The Bond Lending Channel of Monetary Policy

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Abstract

Given that an increasing share of firms' borrowing occurs through bond markets, we study how debt structure affect the transmission of monetary policy. We present a high-frequency framework that combines identified monetary shocks with cross-sectional firm-level stock price reaction. An envelope argument shows that firm-level stock market data is particularly informative: since firms maximize equity value subject to constraints, stock price reactions directly reflect how monetary policy affects constraints in the population of firms once we control for equity duration. We apply this idea to a sample of US and Eurozone public firms in 2001-07. In Europe, contrary to classical bank lending channel predictions, firms with more bank debt are less affected by surprise monetary tightening relative to other firms. On the other hand, we find no differential effect in the United States. We stress the role of firm liquidity management and difference in financial systems to explain these findings.

Keywords: Monetary policy, debt structure, stock market, banking relationships, corporate bonds
JEL codes: E44, E52, G21, G23

*Preliminary, comments welcome.

1 Introduction

Most macroeconomic aggregates—such as investment, output or employment—are determined by firm decisions and influenced by monetary policy. Given that changes to the policy rate directly affect the cost of external financing, it is plausible that firms' debt play an important role.[1] A (multiform) "bank lending channel" is the pre-dominant view to understand the financial transmission of monetary policy. However, bond debt has been rising at the expense of bank lending in recent years. Europe is a striking example of this rapid growth: although its bond markets were historically less developed than in the U.S., according to the European Commission, the share of market financing almost doubled between 2000 and 2016. How does monetary transmission depend on the bond-bank share? This is an open and consequential issue—indeed, the stock of bond debt has become a major concern for central bankers.[2]

Addressing this question presents two challenges. On the empirical front, cleanly identifying the effect of monetary policy is hindered by the fact that policy decisions are endogenous and correlated with many drivers of firm choices. While high-frequency approaches have been remarkably successful in isolating monetary shocks (Nakamura and Steinsson, 2018b), tracing the impact of these shocks on the real economy has proven more difficult. Second, the conceptual front is equally challenging. While bank loans, unlike bonds, are provided by levered intermediaries with significant liquidity mismatch, there are others channels for which the difference between bonds and loans can matter for monetary transmission. For instance, the corporate finance literature emphasizes that market debt is more rigid and harder to renegotiate relative to bank loans, or "relationship financing" (Bolton and Scharfstein, 1996). They also tend to have different contractual characteristics, such as maturity, interest rate fixation, or seniority among others.

To address these challenges, this paper presents a high-frequency approach that combines identified monetary shocks with cross-sectional firm-level stock price reaction. An

[1] Indeed, a growing number of papers have emphasized the role of firm liabilities in shaping the response of the economy to aggregate shocks (Jiménez, Ongena, Peydró, and Saurina (2012), Giroud and Mueller (2017), Crouzet (2017), Gomes, Jermann, and Schmid (2016) or Ottonello and Winberry (2018)).

[2] The January 2019 minutes of the FOMC state that "the build-up in overall nonfinancial business debt to levels close to historical highs relative to GDP was viewed as a factor that could amplify adverse shocks to the business sector." The President of the Federal Reserve of Dallas recently claimed: "As a central banker, I am carefully tracking the growth in BBB and less-than-investment-grade debt. In a downturn, some proportion of BBB bonds maybe at risk of being downgraded, creating dislocations."

envelope argument shows that stock market data is special: since firms maximize equity value subject to constraints, stock price reactions directly reflect how monetary policy affects constraints in the population of firms once we control for equity duration. We provide an unifying framework of debt structure and monetary transmission and apply our empirical strategy to a sample of Eurozone and U.S. public firms. In Europe, contrary to standard bank lending channel predictions, firms with more bank debt are less affected by surprise monetary tightening relative to other firms. This is consistent with the value of banking relationships: since bonds are harder to renegotiate in bad times than loans, rate hikes tighten liquidity constraints relatively more for bond-reliant firms. On the other hand, we find no differential effect in the United States. This is consistent with well-developed bond markets and rating agencies, leading to a low value of banking relationships for large U.S. firms.

The first part of the paper explains how to interpret stock market reactions in order to learn about the effect of monetary policy on firms. We first highlight a very general envelope argument: to a first order, since firms maximize equity value subject to constraints, their stock price reaction is not driven by change in optimal firm's policies. Instead, it reveals how monetary policy affects the constraints faced by the firm, as well as a direct equity duration effect. Leaning on recent developments in the asset pricing literature to control for equity duration (Gormsen and Lazarus, 2019; Weber, 2018), this suggests a clean high-frequency approach to estimate how monetary policy tightens or relaxes financial constraints, a force at the heart of recent macro-finance models of monetary transmission. We then specialize this approach to study how differences between bonds and bank loans matters for monetary transmission. Our organizing framework nests three general forces. First, bonds and loans have different maturity and interest rate fixation (Ippolito, Ozdagli, and Perez-Orive, 2018), which will be subsumed in our equity duration controls. Second, the (multiform) bank lending channels suggest that higher rates reduce loan supply.[3] This would imply that more bank financing *tightens constraints* after a rate hike. Third, bonds are harder to renegotiate in bad times and banking relationships provide insurance against temporary shocks (Bolton and Scharfstein, 1996; Crouzet,

[3]Because banks are levered intermediaries issuing liquid deposits to fund illiquid loans, they are potentially affected by monetary policy in specific ways. Classical views stress the role of reserves and capital, whereas more recent theories emphasize market power (Drechsler, Savov, and Schnabl, 2017), the composition of bank interest income (Wang, 2018) or interest coverage covenants (Greenwald, 2019).

2017; Bolton, Freixas, Gambacorta, and Mistrulli, 2016; De Fiore and Uhlig, 2015). In that case, more bank financing *relaxes constraints* after a rate hike. In general, the effect of debt structure is ambiguous: our empirical estimates will determine which force dominates in a specific sample.[4]

In the second part of the paper, we apply this approach to two samples of public firms in the Eurozone and the United States. We construct a panel that combines information on policy announcements, asset prices, firm balance sheets and financing structure. We focus on conventional monetary policy between 2001 and 2007, from the early years of the Euro to the beginning of the financial crisis. In the Eurozone, we follow Corsetti, Duarte, and Mann (2018) and construct identified monetary policy shocks using quasi-intraday data on interest swaps. In the United States, we use the time series of shocks constructed by Nakamura and Steinsson (2018a). These shocks capture the surprise content of central banks' announcements and are hence little affected by general macro-economic information that did not fall on that specific time window of the day. Daily stock prices are merged with balance sheet information as well as comprehensive corporate bond issuance data to measure the reliance of firms on bond financing.

We find contrasting results across the two samples. In the Eurozone, there is strong evidence that debt composition matters for the transmission of monetary policy: firms with more bond debt are relatively more affected by surprise interest rate changes. This finding holds true when we control for total debt and sector-specific sensitivities to monetary policy.[5] Quantitatively, after 25 basis point increase in interest rates, firms in the bottom quartile of the bonds over assets distribution have a 50 basis point lower stock return relative to firms in the top quartile.[6] A number of robustness tests confirm this fact, including the inclusion of traditional balance sheet covariates that are thought to drive bond financing or the response to monetary policy. This finding is hard to square with a (multiform) bank lending channel. Irrespective of the exact micro-foundation, this type of explanation would imply that bond-reliant firms are relatively less responsive,

[4]Naturally, the distinction between these broad forces is not always clear cut. For instance, the channel in Acharya, Almeida, Ippolito, and Perez-Orive (2018) suggests that liquidity insurance offered by banks can be impaired if their balance sheet is negatively affected by monetary tightening.

[5]A number of potential transmission channels of monetary policy can affect firms indirectly, independently of their liabilities. Important examples include changes to consumer demand or labor supply. However, it is likely that those channels operate mainly at the sectoral level and are netted out in a within-sector, across-firm specification.

[6]The sample standard deviation of stock returns on monetary announcement days is 2.5%.

the opposite of what the data suggest. On the other hand, the evidence is consistent with banking relationships providing insurance against temporary shocks, and thus that more bond financing tightens constraints after a rate hike.

However, we find no difference in the United States across firms with different debt structure, once we control for equity duration.[7] This suggests that banking relationships do not relax liquidity constraints for U.S. firms. In fact, this striking difference across regions can plausibly be rationalized by sharp differences between these two financial systems. Indeed, a number of stylized facts suggest that the value-added of banking relationships relative to market financing is much lower in the United States compared to the Eurozone. For instance, the prevalence of ratings agencies and public information is significantly different: the ECB estimates that in 2004 only 11% of firms with turnover over €50M had an S&P rating in Europe, compared to 92% in the U.S. We also show that rating downgrades have a stronger effect for Eurozone firms. Acharya, Almeida, Ippolito, and Perez-Orive (2018) show that U.S. firms with more bonds get liquidity insurance not from a relationship bank, but by signing credit line agreements that are frequently undrawn. Finally, Darmouni (2019) finds little evidence of private information embedded in banking relationships for large U.S. firms.

The chief implication of our findings is that macroeconomic models would benefit from featuring heterogeneity in debt structure more prominently, and, in particular, the mix of bonds and bank loans. Sources of external financing are not perfect substitutes and the underlying tradeoffs affect the pass-through of monetary policy. Meanwhile, debt structure is driven by past financing patterns, which are in turn determined by past policies. This implies a path-dependence to the actions of central banks: episodes of quantitative easing and low interest rates bring about a larger reliance on corporate bond financing, a trend that influences how conventional monetary policy operates going forward.

Related literature

This paper builds on an extensive body of works at the intersection of corporate finance and macroeconomics. First, it relates to the literature on the choice between bonds and

[7]This is line with the findings of Ippolito, Ozdagli, and Perez-Orive (2018).

bank loans. Crouzet (2017), Acharya, Almeida, Ippolito, and Perez-Orive (2018) and Crouzet (2014) show that the optimal mix of bonds versus loans varies in the cross-section of firms and that this fact has implications for real outcomes. Crouzet and Mehrotra (2017) find that U.S. bond issuers are more sensitive to recessions. De Fiore and Uhlig (2015, 2011) also study the choice of debt type in a macroeconomic context and show that it played a role in Europe during the financial crisis. We emphasize the role of bond debt rigidity, following classical theoretical (Bolton and Scharfstein, 1996; Diamond, 1991; Rajan, 1992) and empirical contributions. We further complement papers that show how policies stimulating bond markets can have aggregate effects through the substitution of bank loans toward bonds (Balloch, 2018; Grosse-Rueschkamp, Steffen, and Streitz, 2019; Arce, Gimeno, and Mayordomo, 2018). Kashyap, Stein, and Wilcox (1996) and Bolton and Freixas (2006) suggest that monetary policy pass-through depends on the composition of external finance, although the mechanism is very different. Lhuissier and Szczerbowicz (2018) and Becker and Ivashina (2014) provide evidence on monetary policy influencing firms' choice of debt structure.

We also relate to an extensive literature on corporate liquidity management (see Almeida, Campello, Cunha, and Weisbach (2014) for a survey). In particular, we build on recent work stressing the role of corporate finance and liquidity in monetary transmission (Rocheteau, Wright, and Zhang, 2018; Acharya and Plantin, 2019; Kiyotaki and Moore, 2018; Cloyne, Ferreira, Froemel, and Surico, 2018). Our paper is also related to the literature on the bank lending channel of monetary policy (Drechsler, Savov, and Schnabl, 2017; Kashyap and Stein, 2000; Jiménez, Ongena, Peydró, and Saurina, 2012; Wang, 2018; Wang, Whited, Wu, and Xiao, 2018).

In terms of its approach, this paper relies on high-frequency identification of monetary policy shocks (Cook and Hahn, 1989; Kuttner, 2001; Cochrane and Piazzesi, 2002; Bernanke and Kuttner, 2005a; Nakamura and Steinsson, 2018a; Corsetti, Duarte, and Mann, 2018). The most related work in this area describes heterogeneous reactions of stocks to high-frequency monetary shocks based on a broad set of balance sheet characteristics (Ozdagli (2018), Ozdagli and Velikov (2019) and Haitsma, Unalmis, and de Haan (2016)), while Andreson and Cesa-Bianchi (2018) studies the response of credit spreads. In contrast, we focus on the role of bond financing.

In terms of its findings, this paper aligns with the growing consensus that heterogeneity is key to monetary policy transmission. For instance, Ottonello and Winberry (2018), Jeenas (2018) and (Lakdawala and Moreland, 2019) emphasize heterogeneous response of firms with different financial positions. Gomes, Jermann, and Schmid (2016) and De Fiore, Teles, and Tristani (2011) present macroeconomic models of monetary policy with a focus on firms' external financing. Greenwald (2019) describes a covenant channel of monetary transmission. Rodnyansky (2019) investigates how firm heterogeneity together with intermediate import intensities mediate the monetary transmission process in unorthodox ways. Auclert (2019), Wong (2019), Kaplan, Moll, and Violante (2018), Coibion, Gorodnichenko, Kueng, and Silvia (2017) also highlight the importance of heterogeneity, with a stronger focus on the household sector.

2 High-Frequency Approach

2.1 Envelope Argument: Information in Stock Price Reaction

This section offers a general illustration of the envelope argument that will guide our empirical strategy. We argue that stock price data is special. Not only it is available at high-frequency to help identification, it is also particularly revealing because it is related to the objective function of firms. Given firms maximize equity value subject to constraints, stock price reactions have a clear interpretation given by the envelope theorem.

To fix ideas, consider a setting that potentially fits many macro-finance models of firms facing financial constraints. The firm has a vector of characteristics x and denote the monetary policy target by r^f. The firm chooses its optimal policies $y^* = (I^*, N^*, D^*...)$ for path of inputs, debt, etc. These policies are chosen to maximise the present value of future expected profits $E(y, x, r^f) = \Sigma_t \frac{\pi_t(y,x)}{(1+r_t)^t}$. In addition, the firm is subject to a number K of constraints $G_k(y, x, r^f) \geq 0$, which potentially depend on the policy rate r^f. In this setting, equity value is the value function:

$$V = \max_y E(y, x, r^f) \text{ s.t. } G_k(y, x, r^f) \geq 0 \forall k$$

The stock price reaction to small monetary policy shocks can be computed directly using the envelope theorem:

$$\frac{\mathrm{d}V}{\mathrm{d}r^f} = \underbrace{\frac{\partial E(y^*, x, r^f)}{\partial r^f}}_{\text{equity duration}} + \underbrace{\Sigma_k \lambda_k \frac{\partial G_k(y^*, x, r^f)}{\partial r^f}}_{\text{how MP affects constraints}}$$

In particular, the change in optimal policy $\frac{\mathrm{d}y^*}{\mathrm{d}r^f}$ induced by monetary policy is second order. Instead, the stock price reaction can be decomposed in two terms. The first is the direct effect: the revaluation of the objective function induced by the shock, *keeping the firm policies constant*. We label this direct term "equity duration", borrowing from the asset pricing literature in which it denotes the interest-rate sensitivity of the present value of a given cash flow stream. Recent works have argued that duration is an important driver of the cross-section of stock returns (Gormsen and Lazarus, 2019; Weber, 2018) and we will use their measures in our empirical analysis.

