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INFORMED CORPORATE CREDIT MARKET BEFORE MONETARY POLICY SURPRISES: EXPLAINING PRE-FOMC STOCK MARKET MOVEMENTS

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Informed Corporate Credit Market before Monetary Policy Surprises: Explaining Pre-FOMC Stock Market Movements*

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ABSTRACT

We show that U.S. corporate bond market movements during the days preceding FOMC announcements can predict monetary policy surprises, as well as the pre-FOMC stock market movements. Starting several days before an expansionary (contractionary) surprise in FOMC decisions, corporate bond prices surge (decline) and yield spreads decline (surge). The pattern is statistically and economically significant. Moreover, corporate bond customers buy (sell) more often from dealers before expansionary (contractionary) surprises, suggesting that in aggregate they have more accurate information about the outcome of FOMC announcements. A portfolio that mimics customer trades is profitable with a Sharpe ratio of 0.64 and is profitable before both contractionary and expansionary surprises. Furthermore, consistent with the informativeness of corporate bond transactions, we show that lagged corporate bond customer-dealer trade imbalances can predict pre-FOMC stock market movements and explain pre-FOMC drift. Corporate bond yield changes "Granger-cause" stock pre-FOMC movements, and a 1% surge in the constructed TRACE bond yield during a 2 p.m.-to-2 p.m. period ending one day before an FOMC announcement, predicts a 5.8% decline in the S&P 500 index for the 2 p.m.-to-2 p.m. period ending on the FOMC meeting day. This bond-to-stock granger causality does not exist for non-pre-FOMC periods and is stronger for the companies with higher probability of default.

JEL Classification: G10, G12, E44, E52

Keywords: Pre-FOMC Announcement Drift, Corporate Bond, Credit Risk, Enhanced TRACE, TAQ

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Introduction

This paper provides extensive evidence on the economically and statistically significant corporate credit market movements *before* the Federal Open Market Committee (FOMC) announcements, which are aligned with the direction of FOMC surprises and predict surprises. Furthermore, this evidence explains the puzzling stock market movements before FOMC announcements (Lucca and Moench 2015) by using corporate credit risk as an informative predictor of the economy for this particular period.

We rely on trade-level stock and corporate bond data to conduct the study. Doing so enables us to create matching time periods between stocks and corporate bonds that end before an FOMC announcement. Through this matching, we can measure the way corporate bond and stock markets interact before FOMC announcements, in the most precise way, without overlapping with the announcement.[1] Moreover, thanks to the TRACE data, we can follow the individual trade directions between dealers and customers.

We discuss three main findings in the paper. First, we document that starting several days before FOMC contractionary (expansionary) surprises, corporate bond market prices decline (surge), and corporate bond market yields and yield spreads surge (decline). We show that the 8-day cumulative returns for a period ending at 2 p.m. of the FOMC meeting day is, on average, 1.24% higher for expansionary FOMC surprises compared with contractionary surprises, and the difference is statistically significant. The difference in cumulative returns starts being statistically significant at the 5% level starting 5 days before FOMC announcements. This suggests that the corporate bond market starts adjusting to the monetary policy shocks, which are considered a surprise for other markets, at least 1 week before an FOMC announcement. We see similar economically and

[1] FOMC announcements are usually made around 2:15 p.m., and, therefore, end-of-day stocks or bonds data will overlap with the announcement.

statistically significant results for the cumulative changes in the corporate bond yield and yield spreads.[2] We find this result using the value-weighted TRACE index that we construct and also find similar results using a panel of individual corporate bonds. Moreover, cumulative bond movements before FOMC announcement days can even predict the supposedly exogenous Kuttner (2001) surprises. The results further corroborate empirical studies that show the informativeness of corporate bond credit spreads in predicting economy output by demonstrating that they can predict FOMC surprises as well. Gilchrist, Yankov, and Zakrajšek (2009) and Gilchrist and Zakrajšek (2012), among others, show that the corporate credit market has valuable information in forecasting the business cycle. Philippon (2009) shows that bond prices, compared with stock prices, provide a less noisy proxy for Tobin's q.

Second, we show that corporate bond customers tend to buy (sell) more often before expansionary (contractionary) FOMC surprises. We document that this evidence is statistically and economically significant. A 10-bps expansionary (contractionary) surprise on FOMC announcement days is met with a 5.3% increase (decrease) in the average customer-dealer trading imbalances for the 7 days *before* an FOMC announcement. This suggests that customers, in aggregate, might have more accurate information about the outcome of FOMC meetings, and trade based on their information in the corporate bond market. To further corroborate the informational advantage of customers, we show that a portfolio mimicking customer-dealer trades is profitable, on average, before both expansionary and contractionary surprises. More specifically, using bond trade imbalances during a 7-day period ending one day before an FOMC announcement, we show that a mimicking portfolio that goes long on bonds most often bought by the customers, and goes short on

[2] Confirming that the results are solely driven by yield spreads, and government bonds do not contain any information about the FOMC surprises, we make separate statistical tests for the Treasury yields and find no statistically significant movements before FOMC announcements. Furthermore, we repeat the exercise for the stock market index, and we do not find any statistically significant results before FOMC meetings. The appendix provides the results.

ones most often sold by them has an average 7-day return of 1% and a Sharpe ratio of 0.64, while holding corporate bond market portfolio has average return and Sharpe ratio next to zeroes. The mimicking portfolio is highly profitable both before expansionary and contractionary surprises, whereas holding the corporate bond market portfolio is mainly profitable before expansionary surprises. Strikingly, the mimicking portfolio average returns are higher before the announcements with either positive or negative surprises, compared to announcements with no surprises, in line with the idea that trading based on information is profitable when information asymmetry exists.

Third, and finally, we show that corporate bond market movements predict stock market movements before FOMC announcements are made. Corporate bond customer-dealers trade imbalances not only predict stock market movements around FOMC but also explain the so-called "pre-FOMC announcement drift" (Lucca and Moench 2015). While in general stock market movements predict corporate bond market yield changes, in line with previous findings (Kwan 1996), corporate bond market yield changes predict stock market movements before FOMC announcements. These striking findings further corroborate that around times of monetary policy uncertainty, corporate credit market contains valuable information about the surprises, to the extent that stock market follows corporate bond market movements as well. Furthermore, we also study the predictability of individual stock price movements using past bond market movements to understand the predictability in the cross-section of stocks. We show that, before FOMC announcements are made, the stocks of companies with a higher Merton's (1974) probability of default tend to be more sensitive to past changes in the bond market yield. This result further extends and confirms the findings of the previous sections by showing that stocks of companies with a higher credit risk, which are also more sensitive to economic output, are more strongly predictable by the movements in the corporate credit market, and consequently, further contribute to the overall market-wide predictability.

We argue that the information about the FOMC outcome is better crystallized in the corporate bond market because of at least two reasons. First, corporate credit market is in general a strong predictor of the economy output, and therefore, if any information about the FOMC surprises exist, corporate bond market shall be the right place to trade based on it. Second, transparency of trade directions in the corporate bond market, which is guaranteed by the Financial Industry Regulatory Authority (FINRA)-developed Trade Reporting and Compliance Engine (TRACE) system, makes the information in trades be reflected in prices. In contrast with the bond market, in the stock market, the order flow of informed traders does not tend to be strongly revealing (Collin-Dufrense and Fos 2015, among others), and previous studies have not found abnormal stock market order flow outside the 30-minute news lockup period before an FOMC announcement (Bernile, Hu, and Tang 2016).

We contribute to the literature in at least three ways. First, we corroborate the extensive body of literature on how the informativeness of the corporate credit market predicts economic output (e.g., Gilchrist, Yankov, and Zakrajšek 2009, Gilchrist, and Zakrajšek 2012, Philippon 2009, Gomes, Grotteria, and Wachter 2018, among others) by showing that corporate bond credit risk is also informative before FOMC announcements are made, to the extent that corporate credit market movements before FOMC surprises reflect the direction of FOMC surprises and can predict these future shocks. Whereas Neuhierl and Weber (2018) do not find statistically significant stock market movements *before* FOMC surprises, we document corporate credit market movements that are economically and statistically significant at the 1% level.

Second, by providing empirical evidence about the informativeness and profitability of customer-dealer trade imbalances in the corporate bond market before FOMC announcements are made, we contribute to research on information asymmetry, a vein of the literature that goes back to Kyle (1985) and Akerlof (1970). Our results are in line with the Cieslak, Morse, and Vissing-Jorgensen (2018) hypothesis and anecdotal evidence on the Fed informally or indirectly sharing information about the announcements with institutions. Finer (2018) builds on the same hypothesis by

documenting an abnormal number of NYC taxi rides to the district of liberty street certain times before FOMC announcements. Although (1) recent empirical results on the stock market do not support the idea that measures of informed trading relying on price data can identify the existence of informed trades (Collin-Dufrense and Fos 2015, among others) and (2) previous analysis of pre-FOMC order flows does not find supportive evidence of predictive power of order flows before the 30-minute news lockup period (Bernile, Hu, and Tang 2016), we find extensive empirical support for the informativeness of the customer-dealer corporate bond transactions about FOMC surprises during a long 7-day period before the FOMC announcement days.

Third, and finally, we contribute to existing work documenting abnormal stock market movements before FOMC announcements are made (Lucca and Moench 2015) by employing the information in the corporate bond market to explain pre-FOMC stock market movements and pre-FOMC announcement drift. Doing so goes hand in hand with Lucca and Moench (2015) argument about the information disadvantage of stock holders before FOMC announcement and that they need to be compensated for it. In line with Easley and O'Hara (2004), we argue that information asymmetry---the existence of which is suggested by the extensive set of documented evidence in the corporate bond market---increases the cost of capital for the stock market, where the largest group of asset holders are risk-averse households (Easley and O'Hara 2004). The cost of capital discounts the stock prices. As the announcement approaches, more participants learn about the news, and the discount starts disappearing (Easley, O'Hara, and Yang 2016), which creates the drift in the stock market. Our results also contribute to previous empirical results on the informativeness of the corporate bond and stock markets in predicting each other. Previous empirical results either suggest that stock prices predict next-period corporate bond prices (Kwan 1996) or suggest no lead-lag relation between the stock market and the corporate bond market (Hotchkiss and Ronen 2002). We confirm that the stock market generally predicts the corporate bond market, and we document the

striking evidence that before FOMC announcements are made, the corporate bond market predicts the stock market's movements.

