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Monetary policy shocks and distressed firms' stock returns: Evidence from the publicly traded U.S. firms

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HIGHLIGHTS

- We estimate U.S. firms' stock-return sensitivities to monetary policy shocks.
- We investigate determinants of firm-level sensitivities to monetary policy shocks.
- Expansionary monetary shocks disproportionately increase distressed firms' returns.
- The distressed firm's profit is substantially smaller than its interest expense.
- Monetary loosening increases market values of firms in need of external financing.

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ABSTRACT

We study U.S. firms' stock-return sensitivities to monetary policy shocks over the 2001–2015 period. Expansionary monetary shocks disproportionately increase returns of a distressed firm which has profit substantially smaller than its interest expense and is in need of external financing.

1. Introduction

Recent observations of prolonged expansionary monetary policies have revived the issue of how monetary policies would affect firms, especially their differential effects across different industries and firms. An increased liquidity provision would induce banks to soften lending standards (Maddaloni and Peydró, 2011) and hence help the liquidity-constrained companies to access the capital market more easily than before. This paper investigates if an expansionary monetary policy shock disproportionately increases the market value of a distressed firm which has a profit substantially smaller than its interest expense and hence is likely to need costly external financing to pay the interest.

We begin by estimating the publicly traded US firms' stock-return sensitivities to monetary policy shocks (MPS), labeled *MPS beta*, by controlling for the four pricing factors used in the investment-based factor model (Hou et al., 2015) that is successful in reducing pricing errors. By doing so, we minimize the concern that the MPS beta is contaminated by omitted variables related to the stock returns. The sample is daily and covers the period 2001–2015. We measure monetary policy shocks as unexpected increases in the US Federal funds rate by using the data on the Federal funds rate futures price (Kuttner, 2001; Bernanke and Kuttner, 2005). At the second stage regression, we examine how the firm-level MPS beta is related to the firm's characteristics, especially a distress dummy that indicates whether the firm's profitability is so bad that the firm's profit would be smaller than the interest expense even if the firm had been offered the market-wide lowest interest rate. This distress dummy, related to the "profitability-side" index to identify zombie firms in the literature

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(Fukuda and Nakamura, 2011; Imai, 2016), strongly indicates that the firm is likely to need costly external financing to pay its interest expense.

We find that for an unexpected reduction in the Federal funds rate, a distressed firm's stock return disproportionately increases, holding constant other firm-level fundamentals (e.g., size, leverage ratio, age, and market-to-book ratio). Our findings suggest that an expansionary monetary policy shock can reduce the costs associated with external financing and hence increase the firm value, especially for a distressed firm in need of costly external financing.

2. Methodology

We measure monetary policy shocks as unexpected increases in the US Federal funds rate by using the data on the Federal funds rate futures price (Kuttner, 2001; Bernanke and Kuttner, 2005). Changes in the monetary policy occur in the Federal Open Market Committee (FOMC) meetings, which are not daily events. As such, we need a daily proxy for the monetary policy shock. As in the asset pricing literature (Adrian et al., 2014; Detzel, 2015), we construct a portfolio of publicly traded stocks and investment-grade corporate bonds such that returns to this portfolio mimic well monetary policy shocks observed during the FOMC meeting dates.[1] (For more detailed procedures, see Online Appendix.) We use this portfolio, labeled *mimicking portfolio*, as a proxy for a monetary policy shock and estimate the firm-level stock return sensitivity to the mimicking portfolio's return, labeled *MPS beta*.

We estimate the firm-level MPS beta by controlling for a number of pricing factors. By doing so, we aim that estimates of MPS betas are not contaminated by omitted factors. By contrast, many of previous studies do not control for such pricing factors (other than the market factor) in estimating the return response to monetary policy shocks. (See, e.g., Cenesizoglu and Essid, 2012; Maio, 2014.)

More specifically, we use the recently developed investment-based pricing model (Hou et al., 2015) that greatly reduces pricing errors: this model can explain a wide range of anomalies found from the CAPM and Fama–French three-factor model. This model employs the four pricing factors as follows: (i) the market portfolio, (ii) the small minus big (SMB) factor, (iii) the robust minus weak (RMW) factor, and (iv) the conservative minus aggressive (CMA) factor. The SMB factor represents the zero-investment portfolio that is long in small market value stocks and short in large market value stocks; the RMW factor is long in firms with high operating profitability (robust) and short in firms with low operating profitability (weak); the CMA factor is long in firms with a low investment rate (conservative) and short in firms with a high investment rate (aggressive).