The second term is of particular interest to understand the monetary transmission channel. It captures how monetary policy relaxes or tightens the constraints faced by firms. This channel is absolutely central to macro-finance models with financial frictions. Interestingly, our envelope argument shows that stock prices are *directly informative* about this channel, once we control for equity duration. This is remarkable given that detecting constraints empirically is generally thought to be especially difficult. Note that this idea is quite general. It only relies on firms maximizing equity value and not on the type of policies or constraints considered.

2.2 Cross-sectional Approach

Our empirical approach leverages this idea by combining time series and cross-sectional high-frequency variation. Monetary policy shocks can be recovered from change in market interest rates over short windows around policy announcements (Kuttner, 2001; Nakamura and Steinsson, 2018a; Corsetti, Duarte, and Mann, 2018). We then look at firm-level stock market response to these shocks across firms.

We focus on the role of debt structure in monetary transmission and ask whether firms with more bond financing respond differently to monetary policy. The envelope argument above shows that this cross-sectional stock market response reveals how MP affects constraints *differentially* across firms with different debt structure.

A few comments are in order. First, it is important to adequately control for equity duration. Second, we can only detect constraints that are affected by monetary policy. Third, stock price reaction are, to a first order, not driven by changes in credit flows. Our results are therefore complimentary to the extensive literature that has shown that monetary policy drives bond and loan issuance differentially (Becker and Ivashina, 2014; Lhuissier and Szczerbowicz, 2018). Finally, cross-sectional estimates can only capture constraints for which debt structure matters. If monetary policy relaxes constraints uniformly across firms with different debt structure, our estimate will be zero. The next two subsections elaborate on this issues.

2.3 Bank vs. Bonds and Monetary Transmission

Since stock price reaction reveals how monetary policy tightens constraints, to interpret our findings one needs to understand how debt structure matters for financial constraints. Existing works have argued that bank loans and bonds are not perfect substitutes. In this section, we aim to map out three broad types of differences across of bonds and loans that are relevant for monetary transmission. The next subsection nests these forces into a simple organizing framework.

Maturity and fixed vs. floating rates: Bonds and loans tend to have different maturity and interest rate fixation. Corporate bonds tend to have longer maturities than bank loans and are more likely to have fixed interest rates Ippolito, Ozdagli, and Perez-Orive (2018). Note however that these differences are more pronounced in the United States relative to Europe. In the Eurozone, bonds tend to have shorter maturities than their U.S. counterparts, while the share of bank loans with floating rates is significantly smaller than in the U.S.

The revaluation of debt (and assets) with respect to a change in interest rates is summarized by its duration—the (percentage) change in net present value to a change in the interest rate. The duration increases (becomes more negative) with longer maturity and with fixed as opposed to variable coupon payments. In our setting, the present value of bond repayments falls relatively more than for a loan, due to their longer maturity and fixed interest rate as a consequence to a rise in the interest rate. Because debt is a liability for the firm, this implies that, *ceteris paribus*, more bonds lead to smaller (less negative) equity duration. Intuitively, bonds are revalued significantly downward after a rate hike, while the revaluation of loans is smaller.

Interest rate pass-through: Monetary policy affects the cost of credit for firms, both through the risk-free rate as well as the risk premium (Drechsler, Savov, and Schnabl, 2018; Kekre and Lenel, 2019). However, different debt instruments have different interest rate pass-through to borrowers. This interest pass-through is at the core of existing views of the (multiform) bank lending channel of monetary policy. Classical views emphasized the role of reserves or bank capital, while recent views have argued that banks' market power, loan covenants or bank income composition are quantitatively important (Drechsler, Savov, and Schnabl, 2017; Wang, Whited, Wu, and Xiao, 2018; Greenwald, 2019; Wang, 2018). The floating rate nature of bank loans also matters for this channel Ippolito, Ozdagli, and Perez-Orive (2018), in addition to affecting equity duration. Independent of their exact micro-foundations, these theories rely on bank-related frictions and suggest that bonds have a lower interest rate pass-through relative to loans.

Corporate liquidity management: The third force is motivated by extensive work in corporate finance that stresses the importance of firms' liquidity management: investment, debt and cash hoarding policies are jointly determined in a forward-looking manner to avoid financial distress. When capital markets are not frictionless, firms have incentives to self-insure against temporary cash-flow shocks by holding liquid assets. Corporate liquidity has been recently recognized a key force for monetary transmission (Rocheteau, Wright, and Zhang, 2018; Kiyotaki and Moore, 2018; Altavilla, Burlon, Giannetti, and Holton, 2019).

Through this channel, debt structure can affect monetary transmission in a novel way. Indeed, an equally large body of work emphasizes the distinction between relationship banking and market financing. A key aspect of this difference is that bonds tend to be widely held by a dispersed base of investors, which make them harder to renegotiate (Bolton and Scharfstein, 1996). On the other hand, in bad times banks are better able to help their relationship borrowers avoid financial distress (Crouzet, 2017; Bolton, Freixas, Gambacorta, and Mistrulli, 2016; De Fiore and Uhlig, 2015). Debt structure thus alters firm liquidity management in normal times. A rate hike drains future cash-flow and, *ceteris paribus*, tightens liquidity constraints relatively more for firms with more bonds.

The discussion makes clear that the effect of debt structure on monetary transmission is ambiguous. While the first two forces predict that firms with more bank loans should be relatively more affected by monetary shocks, the third force predicts the opposite effect. Which force dominates is likely driven by the relative strength of the different frictions faced by firms in the environment in which they operate. Our empirical results will shed light on this question, and compare the Eurozone with the United States, two regions with very different financial systems.

2.4 Organizing Framework

To fix ideas, this section presents a simple model that nests the three forces above in a coherent framework. The goal is not to present the most general model but to illustrate what is revealed by stock price reactions. We apply our envelope argument in this setting to illustrate how debt structure matters for monetary transmission. We model firms with debt in place that face potential temporary cash-flow shocks. Financial frictions imply that firms have to jointly manage their investment and liquidity holdings. To keep exposition short, we do not endogenize all margins.[8]

Setup: A firm has a legacy project (assets in place) that pays cash flows in each period, as well as debt obligations that must be paid in each period. We model three dates explicitly: t=0, 1 and 2. Figure 1 illustrates the timeline. The last period t=2 summarizes all future cash-flows. The existing assets in place generate a payoff stream for the firm with present value $PVE_0 = PVA_0 - PVD_0$, which is the difference between the all future cash-flows and debt service payments. We allow the structure of these payoff streams to be arbitrary, and their duration (how their present value changes with discount rates) is the only summary statistics needed for the analysis below. At t=0, the firm has a new investment opportunity. This new project generates a stream of cash-flows starting from t=2. An amount I invested at t=0 generates a present value of $R(I)PVI$ at t=2. Assume decreasing returns to scale, so that R is increasing and concave. The term PVI summarizes the temporal structure of the cash-flows and captures the new project duration, that plays an important role in the analysis.[9]

[8]For instance, the model could be extended in the line of Acharya, Almeida, Ippolito, and Perez-Orive (2018) to account for the joint choice of debt structure and liquidity instruments. We also abstract from payouts (Acharya and Plantin, 2019) and maturity choice for simplicity.

[9]For example, if the project pays a first cash-flow $R(I)$ that grows a rate g every period and the discount rate is ρ, $R(I)PVI = R(I)/(\rho - g)$.

Liquidity shock: Following Holmström and Tirole (1998), we model liquidity shocks at the interim period t=1. The source of the liquidity shock is that temporary cash-flow at t=1 are uncertain: π_1 can be unexpectedly low, without any implication for terminal cash-flows. The firm faces a credit event if at t=1 its current financial resources are too small relative to current debt service payments[10]. For simplicity, assume that the firm is liquidated with zero recovery value in case of a credit event. More generally, the framework is well suited to understand how firms manage their credit rating or plan in advance to prevent covenant violations, over and above avoiding conventional defaults.

Corporate liquidity demand: The central question that we study in this framework is the decision of firms to withstand a liquidity shock in equilibrium. To withstand a liquidity shock, the firm can renegotiate down debt obligation R_1 and lower them by up to $\tilde{\pi}$ at t=1 (equivalently, raises up to $\tilde{\pi}$ from capital markets or draws down a credit line). However, this is unlikely to be enough to raise enough liquidity to withstand all shocks because of two frictions, that are well understood in the literature. The first is the lack of pledgeability of future cash flows due to, for example, moral hazard or lack of enforcement.

The second is debt rigidity which plays a crucial role in our comparison of bonds and bank financing. Following a large temporary cash-flow shock, rather than letting the firm enter financial distress, it is often in the creditors' best interest to renegotiate their claims or let themselves be diluted by the issuance of new claims. However, renegotiation frictions can create a "debt overhang" problem at the intermediate stage. Indeed, existing creditors might refuse to be diluted by new issuance or fail to coordinate on a mutually beneficial renegotiation. This can explain why market debt, which is held by a dispersed investor base, is more rigid relative to relationship banking (Bolton and Scharfstein, 1996). In the model, that can be formalized as a lower value of $\tilde{\pi}$ that can be raised at t=1 to withstand the liquidity shock.[11]

The shortfall that cannot be covered by $\tilde{\pi}$ therefore has to be planned in advance,

[10]Note the difference with solvency concerns in which the present value of *all future cash flows* is too low relative to the present value of future debt services.

[11]Tirole (2010) provides an overview. More explicit microfoundations for $\tilde{\pi}$ would go as follows. In a frictionless world, the firm could raise at t=1 the entire present value of its future income. However, assume that only a fraction $1-\theta$ can be pledged to investors, for example to preserve the insiders' incentives to work. Moreover, because of imperfect renegotiation only a fraction $1-\phi$ of pledgeable income can in fact be raised. This leads to $\tilde{\pi} = (1-\theta)(1-\phi)\times$ future income. The coefficients (θ, ϕ) measure the magnitude of these two frictions.

and comes from the liquidity hoarded at t=0. In practice, liquid assets can come in the form of cash, marketable securities like bonds, or access to credit lines granted by banks. Optimally the firm will not withstand all liquidity shocks. We will see that hoarding liquidity is costly and hence the firm will sometimes incur a dead-weight loss. The firm's "continuation policy" is to choose a threshold π^* such that it withstand the liquidity shock at t=1 only if interim cash-flows are large enough: $\pi_1 > \pi^*$. The probability of a credit event is thus $F(\pi^*)$. Because the firm can only raise at most $\tilde{\pi}$ from renegotiating its debt at t=1, it must accumulate liquidity at t=0 of at least $L = R_1 - \pi^* - \tilde{\pi}$. When $\pi_1 > R_1 - L^*$, the firm does not renegotiate. For intermediate cash-flow realizations, it raises just enough funds by renegotiating and its payoff is zero. Denote by q the price of hoarding liquid assets, in the sense that ensuring 1 unit of liquidity at t=1 implies spending $(1+q)$ at t=0. This direct price can correspond to a "liquidity premium" on near-money assets (Nagel, 2016) or can be a metaphor for the risk that a credit line is revoked at a later date (Acharya, Almeida, Ippolito, and Perez-Orive, 2018).

Equilibrium Liquidity Demand and Investment: At t=0, the firm decides how much to invest in the new project. The legacy project implies disposable income y_0 at t=0 (i.e. earnings after subtracting debt obligations and maintenance of legacy assets). Disposable income is either invested in new project I or stored in liquid assets L, such that $I + (1 + q)L = y_0$. Throughout, we assume that the firm has enough internal funds at t=0 to not have to borrow in order to finance the new project. While it can straightforwardly be relaxed, this is the most empirically relevant case for large firms. The firm chooses its optimal continuation policy π^* at t=1 jointly with its investment I^* and liquid asset holdings L^* at t=0. It maximizes its expected payoff given two constraints:

$$\max_{\pi^*, I^*, L^*} \underbrace{[1 - F(\pi^*)][PVE_0 + R(I^*)PVI]}_{\text{Expected terminal profits}} + \underbrace{\int_{\pi_1 \geq R_1 - L^*} (\pi_1 - R_1 + L^*) dF(\pi)}_{\text{Expected profits at t=1}}$$

s.t. $R_1 = \pi^* + \tilde{\pi} + L^*$ and $I^* + (1+q)L^* = y_0$.

The first constraint says that there is just enough liquidity at t=1 to service debt in the worst continuation scenario ($\pi_1 = \pi^*$). The second is the accounting of cash-flows at t=0. The trade-off behind the optimal continuation policy π^* is intuitive. The FOC implies the following optimality condition:

$$\underbrace{(1+q)}_{\text{price of liquid assets}} \underbrace{R'(I^*)PVI}_{\text{return of new project}} - \frac{1-F(\pi^*+\tilde{\pi})}{1-F(\pi^*)} = \underbrace{\frac{f(\pi^*)}{1-F(\pi^*)}}_{\text{hazard rate of credit event}} \underbrace{[PVE_0 + R(I^*)PVI]}_{\text{loss in case of credit event}}$$

Decreasing π^* (withstanding more liquidity shocks) has the benefit of preserving the returns of the legacy project and the new project, as the shareholders occur a dead-weight loss after a credit event. However, it necessitates liquidity hoarding, which reduces the scale of investment of new project. The FOC clearly summarize this intuition: withstanding liquidity shocks has an opportunity cost of investing less in the new project, in addition to the direct cost q.

Stock Price Reaction to Monetary Policy: Given that firms maximize their equity value given constraints, the stock price reaction to a change in interest rates can be computed directly using the envelope theorem:

$$\frac{\mathrm{dEquity}}{\mathrm{d}r^f} = \underbrace{(1-F(\pi^*))\left\{\frac{\partial PVE_0}{\partial r^f} + R(I^*)\frac{\partial PVI}{\partial r^f}\right\}}_{\text{equity duration}} - \underbrace{(1-F(\pi^*))R'(I^*)PVI}_{\text{shadow value of liquidity}}\left\{\underbrace{\frac{\partial R_1}{\partial r^f}(1+q)}_{\text{interest rate pass-through}} + \underbrace{\frac{\partial q}{\partial r^f}L^*}_{\text{change in price of liquid assets}}\right\} \quad (1)$$

The first term reflects equity duration. The second term reveals how monetary policy affects constraints—here, the liquidity constraint faced by the firm. We break it down into three interpretable components. The interest rate pass-through captures how much rate hikes increase debt burden at the intermediate stage. This tightens constraints because a rate hike drains the cash-flow and makes it less likely that the firm withstands a temporary shock, keeping its policy unchanged. Second, the cost of holding liquid assets can rise, as emphasized by recent work in monetary economics (Rocheteau, Wright, and Zhang, 2018; Drechsler, Savov, and Schnabl, 2018; Nagel, 2016).[12] This tightens constraints

[12]Numerous mechanisms have been proposed, such as the change in the opportunity cost of near-money assets or the change in supply of public money through open market operations. Moreover, in practice private money creation by the financial sector is also important: many firms use credit lines granted by banks to insure against future liquidity shocks or hold bank debt directly. A tightening of monetary policy

because a given budget spend on liquid assets at t=0 delivers less liquidity buffer at t=1.