It is worth emphasizing on two novel aspects that this paper departs from the ongoing state of research. First, this paper focuses on the FOMC *surprises* and shows that corporate bond market predicts them. This distinguishes the findings of this paper from the so-called "fed put", where the predictability of federal funds *target rate* changes with stock market declines is discussed (for example, Cieslak and Vissing-Jorgensen 2018). Second, this paper documents the significant predictive power of corporate bond market about the monetary policy surprises, and, therefore, studies the corporate bond market movements *before FOMC announcements*. This distinguishes the findings of this paper from the documented statistically significant *post-announcement* drifts in the treasury and the corporate bond markets (Brooks, Katz, and Lustig 2018), and the stock market (Neuhierl and Weber 2018).

We study FOMC announcements between July 2002 and December 2009. The availability of the TRACE dataset defines the start date of our analysis as July 2002. We pick the end of our sample as 2009, when both the zero lower bound (ZLB) is reached, and afterwards, the stock market stops drifting significantly within one day before FOMC announcements. The magnitude of FOMC surprises, measured by the average absolute change in the federal funds futures rate, and adjusted following Kuttner (2001), is on average 5 times lower after 2009, compared with its magnitude during the sample period. Although we exclude the current decade from our analysis, our results are relevant today, because the interest rate has gradually started to move away from the lower bound, and FOMC surprises should reclaim their conventional role on the economy output.

The rest of the paper is organized as follows. Section I describes the data used in our analysis. Section II presents the results for corporate bond market movements before FOMC surprises are realized. Section III provides evidence on the informativeness and profitability of the customer-dealer trade imbalances before FOMC surprises. Section IV explains the pre-FOMC stock drift and

movements before FOMC announcements are made, using corporate bond trades and prices, and further explores predictability in the cross-section of stocks. Section V concludes.

I. Data

We use the Enhanced TRACE dataset for corporate bond transactions and rely on the Mergent Fixed-Income Securities Database (FISD) for additional information about corporate bonds, including par values and the Standard and Poor's (S&P) credit ratings. For the stock market, we rely on Daily and Monthly TAQ files, respectively, known as DTAQ and MTAQ datasets, CRSP, and the merged CRSP/Compustat dataset.

A. Corporate bond data

We obtain corporate bond transactions from the Enhanced TRACE dataset and follow Dick-Nielsen (2014) to clean the dataset. We only keep corporate bond transactions for bonds of S&P 500 index companies and for the time that the companies are listed in the index.[3] The availability of the Enhanced TRACE dataset defines the start of our sample as July 2002. We set the end of our sample as December 2009, because the interest rate reaches ZLB, and afterwards, the 24 hour pre-FOMC announcement drift in stock market disappears.

After applying the Dick-Nielsen (2014) cleaning, we still find reported transaction prices that are off by a factor of 10, suggesting so-called "fat-finger errors" in reporting transactions. To exclude them, we follow Brownlees and Gallo (2006) to remove the outliers. More specifically, we exclude transactions that do not fulfill the lenient criteria shown here:

$$\left|p_t - \overline{p}_{t^-}\right| \leq 5\, s_{t^-} + k\,, \quad k = 0.40\,, \tag{1}$$

[3] More specifically, we merge the CRSP S&P 500 list of entrances and exits, with the CRSP daily stock names files to include the tickers, and we use the outcome as the link table between S&P-listed CRSP stocks and their issued bonds in TRACE.

where p_t is the current transaction log-price and $\overline{p}_{t^-}$ and s_{t^-} are the average and sample standard deviations of p for the past 20 transactions, respectively. We add $\pm 40\%$ to the acceptance interval to prevent removing accurate transactions that follow a series of unchanged prices. We also exclude transactions with reported yields below 0 and above 100%.

We take daily 2 p.m.-to-2 p.m. intervals and keep the last transaction recorded before 2 p.m. every day as the daily price of the bond. We select 2 p.m.-to-2 p.m. intervals for two reasons: (1) to construct a daily time period that ends before FOMC announcement times and (2) to avoid any potential end-of-day liquidity-driven price fluctuations, which are documented in various financial markets.[4] We merge the outcome with the Mergent FISD dataset, which provides the par value and S&P credit ratings.

Finally, we merge the data with the FISD dataset and only keep those bonds that (a) have a face value of USD 1,000, (b) have at least 100 days with transaction records, (c) have transaction records for at least 40% of the days between their first and last records, (d) have at least an average of 4 transactions per day between the days of their first and last record, and (e) have, at the transaction day, a time to maturity between 30 days and 30 years. By using these criteria, we ensure that the index we construct from TRACE does not include many stale prices. Besides, limiting the number of days with no trades ensures that we omit illiquid bonds, because the number of days with zero trades is an accurate measure of illiquidity (Lesmond, Odgen, and Trzcinka 1999, Fong, Holden, and Trzcinka 2017). Furthermore, to minimize the effect of microstructure biases, we construct value-weighted indices, following Asparouhova, Bessembinder, and Kalcheva (2010, 2013). Figure 1 shows the yield index that we construct using these bonds. The index is value weighted using the

[4] See Harris (1989) and McInish and Wood (1990) for end-of-day price fluctuations in the stock market. Adrian et al. (2016) document and explain end-of-day inventory-driven price movements for government bonds.

outstanding amount for every bond. Panel A of Table I shows the summary statistics for the constructed daily bond data, which are used to construct the index.

[Figure 1 about here]

B. Equity data

We rely on the Daily TAQ and Monthly TAQ datasets for the stock market data. Following Holden and Jacobsen (2014), we use Daily TAQ dataset, as the more accurate dataset, when it becomes available in October 2003 onward, and, before that, we use the Monthly TAQ dataset. We follow Holden and Jacobsen (2014) to clean the data.[5] We use the SPDR S&P 500 exchange-traded fund (SPY ETF) prices from the TAQ dataset to measure the aggregate stock market movements.[6] For individual constituents of the S&P 500 index, we obtain the last prices before 2 p.m. from the TAQ datasets and merge them with the CRSP dataset in order to adjust for dividend and splits, as well as using the CRSP permanent stock identifies of the companies.[7] Panel B of Table I provides basic summary statistics for the stock data.

C. FOMC meetings and surprises

We consider all scheduled FOMC meetings between July 2002 and December 2009. Following an extensive body of research, for example, Kuttner (2001) and Bernanke and Kuttner (2005), we measure the monetary surprise as the change in the current federal funds futures rate by comparing the daily rate before and after FOMC meetings and adjusting the level of rate change for the number of days remaining until the end of the month. Following Kuttner (2001), and to reduce the noise in the shocks, we use next month federal fund futures for the FOMC announcements in the last 7 days

[5] We are grateful to Craig Holden for kindly making the SAS codes available on his website.
[6] We also can directly calculate the S&P 500 portfolio returns and use them as the market return. However, SPY is more liquid, so we use it for this purpose.
[7] We use the CUSIPs in the Monthly TAQ and Daily TAQ master files to merge the TAQ and CRSP datasets. For more details on merging these datasets, see Abdi and Ranaldo (2017).

of the month. We consider a decrease (increase) in the federal funds futures rate after an FOMC announcement to be an expansionary (contractionary) surprise. In 27 of the 60 announcement days, we see no rate movement and consider them to be zero surprises days.

[Table I about here]

II. Corporate Bond Market ahead of FOMC

To visually show the movements, for every FOMC announcement day, we calculate cumulative returns and yield changes at 2 p.m. starting 8 business days before the announcement day. We estimate the average cumulative returns around the three types of surprises, namely expansionary, contractionary, and zero surprises. Figure 2 shows the cumulative returns of the constructed TRACE price index around FOMC announcements. The vertical line at $t = 0$ represents an FOMC announcement day at 2 p.m. As it is evident in the picture and as we formally test in the paper, corporate bond market prices surge (decline) starting around 8 days before FOMC announcements with an expansionary (contractionary) surprise. We examined longer time horizons before FOMC announcements are made, but we do not see a discernable pattern in the days before the currently specified 8-day period. We pick the 8-day horizon because (1) no discernable movements before that are visible, and (2) the 8-day before the announcement coincides with the start of the blackout period, which makes it a natural candidate for a period where no formal news communication occurs.[8] We also calculate the yield changes compared to the 8 days before FOMC announcement days as a reference point, and we see similar results, which are shown in Figure 3.

[Figure 2 about here]

[Figure 3 about here]

[8] We provide figures for the 16-day horizons in the appendix.

To ensure that the effect is attributed to the yield spreads, and not to the Treasury market, we repeat the analysis using yield spreads and find even sharper evidence. To do so, we obtain the daily government Treasury yield data from the Department of Treasury website.[9] According to Department of Treasury website, yield curves are estimated every day around 3:30 p.m. Eastern time. Therefore, we construct a dedicated daily dataset using the last TRACE yields before 3:30 p.m. and calculate the spreads using a linear interpolation of the Treasury yield curve. Figure 4 shows the changes in the yield spreads compared to 8 days before an FOMC announcement meeting.

[Figure 4 about here]

A. Bond market regression

To formally test the hypothesis that corporate bond credit markets movements before FOMC announcement days are significant, and align with the surprises, we run the regression specified in Equation (2). We run the regression several times for cumulative returns of different periods starting 8 days before FOMC announcement days and ending at date t, which is between 7 days before and 7 days after an FOMC announcement day.

$$R^{M}_{t,t_0} = \alpha_t + \beta_t^{(0)} \mathbb{1}_{\{MPS=0\}} + \beta_t^{(-)} \mathbb{1}_{\{MPS<0\}} + \varepsilon_{t,t_0}\,, \quad t_0 = t_{FOMC} - 8\,, \tag{2}$$

where R^{M}_{t,t_0} is the cumulative return in the bond market between t_0, that is, 8 days before an FOMC announcement day at 2 p.m. and t. $\mathbb{1}_{\{MPS=0\}}$ ($\mathbb{1}_{\{MPS<0\}}$) equals 1 for the cumulative returns of periods starting before FOMC announcement days with zero (negative) monetary policy surprises, and 0 otherwise, reflecting zero (expansionary) surprises at the FOMC meetings. We define FOMC monetary policy surprises following Kuttner (2001) by taking the change in the federal funds futures rate of the current month and adjusting it depending on the number of days remaining in the month.

