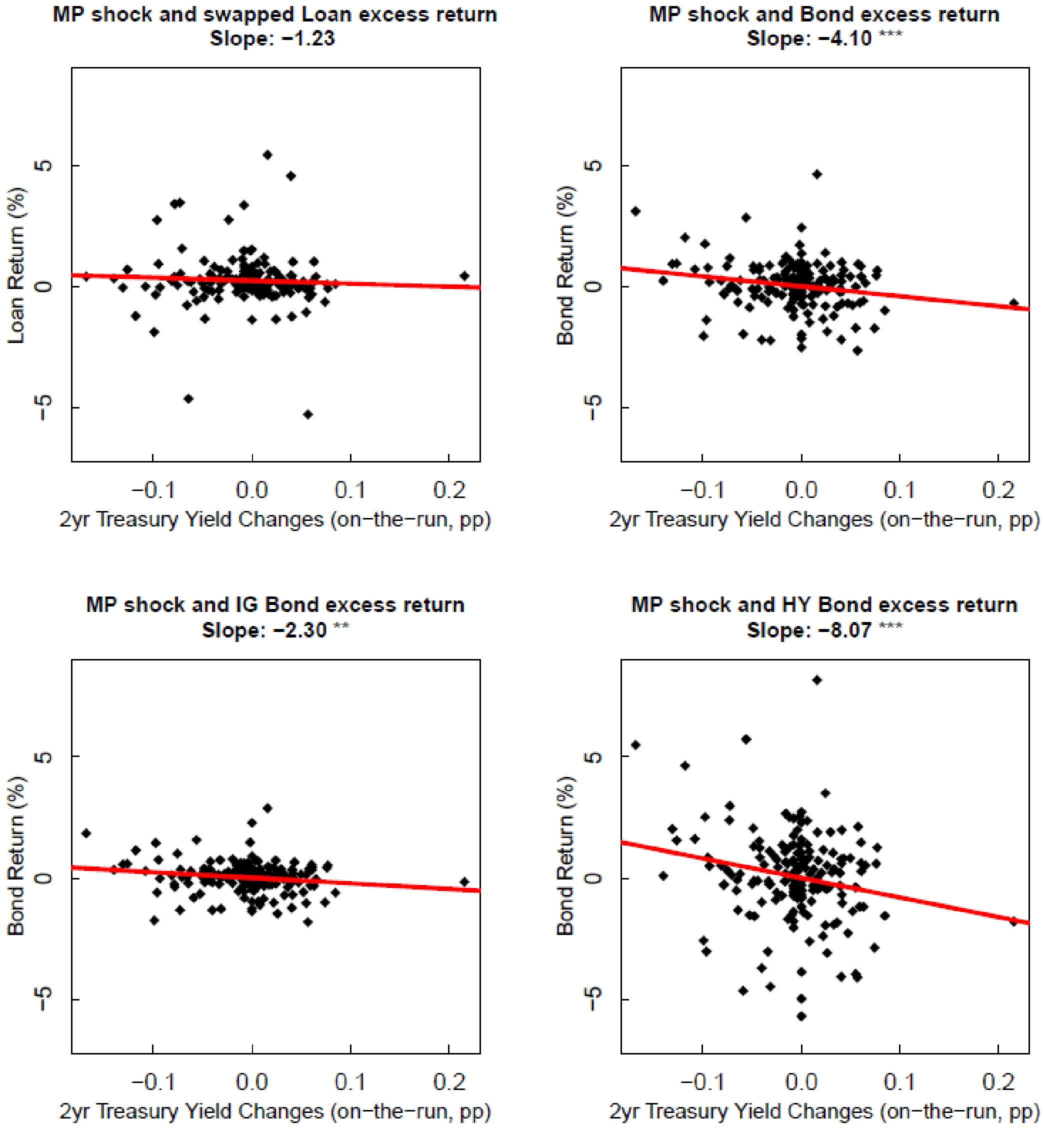
Appendix Figures

Figure A1: Monetary Policy Shock vs. Loan and Bond Returns



Source: Refinitiv, LSTA/LPC Mark-to-Market Pricing and Euro Pricing Service; ICE Data Indices, LLC, used with permission.
Note: The figure plots loan and bond returns from 1 day before through 10 days after FOMC announcements vs. changes of the 2-year on-the-run Treasury yields from 10 minutes before through 20 minutes after FOMC announcements. The red lines are fitted lines based on the OLS regression. The regression coefficients and their statistical significance are noted above each subfigure. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994). Swapped loan returns refer to returns of a synthetic instrument with fixed-rate payments constructed from a loan using the corresponding interest rate swap (as described in Figure 1). IG refers to investment grade bonds and HY refers to high yield bonds. Sample period is from 1999/07 through 2021/06.