Finally, we dub the third term "shadow value of liquidity" (SVL) as it represents the Lagrange multiplier on the liquidity constraint. The SVL is defined as the marginal value of an additional dollar of disposable income at t=0. Importantly, in equilibrium, it is equal to the risk-adjusted return on the new project. That's intuitive: the new project is the opportunity cost of every dollar of liquidity hoarded at t=0. In equilibrium, firms that face greater liquidity risk have a larger shadow value of liquidity. Indeed, they invest less and, due to decreasing returns to scale, have higher marginal return on investment.

The Role of Debt Structure: This decomposition makes it clear that debt structure matters for stock market response but that the sign of the total effect is ambiguous. On the one hand, more bonds imply lower equity duration and lower interest-rate pass-through, everything else equal. On the other hand, the rigidity of bonds constrains investment and implies a larger shadow value of liquidity in equilibrium. In general, which effect dominates depends on details of the environment. Our empirical analysis will compare the Eurozone with the United States.

3 Empirical Results

The main focus of our empirical analysis is on conventional monetary policy between 2001 and 2007. The scope is dictated by three considerations: (i) availability of identified monetary policy shocks at high-frequency; (ii) the introduction of the Euro[13]; and (iii) the availability of high quality capital structure data. The period covers a full monetary cycle in both economic regions, as can be seen in Figure 2.

can also reduce private money creation, leading to a fall in the aggregate supply of liquid assets. The slope $\partial q/\partial r^f$ represent the total sum of these different channels.

[13]The Euro was formally introduced on 01/01/1999 which locked all national currencies at a fixed rate to the Euro. Contemporaneously, the ECB started to set its target rate. The initial period was associated with great operational and policy uncertainty as reflected by the ECB's decision to narrow the corridor of its main refinancing rate. For this reason, we allow for some phasing in. The end of the sample period, July 2007, is dictated by OIS swap rate becoming increasingly uninformative about monetary policy with the onset of the financial crisis. For a discussion of monetary transmission below the zero lower bound, see Heider, Saidi, and Schepens (2019).

3.1 Data and Summary Statistics

Construction of monetary shocks: In the Eurozone we follow Corsetti, Duarte, and Mann (2018) and construct a time series of monetary policy shocks using quasi-intraday data on overnight interest swaps (OIS swaps). OIS swaps exchange the overnight rate, EONIA[14], against a fixed rate for an agreed period. At the point of contracting, the fixed rate represents the geometric average of the expected overnight rate over the contract period. In other words, the fixed rate is the average of the rate at the short end of the yield curve—the primary instrument for conventional monetary policy. OIS swaps represent an attractive alternative to futures on the overnight rate which are commonly used in the U.S. for high-frequency identification of monetary policy. Lloyd (2017) finds that the OIS swap rates accurately measure expectations of future short-term interest rates at a horizon between 1 and 24 months in the Eurozone until 09/2007.[15] Following Corsetti, Duarte, and Mann (2018), we exploit the closing times of the Tokyo and London stock exchange to obtain changes in the OIS swap rate in a narrow time frame around the monetary policy announcement. Specifically, we construct the monetary policy shock as the difference in the fixed rate of the 1-month OIS swap in the 6 hour (13.00–19.00 CET) window surrounding the ECB monetary policy announcement. Using this procedure, a positive shock corresponds to a surprise increase, i.e., a monetary tightening. Closing data from the Tokyo and London stock exchange are obtained via Bloomberg.

In the U.S. we obtain the shock series from the replication files of Nakamura and Steinsson (2018a)—this series is derived from the change of federal funds futures rates in a tight window around the Federal Open Market Committee (FOMC) announcement.[16]

Table 1 tabulates the summary statistics of the shocks. The properties of the identified monetary policy shock in the Eurozone are comparable with those of the better known shock in the U.S. Across the two samples many shocks are a few basis points and the mean absolute value is 2.2 and 2.4 bps in the Eurozone and U.S., respectively [17]. The sum-

[14]This is the counterpart to the effective federal funds rate in the U.S. Note also that the ECB target rate and the EONIA have historically tracked each other closely as the ECB target rate can be understood as the target that is intended to be implemented by open market operations.

[15]The Eurozone money market underwent significant stress post 09/2007; we have chosen the sample period such that the identified monetary shocks are unaffected by this.

[16]In contrast to the seminal work of Kuttner (2001) and Bernanke and Kuttner (2005b), Nakamura and Steinsson (2018a) use only regularly scheduled FOMC meetings and focus on changes in a tight time window around the announcement instead of daily changes.

[17]To validate the economic significance of our shock for firms, we show that it significantly impacts stock

mary statistics suggest that monetary policy announcements were largely anticipated by the market. On the other hand, there were a significant number of occasions when the announcement contained unexpected information. Some of these shocks had a magnitude of ten to twenty basis points, which is large given that rate changes are typically twenty five basis points, and are concentrated in the first half of the sample. The shock of forty basis points on September 17, 2001, (following the September 11, 2001, attack) constitutes an outlier in the Eurozone. While there is reason to believe that this was a genuine monetary shock in Europe, our results are robust to excluding this particular day. As there is no established shock in the Eurozone, we confirm the robustness of our result with respect to other definitions of monetary shocks, such as, daily differences in the EURIBOR or OIS rate.

Firm-level data: We combine different data sources in order to create a panel of firms during our period of interest. Balance sheet items come from Thomson Reuters Worldscope and stock information from Datastream. Information on bond issuance comes from SDC Platinum. An alternative to the balance sheet information from Worldscope is the Capital IQ database. Capital IQ contains more granular information regarding the debt structure of firms than what is present in Worldscope.[18] One drawback of Capital IQ is that it gained increasing popularity more recently which makes its coverage limited and somewhat unreliable towards the beginning of our sample. We use it primarily as an additional source to validate the construction of some of the debt variables.[19] The proxy for equity duration follows closely the one used in Gormsen and Lazarus (2019). The authors show that equity duration is analytically related to the growth rate in earnings per share in the special case of the Gordon growth model. Analogously to Gormsen and Lazarus (2019), we use analyst forecasts for long term growth (LTG) of earnings per share from IBES for those firm- year observations for which the measure is available; we impute the remainder by a linear prediction that uses the duration measure of Weber (2018), return

markets. We run daily regressions of different stock market indices on our monetary shock series. Table 2 shows evidence at the aggregate stock market level. Overall, Eurozone and national indices react strongly to surprise monetary announcements. In the U.S. this confirms the results of Bernanke and Kuttner (2005a) with a different set of shocks and a subset of their original sample.

[18]Note that we cannot measure bank debt directly. For clarity of exposition, we nevertheless refer to non-bond debt as bank debt. In practice, most non-bond long-term debt issued by corporation is from a bank, in the forms of credit lines, term loans or capital leases.

[19]Our measure of bond debt from SDC is over 85% correlated with that of Capital IQ.

on equity and sales growth as inputs[20].

The research design limits our sample to firms with liquid enough stocks—this seems a reasonable requirement for stock prices to incorporate new information about monetary policy within a day. We thus constrain our analysis on constituents of highly visible stock market indices with broad coverage. This approach that defines the criterion for inclusion in the sample has at least two advantages. First, it leads to an unbalanced panel to automatically account for mergers and acquisition, as well as the rise of new industry leaders or the demise of former incumbents. Second, the presence in an index ensures that firms are monitored carefully by analysts and market participants during the day. For our baseline results we focus on the EURO STOXX sectoral indices and the S&P500 Index in the Eurozone and US, respectively.[21] Proceeding in this way and excluding financials and utilites, we obtain a sample of 237 and 409 distinct firms in the Eurozone and U.S., respectively. As further evidence that our firm panels capture the relevant macro variation, Table 7 and 8 show that we can replicate the aggregate stock market results in weighted firm-level regressions. Some interesting patterns emerge from the summary statistics, tabulated in Tables 3 and 4, and the corresponding histograms in Figure 3: (i) The size distribution between the two samples is very similar; (ii) the median leverage ratio is 26 % and 24% in the Eurozone and U.S., respectively. (iii) the debt to asset ratio shows large heterogeneity; ranges from 16% at the 25th percentile to 36% at the 75th percentile in Eurozone, and from 15% at the 25th percentile to 33% at the 75th percentile in the US; (iv) the median bond debt to asset ratio is relatively low at 6% in the Eurozone and 17% in the U.S. This is a well-documented fact, sometimes referred as a European "bank bias" (Langfield and Pagano, 2016). The low level persists today in spite of some recent upward trend and convergence to the United States.[22] Institutional and historical reasons have been put forward to explain those differences; (v) Apart from the level difference between the Eurozone and the United States, the bond debt-over-debt distributions show a glaring contrast: the bond debt-over-debt distribution is right skewed in the

[20] The results are changing only marginally by excluding missing observations or by using the imputed measure for the entire sample

[21] Although avoiding injecting researchers' subjectivity about the sample selection into the analysis is beneficial, it does not mean that the selection procedure is absolutely free of bias. As an alternative to the preceding selection based on indices, we selected the top 500 Eurozone firms by market capitalization in each year. Our findings are robust to this sample alternation and can be requested from the authors.

[22] Between 2000 and 2016, the share of bond financing for nonfinancial corporations increased from 9 to 17 percent in Europe, versus 19 to 34 percent in the United States (McKinsey, 2018).

Eurozone whereas left skewed in the United States. In other words, not only have firms in the United States more bond debt they also tilt their financing mix heavily towards bond debt. For firms in the Eurozone, in contrast, the 25th percentile is 0% and the 75th percentile 59%.

3.2 Model Specification and Identification

To understand the heterogeneity of the cross-sectional response and to shed light on the transmission mechanism, we explore the richness of the micro-data. Specifically, we use longitudinal data to estimate models of the form:

$$\Delta \log P_{i,t} = \alpha_i + \nu_t + \gamma \Delta MP_t \times X_{i,t} + \beta \Delta MP_t \times Duration_{i,t} + \delta Z_{i,t} + \eta \Delta MP_t \times Sector_i + \epsilon_{i,t} \quad (2)$$

The panel structure allows for a rich set of fixed effects and controls which act as a defense against confounding factors. We use firm fixed effects, α_i, as well as date fixed effects, ν_t. We also include time-varying firm level controls, $Z_{i,t}$, from the balance sheet;[23] in the main specification these encompass cash-over-assets, earnings-over-assets, debt-over-earnings, fixed assets-over-assets, and log market-to-book ratio. Importantly, we include interactions of the monetary policy shock with the proxy for equity duration and with the firm's sector. Former controls for the "mechanical" revaluation effect with regard to a change in interest rates and latter controls for sector specific sensitivities of firms to monetary policy. The interactions of the sector with the monetary policy shock act as a first defense against unobserved sector specific and time-invariant factors that affect firms' response to monetary shocks, such as, a change in consumer demand, labor supply or exchange rates.

The coefficient of interest is γ as it captures the heterogeneous stock market response of firms to a monetary policy shock that is related to the firms' characteristic X. For $\gamma \neq 0$, characteristic X can forecast the cross-sectional response and plausibly has a role in the transmission channel. Through the lens of our model, as outlined in Section 2.4, γ identifies the magnitude of the financial friction that is associated with characteristic X.

[23]We use lagged balance sheet characteristics for two reasons. First, the majority of firms report at the end of the calendar year. We want analysts and investors to observe the firm's capital structure before evaluating the impact of monetary policy on the firm. Second, lagging the controls can alleviate some of the problems with bad controls as described by Angrist and Pischke (2008).

Given our set of controls and fixed effects, the coefficient γ is identified from within-day and within-sector variation. A negative γ implies that firms with larger value of variable X respond more strongly to a surprise monetary contraction relative to other firms in their sector (remember that the average effect is negative), over and above the average response on that particular day.

The key empirical difficulty that researchers face is that the stance of monetary policy reflects current conditions and/or anticipated developments in the economy. More precisely, there are two identification challenges.

1. Monetary policy shocks: It is necessary to separate the expected from the unexpected stance of monetary policy. The expected component of monetary policy is problematic as it is correlated with many third factors driving firms' decisions. To address this issue, we use asset price changes in a tight window around the monetary policy announcement of the Federal Reserve or ECB. The approach posits that asset prices reflect all publicly available information before the monetary policy announcement and that the change in asset prices reflects the newly revealed information. Measuring changes in asset prices in a tight window around the policy announcement makes any change likely to be disproportionately affected by an unexpected change in monetary policy.[24]

2. Firm heterogeneity: Finally, even with well-identified monetary shocks and a good firm outcome variable, a firm's debt structure is not randomly assigned. The decision to access bond or bank debt is a choice, which leads to a potential identification concern akin to an omitted variable problem. The question is whether there is a covariate that both drives debt structure and firm reactions to monetary policy.[25]

One prominent firm characteristic that comes to mind is total leverage, which is a strong predictor for bond debt exposure and a likely driver of the response to monetary policy by firms: leverage increases risk, sensitivity to interest rates and it is elevates real frictions through debt financing (i.e., debt over-hang). Therefore, we include leverage as a control in our main specification along with firm fixed effects that absorb time-invariant firm characteristics. Furthermore, we control for time varying observable balance sheet characteristics on which firms could select into bond financing, and which have been

[24] This approach has been used by Cook and Hahn (1989), Kuttner (2001), Bernanke and Kuttner (2005b), Cochrane and Piazzesi (2002), Nakamura and Steinsson (2018a).

[25] The theoretical literature at the intersection of debt structure and monetary policy is thin, and, therefore, provides little definitive guidance.

found to drive the cross-sectional response to monetary policy in the U.S. (Ozdagli, 2018; Ottonello and Winberry, 2018; Jeenas, 2018; Ippolito, Ozdagli, and Perez-Orive, 2018).

One might also be concerned about potential transmission channels of monetary policy that affect firms through consumer demand, labor supply or exchange rate movements. However, those channels are often specific to product type, production technology, or market and hence they are likely to vary at the industry level.[26] Therefore, we include interactions of industry fixed effects with monetary policy shocks as controls.

Ultimately, the presented framework does offer some insights into two questions that may help to "sign the bias":[27] (i) which firm characteristics drive the value of debt flexibility? (ii) are these characteristics also related to a firm's sensitivity to monetary policy? In our model, the marginal value of increasing debt flexibility can be computed directly from the envelope theorem. In fact, in our simple model this marginal value is directly related to the shadow value of liquidity (SVL) described above:

$$\frac{\partial Equity}{\partial \tilde{\pi}} = (1+q) \times SVL - [1 - F(\pi^* + \tilde{\pi})]$$

Consistent with our main argument, the marginal value of debt flexibility is related to the marginal returns on the initial project, since more rigid debt implies less investment in favor of hoarding liquid assets. This is a very useful result to discuss the two questions we are interested in. First, intuitively riskier, cash-poor and less productive firms tend to invest less, and hence have a higher marginal returns. This implies that they place a larger value on debt flexibility relative to firms that are safer, cash-rich or more productive.[28] To a first order, this is intuitive and matches many accounts on which firms relies on bonds as opposed to bank loans. Nevertheless, we note that some careful theoretical and empirical works often argue that the full picture is a little more subtle. Second, there is clearly a relation between the choice of bank and bond financing and sensitivity to monetary policy. This is because, through the lens of our model, the shadow value of liquidity is a key quantity that crucially affects both. This comparative static result suggests that

[26] Valuation ratios within industry tend to be strongly aligned and industry peers are often used for a variety of benchmarking exercises.