[9] https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield

We use the Newey-West (1987) standard errors with four lags to account for heteroskedasticity and autocorrelation.

Table II shows the results of the regression. Three clear results emerge from the regression: First, prices (yields) increase (decrease) 8 days before an expansionary surprise compared with a contractionary surprise. Second, the difference between the expected cumulative returns for expansionary and contractionary surprises is already statistically significant at 5% level 5 days before FOMC meetings and at the 1% level at 4 days before FOMC meetings. Third, and finally, the magnitude of the difference grows at least until the FOMC announcement date. We see similar results for prices, yields, and yield spreads, suggesting that the effect is robust to the choice of the data and that the effect is attributed to corporate bond yields, rather than treasury yields. We will more formally confirm the hypothesis that the information is mainly attributed to the corporate bond market, and not stock or Treasury market, in Section II.C.

[Table II about here]

The results cannot be explained using the so-called "Fed-put hypothesis," also known as "Greenspan put" or "Bernanke put," which suggests that the Fed facilitates expansionary surprises following market declines, in the same spirit of providing an implicit put option for the market. In fact, we document the opposite, because corporate bond prices surge, instead of declining, before expansionary surprises.

B. Panel regression

Although the results of the simple time-series regression specified in Equation (2) are already strong, to provide further support for the corporate credit market movements before FOMC surprises, we run fixed effects (FEs) panel regressions, which are specified in Equation (3), for all bonds issued by S&P 500-listed companies.

$$R^{i}_{t,t_0} = \alpha_{i,t} + \beta^{(0)}_{t}\mathbb{1}_{\{MPS=0\}} + \beta^{(-)}_{t}\mathbb{1}_{\{MPS<0\}} + \varepsilon_{i,t,t_0}\,, \quad t_0 = t_{FOMC} - 8\,, \tag{3}$$

where R^{i}_{t,t_0} is the cumulative return of bond i at t_0, that is, 8 days before an FOMC announcement day at 2 p.m. and t. $\mathbb{1}_{\{MPS=0\}}$ and $\mathbb{1}_{\{MPS<0\}}$ are dummy variables similar to the ones specified in the regression framework of equation (2). Table III shows the results. To account for the cross-sectional dependence between bonds, we calculate the standard errors following Driscoll and Kraay (1997).

[Table III about here]

C. Attribution of different markets to the FOMC surprise

We take several steps to determine whether the information about FOMC surprises is mainly attributed to corporate credit spreads, and not Treasury yields or stocks. To do so, we first replicate the time-series regression of Equation (2) for 1- and 10-year Treasury yields, and we do not find any statistically significant difference between the Treasury yield movements before expansionary and contractionary monetary policy surprises. In addition, we replicate this regression for the stock market using S&P 500 ETFs, and we find no statistically significant movement before FOMC surprises, which is consistent with the stock market findings of Neuhierl and Weber (2018), who only find statistically significant results in periods overlapping with FOMC announcements. For the sake of brevity, we provide the results for this analysis in the appendix. The results for both the Treasury and stocks markets suggest that the information in the market before FOMC surprises is solely attributed to the corporate credit market.[10]

Furthermore, we directly examine the predictive power of 7-day cumulative returns and yield changes in the already mentioned markets for predicting the Kuttner (2001) FOMC surprises. Table IV provides the results. We use the Newey-West (1987) standard errors with four lags to account for

[10] Our results are also unlikely to be driven by the effect of other macroeconomic announcements around the FOMC announcement day. The only main macroeconomic announcement in the blackout period is the initial jobless claims, which is announced at 8:30 am on the Thursdays before the FOMC meetings. In the same spirit of Andersen et al (2003) we test whether corporate bond yields react significantly to the shocks in the initial jobless claims, and we do not find supporting evidence for that hypothesis. The results for these regressions are provided in the Appendix.

potential heteroskedasticity or autocorrelation. The results in the table clearly confirm that the prediction of FOMC surprises is solely attributed to the corporate bond market, and not the stock and Treasury markets. The results hold for the entire sample period (Panel A), the subperiods before the 2008 financial crisis (Panel B), and the period during the financial crisis (Panel C). While the results in Table IV are provided using the constructed TRACE index of S&P 500 companies bonds, we get similar results using readily available Bloomberg TRACE indices, as well as Moody's corporate bond market index. The results for these indices are provided in the appendix. Furthermore, we get similar results using 30-minute monetary policy surprises around the FOMC announcements (Gilchrist, López-Salido, and Zakrajšek 2015), instead of daily Kuttner (2001) surprises. The results for the 30-minute surprises are provided in the appendix.

[Table IV about here]

The scatterplot in Figure 5 considers individual announcements and provides a clear visualization for the informativeness of the corporate bond market about FOMC surprises. The figure shows the cumulative returns of the constructed TRACE corporate bond index in a 7-day period ending at 2 p.m. on the day before an FOMC announcement is made versus the Kuttner (2001) FOMC surprise for every FOMC meeting in our sample.

[Figure 5 about here]

III. Corporate Bond Trading before FOMC Surprises

The results of this paper corroborate the informativeness of corporate credit risk about the future of the economy. However, that the corporate bond market contains information about a particular *event* that affects the future of the economy extends the argument of informativeness about economic output. These results suggest the possibility that some participants in the market might have more

accurate information about the outcome of the FOMC meetings, and trades in the corporate bond prices market reveal this information as well.

A. Customer-dealer trade imbalances

Corporate bond market customers include large financial and insurance companies. That they might be informed about the news is unsurprising (e.g., Hendershott, Livdan, and Schürhoff 2015, among others). If some customers have more accurate information about the outcome of the FOMC meeting, one of the many places to use this information would be the corporate bond market. Using daily trade imbalances calculated for every corporate bond in our sample, we see that customers buy (sell) a corporate bond more often *before* expansionary (contractionary) surprises.

We calculate customer-dealer trade imbalances for every bond and every day between 8 days and 1 day before FOMC meetings to determine whether they reflect upcoming Kuttner (2001) surprises in the following FOMC meeting. We calculate customer-dealer trade imbalances, from the customer's point of view, based on both the number of trades, which we refer to as NTI, and the dollar volume of trades, which we refer to as DTI. Consistent with previous parts of the paper, we use the same 2 p.m.-to-2 p.m. definition of days. Equations (4) and (5), respectively, show how NTI and DTI are defined. We calculate market-wide trade imbalances by taking the average of trade imbalances across the bonds:

$$NTI_{i,t} \equiv \frac{Number\ of\ Customer\ Buy\ Transactions_{i,t} - Number\ of\ Costumer\ Sell\ Transactions_{i,t}}{Number\ of\ Customer-Dealer\ Transactions_{i,t}} \times 100\%\ , \quad (4)$$

$$DTI_{i,t} \equiv \frac{Dollar\ Value\ of\ Customer\ Buy\ Transactions_{i,t} - Dollar\ Value\ of\ Customer\ Sell\ Transactions_{i,t}}{Dollar\ Value\ of\ All\ Customer-Dealer\ Transactions_{i,t}} \times 100\%. \quad (5)$$

Table V shows the results of the analysis. Panel A shows the results for a panel regression of bond trade imbalances using the Kuttner (2001) shocks of the upcoming FOMC announcement day and includes fixed effects for individual bonds. We account for the comovement of imbalances when calculating *t*-statistics by using the Driscoll and Kraay (1998) standard errors. The results clearly

suggest that customer buy (sell) bonds more often before expansionary (contractionary) surprises. The results are statistically significant at the 1% level and are economically significant as well. A 10-bps expansionary (contractionary) surprise is met with a sharp 3.5% increase (decrease) in the trade imbalance estimated based on number of trades and a 2.4% increase (decrease) in the dollar-volume trade imbalance. We also repeat the analysis by splitting the data into two subsamples: (1) bonds having an S&P rating of A, that is, the median rating, or better and (2) bonds having a rating of A- or worse. Panels B and C, respectively, show the results for this analysis. The results clearly hold for both subsamples.

In Panel D, we employ a time-series regression of the market average of imbalances on the upcoming FOMC surprises, and we see even economically sharper results compared with Panel A. We account for any potential time-series autocorrelation or heteroskedasticity, using the Newey-West (1978) standard errors with four lags. For panels B and C, we repeat the analysis for the bonds with a rating of A or better and a rating of A- or worse, respectively, and we find similar results. The results generally hold for all samples and all imbalance measures. In sum, the results of Panels D to F confirm the results of Panels A to C.

[Table V about here]

If some customers are informed, they might use this information to trade in several markets, besides the corporate bond market. However, in more liquid markets, informed traders' activities do not tend to move prices, because they have the opportunity to trade when market is more liquid (Collin-Dufrense and Fos 2015). Consistent with this, Bernile, Hu, and Tang (2016) do not find abnormal stock market order flow outside the 30-minute news lockup period before FOMC announcements. Unlike the stock market, trades are infrequent and costly in corporate bond market, and, thanks to TRACE, accurate records for trade directions in this market exist. Therefore, corporate bond trades reveal the information and eventually move prices.

B. Customer trades mimicking portfolio

We construct portfolios that mimic customer-deader trades during the 7-day periods ending at 2 p.m. on the day before FOMC announcements. To do so, we sort corporate bonds using the 7-day number trade imbalances, $NTI_{t-1,t-8}$, and calculate the 7-day period returns of a portfolio that goes long on the decile of bonds most often bought by customers and goes short on the decile of bonds most often sold by them.

[Table VI about here]

Table VI shows the average returns of this portfolio during the 7-day period. Three clear results emerge from the table: First, the mimicking portfolio has both a higher return and a higher Sharpe ratio compared to the holding corporate bond market portfolio. Second, the mimicking portfolio is highly profitable both before expansionary and contractionary surprises, while holding the corporate bond market portfolio is mainly profitable before expansionary surprises. Finally, the average mimicking portfolio returns before expansionary and contractionary surprises are considerably larger than those before announcements without surprises, which is consistent with profits being driven by information about surprises.