Let $R_{i,t}$ denote stock i's excess return (above one-month Treasury bill rate) on date t. We write the regression equation of $R_{i,t}$ as:

$$R_{i,t} = \alpha + \beta_{M,i}R_{M,t} + \beta_{SMB,i}R_{SMB,t} + \beta_{RMW,i}R_{RMW,t} + \beta_{CMA,i}R_{CMA,t} + \beta_{MPS,i}R_{MPS,t} + \epsilon_{i,t} \quad (1)$$

where $R_{M,t}$ refers to the excess return to the market portfolio, $R_{SMB,t}$ the return to SMB factor, $R_{RMW,t}$ the return to RMW factor, $R_{CMA,t}$ the return to CMA factor, $R_{MPS,t}$ the return to the portfolio mimicking the monetary policy shocks, and $\epsilon_{i,t}$ the error term. We estimate firm-level stock-return sensitivities to these five factors during each of five subsample periods: (i) 2001–2003, (ii) 2004–2006, (iii) 2007–2009, (iv) 2010–2012, and (v) 2013–2015. Thus, we allow the MPS beta to vary over different periods, especially differences in MPS beta between the crisis period of 2007–2009 and the non-crisis period.

We proceed to investigating determinants of MPS betas $\hat{\beta}_{MPS,i,s}$ that are estimated for firm i during subsample period s and significant at the five percent level. That is, we run a panel regression of significant $\hat{\beta}_{MPS,i,s}$ on firm characteristics and other controls as:

$$\hat{\beta}_{MPS,i,s} = \delta + \gamma_1 Distress_{i,s} + \gamma_2 SIZE_{i,s} + \gamma_3 Lev_{i,s} + \gamma_4 MB_{i,s} + \Omega\, \overline{Other\ Controls_{i,s}} + e_{i,s} \quad (2)$$

where $Distress_{i,s}$ refers to the distress dummy indicating unprofitability (explained later), $SIZE_{i,s}$ the size (i.e., book value of total assets), $Lev_{i,s}$ the leverage ratio (i.e., total debt-to-total assets ratio), $MB_{i,s}$ the market-to-book value ratio of equity (proxy for the growth option), and $e_{i,s}$ the error term. Ω is the vector of coefficients on other control variables: age; tangibility of assets (measured as the property, plant and equipment relative to total assets); industry dummies; crisis dummy indicating whether an observation belongs to 2007–2009 period; and interaction terms between the financial industry dummy and three key fundamentals: size, leverage, and market-to-book ratio, so that we can control for financial industry-specific effects, if any, of these three fundamentals on the MPS beta.

Note that many previous studies compare MPS betas between different portfolios sorted by firm characteristics (Maio, 2014). Importantly, many of such firm characteristics (e.g., size, leverage ratio, market-to-book ratio, and age) are correlated with each other. Therefore, in the regression of MPS beta, we explicitly control for these firm characteristics to isolate the effect of each of these characteristics on the MPS beta.

2.1. Discussion: definition and external financing need of a distressed firm

It is of our main interest to examine the relationship between the firm's MPS beta and distress. Our benchmark measure of distress is a distress dummy $Distress_{i,s}$ that indicates whether the firm's profitability is substantially bad such that the firm's profit is smaller than the interest expense implied by the market-wide minimum interest rate as in the literature studying 'zombie' firms (Fukuda and Nakamura, 2011; Imai, 2016). More specifically, $Distress_{i,s}$ is set to one if the firm's before-tax profit (measured as earnings before interest, taxes, depreciation and amortization (EBITDA)) is, on average, smaller than the firm's minimum interest expense that is calculated by multiplying the firm's outstanding short- and long-term debts by the short-term prime loan rate and the AAA-rated long-term corporate bond rate, respectively. Thus, our distress dummy strongly indicates that in the near future, the firm will need external financing to pay its interest expense. For robustness check, we also consider an alternative measure of distress: the interest coverage ratio, measured as the ratio of before-tax profit (EBITDA) to the firm's actual interest expense, which is an inverse measure of distress.

3. Theoretical background

We consider two hypotheses about the reason why a distressed firm is more sensitive to monetary policy shocks, even after controlling for leverage and future profitability. First, a distressed firm has the smaller internal funds (e.g., retained profits) and hence the greater need for external funds (e.g., bank loans and bonds) to pay interest expenses than a non-distressed firm does, holding all else constant. Importantly, external funds are more costly than internal funds, due to financial market imperfections (Hennessy and Whited, 2007). In this case, a drop in the interest rate directly reduces the level of interest expense and hence

[1] The correlation coefficient between monetary policy shocks and mimicking portfolio returns is 0.49, which is much higher than the typical correlation coefficient between the infrequently observed pricing factor and its mimicking portfolio return in the asset pricing literature, e.g., 0.37 in Adrian et al. (2014) and 0.35 in Detzel (2015).