[27] A more complete model of equilibrium debt composition is proposed in Crouzet (2014).

[28] This discussion ignores the fact that the cost of debt flexibility (for instance through intermediation cost being passes through to higher spread) might vary across firms. In many of the existing models, this cost is often thought to be relatively stable across firms, such as a constant bond-loan spread (Crouzet, 2014).

bond-dependent firms are selected on characteristics that predict a low shadow value of liquidity. This in turn should make them less responsive to monetary policy. The model predicts that the presence of "selection" is likely to result in a positive bias and, hence, the estimates obtain the interpretation of an upper bound.

3.3 Results: the role of debt structure

We find evidence that debt structure is a strong driver of firms' response to monetary policy in the Eurozone but less so in the US.

In the Eurozone firms, with a larger share of bond debt are robustly more affected by monetary shocks. Table 5, column 1, shows that leverage (measured by debt over assets) itself has some predictive power. The bonds-over-assets ratio also significantly increases firms' sensitivity to interest rate shocks as shown in column 2. The economic significance of this effect is not trivial: following a 25 basis points increase in interest rates, firms in the top quartile of the bonds over assets distribution have a 58 basis points lower stock return relative to firms in the bottom quartile. Column 3 and 4 confirm this result when estimated non-parametrically, by using a bond outstanding dummy and terciles of bonds-over-assets, respectively. Importantly, columns 5 and 6 control for the firm's total leverage and use levels and terciles of bond debt-over-debt, respectively. In both specifications, the share of debt raised through bonds is strongly significant, for a given level of indebtedness. Column 7 shows that the effect on bonds-over-assets remains significant and robust when total leverage is included. Collectively, those results point to the special role of bond debt in the Eurozone.

In the United States, shown in Table 6, the debt structure of firms seems to have very limited power to predict the response to monetary policy shocks. In fact, we do not find the debt structure to interact significantly with the monetary policy shock; despite the strong negative average response to the monetary policy shock.

Robustness: The results are robust to a variety of model alterations. Tables 9 and 10 show little change when observations are weighted by assets or market capitalization. Another concern might be that the results are confounded by the credit risk that is correlated with the firms' debt structure. Tables 11 and 12 add interactions of the rating category with the monetary policy shocks. As the rating coverage in the Eurozone is limited we calculate the "distance-to-default" based on the framework by Merton (1974) and subsequently adopted by, among others, Gilchrist and Zakrajšek (2012). The "distance-to-default" is a market based measure of the firms' likelihood to default in the following year[29]; we find our results to be robust to an inclusion of a continuous measure as well as indicators for each quartile of the distance-to-default measure. We check the robustness of our results also with respect to a single factor model—the CAPM. The results hold when considering only abnormal returns as shown in Tables 15 and 16. In the Eurozone we check the robustness with regard to a few additional alternatives: (i) Table 17 uses alternative monetary shocks based on daily changes in the Euribor 1M or the daily changes of the OIS swap rate; (ii) Table 18 excludes September 17, 2001; (iii) as an alternative to the preceding sample selection we selected the top 500 firms by market capitalization in each year. This yields a broader sample with 635 distinct firms. The main results are very similar in size and significance. We have a slight preference for the sample based on the EURO STOXX indices as it has a comparable size distribution to the historical constituents of the S&P 500 index in the United States.

4 Discussion and Implications

4.1 Interpretation of Findings

Eurozone: The finding for European firms is hard to square with the classical bank lending channel. Irrespective of the exact micro-foundation, this type of explanation would imply that bond-reliant firms are relatively less responsive, the opposite of what the data indicates. On the other hand, the evidence is consistent with the broad forces related to corporate liquidity management. According to this view, banking relationships provide more implicit insurance against temporary shocks relative to harder-to-renegotiate bonds. Our findings could be explained by the value of banking relationships: a rate hike drains future cash-flow and tightens liquidity constraints relatively more for bond-financed firms. In the language of the framework of Section 2.4, the "shadow value of liquidity" term seems to dominate for Eurozone firms.

United States: We find no difference in the United States across firms with differ-

[29]The "distance-to-default" model underwent a few alterations after its initial publication and is nowadays better known in its commercial version as KMV model which is used by Moody's.

ent debt structure, once we control for equity duration. This is line with the findings of Ippolito, Ozdagli, and Perez-Orive (2018) that find that the floating rate channel of monetary policy is only at play for firms that do not hedge their interest rate exposure. Like in Europe, the evidence speaks against these firms being affected by classical versions of the bank lending channel. Interestingly, it also suggests that banking relationships do not relax liquidity constraints for U.S. firms.

4.2 Europe vs. United States: Reconciling the Two Samples

The divergence between the two samples is striking. The framework in Section 2.4 shows that this is a possibility: the effect of debt structure is ambiguous, with different forces pushing in different directions. Which force dominates depends on the environment in which firms operate. In this section, we provide some stylized facts about the difference between Europe and the United States to try to reconcile the two samples. While we acknowledge that this additional evidence is only suggestive, it seems plausible that our findings can be rationalized by differences between the two financial systems.

Indeed, a collection of additional facts suggests that the value-added by banking relationships relative to market financing is much lower in the United States compared to the Eurozone. Conceptually, the value of banking relationships is lower when capital markets are a more reliable source of financing. Note first that the extent to which firms are rated and the associated public information about the credit profile is significantly different. The ECB estimates that in 2004 only about 11% of firms with turnover over €50m have an S&P rating, compared to 92% in the United States.[30] The sparseness of public information makes it difficult for a firm to access capital markets in bad times, which plausibly makes banking relationships more valuable in Europe.

Second, we also show that rating downgrades have a stronger effect for Eurozone firms. Figure 5 presents the average stock market response to being downgraded from investment grade (BBB- and above) to speculative grade (BB+ and below) across the two regions. The raw data reveals that the difference is large and significant: about five percentage points lower in Europe relative to the United States.

Moreover, Acharya, Almeida, Ippolito, and Perez-Orive (2018) show that U.S. firms

[30] For more on the impact of bond ratings on firms across the two regions, see Von Beschwitz and Howells (2016).

with more bonds get liquidity insurance not from a relationship bank, but by signing credit line agreements that are frequently undrawn. In the language of the framework of Section 2.4, this pattern would imply that differences in debt structure imply limited differences in the shadow value of liquidity in this region. Indeed, in equilibrium firms with more rigid debt in the form of bonds counteract this rigidity by having more undrawn lines of credit. Finally, Darmouni (2019) finds little evidence of private information embedded in banking relationships for large U.S. firms.

5 Conclusion

The share of firm financing that comes from bond markets has been growing globally in the past decade. What does that mean for the transmission of monetary policy through firms? This paper develops a high-frequency framework to shed light on this question. We find different results in different financial systems. In the Eurozone, firms with more bonds are more affected by monetary policy, contrary to the predictions of a classical bank lending channel. On the other hand, we find no differential effect in the United States. We present an organizing framework based on corporate liquidity management that can rationalize these findings.

The overall macroeconomic implications of firms' debt composition are still insufficiently understood. This paper provides evidence that sources of external financing are not unconditionally perfect substitutes and the underlying trade-offs affect the pass-through of monetary policy. Finally, policy is naturally path-dependent: existing debt structure is driven by past financing patterns, which are in turn driven by past policies. After quantitative easing and a long period of low long-term interest rates, a large share of economy now borrows from the bond market, a trend that influences conventional interest rate policy going forward.

References

ACHARYA, V. V., H. ALMEIDA, F. IPPOLITO, AND A. PEREZ-ORIVE (2018): "Credit lines and the liquidity insurance channel," *Available at SSRN 2795794*.

ACHARYA, V. V., AND G. PLANTIN (2019): "Monetary Easing, Leverage Payouts and Lack of Investment," Working Paper.

ALMEIDA, H., M. CAMPELLO, I. CUNHA, AND M. S. WEISBACH (2014): "Corporate Liquidity Management: A Conceptual Framework and Survey," *Annu. Rev. Financ. Econ.*, 6(1), 135–162.

ALTAVILLA, C., L. BURLON, M. GIANNETTI, AND S. HOLTON (2019): "Is There a Zero Lower Bound? The Effects of Negative Policy Rates on Banks and Firms," Working Paper.

ANDRESON, G., AND A. CESA-BIANCHI (2018): "Firm Heterogeneity, Credit Spreads and Monetary Policy," Working Paper.

ANGRIST, J. D., AND J.-S. PISCHKE (2008): *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press.

ARCE, Ó., R. GIMENO, AND S. MAYORDOMO (2018): "The Effects of the Eurosystem's Corporate Sector Purchase Programme on Spanish Companies," Working Paper.

AUCLERT, A. (2019): "Monetary Policy and the Redistribution Channel," *American Economic Review*, 109(6), 2333–67.

BALLOCH, C. M. (2018): "Inflows and Spillovers: Tracing the Impact of Bond Market Liberalization," Working Paper.

BECKER, B., AND V. IVASHINA (2014): "Cyclicality of Credit Supply: Firm Level Evidence," *Journal of Monetary Economics*, 62, 76–93.

BERNANKE, B. S., AND K. N. KUTTNER (2005a): "What Explains the Stock Market's Reaction to Federal Reserve Policy?," *Journal of Finance*, 60(3), 1221–1257.

——— (2005b): "What Explains the Stock Market's Reaction to Federal Reserve Policy?," *Journal of Finance*, 60(3), 1221–1257.

BOLTON, P., AND X. FREIXAS (2006): "Corporate Finance and the Monetary Transmission Mechanism," *Review of Financial Studies*, 19(3), 829–870.

Bolton, P., X. Freixas, L. Gambacorta, and P. E. Mistrulli (2016): "Relationship and Transaction Lending in a Crisis," *Review of Financial Studies*, 29(10), 2643–2676.

Bolton, P., and D. S. Scharfstein (1996): "Optimal Debt Structure and the Number of Creditors," *Journal of Political Economy*, 104(1), 1–25.

Cloyne, J., C. Ferreira, M. Froemel, and P. Surico (2018): "Monetary Policy, Corporate Finance and Investment," Working Paper.

Cochrane, J. H., and M. Piazzesi (2002): "The Fed and Interest Rates—A High-Frequency Identification," *American Economic Review*, 92(2), 90–95.

Coibion, O., Y. Gorodnichenko, L. Kueng, and J. Silvia (2017): "Innocent Bystanders? Monetary policy and inequality," *Journal of Monetary Economics*, 88, 70–89.

Cook, T., and T. Hahn (1989): "The Effect of Changes in the Federal Funds Rate Target on Market Interest Rates in the 1970s," *Journal of Monetary Economics*, 24(3), 331–351.

Corsetti, G., J. B. Duarte, and S. Mann (2018): "One Money, Many Markets: A Factor Model Approach to Monetary Policy in the Euro Area with High-Frequency Identification," Working Paper.

Crouzet, N. (2014): "Firm Investment and the Composition of Debt," Working Paper.

——— (2017): "Aggregate Implications of Corporate Debt Choices," *Review of Economic Studies*, 85(3), 1635–1682.

Crouzet, N., and N. Mehrotra (2017): "Small and Large Firms over the Business Cycle," Working Paper.

Darmouni, O. (2019): "Informational frictions and the credit crunch," *Journal of Finance Forthcoming*.

De Fiore, F., P. Teles, and O. Tristani (2011): "Monetary Policy and the Financing of Firms," *American Economic Journal: Macroeconomics*, 3(4), 112–42.

De Fiore, F., and H. Uhlig (2011): "Bank Finance versus Bond Finance," *Journal of Money, Credit and Banking*, 43(7), 1399–1421.

——— (2015): "Corporate Debt Structure and the Financial Crisis," *Journal of Money, Credit and Banking*, 47(8), 1571–1598.

DIAMOND, D. W. (1991): "Monitoring and Reputation: The Choice between Bank Loans and Directly Placed Debt," *Journal of Political Economy*, 99(4), 689–721.

DRECHSLER, I., A. SAVOV, AND P. SCHNABL (2017): "The Deposits Channel of Monetary Policy," *Quarterly Journal of Economics*, 132(4), 1819–1876.

——— (2018): "A Model of Monetary Policy and Risk Premia," *Journal of Finance*, 73(1), 317–373.

GILCHRIST, S., AND E. ZAKRAJŠEK (2012): "Credit Spreads and Business Cycle Fluctuations," *American Economic Review*, 102(4), 1692–1720.

GIROUD, X., AND H. M. MUELLER (2017): "Firm Leverage, Consumer Demand, and Employment Losses during the Great Recession," *Quarterly Journal of Economics*, 132(1), 271–316.

GOMES, J., U. JERMANN, AND L. SCHMID (2016): "Sticky Leverage," *American Economic Review*, 106(12), 3800–3828.

GORMSEN, N. J., AND E. LAZARUS (2019): "Duration-Driven Returns," Working Paper.

GREENWALD, D. (2019): "Firm Debt Covenants and the Macroeconomy: The Interest Coverage Channel," Working Paper.

GROSSE-RUESCHKAMP, B., S. STEFFEN, AND D. STREITZ (2019): "A Capital Structure Channel of Monetary Policy," *Journal of Financial Economics*, 133(2), 357–378.

HAITSMA, R., D. UNALMIS, AND J. DE HAAN (2016): "The Impact of the ECB's Conventional and Unconventional Monetary Policies on Stock Markets," *Journal of Macroeconomics*, 48, 101–116.

HEIDER, F., F. SAIDI, AND G. SCHEPENS (2019): "Life below zero: Bank lending under negative policy rates," *The Review of Financial Studies*, 32(10), 3728–3761.

HOLMSTRÖM, B., AND J. TIROLE (1998): "Private and Public Supply of Liquidity," *Journal of Political Economy*, 106(1), 1–40.

IPPOLITO, F., A. K. OZDAGLI, AND A. PEREZ-ORIVE (2018): "The Transmission of Monetary Policy through Bank Lending: The Floating Rate Channel," *Journal of Monetary Economics*, 95, 49–71.

JEENAS, P. (2018): "Monetary Policy Shocks, Financial Structure, and Firm Activity: A Panel Approach," Working Paper.

JIMÉNEZ, G., S. ONGENA, J.-L. PEYDRÓ, AND J. SAURINA (2012): "Credit Supply and Monetary Policy: Identifying the Bank Balance-Sheet Channel with Loan Applications," *American Economic Review*, 102(5), 2301–26.

KAPLAN, G., B. MOLL, AND G. L. VIOLANTE (2018): "Monetary Policy According to HANK," *American Economic Review*, 108(3), 697–743.

KASHYAP, A. K., AND J. C. STEIN (2000): "What Do a Million Observations on Banks Say about the Transmission of Monetary Policy?," *American Economic Review*, 90(3), 407–428.

KASHYAP, A. K., J. C. STEIN, AND D. W. WILCOX (1996): "Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance: Reply," *American Economic Review*, 86(1), 310–314.

KEKRE, R., AND M. LENEL (2019): "Redistribution, Risk Premia, and the Macroeconomy," .

KIYOTAKI, N., AND J. MOORE (2018): "Liquidity, Business Cycles, and Monetary Policy," *Journal of Political Economy*.