IV. Corporate Bond Credit Risk and Stock Market Movements

In the previous sections, we provided extensive evidence to show that the corporate credit market's prices and trades move before FOMC announcement surprises, reflecting the direction and the magnitude of the surprise. This raises a natural question: if the corporate bond market contains information about the future, how and when this information will be reflected in the stock market? Answering this question also can help us better understand the puzzling stock market movements before FOMC announcements, for example, the so-called "pre-FOMC announcement drift." In this

section, we attempt to address this question both for the stock market, proxied by the liquid S&P 500 SPY ETF, and for individual stocks.[11]

A. Explaining the pre-FOMC announcement drift

We directly employ trade imbalances, for which we provided evidence of their informativeness about FOMC surprises in the previous section, to predict stock market movements. To do so, we run the following regression framework:

$$R^S_{M,t} = \omega + \gamma R^S_{M,t-1} + \delta \overline{NTI}_{t-1,t-8} + \eta \Delta fff_{t-1} + \mathbb{1}_{\{FOMC\}}\left[\omega' + \gamma' R^S_{M,t-1} + \delta' \overline{NTI}_{t-1,t-8} + \eta' \Delta fff_{t-1}\right] + \varepsilon_t \,, \quad (6)$$

where $R^S_{M,t}$ shows the 2 p.m.-to-2 p.m. return for the SYP index ending at day t. We include lagged changes of the federal funds futures rate to control for the changes in the expected target rates. We reduce the effect of noise in the trade imbalances by using a 7-day rolling window as the explanatory variable. More specifically, $\overline{NTI}_{t-1,t-8}$ is the total number of customer-dealer buys, subtracted by the total number of sells, and then divided by the total number of customer-dealer transactions during a 7-day period preceding the nonoverlapping 2 p.m.-to-2 p.m. return period of the stock market. $\mathbb{1}_{\{FOMC\}}$ is a dummy variable that equals 1 for the 2 p.m.-to-2 p.m. time period before the actual announcement. Including the interaction with this dummy enables us to distinguish any different patterns around FOMC meetings. Table VII reports the results of this regression. We account for the time-series autocorrelation and heteroskedasticity using the Newey-West (1987) standard errors with four lags.

[Table VII about here]

Column (1) simply confirms the pre-FOMC announcement drift previously documented by Lucca and Moench (2015). We obtain two important results in column (3). First, we show that the

[11] See Ben-David, Franzoni, and Moussawi (2018), who empirically show that ETFs are more liquid than the constituents.

lagged corporate bond trade imbalances predict stock market movements during the pre-FOMC 24 hours, consistent with the informativeness of the corporate bond market about the surprise and suggesting that the stock market follows the movement of the corporate bond market to assess the surprise. Our second finding is that corporate bond trades explain the pre-FOMC announcement drift by making the drift economically and statistically insignificant. Comparing columns (1) and (3), we see that the pre-FOMC drift declines from 75 to -4 bps, with a *t*-statistic near 0. Both findings hold after controlling for the lagged changes in the federal funds futures rate in column (4).

At best, only a fraction of stock market participants are informed about FOMC surprises, because of the three following reasons: First, stock market participants and bond market participants do not fully overlap, and therefore, stock market participants might not concentrate on discerning information from TRACE, which requires a subscription fee. Second, TRACE did not disseminate detailed information, including trade directions, until November 2008, which could make discerning information less reliable and slower. Third, and finally, discerning informed trades directly from a stock market transaction does not seem to be reliable. Therefore, stock market participants might rely on lagged aggregate corporate bond data to make conjectures about the upcoming FOMC surprises.

Trades in the stock market might not reveal private information, not necessarily because informed trades are not occurring on the stock market, but because informed traders can selectively trade using limit orders when the market is very liquid, to make sure that their orders are not revealing (Collin-Dufrense and Fos 2015). Consequently, similar to other markets with asymmetric information (Akerlof 1970), stock prices were discounted on the days preceding an FOMC announcement. This is because risk-averse stock market investors require compensation for the information asymmetry (Easley and O'Hara 2004).

The stock market order flow only starts revealing information in the hours approaching an FOMC announcement, consistent with Bernile, Hu, and Tang (2016), who document this finding for the 30-minute lockup period. Their finding could be explained by the competition between informed

participants during the constrained time approaching the announcement. As more participants become informed about the news, the cost of capital lowers (Easley, O'Hara, and Yang 2016), and therefore, the discount attributed to information asymmetry disappears, creating the drift in the stock market.

In sum, the results suggest that stock market participants might discern information about the FOMC surprises using lagged corporate bond market movements, and the pre-FOMC announcement drift in the stock market is attributed to disappearance of the information asymmetry discount after participants discern the information from bond market.

B. Time-series Granger causality

In the previous section, we already confirmed the informativeness of the corporate bond market movements in explaining the stock market movements before FOMC announcements. Here, we follow the existing literature and methodologies (e.g., Kwan 1996, Hotchkiss and Ronen 2002, among others) to test the Granger causality between the stock and bond markets and test whether the findings in other works hold before FOMC announcements are made as well. Using the constructed corporate bond yield and price indices, we run the following Granger causality regression framework:

$$R^S_{M,t} = \gamma_0 + \sum_{k=1}^{2}\gamma_k R^S_{M,t-k} + \sum_{k=1}^{2}\delta_k R^B_{M,t-k} + \sum_{k=1}^{2}\vartheta_k \Delta fff_{t-k} + \mathbb{1}_{\{FOMC\}}\left[\gamma'_0 + \sum_{k=1}^{2}\gamma'_k R^S_{M,t-k} + \sum_{k=1}^{2}\delta'_k R^B_{M,t-k} + \sum_{k=1}^{2}\vartheta'_k \Delta fff_{t-k}\right] + \varepsilon_t \,, \quad (7)$$

$$R^B_{M,t} = \gamma''_0 + \sum_{k=1}^{2}\gamma''_k R^S_{M,t-k} + \sum_{k=1}^{2}\delta''_k R^B_{M,t-k} + \sum_{k=1}^{2}\vartheta''_k \Delta fff_{t-k} + \mathbb{1}_{\{FOMC\}}\left[\gamma'''_0 + \sum_{k=1}^{2}\gamma'''_k R^S_{M,t-k} + \sum_{k=1}^{2}\delta'''_k R^B_{M,t-k} + \sum_{k=1}^{2}\vartheta'''_k \Delta fff_{t-k}\right] + \epsilon_t, \quad (8)$$

where $R^S_{M,t}$ and $R^B_{M,t}$, respectively, show the 2 p.m.-to-2 p.m. return for the SYP index and the corporate bond market index. We also include lagged changes in the federal funds futures rate to control for the changes in the expected target rates. $\mathbb{1}_{\{FOMC\}}$ is a dummy variable that equals 1 for the

2 p.m.-to-2 p.m. time period ending on an FOMC announcement day. Including the interaction with this dummy enables us to distinguish any different patterns in the lead-lag relationship between stocks and bonds around FOMC meetings.

[Table VIII about here]

Table VIII shows the results of the time-series regressions. In Panel A, we use the returns on the TRACE bond price index, and, in Panel B, we use the changes in the TRACE corporate bond yield index. Three clear results emerge from the regressions. First, outside the FOMC meeting days, the stock market Granger-causes corporate bond market. This finding is in line with the findings of Kwan (1996), among others. Second, and more strikingly, bond market movements lead the stock market movements before FOMC announcements are made. This striking evidence, which, to the best of our knowledge, we are the first to document, is in line with (1) the theoretical and empirical findings that show that the credit risk market contains valuable information that can predict business cycles and (2) our findings in the previous sections showing that the corporate market predicts FOMC surprises. Therefore, stock investors might rely on this information, specifically in and around times of economic uncertainty. Finally, around the FOMC announcements, lagged corporate bond market movements can predict one-period-ahead bond market movements, a finding that is in line with our findings in Section II, which showed that bond market movements start several days before an FOMC announcement is made.

C. Predictability in the cross-section of stocks

So far, we have documented that around FOMC announcements, bond market movements predict the stock market index, namely the SPY ETF. Here, we look at the constituents of the S&P 500 index to determine whether Granger causality is stronger for certain stocks. This line of inquiry is in the same spirit of Gomes, Grotteria, and Wachter (2018), who show that predictability of corporate credit

risk about the real economy is driven by the heterogeneous exposure of different firms to the shocks in the economy.

Following Gomes, Grotteria, and Wachter (2018) and Bharath and Shumway (2008), we calculate the expected default frequency (EDF) according to the Merton (1974) model:

$$EDF_{i,t} = \phi\left(\frac{-\log\left(\frac{V_{i,t}}{B_{i,t}}\right)-\left(\mu_{V_{i,t}}-\frac{\sigma^2_{V_{i,t}}}{2}\right)}{\sigma^2_{V_{i,t}}}\right), \quad (9)$$

where ϕ is the cumulative normal distribution function, and $B_{i,t}$ and $V_{i,t}$ are the book value of debt and firm value, respectively, calculated as the book value of debt plus the market value of equities. Following Campbell, Hilscher, and Szilagyi (2008) and Gomes, Grotteria, and Wachter (2018), we proxy the debt coming due in the current quarter by adding one-fourth of the short-term debt ($dlcq$) to one-eighth of the long-term debt ($dlttq$). We use the average daily 2 p.m.-to-2 p.m. equity returns of the past 250 days to calculate $\mu_{V_{i,t}}$ and return volatility $\sigma_{E_{i,t}}$. Following Bharath and Shumway (2008), we approximate the firm value volatility as follows:

$$\sigma_{V_{i,t}} = \frac{E_{i,t}}{E_{i,t}+B_{i,t}}\sigma_{E_{i,t}} + \frac{B_{i,t}}{E_{i,t}+B_{i,t}}\left(0.05/\sqrt{12} + 0.25\sigma_{E_{i,t}}\right). \quad (10)$$

We use the estimated EDFs in a panel regression of past bond market returns on individual stock returns, specified here:

$$R^S_{i,t} = \theta_{i,0} + \theta_1 R^S_{i,t-1} + \theta_2 R^S_{m,t-1} + \theta_3 \Delta y^B_{m,t-1} + \theta_5 EDF_{i,t-1} + \theta_6 \Delta y^B_{m,t-1} EDF_{i,t-1} + \xi_{i,t}\,, \quad (11)$$

where $R^S_{i,t}$ is the 2 p.m.-to-2 p.m. individual stock return ending on an FOMC announcement day, and $R^S_{m,t-1}$is the lagged SPY return. $\Delta y^B_{m,t-1}$ shows the lagged change in the corporate bond index yield. We account for the comovement of residuals by using the Driscoll and Kraay (1998) standard errors.