Figure A2: Monetary Policy Shock vs. Loan and Bond Excess Returns



MP shock and swapped Loan excess return
Slope: −1.23

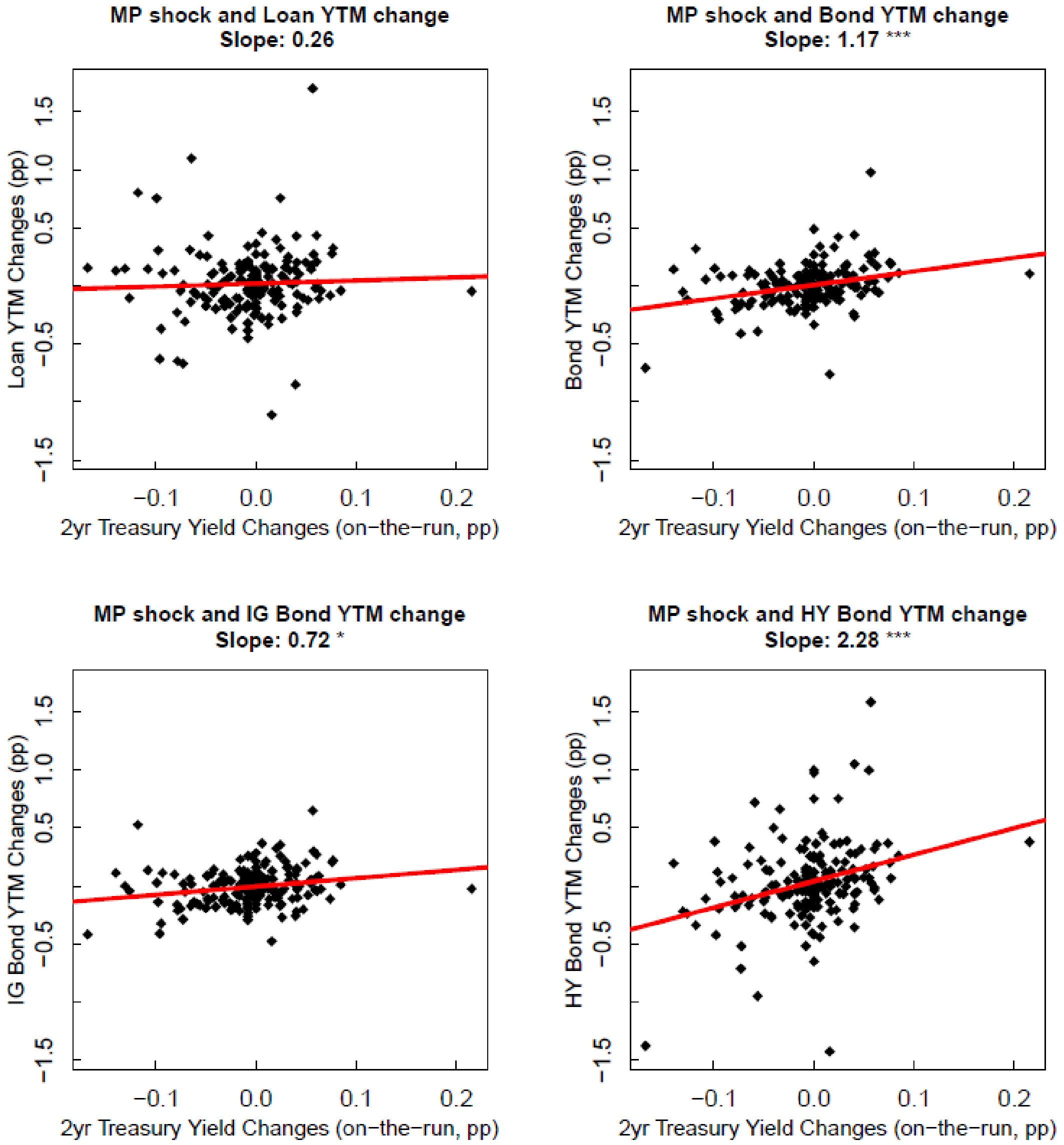
MP shock and Bond excess return
Slope: −4.10 ***

MP shock and IG Bond excess return
Slope: −2.30 **

MP shock and HY Bond excess return
Slope: −8.07 ***

Source: Refinitiv, LSTA/LPC Mark-to-Market Pricing and Euro Pricing Service; ICE Data Indices, LLC, used with permission.
Note: The figure plots excess loan and bond returns from 1 day before through 10 days after FOMC announcements vs. changes of the 2-year on-the-run Treasury yields from 10 minutes before through 20 minutes after FOMC announcements. Excess returns refer to raw returns in excess of the return of a risk-free asset with the identical cash flows. For loans (top left figure), raw returns are from those of a synthetic fixed-rate instrument using an interest rate swap (as described in Figure 1) to make the payment schedule fixed (otherwise, there is no corresponding "risk-free" asset). The red lines are fitted lines based on the OLS regression. The regression coefficients and their statistical significance are noted above each subfigure. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994). IG refers to investment grade bonds and HY refers to high yield bonds. Sample period is from 1999/07 through 2021/06.

Figure A3: Monetary Policy Shock vs. Loan and Bond Yield-to-Maturity



MP shock and Loan YTM change
Slope: 0.26

MP shock and Bond YTM change
Slope: 1.17 ***

MP shock and IG Bond YTM change
Slope: 0.72 *

MP shock and HY Bond YTM change
Slope: 2.28 ***

Source: Refinitiv, LSTA/LPC Mark-to-Market Pricing and Euro Pricing Service; ICE Data Indices, LLC, used with permission.
Note: The figure plots changes of yields-to-maturity (YTMs) from 1 day before through 10 days after FOMC announcements vs. changes of the 2-year on-the-run Treasury yields from 10 minutes before through 20 minutes after FOMC announcements. For loans (top left figure), YTMs are from those of a synthetic fixed-rate instrument using an interest rate swap (as described in Figure 1) to make the payment schedule fixed. The red lines are fitted lines based on the OLS regression. The regression coefficients and their statistical significance are noted above each subfigure. Standard errors are computed using the Newey-West HAC covariance matrix with the Bartlett Kernel, where the optimal bandwidth is chosen following Newey and West (1994). IG refers to investment grade bonds and HY refers to high yield bonds. Sample period is from 1999/07 through 2021/06.