KUTTNER, K. N. (2001): "Monetary Policy Surprises and Interest Rates: Evidence from the Fed Funds Futures Market," *Journal of Monetary Economics*, 47(3), 523–544.

LAKDAWALA, A., AND T. MORELAND (2019): "Monetary Policy and Firm Heterogeneity: The Role of Leverage Since the Financial Crisis," *Available at SSRN 3405420*.

LANGFIELD, S., AND M. PAGANO (2016): "Bank Bias in Europe: Effects on Systemic Risk and Growth," *Economic Policy*, 31(85), 51–106.

LHUISSIER, S., AND U. SZCZERBOWICZ (2018): "Monetary Policy and Corporate Debt Structure," Working Paper.

LLOYD, S. P. (2017): "Estimating Nominal Interest Rate Expectations: Overnight Indexed Swaps and the Term Structure," Working Paper.

MCKINSEY (2018): "Rising Corporate Debt: Peril or Promise?," *McKinsey Discussion Paper*.

MERTON, R. C. (1974): "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates," *Journal of Finance*, 29(2), 449–470.

NAGEL, S. (2016): "The Liquidity Premium of Near-Money Assets," *Quarterly Journal of Economics*, 131(4), 1927–1971.

Nakamura, E., and J. Steinsson (2018a): "High-Frequency Identification of Monetary Non-Neutrality: The Information Effect," *Quarterly Journal of Economics*, 133(3), 1283–1330.

Nakamura, E., and J. Steinsson (2018b): "Identification in Macroeconomics," *Journal of Economic Perspectives*, 32(3), 59–86.

Ottonello, P., and T. Winberry (2018): "Financial Heterogeneity and the Investment Channel of Monetary Policy," Working Paper.

Ozdagli, A. K. (2018): "Financial Frictions and the Stock Price Reaction to Monetary Policy," *Review of Financial Studies*, 31(10), 3895–3936.

Ozdagli, A. K., and M. Velikov (2019): "Show Me the Money: The Monetary Policy Risk Premium," *Journal of Financial Economics*, forthcoming.

Rajan, R. G. (1992): "Insiders and Outsiders: The Choice between Informed and Arm's-Length Debt," *Journal of Finance*, 47(4), 1367–1400.

Rocheteau, G., R. Wright, and C. Zhang (2018): "Corporate Finance and Monetary Policy," *American Economic Review*, 108(4–5), 1147–86.

Rodnyansky, A. (2019): "(Un)Competitive Devaluations and Firm Dynamics," *Working Paper*.

Tirole, J. (2010): *The Theory of Corporate Finance*. Princeton University Press.

Von Beschwitz, B., and C. Howells (2016): "Are Euro-Area Corporate Bond Markets Irrelevant? The Effect of Bond Market Access on Investment," Working Paper.

Wang, O. (2018): "Banks, Low Interest Rates, and Monetary Policy Transmission," Working Paper.

Wang, Y., T. M. Whited, Y. Wu, and K. Xiao (2018): "Bank Market Power and Monetary Policy Transmission: Evidence from a Structural Estimation," Working Paper.

Weber, M. (2018): "Cash flow duration and the term structure of equity returns," *Journal of Financial Economics*, 128(3), 486–503.

Wong, A. (2019): "Refinancing and The Transmission of Monetary Policy to Consumption," Discussion paper, Mimeo.

Appendix: Figures and Tables

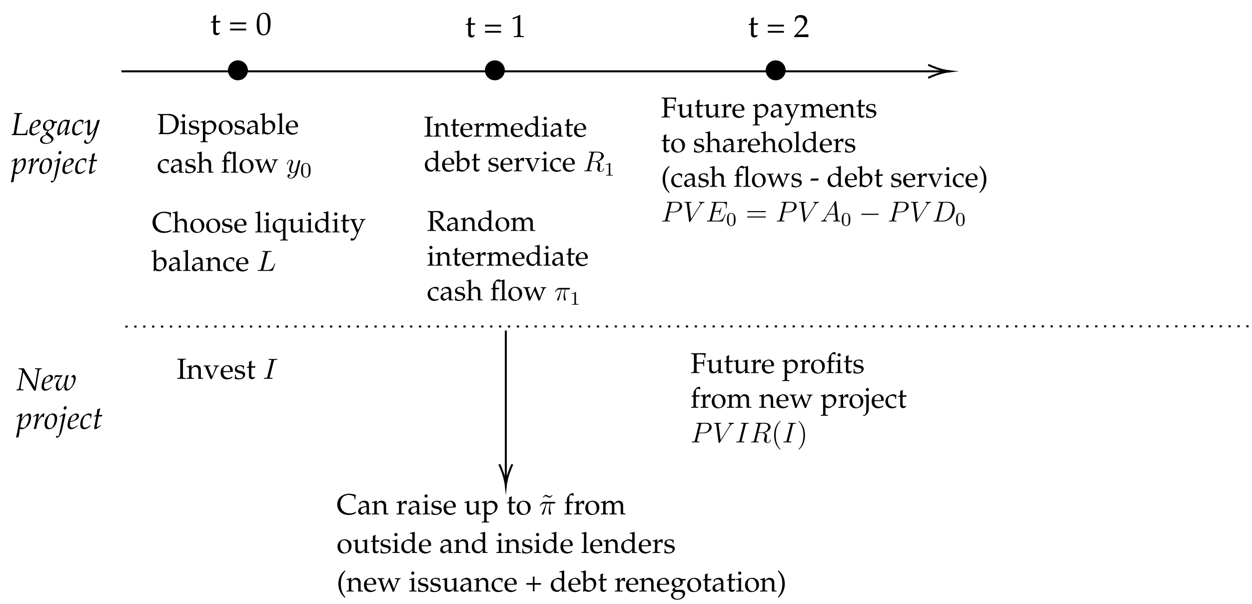
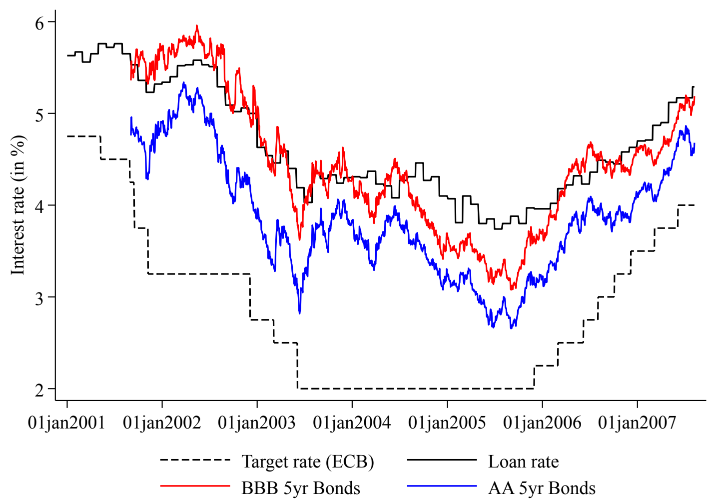
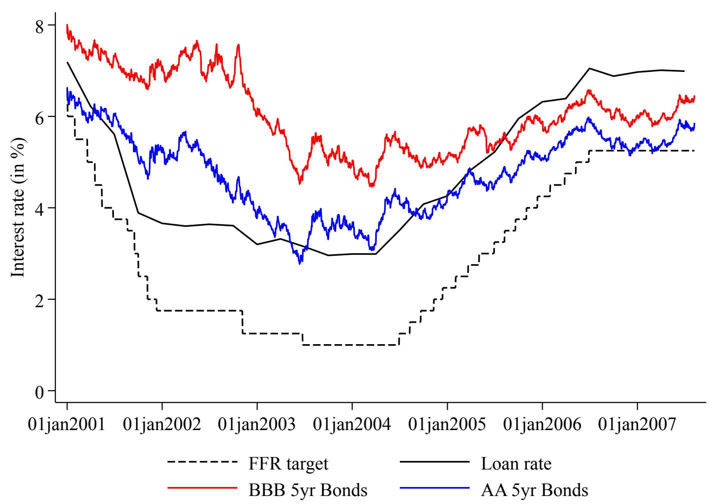


Figure 1 – Timeline



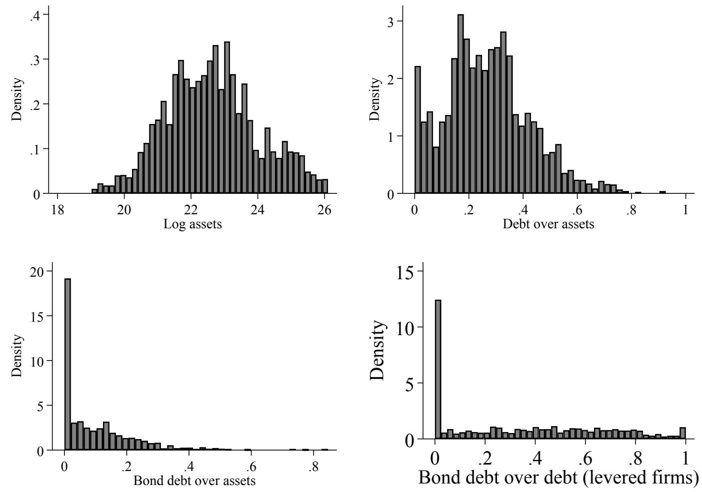
(a) Eurozone



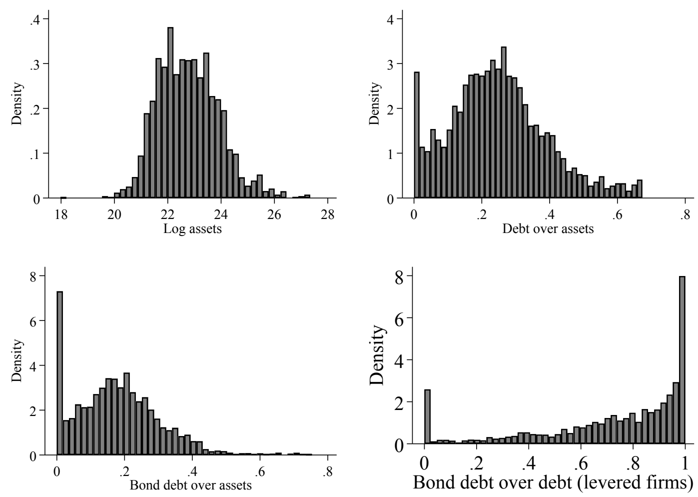
(b) U.S.

Figure 2 – Debt Yields across Monetary Cycle

Note: Eurozone: ECB target rate from: https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb _interest_rates/html/index.en.html); average loan rate in the Eurozone from the ECB statistical data warehouse: https://sdw.ecb.europa.eu/ quickview.do?SERIES_KEY=124.MIR.M.U2.B.A2A.J.R.1.2240.EUR.N; and yields to maturity for bond portfolios with remaining maturity of 5yr and BBB and AA rating from Bloomberg: BFV 5yr EUR Eurozone Industrial BBB Bond Yield and BFV 5yr EUR Eurozone Industrial AA Bond Yield. US: federals funds target rate (DFEDTAR) and weighted industrial and industry loans (EEANQ) from FRED. Yields on bond portfolios with remaining maturity of 5yr and BBB (MLU3BTL) and AA rating (ML2ARTL) from Bloomberg.



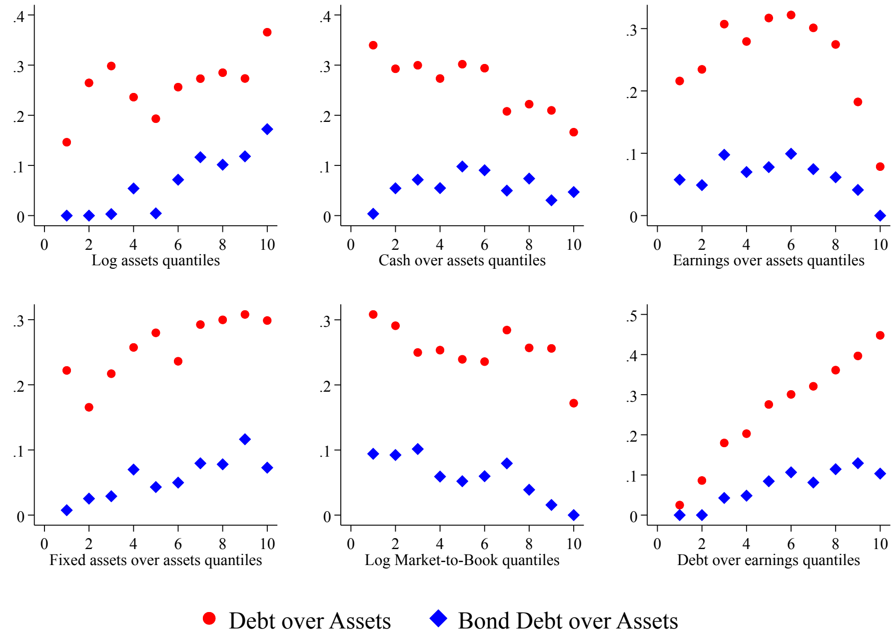
(a) Eurozone



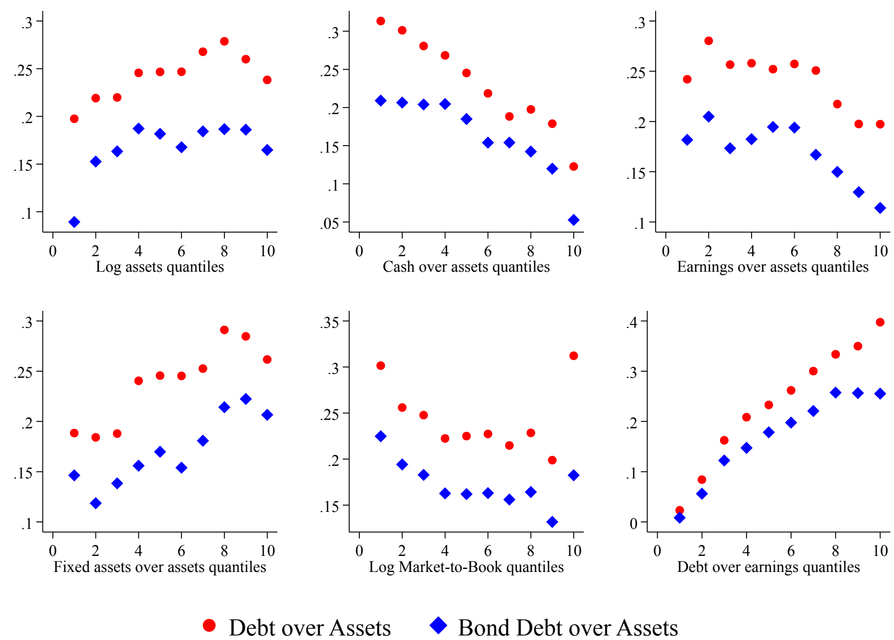
(b) U.S.

Figure 3 – Histograms

Note: Eurozone: The sample is an unbalanced panel of the European firms that are constituents of the EURO STOXX sectoral indices between 2001 and 2007, excluding financials and utilities. Dates include 92 ECB announcements days between 2001 and 2007. US: Sample is an unbalanced panel of the firms that are constituents of the S&P500 index between 2001 and 2007, excluding financials and utilities. Dates include 53 Federal Reserve announcements days between 2001 and 2007. Balance sheet data comes from Worldscope and bond issuance data comes from SDC Platinum for both samples.