[Table IX about here]

Table IX shows the results of the regression. As shown in the last column of the table, the stocks of companies with a higher probability of default tend to be more strongly predictable by lagged corporate bond market movements before FOMC announcements are made.

V. Conclusion

We have shown that corporate bond market movements before FOMC announcements are made contain valuable information about FOMC surprises. We see no such explanatory power in stocks or in the Treasury yields. This occurs up to the extent that, before FOMC announcements are made, in contrast to other times, the bond market predicts stock market movements. Moreover, corporate bond movements can explain the pre-FOMC announcement drift.

We have further corroborated the informativeness of the corporate credit market as an important predictor of economic output. In addition, we have shown that aggregate trades in this market before FOMC surprises reflect upcoming FOMC surprises as well, suggesting that participants in this market might be better informed about upcoming FOMC announcements. Corporate bond customers, which include large financial institutions, appear to have more accurate estimates of FOMC outcomes. Both evidences that (1) corporate bond customers buy (sell) more often before expansionary (contractionary) FOMC surprise, and (2) a simple portfolio mimicking their trades is highly profitable before both expansionary and contractionary surprises, support this hypothesis.

The infrequent and costly nature of transactions in the corporate bond market, as well as transparency of the direction of transactions because of the regulatory framework of TRACE, makes the information in trades be reflected in prices. Consequently, stock market participants rely on lagged corporate bond price movements to discern information about FOMC announcements before they are made.

We have provided novel evidence of the predictability of pre-FOMC stock market movements and drift using lagged corporate bond market movements. We have further shown that the credit market more strongly predicts pre-FOMC stock returns of firms with a higher probability of default, a finding that emphasizes the clear role of credit risk in predicting economic output, especially for companies that are nearer to default. Our results provide further evidence of the segmentation in the U.S. financial markets by showing that the information in the corporate bond market will be reflected in the stock market with a lag.

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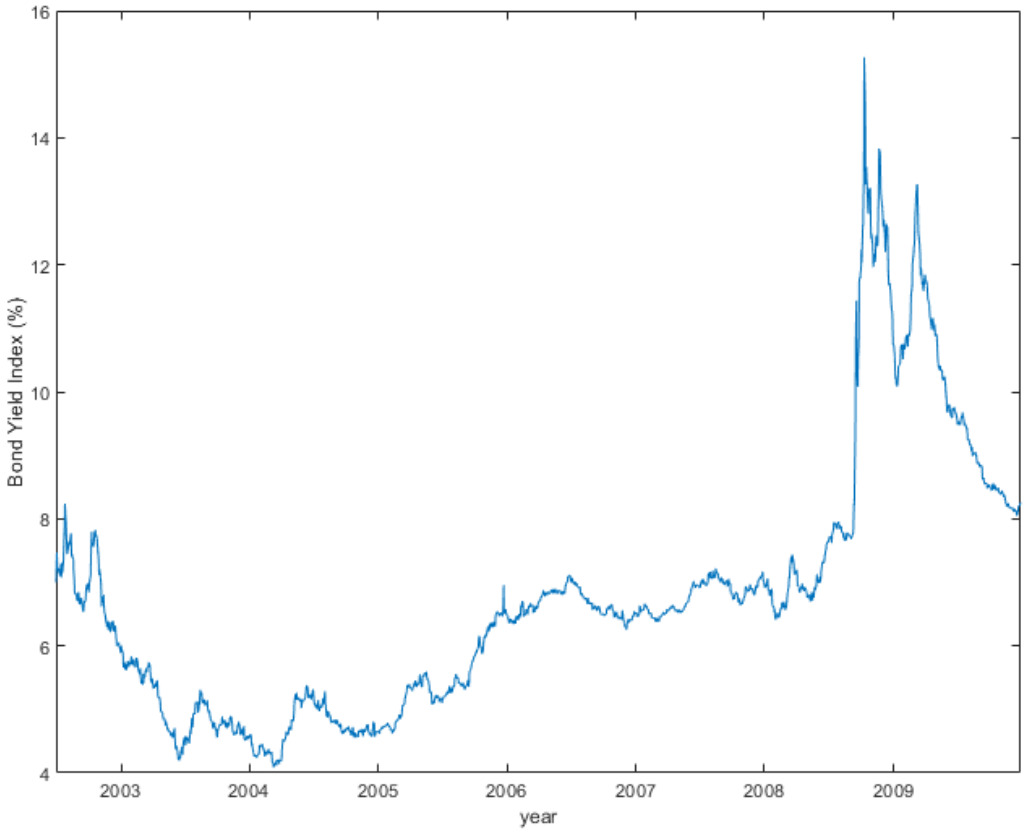

Figure 1. Constructed TRACE and S&P 500 yield index
This figure shows the TRACE yield index, constructed for bonds issued by companies listed in the S&P 500 index, which was calculated daily at 2 p.m. between July 2002 and December 2009.

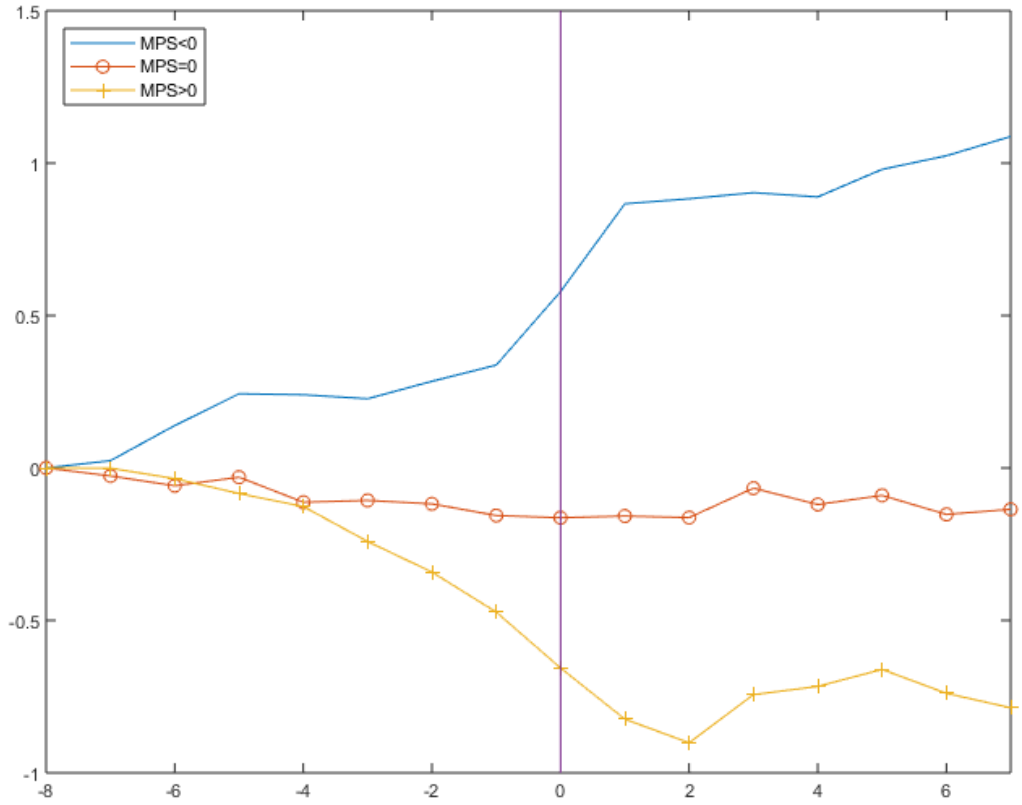

Figure 2. Evolution of the constructed TRACE price index around FOMC surprises
This figure shows the average cumulative returns starting at 2 p.m. 8 days before FOMC meetings between July 2002 and December 2009. MPS<0, MPS=0, and MPS>0 represent the return averages around FOMC meetings with expansionary, zero, and contractionary monetary policy surprises, respectively, identified by the sign of the change in the federal funds future rate around an FOMC announcement day.