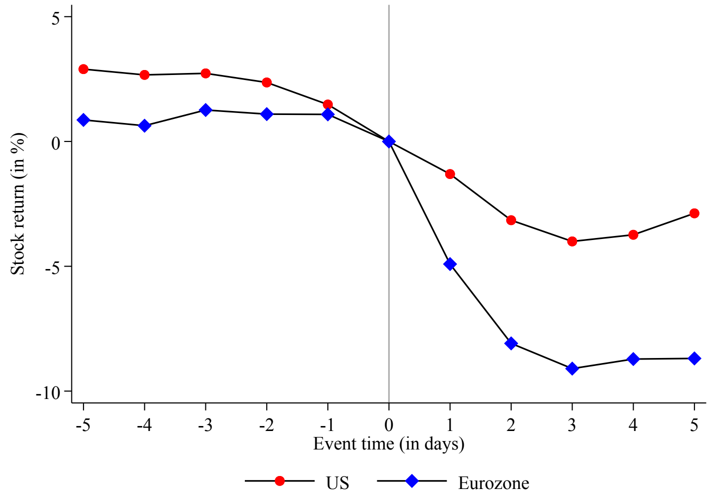
(a) Eurozone



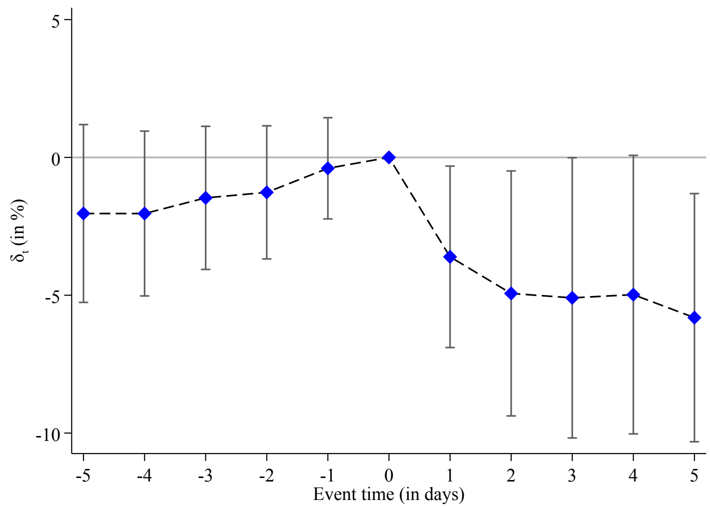
(b) U.S.

Figure 4 – Cross-sectional Capital Structure

Note: Eurozone: The sample is an unbalanced panel of the European firms that are constituents of the EURO STOXX sectoral indices between 2001 and 2007, excluding financials and utilities. Dates include 92 ECB announcements days between 2001 and 2007. US: Sample is an unbalanced panel of the firms that are constituents of the S&P500 index between 2001 and 2007, excluding financials and utilities. Dates include 53 Federal Reserve announcements days between 2001 and 2007. Balance sheet data comes from Worldscope and bond issuance data comes from SDC Platinum for both samples.



(a)



(b)

Figure 5 – Rating Downgrade

Note: Sample encompasses all entity ratings from the S&P rating panel available on WRDS. Rating downgrade is defined as downgrade from investment grade (BBB- and above) to speculative grade (BB+ and below). Stock price data is obtained from Datastream. Panel (a) plots average raw returns with respect to the event date for the Eurozone and the US separately. Panel (b) plots the coefficients $\{\delta_t\}_{t=-5}^{5}$ of the following model $(lnP_{it} - lnP_{i0}) * 100 = \sum_{s=-5}^{5} \gamma_s \times \mathcal{I}_{s=t} + \sum_{s=-5}^{5} \delta_s \times \mathcal{I}_{s=t} \times \mathcal{I}_{Europe_i} + \epsilon_{it}$, where t denotes event time and $\mathcal{I}$ is the indicator function. Bars indicate the $\alpha = 0.9$ confidence intervals.

	N	Mean	SD	Min	Max
Panel A: Market Returns (in pp)					
MP announcement days					
Δ MSCIEMU	92	-0.032	1.37	-4.16	3.12
Δ DAX30	92	-0.094	1.68	-4.65	5.08
Δ IBEX35	92	0.040	1.36	-3.78	4.22
Δ CAC40	92	-0.096	1.49	-5.25	3.77
Δ FTSEMIB	92	-0.080	1.31	-3.47	3.28
Δ S&P500	53	0.122	0.96	-2.44	2.13
Other days					
Δ MSCIEMU	1631	0.004	1.26	-6.53	6.17
Δ DAX30	1631	0.016	1.57	-8.87	7.55
Δ IBEX35	1631	0.028	1.24	-5.99	5.79
Δ CAC40	1631	0.004	1.37	-7.68	7.00
Δ FTSEMIB	1631	0.000	1.20	-7.87	7.63
Δ S&P500	1670	0.004	1.04	-5.05	5.57
Panel B: Shocks (in bps)					
MP announcement days					
Δ OIS	92	-0.047	5.49	-39.25	15.00
Δ FFR	53	-0.065	4.67	-20.00	12.50
Δ EURIBOR 1M	92	-0.000	5.80	-41.80	15.40
Δ OIS (daily)	92	-0.127	5.30	-37.75	10.00
Other days					
Δ OIS	1626	-0.141	2.94	-74.50	20.50
Δ EURIBOR 1M	1631	-0.041	1.30	-11.30	10.80
Δ OIS (daily)	1623	-0.036	1.50	-11.75	15.50

Table 1 – Summary Statistics Returns and Shocks

Note: Summary statistics for the market returns of a broad market index (MSCIEMU), national blue chip indices for Germany (DAX30), Italy (FTSEMIB), Spain (IBEX35), France (CAC40) in the Eurozone and the S&P500 in the US. Panel B shows summary statistics for shocks derived from overnights index swaps (OIS) intraday, from federal funds futures, the daily change in the 1M EURIBOR, and OIS at daily frequency. All summary statistics are for the sample period January 2001-July 2007.

	(1) Δ MSCIEMU	(2) Δ DAX30	(3) Δ IBEX35	(4) Δ CAC40	(5) Δ FTSEMIB	(6) Δ S&P500
Δ OIS	-5.148**	-5.843*	-5.132**	-5.580**	-1.467	
	(1.893)	(2.625)	(1.789)	(2.069)	(2.041)	
Δ FFR						-7.466**
						(2.274)
R^2	0.043	0.036	0.043	0.042	0.004	0.130
Observations	92	92	92	92	92	53

Table 2 – Stock Price Index Reaction to MP Shocks

Note: This table reports regression estimates of daily returns of the market index on the (baseline) monetary policy shock in the sample period January 2001-July 2007 at monetary policy announcement dates. All variables are expressed in percentage points. Market regressions use a broad market index (MSCIEMU), national blue chip indices for Germany (DAX30), Spain (IBEX35), France (CAC40), and Italy (FTSEMIB) in the Eurozone and the S&P500 in the US. The estimated model is $\Delta R_t = \alpha + \beta \times MPShock_t + u_t$. *Standard errors in parentheses are robust to heteroskedasticity. +,*,** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	mean	p25	p50	p75	count
No bond debt					
Assets (in bn)	5.654	1.411	2.798	5.883	4923
Cash over assets	0.0644	0.0197	0.0400	0.0787	4923
Earnings over assets	0.166	0.105	0.145	0.232	4923
Fixed assets over assets	0.238	0.0880	0.193	0.350	4923
Equity duration proxy	12.10	7.460	10.88	16	4923
Market-to-Book	4.303	1.864	3.034	5.413	4923
Debt over earnings	1.434	0.319	1.354	2.546	4923
Earnings over interest expenses	33.76	6.405	11.84	31.03	4923
Debt over assets	0.217	0.0665	0.180	0.308	4923
Debt due within year over debt	0.456	0.210	0.394	0.675	4923
Bond debt over assets	0.00168	0	0	0	4923
Bond debt over debt	0.0215	0	0	0	4923
Low bond debt					
Assets (in bn)	20.40	4.130	9.940	19.49	4115
Cash over assets	0.0516	0.0215	0.0369	0.0632	4115
Earnings over assets	0.134	0.0859	0.129	0.178	4115
Fixed assets over assets	0.277	0.115	0.260	0.399	4115
Equity duration proxy	11.03	6.390	10	14.64	4115
Market-to-Book	2.536	1.383	2.113	3.010	4115
Debt over earnings	2.039	1.127	1.811	2.732	4115
Earnings over interest expenses	13.99	6.351	10.24	16.12	4115
Debt over assets	0.231	0.160	0.202	0.302	4115
Debt due within year over debt	0.329	0.171	0.302	0.470	4115
Bond debt over assets	0.0702	0.0389	0.0655	0.105	4115
Bond debt over debt	0.365	0.171	0.336	0.521	4115
High bond debt					
Assets (in bn)	28.81	4.811	11.48	37.33	4518
Cash over assets	0.0625	0.0212	0.0373	0.0724	4518
Earnings over assets	0.117	0.0912	0.123	0.159	4518
Fixed assets over assets	0.290	0.153	0.272	0.418	4518
Equity duration proxy	10.70	6	10	13.38	4518
Market-to-Book	2.579	1.243	2.023	3.186	4518
Debt over earnings	2.303	1.899	2.659	3.966	4518
Earnings over interest expenses	9.499	4.587	7.047	11.28	4518
Debt over assets	0.375	0.281	0.348	0.448	4518
Debt due within year over debt	0.246	0.128	0.216	0.338	4518
Bond debt over assets	0.232	0.152	0.206	0.274	4518
Bond debt over debt	0.628	0.473	0.640	0.782	4518
Total					
Assets (in bn)	17.85	2.553	6.724	16.35	13556
Cash over assets	0.0599	0.0209	0.0377	0.0710	13556
Earnings over assets	0.140	0.0932	0.132	0.182	13556
Fixed assets over assets	0.267	0.111	0.235	0.393	13556
Equity duration proxy	11.31	6.500	10	15	13556
Market-to-Book	3.192	1.411	2.345	3.731	13556
Debt over earnings	1.907	0.976	1.962	3.063	13556
Earnings over interest expenses	19.67	5.413	9.293	16.11	13556
Debt over assets	0.274	0.163	0.257	0.361	13556
Debt due within year over debt	0.347	0.157	0.288	0.481	13556
Bond debt over assets	0.0991	0	0.0566	0.155	13556
Bond debt over debt	0.328	0	0.267	0.591	13556

Table 3 – Eurozone Firms Balance Sheet Summary Statistics

Note: The table presents summary statistics for an unbalanced panel of the European firms that were part of EURO STOXX Supersector Eurozone indices, excluding financials and utilities. Dates include 92 ECB announcements days between 2001 and 2007. The subsamples "No bond debt", "Low bond debt" and "High bond debt" to corresponds to the terciles of the bonds-over-assets ratio, recalculated every year. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum, and stock market information comes from Datastream.

	mean	p25	p50	p75	count
Low bond debt					
Assets (in bn)	14.96	2.548	5.857	14.69	5788
Cash over assets	0.166	0.0492	0.115	0.242	5788
Earnings over assets	0.155	0.0997	0.161	0.229	5788
Fixed assets over assets	0.238	0.111	0.183	0.305	5788
Equity duration proxy	15.44	11	15	19	5788
Market-to-Book	4.115	2.206	3.250	5.422	5788
Debt over earnings	1.093	0.217	0.692	1.343	5788
Earnings over interest expenses	40.77	11.07	25.78	56.72	5788
Debt over assets	0.137	0.0503	0.114	0.183	5788
Debt due within year over debt	0.285	0.0225	0.168	0.452	5788
Bond debt over assets	0.0489	0.00113	0.0420	0.0883	5788
Bond debt over debt	0.477	0.00906	0.471	0.878	5788
Medium bond debt					
Assets (in bn)	17.60	3.607	7.413	16.72	5731
Cash over assets	0.0937	0.0226	0.0565	0.130	5731
Earnings over assets	0.147	0.103	0.152	0.197	5731
Fixed assets over assets	0.309	0.152	0.253	0.399	5731
Equity duration proxy	12.83	10	12	15	5731
Market-to-Book	3.559	1.952	2.923	4.268	5731
Debt over earnings	1.831	0.995	1.496	2.179	5731
Earnings over interest expenses	13.31	6.584	10.47	16.50	5731
Debt over assets	0.237	0.181	0.225	0.268	5731
Debt due within year over debt	0.158	0.0254	0.105	0.233	5731
Bond debt over assets	0.170	0.145	0.170	0.197	5731
Bond debt over debt	0.769	0.633	0.815	0.955	5731
High bond debt					
Assets (in bn)	20.35	3.876	8.196	17.73	5734
Cash over assets	0.0870	0.0174	0.0411	0.109	5734
Earnings over assets	0.143	0.0902	0.141	0.185	5734
Fixed assets over assets	0.348	0.182	0.305	0.516	5734
Equity duration proxy	11.89	9	11	15	5734
Market-to-Book	3.720	1.656	2.731	4.493	5734
Debt over earnings	2.752	1.617	2.398	3.713	5734
Earnings over interest expenses	8.886	3.881	6.347	9.738	5734
Debt over assets	0.372	0.288	0.348	0.429	5734
Debt due within year over debt	0.139	0.0200	0.0903	0.209	5734
Bond debt over assets	0.316	0.254	0.293	0.358	5734
Bond debt over debt	0.865	0.775	0.913	0.980	5734
Total					
Assets (in bn)	17.63	3.294	7.214	16.44	17253
Cash over assets	0.116	0.0245	0.0658	0.159	17253
Earnings over assets	0.148	0.0974	0.150	0.204	17253
Fixed assets over assets	0.298	0.142	0.240	0.418	17253
Equity duration proxy	13.40	10	12	15	17253
Market-to-Book	3.799	1.930	2.974	4.665	17253
Debt over earnings	1.889	0.780	1.506	2.504	17253
Earnings over interest expenses	21.05	5.689	10.37	21.68	17253
Debt over assets	0.248	0.152	0.240	0.330	17253
Debt due within year over debt	0.194	0.0225	0.109	0.278	17253
Bond debt over assets	0.178	0.0820	0.170	0.254	17253
Bond debt over debt	0.703	0.552	0.807	0.961	17253

Table 4 – US Firms Balance Sheet Summary Statistics

Note: The table presents summary statistics for an unbalanced panel of the firms that were included in the S&P500 between 2001 and 2007, excluding financials and utilities. Dates include 53 regularly scheduled FOMC announcements days between 2001 and 2007. The subsamples "Low bond debt", "Medium bond debt" and "High bond debt" correspond to the terciles of the bonds-over-assets ratio, recalculated every year. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum, and stock market information comes from Datastream.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ OIS × Equity duration proxy	-0.126	-0.137	-0.122	-0.124	-0.135	-0.124	-0.137
	(0.159)	(0.155)	(0.156)	(0.156)	(0.171)	(0.160)	(0.174)
Equity duration proxy	0.135	0.131	0.163	0.124	0.130	0.131	0.130
	(0.506)	(0.505)	(0.510)	(0.505)	(0.508)	(0.508)	(0.505)
Δ OIS × Debt over assets	-5.333**				-2.545	-2.856	0.613
	(2.277)				(2.539)	(2.466)	(2.140)
Debt over assets	-11.13					-10.33	0.985
	(31.97)					(32.40)	(31.75)
Δ OIS × Bond debt over assets		-17.08***					-17.53***
		(3.048)					(3.265)
Bond debt over assets		-31.23					-31.77
		(37.50)					(38.80)
Δ OIS × Bond Issued			-1.740***				
			(0.657)				
Bond outstanding			-11.50				
			(7.427)				
Δ OIS × Tercile of bond debt over assets				-1.193***			
				(0.335)			
Tercile of bond debt over assets				-4.157			
				(4.542)			
Δ OIS × Bond debt over debt					-5.851***		
					(1.702)		
Bond debt over debt					0.117		
					(14.71)		
Δ OIS × Tercile of bond debt over debt						-1.289***	
						(0.443)	
Tercile of bond debt over debt						-0.842	
						(5.158)	
R^2	0.226	0.227	0.227	0.227	0.227	0.227	0.227
Date FE	✓	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓	✓
Sector-MP Shock interactions	✓	✓	✓	✓	✓	✓	✓
Observations	13556	13556	13556	13556	13556	13556	13556

Table 5 – Eurozone Debt Structure and Monetary Policy Shocks

*Note: This table presents regression results for estimating Equation 2 using different measures of bond debt as interacted variable X. The dependent variable is daily stock return, and MP Shock are constructed as in Corsetti, Duarte, and Mann (2018). The sample consists of an unbalanced panel of the European firms that were part of EURO STOXX Supersector Eurozone indices, excluding financials and utilities. Dates include 92 ECB announcements days between 2001 and 2007. Controls include firm fixed effects, date fixed effects, sector-times-monetary shocks interactions and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ FFR $\times$ Equity duration proxy	-0.270	-0.266	-0.233	-0.285*	-0.269	-0.269	-0.269
	(0.176)	(0.169)	(0.167)	(0.169)	(0.170)	(0.171)	(0.171)
Equity duration proxy	-1.813	-1.780	-1.735	-1.819	-1.822	-1.783	-1.784
	(1.381)	(1.352)	(1.347)	(1.376)	(1.381)	(1.362)	(1.352)
Δ FFR $\times$ Debt over assets	-1.827				-1.852	-1.805	-2.285
	(3.098)				(3.140)	(3.087)	(4.291)
Debt over assets	17.69					20.04	3.902
	(49.84)					(50.43)	(48.84)
Δ FFR $\times$ Bond debt over assets		-0.888					0.701
		(2.813)					(3.973)
Bond debt over assets		23.61					22.50
		(49.03)					(51.05)
Δ FFR $\times$ Bond Issued			2.020				
			(1.511)				
Bond outstanding			16.73				
			(16.24)				
Δ FFR $\times$ Tercile of bond debt over assets				-0.649			
				(0.396)			
Tercile of bond debt over assets				-0.891			
				(4.579)			
Δ FFR $\times$ Bond debt over debt					0.139		
					(1.195)		
Bond debt over debt					-2.156		
					(11.92)		
Δ FFR $\times$ Tercile of bond debt over debt						0.0773	
						(0.467)	
Tercile of bond debt over debt						2.615	
						(3.330)	
R^2	0.206	0.206	0.206	0.206	0.206	0.206	0.206
Date FE	✓	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓	✓
Sector-MP Shock interactions	✓	✓	✓	✓	✓	✓	✓
Observations	17241	17241	17241	17241	17241	17241	17241

Table 6 – US Debt Structure and Monetary Policy Shocks

*Note: This table presents regression results for estimating Equation 2 using different measures of bond debt as interacted variable X. The dependent variable is daily stock return, and MP shocks are taken from Nakamura and Steinsson (2018a). The sample consists of an unbalanced panel of the American firms that were part of S&P 500 index, excluding financials and utilities. Dates include 53 scheduled FOMC meeting announcements days between 2001 and 2007. Controls include firm fixed effects, date fixed effects, sector-times-monetary shocks interactions and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	(1)	(2)	(3)
Δ OIS	-1.014	-4.328**	-4.772***
	(1.581)	(1.912)	(1.793)
Log assets	-10.39	9.870	13.61
	(20.52)	(29.98)	(29.57)
Cash over assets	-87.89	-162.2**	-212.5*
	(88.76)	(79.29)	(118.4)
Earnings over assets	-52.87	19.84	-3.452
	(78.06)	(85.30)	(130.2)
Fixed assets over assets	-44.62	33.27	-104.8
	(80.00)	(103.6)	(105.8)
Log Market-to-Book	42.84*	53.55*	46.88
	(22.45)	(30.89)	(35.94)
Debt over earnings	0.0750	0.249	-0.0580
	(0.270)	(0.555)	(0.292)
Earnings over interest expenses	-0.0348	-0.144	-0.126
	(0.0686)	(0.166)	(0.199)
R^2	0.019	0.039	0.027
Firm FE	✓	✓	✓
Weight	–	MarketCap	Assets
Observations	13868	13868	13868

Table 7 – Average effect of MP Shocks

Note: This table presents estimates of the model $\Delta \log P_{i,t} = \alpha_i + \beta \Delta MP_t + \delta Z_{i,t} + \epsilon_{i,t}$. *The dependent variable is daily stock return and MP Shock are constructed as in Corsetti, Duarte, and Mann (2018). Column 1 uses no weights, Column 2 weights observations by market capitalization and Column 3 by book assets. The sample consists of an unbalanced panel of the European firms that were part of EURO STOXX Supersector Eurozone indices, excluding financials and utilities. Dates include 92 ECB announcements days between 2001 and 2007. Controls include firm fixed effects and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	(1)	(2)	(3)
Δ FFR	-8.487***	-7.604***	-9.237***
	(1.695)	(2.084)	(1.747)
Log assets	-7.707	-8.209	-14.52
	(22.23)	(26.65)	(32.20)
Cash over assets	82.80	32.06	103.6
	(84.66)	(88.59)	(123.4)
Earnings over assets	-104.1	-164.4	-99.19
	(65.99)	(109.3)	(109.7)
Fixed assets over assets	146.8*	57.33	138.6
	(74.17)	(67.80)	(120.9)
Log Market-to-Book	-35.40**	-24.77	-50.57**
	(15.43)	(18.66)	(19.08)
Debt over earnings	-0.481	3.635	1.468
	(3.498)	(3.801)	(6.810)
Earnings over interest expenses	-0.487**	-0.415*	-0.530**
	(0.205)	(0.228)	(0.239)
R^2	0.063	0.063	0.066
Firm FE	✓	✓	✓
Weight	–	MarketCap	Assets
Observations	17330	17330	17330

Table 8 – Average effect of MP Shocks

*Note: This table presents estimates of the model $\Delta \log P_{i,t} = \alpha_i + \beta \Delta MP_t + \delta Z_{i,t} + \epsilon_{i,t}$. The dependent variable is daily stock return, and MP shocks are taken from Nakamura and Steinsson (2018a). Column 1 uses no weights, Column 2 weights observations by market capitalization and Column 3 by book assets. The sample consists of an unbalanced panel of constituents of the S&P500, excluding financials and utilities. Dates include 53 scheduled FOMC meeting announcements days between 2001 and 2007. Controls include firm fixed effects and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ OIS × Equity duration proxy	-0.179	-0.122	-0.174	-0.142	-0.0231	0.0381	-0.00600	0.0288
	(0.149)	(0.0931)	(0.109)	(0.124)	(0.238)	(0.230)	(0.248)	(0.244)
Equity duration proxy	-0.170	-0.162	-0.131	-0.157	-0.843	-0.852	-0.777	-0.841
	(0.760)	(0.748)	(0.753)	(0.723)	(1.144)	(0.941)	(1.137)	(1.229)
Δ OIS × Bond debt over assets	-18.77***				-18.56**			
	(2.267)				(7.533)			
Bond debt over assets	-13.80				1.049			
	(29.20)				(38.21)			
Δ OIS × Tercile of bond debt over assets		-2.512***				-1.887***		
		(0.511)				(0.562)		
Tercile of bond debt over assets		-3.189				1.442		
		(4.144)				(5.798)		
Δ OIS × Bond debt over debt			-6.418***				-7.018*	
			(1.448)				(3.537)	
Bond debt over debt			10.66				27.79*	
			(10.25)				(15.80)	
Δ OIS × Debt over assets			-7.158**	-8.024***			-9.657	-12.66***
			(3.509)	(2.967)			(7.126)	(4.203)
Debt over assets			-49.52	-47.19			-113.6**	-108.6**
			(37.43)	(36.85)			(50.33)	(47.28)
Δ OIS × Tercile of bond debt over debt				-2.033***				-1.542**
				(0.661)				(0.767)
Tercile of bond debt over debt				1.805				8.776
				(6.021)				(5.423)
R^2	0.353	0.353	0.354	0.354	0.352	0.351	0.353	0.352
Date FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓	✓	✓
Sector-MP Shock interactions	✓	✓	✓	✓	✓	✓	✓	✓
Weight	MarketCap	MarketCap	MarketCap	MarketCap	Assets	Assets	Assets	Assets
Observations	13556	13556	13556	13556	13556	13556	13556	13556

Table 9 – Eurozone Debt Structure (weighted)

*Note: This table presents regression results for estimating Equation 2 using different measures of bond debt as interacted variable X, weighing observations by market capitalization (Columns 1 to 4) or book assets (Columns 5 to 8). The dependent variable is daily stock return, and MP Shock are constructed as in Corsetti, Duarte, and Mann (2018). The sample consists of an unbalanced panel of the European firms that were part of EURO STOXX Supersector Eurozone indices, excluding financials and utilities. Dates include 92 ECB announcements days between 2001 and 2007. Controls include firm fixed effects, date fixed effects, sector-times-monetary shocks interactions and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ FFR $\times$ Equity duration proxy	-0.156	-0.136	-0.150	-0.143	-0.366	-0.356	-0.370	-0.362
	(0.202)	(0.203)	(0.225)	(0.202)	(0.226)	(0.257)	(0.391)	(0.275)
Equity duration proxy	-1.010	-1.072	-0.981	-0.978	-3.523	-3.946	-3.788	-3.624
	(1.553)	(1.550)	(1.575)	(1.542)	(2.501)	(2.778)	(3.016)	(2.959)
Δ FFR $\times$ Bond debt over assets	-3.740				-1.843			
	(3.953)				(5.128)			
Bond debt over assets	-10.96				69.93			
	(40.96)				(80.18)			
Δ FFR $\times$ Tercile of bond debt over assets		-0.150				0.0375		
		(0.610)				(0.649)		
Tercile of bond debt over assets		-6.882				-10.35*		
		(4.828)				(5.951)		
Δ FFR $\times$ Bond debt over debt			-1.039				-1.093	
			(1.394)				(2.200)	
Bond debt over debt			3.482				-7.664	
			(10.50)				(8.723)	
Δ FFR $\times$ Debt over assets			-1.578	-1.642			-1.017	-1.182
			(2.566)	(2.491)			(2.991)	(3.009)
Debt over assets			-10.78	-10.79			81.69	87.91
			(46.13)	(45.88)			(95.11)	(98.74)
Δ FFR $\times$ Tercile of bond debt over debt				-0.230				-0.455
				(0.639)				(1.178)
Tercile of bond debt over debt				1.173				4.222
				(2.950)				(3.687)
R^2	0.254	0.254	0.254	0.254	0.212	0.212	0.212	0.212
Date FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓	✓	✓
Sector-MP Shock interactions	✓	✓	✓	✓	✓	✓	✓	✓
Weight	MarketCap	MarketCap	MarketCap	MarketCap	Assets	Assets	Assets	Assets
Observations	17241	17241	17241	17241	17241	17241	17241	17241

Table 10 – US Debt Structure (weighted)

*Note: This table presents regression results for estimating Equation 2 using different measures of bond debt as interacted variable X, weighing observations by market capitalization (Columns 1 to 4) or book assets (Columns 5 to 8). The dependent variable is daily stock return, and MP shocks are taken from Nakamura and Steinsson (2018a). The sample consists of an unbalanced panel of the American firms that were part of S&P 500 index, excluding financials and utilities. Dates include 53 scheduled FOMC meeting announcements days between 2001 and 2007. Controls include firm fixed effects, date fixed effects, sector-times-monetary shocks interactions and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	(1)	(2)	(3)	(4)
Δ OIS $\times$ Equity duration proxy	-0.137	-0.149	-0.146	-0.134
	(0.183)	(0.183)	(0.183)	(0.178)
Equity duration proxy	0.112	0.104	0.109	0.110
	(0.509)	(0.504)	(0.513)	(0.510)
Unrated	1.893	-0.855	1.025	0.708
	(11.80)	(11.80)	(11.77)	(11.65)
IG below AA	10.62	9.542	10.08	10.29
	(8.482)	(8.633)	(8.632)	(8.385)
IG AA and above	1.849	-0.435	0.867	0.878
	(13.65)	(13.46)	(13.91)	(13.95)
Unrated $\times$ Δ OIS	-2.867	-4.276	-4.396	-4.659
	(3.891)	(3.528)	(3.425)	(3.637)
IG below AA $\times$ Δ OIS	-4.055	-3.253	-3.590	-3.851
	(3.845)	(3.564)	(3.582)	(3.722)
IG AA and above $\times$ Δ OIS	-5.122	-5.496	-5.022	-4.968
	(3.938)	(3.558)	(3.431)	(3.581)
Δ OIS $\times$ Bond debt over assets		-19.86***		
		(4.442)		
Bond debt over assets		-33.86		
		(36.65)		
Δ OIS $\times$ Bond debt over debt			-6.325***	
			(2.112)	
Bond debt over debt			-0.515	
			(14.71)	
Δ OIS $\times$ Debt over assets			-3.569	-3.667
			(2.343)	(2.333)
Debt over assets			-10.87	-10.24
			(32.65)	(32.29)
Δ OIS $\times$ Tercile of bond debt over debt				-1.507**
				(0.630)
Tercile of bond debt over debt				-1.276
				(5.069)
R^2	0.227	0.228	0.228	0.227
Date FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓
Sector-MP Shock interactions	✓	✓	✓	✓
Observations	13480	13480	13480	13480