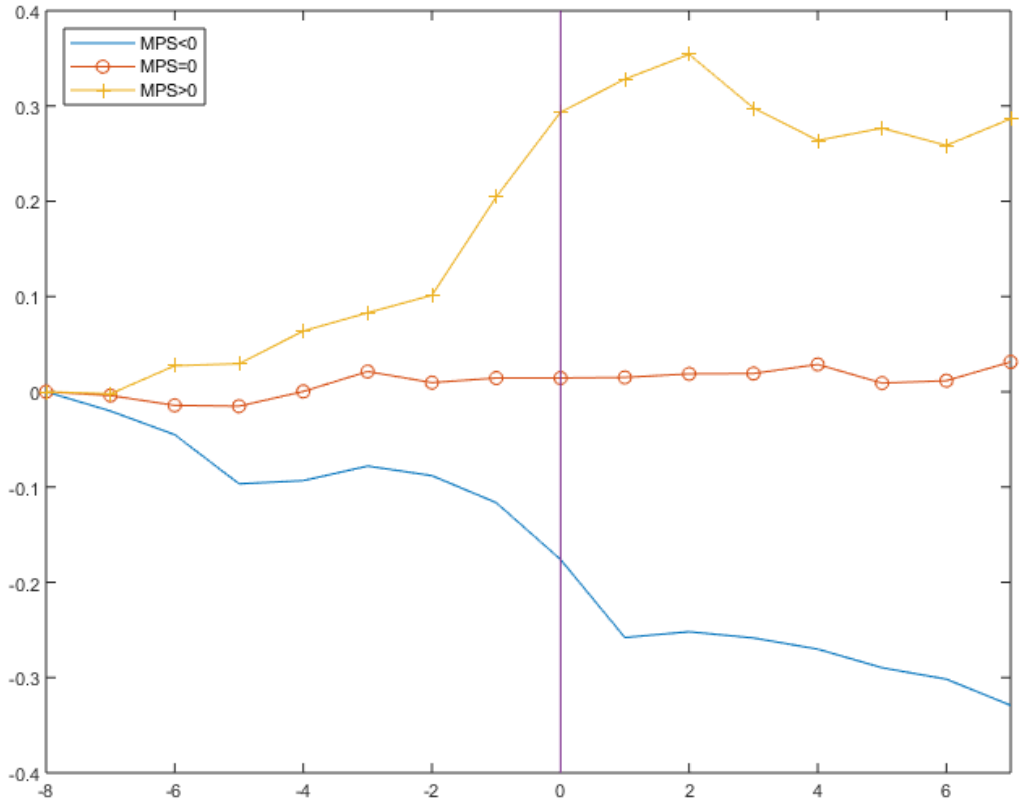

Figure 3. Evolution of the average TRACE corporate bond yields around FOMC surprises
This figure shows the average change in cumulative yield starting at 2 p.m. 8 days before FOMC meetings between July 2002 and December 2009. MPS<0, MPS=0, and MPS>0 represent the yield changes around FOMC meetings with expansionary, zero, and contractionary monetary policy surprises, respectively, identified by the sign of the change in the federal funds future rate around an FOMC announcement day.

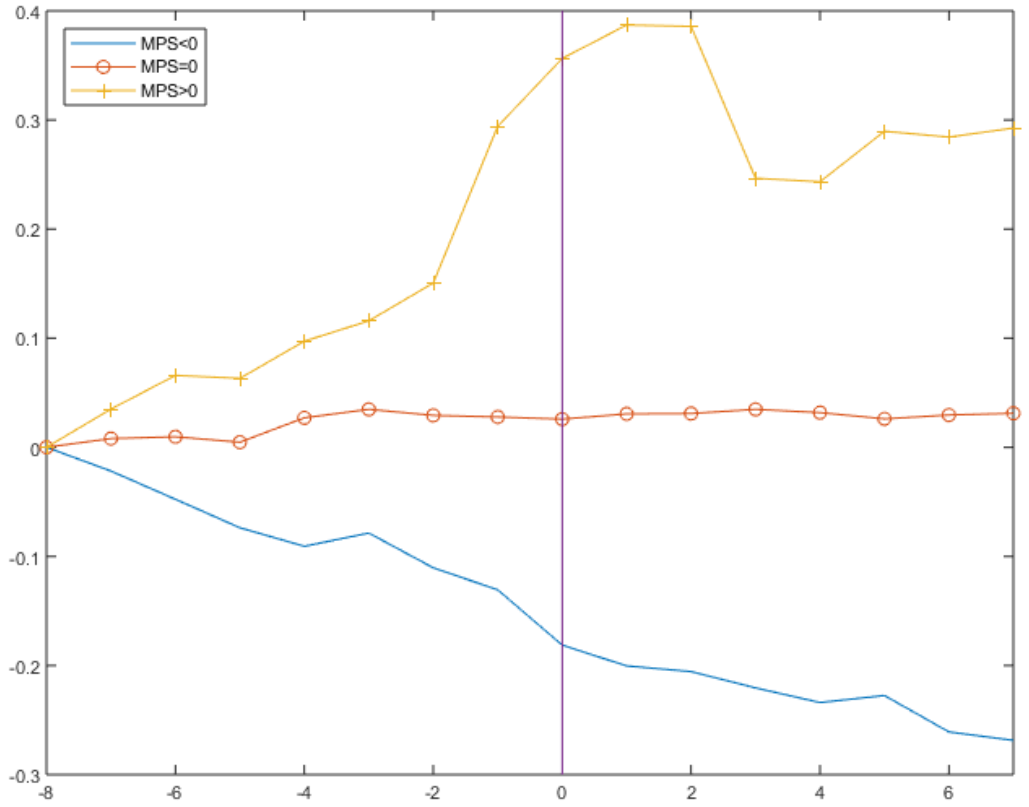

Figure 4. Evolution of the average TRACE corporate bond yield spreads around FOMC surprises
This figure shows the average change in the cumulative yield spread starting at 3:30 p.m. 8 days before FOMC meetings between July 2002 and December 2009. MPS<0, MPS=0, and MPS>0 represent the change in yield spreads around FOMC meetings with expansionary, zero, and contractionary monetary policy surprises, respectively, identified by the sign of the change in the federal funds future rate around an FOMC announcement day.

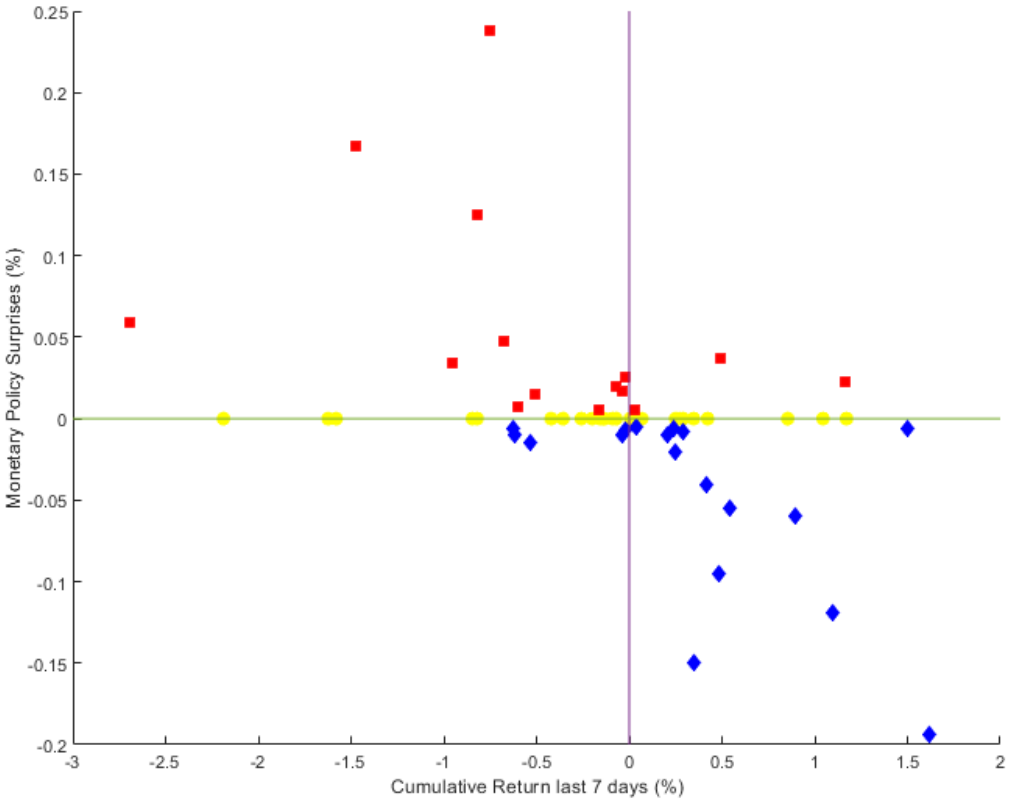

Figure 5. FOMC surprises versus the cumulative corporate bonds returns before an FOMC announcement day
This figure provides a scatterplot for the Kuttner (2001) FOMC surprise, that is, the adjusted change in the federal funds futures rate on an FOMC announcement day (*y*-axis) versus the cumulative corporate bond market return for the 2 p.m.-to-2 p.m. period starting 8 days before the FOMC meeting and ending 1 day before the FOMC meeting (*x*-axis). Expansionary, zero, and contractionary surprises are represented by blue diamonds, yellow circles, and red squares, respectively.

Table I. Summary Statistics

	N	Mean	Std. Deviation	1% Quantile	Median	99% Quantile
Panel A. Corporate Bond Market	(2,184 bonds)					
Principal Amount (USD)	1,818,608	1,000	0	1,000	1,000	1,000
Amount Outstanding (USD millions)	1,818,608	878.61	776.19	54.25	650.00	4,000.00
Yield to Maturity	1,818,608	6.18%	4.70%	1.00%	5.42%	25.29%
Price (USD thousands)	1,818,608	99.11	12.30	47.50	110.76	121.099
Credit Rating	1,818,608	7.19 (A-)	3.48	1 (AAA)	6 (A)	17 (CCC+)
NTI	1,476,666	-13.38%	70.19%	-100%	-20%	100%
DTI	1,476,666	-10.20%	79.91%	-100%	-17.16%	100%
Panel B. Stock Market	(326 stocks)					
SPY Returns	1,891	0.01%	1.33%	-4.02%	0.04%	3.76%
Stocks Returns	358,402	-0.01%	3.02%	-8.39%	0.00%	8.04%
Panel C. FOMC Surprises						
MPS	60	0.00%	0.06%	-0.19%	0.00%	0.24%

This table provides the main summary statistics for the data used in the paper. Panel A provides information for the constructed daily TRACE dataset between July 2002 and December 2009, as explained in the paper. Yields and prices correspond to the last recorded transactions before 2 p.m. of every day. Prices are in thousands of dollars and correspond to quotes that reflect a size of 100 bonds ($100,000 par value). Credit ratings refer to Mergent FISD ordinal records of the Standard and Poor's credit ratings, starting from 1 for AAA. The corresponding credit ratings to the rounded ordinal value are reported in parentheses, for the sake of convenience. Rows labeled "DTI" and "NTI" correspond to the customer-dealer trade imbalances for every bond during daily 2 p.m.-to-2 p.m. periods, respectively. No imbalance is calculated for bond-days with zero customer-dealer trades. Panel B shows the summary statistics for the 2 p.m.-to-2 p.m. returns of the S&P 500-listed stocks, which could be matched with the bond market data. Panel C provides information about FOMC announcement days and surprises.