Table 11 – Eurozone Rating Categories and MP Shocks

*Note: This table presents regression results for estimating Equation 2 using different measures of bond debt as interacted variable X, adding interactions with rating categories (High Yield is the excluded category). The dependent variable is daily stock return, and MP Shock are constructed as in Corsetti, Duarte, and Mann (2018). The sample consists of an unbalanced panel of the European firms that were part of EURO STOXX Supersector Eurozone indices, excluding financials and utilities. Dates include 92 ECB announcements days between 2001 and 2007. Controls include firm fixed effects, date fixed effects, sector-times-monetary shocks interactions and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	(1)	(2)	(3)	(4)
Δ FFR $\times$ Equity duration proxy	-0.261	-0.267	-0.270	-0.270
	(0.177)	(0.192)	(0.198)	(0.192)
Equity duration proxy	-2.028	-2.001	-2.032	-1.999
	(1.439)	(1.420)	(1.423)	(1.418)
Unrated	-7.792	-6.969	-7.477	-7.236
	(13.47)	(13.74)	(13.85)	(13.76)
IG below AA	-4.873	-4.064	-4.597	-4.596
	(12.77)	(12.84)	(12.78)	(12.70)
IG AA and above	-7.221	-6.683	-6.864	-7.336
	(17.14)	(17.39)	(17.11)	(17.00)
Unrated $\times$ Δ FFR	0.491	0.470	0.437	0.414
	(2.885)	(2.875)	(2.766)	(2.788)
IG below AA $\times$ Δ FFR	0.716	0.698	0.676	0.654
	(2.809)	(2.807)	(2.822)	(2.826)
IG AA and above $\times$ Δ FFR	0.0705	0.0342	-0.0546	-0.0534
	(3.592)	(3.637)	(3.493)	(3.602)
Δ FFR $\times$ Bond debt over assets		-0.985		
		(2.956)		
Bond debt over assets		19.63		
		(48.42)		
Δ FFR $\times$ Bond debt over debt			0.112	
			(1.227)	
Bond debt over debt			-1.674	
			(11.94)	
Δ FFR $\times$ Debt over assets			-1.906	-1.879
			(3.667)	(3.621)
Debt over assets			8.785	11.64
			(48.08)	(48.49)
Δ FFR $\times$ Tercile of bond debt over debt				0.0548
				(0.506)
Tercile of bond debt over debt				2.617
				(3.357)
R^2	0.206	0.206	0.206	0.206
Date FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓
Sector-MP Shock interactions	✓	✓	✓	✓
Observations	17233	17233	17233	17233

Table 12 – US Rating Categories and MP Shocks

*Note: This table presents regression results for estimating Equation 2 using different measures of bond debt as interacted variable X, adding interactions with rating categories (High Yield is the excluded category). The dependent variable is daily stock return, and MP shocks are taken from Nakamura and Steinsson (2018a). The sample consists of an unbalanced panel of the American firms that were part of S&P 500 index, excluding financials and utilities. Dates include 53 scheduled FOMC meeting announcements days between 2001 and 2007. Controls include firm fixed effects, date fixed effects, sector-times-monetary shocks interactions and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	(1)	(2)	(3)	(4)
Δ OIS × Equity duration proxy	-0.144	-0.135	-0.131	-0.123
	(0.168)	(0.159)	(0.166)	(0.168)
Equity duration proxy	0.178	0.177	0.170	0.183
	(0.538)	(0.535)	(0.537)	(0.535)
Δ OIS × Bond debt over assets	-17.04***	-15.33***		
	(2.782)	(3.100)		
Δ OIS × Default probability (KMV)	5.123		5.445	
	(5.367)		(5.476)	
Bond debt over assets	-32.33	-28.61		
	(38.08)	(37.11)		
Default probability (KMV)	32.54		33.89	
	(32.11)		(33.12)	
Quartile Default=1 × Δ OIS		1.144		1.215
		(2.162)		(2.188)
Quartile Default=2 × Δ OIS		-1.384*		-1.709**
		(0.713)		(0.792)
Quartile Default=3 × Δ OIS		-2.139**		-2.569***
		(0.876)		(0.929)
Δ OIS × Tercile of bond debt over assets			-1.231***	-1.085***
			(0.300)	(0.369)
Tercile of bond debt over assets			-4.158	-3.684
			(4.677)	(4.592)
R^2	0.228	0.228	0.228	0.228
Date FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓
Sector-MP Shock interactions	✓	✓	✓	✓
Observations	13376	13376	13376	13376

Table 13 – Eurozone: Distance-to-Default and Monetary Policy Shocks

*Note: This table presents regression results for estimating Equation 2 using different measures of bond debt as interacted variable X, adding a measure of the default probability. The default probability is derived according to the "distance-to-default" framework by Merton (1974) and subsequently adopted by, amongst others, Gilchrist and Zakrajšek (2012). The dependent variable is daily stock return, and MP Shock are constructed as in Corsetti, Duarte, and Mann (2018). The sample consists of an unbalanced panel of the European firms that were part of EURO STOXX Supersector Eurozone indices, excluding financials and utilities. Dates include 92 ECB announcements days between 2001 and 2007. Controls include firm fixed effects, date fixed effects, sector-times-monetary shocks interactions and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	(1)	(2)	(3)	(4)
Δ FFR × Equity duration proxy	-0.246	-0.246	-0.266	-0.268
	(0.168)	(0.163)	(0.169)	(0.163)
Equity duration proxy	-1.262	-1.706	-1.296	-1.760
	(1.206)	(1.318)	(1.213)	(1.366)
Δ FFR × Bond debt over assets	-0.680	-0.327		
	(2.880)	(2.667)		
Δ FFR × Default probability (KMV)	-45.36**		-45.25**	
	(17.09)		(17.07)	
Bond debt over assets	10.90	20.88		
	(42.44)	(49.69)		
Default probability (KMV)	-506.4		-508.2	
	(326.0)		(327.8)	
Quartile Default=1 × Δ FFR		-1.980		-2.193
		(2.060)		(2.015)
Quartile Default=2 × Δ FFR		-1.164		-1.148
		(0.887)		(0.882)
Quartile Default=3 × Δ FFR		-5.675***		-5.620***
		(1.559)		(1.505)
Δ FFR × Tercile of bond debt over assets			-0.608	-0.606
			(0.395)	(0.396)
Tercile of bond debt over assets			-2.417	-1.318
			(4.517)	(4.582)
R^2	0.213	0.208	0.213	0.208
Date FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓
Sector-MP Shock interactions	✓	✓	✓	✓
Observations	17016	17016	17016	17016

Table 14 – US: Distance-to-Default and Monetary Policy Shocks

*Note: This table presents regression results for estimating Equation 2 using different measures of bond debt as interacted variable X, adding a measure of the default probability. The default probability is derived according to the "distance-to-default" framework by Merton (1974) and subsequently adopted by, amongst others, Gilchrist and Zakrajšek (2012). The dependent variable is daily stock return, and MP shocks are taken from Nakamura and Steinsson (2018a). The sample consists of an unbalanced panel of the American firms that were part of S&P 500 index, excluding financials and utilities. Dates include 53 scheduled FOMC meeting announcements days between 2001 and 2007. Controls include firm fixed effects, date fixed effects, sector-times-monetary shocks interactions and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ OIS × Equity duration proxy	0.00734	-0.00366	0.0118	0.00901	-0.000575	0.00928	-0.00247
	(0.151)	(0.126)	(0.126)	(0.127)	(0.210)	(0.166)	(0.202)
Equity duration proxy	-0.0158	-0.0212	0.00472	-0.0249	-0.0228	-0.0225	-0.0201
	(0.505)	(0.504)	(0.504)	(0.503)	(0.506)	(0.506)	(0.547)
Δ OIS × Debt over assets	-6.293***				-3.848*	-3.978**	-1.067
	(1.640)				(1.977)	(1.890)	(1.672)
Debt over assets	-10.92					-11.63	-7.104
	(30.21)					(31.09)	(31.79)
Δ OIS × Bond debt over assets		-16.30***					-15.52***
		(2.628)					(3.256)
Bond debt over assets		-13.02					-9.339
		(31.77)					(33.12)
Δ OIS × Bond Issued			-1.912***				
			(0.554)				
Bond outstanding			-9.540				
			(6.721)				
Δ OIS × Tercile of bond debt over assets				-1.290***			
				(0.217)			
Tercile of bond debt over assets				-1.440			
				(3.765)			
Δ OIS × Bond debt over debt					-5.189***		
					(1.430)		
Bond debt over debt					9.127		
					(12.44)		
Δ OIS × Tercile of bond debt over debt						-1.208***	
						(0.357)	
Tercile of bond debt over debt						1.817	
						(4.159)	
R^2	0.064	0.065	0.064	0.064	0.065	0.065	0.065
Date FE	✓	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓	✓
Sector-MP Shock interactions	✓	✓	✓	✓	✓	✓	✓
Observations	13556	13556	13556	13556	13556	13556	13556

Table 15 – Eurozone - Abnormal Returns

*Note: This table presents regression results for estimating Equation 2 using different measures of bond debt as interacted variable X. The dependent variable is abnormal daily stock return with respect to the CAPM where the market beta is estimated with a one year rolling window. The MP Shock are constructed as in Corsetti, Duarte, and Mann (2018). The sample consists of an unbalanced panel of the European firms that were part of EURO STOXX Supersector Eurozone indices, excluding financials and utilities. Dates include 92 ECB announcements days between 2001 and 2007. Controls include firm fixed effects, date fixed effects, sector-times-monetary shocks interactions and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ FFR × Equity duration proxy	0.152	0.157	0.177	0.135	0.141	0.145	0.151
	(0.121)	(0.110)	(0.110)	(0.107)	(0.116)	(0.116)	(0.142)
Equity duration proxy	-0.908	-0.880	-0.887	-0.917	-0.939	-0.908	-0.894
	(1.244)	(1.208)	(1.224)	(1.232)	(1.245)	(1.226)	(1.205)
Δ FFR × Debt over assets	-4.191				-4.128	-4.257	-4.062
	(2.596)				(2.673)	(2.592)	(3.817)
Debt over assets	29.51					29.14	23.40
	(50.84)					(51.30)	(52.38)
Δ FFR × Bond debt over assets		-3.052					-0.261
		(2.420)					(3.699)
Bond debt over assets		19.58					10.11
		(49.78)					(52.90)
Δ FFR × Bond Issued			0.206				
			(1.097)				
Bond outstanding			4.802				
			(14.67)				
Δ FFR × Tercile of bond debt over assets				-1.043***			
				(0.353)			
Tercile of bond debt over assets				-1.382			
				(4.832)			
Δ FFR × Bond debt over debt					-0.923		
					(0.998)		
Bond debt over debt					-10.96		
					(12.40)		
Δ FFR × Tercile of bond debt over debt						-0.384	
						(0.357)	
Tercile of bond debt over debt						-0.455	
						(3.429)	
R^2	0.058	0.058	0.058	0.058	0.058	0.058	0.058
Date FE	✓	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓	✓
Sector-MP Shock interactions	✓	✓	✓	✓	✓	✓	✓
Observations	17241	17241	17241	17241	17241	17241	17241

Table 16 – US - Abnormal Returns

*Note: This table presents regression results for estimating Equation 2 using different measures of bond debt as interacted variable X. The dependent variable is abnormal daily stock return with respect to the CAPM where the market beta is estimated with a one year rolling window. The MP shocks are taken from Nakamura and Steinsson (2018a). The sample consists of an unbalanced panel of the American firms that were part of S&P 500 index, excluding financials and utilities. Dates include 53 scheduled FOMC meeting announcements days between 2001 and 2007. Controls include firm fixed effects, date fixed effects, sector-times-monetary shocks interactions and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	(1)	(2)	(3)	(4)
MP Shock (EURIBOR) × Equity duration proxy	-0.145	-0.133		
	(0.138)	(0.140)		
Equity duration proxy	0.151	0.145	0.151	0.146
	(0.509)	(0.508)	(0.507)	(0.507)
MP Shock (EURIBOR) × Bond debt over assets	-15.17***			
	(2.455)			
Bond debt over assets	-29.55		-29.17	
	(36.50)		(35.90)	
MP Shock (EURIBOR) × Tercile of bond debt over assets		-1.099***		
		(0.285)		
Tercile of bond debt over assets		-4.092		-4.129
		(4.543)		(4.567)
MP Shock (OIS daily) × Equity duration proxy			-0.211	-0.201
			(0.135)	(0.136)
MP Shock (OIS daily) × Bond debt over assets			-14.52***	
			(3.660)	
MP Shock (OIS daily) × Tercile of bond debt over assets				-0.910**
				(0.412)
R^2	0.227	0.227	0.227	0.227
Date FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓
Sector-MP Shock interactions	✓	✓	✓	✓
Observations	13556	13556	13556	13556

Table 17 – Eurozone Other MP Shocks

*Note: This table presents regression results for estimating Equation 2 using different measures of bond debt as interacted variable X, using alternative measures of monetary policy shock. The dependent variable is daily stock return, and MP Shock are constructed as daily change in EURIBOR 1M contracts (columns 1 and 2) or daily changes in OIS 1M rate (columns 3 and 4). The sample consists of an unbalanced panel of the European firms that were part of EURO STOXX Supersector Eurozone indices, excluding financials and utilities. Dates include 92 ECB announcements days between 2001 and 2007. Controls include firm fixed effects, date fixed effects, sector-times-monetary shocks interactions and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*

	(1)	(2)	(3)	(4)	(5)	(6)
Δ OIS × Equity duration proxy	0.146	0.129	0.142	0.136	0.144	0.130
	(0.134)	(0.122)	(0.126)	(0.167)	(0.143)	(0.151)
Equity duration proxy	0.0224	0.0234	0.0200	0.0209	0.0244	0.0241
	(0.498)	(0.498)	(0.496)	(0.501)	(0.500)	(0.498)
Δ OIS × Debt over assets	-7.771**			-5.108	-5.569	-1.123
	(3.041)			(3.557)	(3.429)	(3.590)
Debt over assets	-9.823			-9.912	-9.458	-0.193
	(32.52)			(33.37)	(32.98)	(31.86)
Δ OIS × Bond debt over assets		-19.66***				-18.85***
		(3.741)				(5.094)
Bond debt over assets		-24.09				-24.16
		(38.43)				(38.48)
Δ OIS × Tercile of bond debt over assets			-1.330**			
			(0.517)			
Tercile of bond debt over assets			-3.234			
			(4.553)			
Δ OIS × Bond debt over debt				-5.890**		
				(2.778)		
Bond debt over debt				3.078		
				(15.05)		
Δ OIS × Tercile of bond debt over debt					-1.291	
					(0.797)	
Tercile of bond debt over debt					-0.0458	
					(5.176)	
R^2	0.230	0.230	0.230	0.230	0.230	0.230
Date FE	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓
Sector-MP Shock interactions	✓	✓	✓	✓	✓	✓
Observations	13428	13428	13428	13428	13428	13428

Table 18 – Eurozone - No Sep 17

*Note: This table presents regression results for estimating Equation 2 using different measures of bond debt as interacted variable X. The dependent variable is daily stock return, and MP Shock are constructed as in Corsetti, Duarte, and Mann (2018). The sample consists of an unbalanced panel of the European firms that were part of EURO STOXX Supersector Eurozone indices, excluding financials and utilities. Dates include 91 ECB announcements days between 2001 and 2007—excluding September 17, 2001, in comparison to the baseline specification. Controls include firm fixed effects, date fixed effects, sector-times-monetary shocks interactions and time varying firm controls (all lagged to preceding year): log assets, cash over assets, earnings over assets, debt over earnings, earnings over interest expenses, fixed assets over assets, log market-to-book. Balance sheet data comes from Worldscope, bond issuance data comes from SDC Platinum and stock market information comes from Datastream. Standard errors are double-clustered at the firm and date level. *,**, *** indicates significance at the 0.1, 0.05, 0.01 level, respectively.*