Table II. Corporate Bond Index Movements before FOMC Surprises

	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7
Panel A. Cumulative Returns (%), 2 p.m. to 2 p.m.															
$\mathbb{1}_{\{MPS=0\}}$	-0.025	-0.023	0.053	0.014	0.135	0.224	0.317	0.493	0.666	0.739	0.677	0.597	0.571	0.587	0.651
	(-0.21)	(-0.20)	(0.38)	(0.12)	(0.91)	(1.41)	(1.36)	(1.06)	(1.25)	(1.26)	(1.55)	(1.41)	(1.13)	(1.11)	(1.15)
$\mathbb{1}_{\{MPS<0\}}$	0.025	0.174	0.327**	0.367**	0.468**	0.626***	0.810**	1.235**	1.691**	1.785**	1.647**	1.606**	1.640*	1.763*	1.874*
	(0.29)	(1.54)	(2.09)	(2.35)	(2.37)	(2.67)	(2.54)	(2.26)	(2.56)	(2.28)	(2.24)	(2.19)	(1.87)	(1.96)	(1.99)
c	-0.001	-0.035	-0.084	-0.126	-0.241	-0.341**	-0.473*	-0.656	-0.824	-0.901	-0.744	-0.716	-0.661	-0.739	-0.787
	(-0.01)	(-0.49)	(-0.85)	(-1.12)	(-1.64)	(-2.07)	(-1.98)	(-1.45)	(-1.51)	(-1.49)	(-1.64)	(-1.59)	(-1.25)	(-1.32)	(-1.30)
N	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Panel B. Changes in Yield to Maturity (%), 2 p.m. to 2 p.m.															
$\mathbb{1}_{\{MPS=0\}}$	-0.002	-0.042**	-0.045*	-0.063**	-0.062	-0.092	-0.190	-0.279	-0.313	-0.335	-0.279	-0.235	-0.268	-0.247	-0.255
	(-0.16)	(-2.53)	(-1.88)	(-2.07)	(-1.39)	(-1.61)	(-1.52)	(-1.32)	(-1.33)	(-1.31)	(-1.56)	(-1.42)	(-1.38)	(-1.23)	(-1.17)
$\mathbb{1}_{\{MPS<0\}}$	-0.018	-0.072**	-0.126**	-0.157***	-0.161**	-0.189**	-0.321**	-0.470*	-0.586**	-0.606*	-0.556**	-0.534**	-0.566*	-0.560*	-0.616*
	(-0.80)	(-2.05)	(-2.56)	(-2.97)	(-2.35)	(-2.29)	(-2.16)	(-1.89)	(-2.03)	(-1.97)	(-2.15)	(-2.09)	(-1.90)	(-1.86)	(-1.93)
c	-0.002	0.027**	0.029	0.064**	0.083*	0.101*	0.204	0.294	0.328	0.354	0.298	0.264	0.277	0.259	0.287
	(-0.22)	(2.40)	(1.33)	(2.18)	(1.79)	(1.76)	(1.58)	(1.38)	(1.38)	(1.36)	(1.65)	(1.57)	(1.39)	(1.25)	(1.28)
N	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Panel C. Changes in Yield Spread (%), 3:30 p.m. to 3:30 p.m.															
$\mathbb{1}_{\{MPS=0\}}$	-0.027	-0.056	-0.059	-0.070	-0.081	-0.121*	-0.266	-0.331	-0.356	-0.355	-0.212	-0.212	-0.264	-0.255	-0.261
	(-1.07)	(-1.67)	(-1.16)	(-1.49)	(-1.36)	(-1.77)	(-1.60)	(-1.31)	(-1.23)	(-1.23)	(-1.17)	(-1.25)	(-1.40)	(-1.24)	(-1.20)
$\mathbb{1}_{\{MPS<0\}}$	-0.057	-0.114*	-0.137*	-0.188**	-0.194**	-0.261**	-0.425**	-0.538*	-0.587*	-0.591*	-0.467*	-0.477*	-0.517*	-0.545*	-0.561*
	(-1.18)	(-1.82)	(-1.92)	(-2.63)	(-2.29)	(-2.62)	(-2.30)	(-1.93)	(-1.82)	(-1.82)	(-1.94)	(-1.95)	(-1.86)	(-1.85)	(-1.87)
c	0.035	0.066**	0.063	0.097**	0.116**	0.151**	0.294*	0.356	0.387	0.386	0.247	0.243	0.290	0.284	0.293
	(1.46)	(2.20)	(1.40)	(2.30)	(2.03)	(2.26)	(1.78)	(1.44)	(1.36)	(1.36)	(1.38)	(1.47)	(1.56)	(1.40)	(1.37)
N	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60

This table shows the results for the regression of cumulative returns around the scheduled FOMC announcement day starting 8 days before the announcement day and ending t days before or after an FOMC announcement day on a dummy variable for expansionary monetary surprise on the FOMC announcement day, $\mathbb{1}_{\{MPS<0\}}$, and a control dummy for FOMC announcements with zero surprises, $\mathbb{1}_{\{MPS=0\}}$. The column labeled "0" includes the results for the regression of the change in cumulative yields for the period starting 8 days before FOMC and ending at 2 p.m. on an FOMC announcement day; all columns follow this setup but differ by t days. The t-statistics reported in parentheses take into account the time-series autocorrelation and heteroskedasticity using Newey-West (1987) standard errors with four lags. Panel A (B) shows the results of the cumulative returns (yield changes), and panel C shows the results for yield spreads. *p < 0.1; **p < 0.05; ***p < 0.01.

Table III. Panel Regression of Individual Corporate Bond Movements before FOMC Surprises

	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7
Panel A. Cumulative Returns (%), 2 p.m. to 2 p.m.															
$\mathbb{1}_{\{MPS=0\}}$	0.036	0.086	0.150	0.165*	0.291**	0.347*	0.608*	0.946	0.978*	1.133*	1.039**	0.977*	0.969*	1.060*	1.123
	(0.67)	(1.26)	(1.63)	(1.68)	(2.19)	(1.95)	(1.95)	(1.65)	(1.69)	(1.73)	(2.04)	(1.98)	(1.69)	(1.75)	(1.67)
$\mathbb{1}_{\{MPS<0\}}$	0.050	0.144	0.336**	0.416***	0.563***	0.631**	0.964**	1.518**	1.876**	2.055**	1.935**	1.863**	1.987**	2.187**	2.338**
	(0.72)	(1.38)	(2.47)	(3.09)	(2.93)	(2.57)	(2.48)	(2.16)	(2.36)	(2.29)	(2.44)	(2.30)	(2.04)	(2.07)	(2.06)
c	-0.012	-0.037	-0.085	-0.179**	-0.331**	-0.388**	-0.653*	-1.007*	-1.042*	-1.187*	-1.040*	-0.966*	-0.943	-1.048	-1.126
	(-0.33)	(-0.62)	(-1.01)	(-2.08)	(-2.40)	(-2.15)	(-1.97)	(-1.69)	(-1.73)	(-1.72)	(-1.95)	(-1.87)	(-1.55)	(-1.62)	(-1.57)
R^2_{Within}	0.0001	0.0004	0.0018	0.0025	0.0038	0.0044	0.0074	0.0139	0.023	0.0263	0.0258	0.024	0.0249	0.0271	0.0301
$N_{\text{Obs.}}$	57,519	57,519	57,519	57,519	57,519	57,519	57,519	57,519	57,482	57,446	57,413	57,367	57,340	57,295	57,273
N_{Bonds}	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184
Panel B. Changes in Yield to Maturity (%), 2 p.m. to 2 p.m.															
$\mathbb{1}_{\{MPS=0\}}$	0.006	-0.022	-0.044	-0.051	-0.058	-0.078	-0.197	-0.339	-0.354	-0.397	-0.313*	-0.270	-0.314	-0.302	-0.315
	(0.43)	(-1.18)	(-1.66)	(-1.65)	(-1.21)	(-1.27)	(-1.49)	(-1.38)	(-1.55)	(-1.49)	(-1.70)	(-1.66)	(-1.64)	(-1.53)	(-1.48)
$\mathbb{1}_{\{MPS<0\}}$	-0.008	-0.039	-0.101**	-0.137***	-0.153**	-0.173**	-0.323**	-0.523*	-0.626**	-0.666**	-0.581**	-0.546**	-0.617*	-0.644*	-0.698**
	(-0.38)	(-1.19)	(-2.28)	(-2.77)	(-2.31)	(-2.12)	(-2.05)	(-1.80)	(-2.14)	(-2.01)	(-2.16)	(-2.13)	(-1.99)	(-1.97)	(-2.03)
c	-0.005	0.015	0.030	0.057*	0.084*	0.105	0.222	0.368	0.376	0.423	0.333*	0.293*	0.324	0.315	0.340
	(-0.46)	(1.02)	(1.21)	(1.90)	(1.68)	(1.66)	(1.61)	(1.46)	(1.61)	(1.54)	(1.76)	(1.76)	(1.62)	(1.52)	(1.52)
R^2_{Within}	0	0.0001	0.0007	0.0011	0.0011	0.0012	0.0031	0.0065	0.0102	0.0108	0.0094	0.0084	0.0095	0.0105	0.0126
$N_{\text{Obs.}}$	57,519	57,519	57,519	57,519	57,519	57,519	57,519	57,519	57,482	57,446	57,413	57,367	57,340	57,295	57,273
N_{Bonds}	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184
Panel C. Changes in Yield Spread (%), 3:30 p.m. to 3:30 p.m.															
$\mathbb{1}_{\{MPS=0\}}$	-0.008	-0.034	-0.040	-0.057	-0.054	-0.098	-0.271	-0.384	-0.392	-0.418	-0.249	-0.239	-0.292	-0.298	-0.305
	(-0.34)	(-1.08)	(-1.09)	(-1.34)	(-0.94)	(-1.47)	(-1.50)	(-1.36)	(-1.34)	(-1.34)	(-1.34)	(-1.43)	(-1.54)	(-1.45)	(-1.45)
$\mathbb{1}_{\{MPS<0\}}$	-0.023	-0.061	-0.090*	-0.138***	-0.142**	-0.205**	-0.412**	-0.569*	-0.611*	-0.648*	-0.483**	-0.477**	-0.553*	-0.611*	-0.640**
	(-0.62)	(-1.53)	(-1.93)	(-2.72)	(-2.16)	(-2.45)	(-2.11)	(-1.84)	(-1.81)	(-1.84)	(-2.03)	(-2.06)	(-1.95)	(-1.97)	(-2.06)
c	0.017	0.043	0.042	0.079**	0.093*	0.133**	0.310*	0.416	0.425	0.453	0.283	0.266	0.320*	0.332	0.346
	(0.93)	(1.63)	(1.37)	(2.16)	(1.70)	(2.08)	(1.70)	(1.47)	(1.46)	(1.46)	(1.53)	(1.61)	(1.69)	(1.60)	(1.64)
R^2_{Within}	0	0.0002	0.0005	0.0011	0.0009	0.0019	0.0051	0.008	0.0098	0.0103	0.0069	0.0066	0.0078	0.0095	0.0106
$N_{\text{Obs.}}$	57,540	57,540	57,540	57,540	57,540	57,540	57,540	57,540	57,498	57,470	57,438	57,389	57,357	57,319	57,301
N_{Bonds}	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180

This table shows the results for the panel regression of cumulative bond returns around the scheduled FOMC announcement day starting 8 days before the announcement day and ending *t* days before or after FOMC announcement day, specified by the column labels, on a dummy variable for expansionary monetary surprise on the FOMC announcement day, $\mathbb{1}_{\{MPS<0\}}$, and a control dummy for an FOMC announcement day with zero surprises, $\mathbb{1}_{\{MPS=0\}}$. The column labeled "0" includes the results for the regression of the change in cumulative yields for the period starting 8 days before FOMC and ending at 2 p.m. on an FOMC announcement day; all columns follow this setup but differ by *t* days. The panel regression includes fixed effects for every bond, and *t*-statistics are robust to comovement of the residuals using Driscoll and Kraay (1998) standard errors. Panel A (B) shows the results of the cumulative returns (yield changes), and panel C shows the results for yield spreads. *p < 0.1; **p < 0.05; ***p < 0.01.

Table IV. Predicting FOMC Surprises

	(1) MPS_t	(2) MPS_t	(3) MPS_t	(4) MPS_t
Panel A. Entire Sample Period				
$\Delta y_{t-1,t-8}^{Corporate}$	0.085**			0.088**
	(2.35)			(2.32)
$R_{t-1,t-8}^{S\&P\ 500}$		-0.001		0.002
		(-0.27)		(1.09)
$\Delta y_{t-1,t-8}^{Treasury\ 10\ yr}$			-0.013	-0.023
			(-0.24)	(-0.52)
c	-0.002	-0.000	-0.000	-0.001
	(-0.26)	(-0.02)	(-0.00)	(-0.17)
N	60	60	60	60
Panel B. 2002–2007				
$\Delta y_{t-1,t-8}^{Corporate}$	0.165***			0.190***
	(2.77)			(3.42)
$R_{t-1,t-8}^{S\&P\ 500}$		-0.001		0.002
		(-0.23)		(0.57)
$\Delta y_{t-1,t-8}^{Treasury\ 10\ yr}$			0.052	-0.064
			(1.02)	(-1.10)
c	0.002	0.003	0.005	0.001
	(0.26)	(0.33)	(0.53)	(0.11)
N	44	44	44	44
Panel C. 2008–2009				
$\Delta y_{t-1,t-8}^{Corporate}$	0.064**			0.056***
	(2.20)			(3.12)
$R_{t-1,t-8}^{S\&P\ 500}$		-0.001		0.003*
		(-0.25)		(1.89)
$\Delta y_{t-1,t-8}^{Treasury\ 10\ yr}$			-0.137	-0.107
			(-1.01)	(-0.84)
c	-0.013	-0.010	-0.007	-0.009
	(-1.28)	(-1.12)	(-0.73)	(-0.69)
N	16	16	16	16

This table shows the results for the regression of Kuttner (2001) FOMC surprises on the past cumulative movements in different markets for the 7-day period starting 8 days before an FOMC announcement and ending 1 day before an FOMC announcement meeting. *t*-statistics, which are reported in parentheses, account for time-series autocorrelation and heteroskedasticity using Newey-West (1987) standard errors with four lags. Panel A provides the results for the entire sample period. Panels B and C repeat the analysis for the period before the 2008 financial crisis and for the period during the 2008 financial crisis, respectively. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Table V. Corporate Bond Trade Imbalances before FOMC Surprises

	Panel A. FEs Regression, All Ratings		Panel B. FEs Regression, Credit Ratings A or Better		Panel C. FEs Regression, Credit Ratings A- or Worse	
	$NTI_{i,t-k}$	$DTI_{i,t-k}$	$NTI_{i,t-k}$	$DTI_{i,t-k}$	$NTI_{i,t-k}$	$DTI_{i,t-k}$
MPS_t	-35.058***	-23.951***	-29.344**	-19.924**	-45.275***	-31.894***
	(3.27)	(3.37)	(2.27)	(2.06)	(3.28)	(3.80)
c	12.775***	9.305***	17.964***	14.289***	6.568***	3.345***
	(-13.30)	(-14.39)	(-15.70)	(-19.09)	(-6.22)	(-4.49)
$N_{Obs.}$	330,542	330,542	179,983	179,983	150,559	150,559
N_{Bonds}	2,184	2,184	1,262	1,262	1,285	1,285

	Panel D. TS Regression, All Ratings		Panel E. TS Regression, Credit Ratings A or Better		Panel F. TS Regression, Credit Ratings A- or Worse	
	$\overline{NTI}_{t-k}$	$\overline{DTI}_{t-k}$	$\overline{NTI}_{t-k}$	$\overline{DTI}_{t-k}$	$\overline{NTI}_{t-k}$	$\overline{DTI}_{t-k}$
MPS_t	-53.351***	-36.702**	-49.172**	-32.166*	-57.768***	-41.112***
	(3.06)	(2.55)	(2.13)	(1.74)	(4.05)	(3.90)
c	11.917***	8.837***	16.755***	13.337***	4.983***	2.558***
	(-10.67)	(-10.86)	(-13.39)	(-14.29)	(-3.98)	(-2.92)
$N_{Obs.}$	420	420	420	420	420	420

This table provides the results of the regression of corporate bond trade imbalances (specified in Equations (4) and (5)) during the 7 days before—but excluding—the FOMC announcement day ($k = 1, \dots, 7$) on the Kuttner (2001) FOMC surprises on the following FOMC announcement day. Panel A shows the results for a panel regression of individual bond imbalances with fixed effects for every bond. *t*-statistics are robust to comovement of the residuals using Driscoll and Kraay (1998) standard errors. Panels B and C, respectively, repeat the same regression for two subsamples: (1) bonds with an S&P credit rating of A or better and (2) bonds with credit ratings of A- or worse. Panel D shows the results for time-series regressions using trade imbalances averaged across all bonds. *t*-statistics reported in parentheses account for time-series autocorrelation and heteroskedasticity using Newey-West (1987) standard errors with four lags. Panels E and F repeat the time-series analysis of the results from Panel D for imbalances averaged across bonds with an S&P credit rating of A or better and bonds with credit ratings of A- or worse. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Table VI. Corporate Bond Customer Trades Mimicking Portfolio Returns

	Customer Trades Mimicking Portfolio			Market Portfolio		
Announcements	Return Mean	SD	Sharpe Ratio	Excess Return Mean	SD	Sharpe Ratio
All Announcements	0.97%	1.52%	0.640	-0.06%	0.82%	-0.076
Before $MPS < 0$	1.08%	1.30%	0.825	0.33%	0.75%	0.434
Before $MPS > 0$	1.58%	2.39%	0.662	-0.42%	1.01%	-0.421
Before $MPS = 0$	0.56%	0.80%	0.699	-0.12%	0.64%	-0.183

This table shows the returns of a portfolio that mimics a corporate bond customer's transactions with the dealers during a 7-day period ending at 2 p.m. on the day before an FOMC announcement. We sort corporate bonds using the 7-day number trade imbalances, $NTI_{t-8,t-1}$, and calculate the 7-day returns of a portfolio that goes long in the decile group of bonds most frequently bought by customers in that period and goes short on the decile group of bonds most frequently sold by them. We report the mean, the standard deviation, and Sharpe ratios of the returns for all announcements in our sample, as well as the subsamples of expansionary ($MPS < 0$), contractionary ($MPS > 0$), and no ($MPS = 0$) surprises.

Table VII. Stock Market Time-Series Predictability with Corporate Bond Trade Imbalances

	(1) R_t^s	(2) R_t^s	(3) R_t^s	(4) R_t^s
R_{t-1}^s		-0.032		-0.033
		(-0.83)		(-0.87)
$\overline{NTI}_{t-1,t-8}$			-0.008**	-0.008**
			(-2.39)	(-2.35)
Δfff_{t-1}		0.235		0.035
		(0.23)		(0.03)
$\mathbb{1}_{FOMC}\, r_{t-1}^s$		-0.468		-0.262
		(-0.95)		(-0.57)
$\mathbb{1}_{FOMC}\, \overline{NTI}_{t-1,t-8}$			0.068***	0.060***
			(3.11)	(4.77)
$\mathbb{1}_{FOMC}\, \Delta fff_{t-1}$		1.168		1.615
		(0.34)		(0.49)
$\mathbb{1}_{FOMC}$	0.750***	0.689***	-0.077	-0.018
	(3.98)	(4.55)	(-0.54)	(-0.13)
c	-0.017	-0.016	0.080**	0.081**
	(-0.59)	(-0.56)	(2.23)	(2.17)
$N_{Obs.}$	1,887	1,887	1,887	1,887

This table shows the results of a regression of daily 2 p.m.-to-2 p.m. period SPY ETF returns on past SPY and corporate bond market movements. $\overline{NTI}_{t-1,t-8}$ is the 7-day period of customer-dealer trade imbalances of corporate bonds, calculated for every bond during a 2 p.m.-to-2 p.m. 7-day period between $t-8$ and $t-1$ and averaged across all bonds. $\mathbb{1}_{FOMC}$ is a dummy variable that equals 1 for the 2 p.m.-to-2 p.m. period before FOMC announcement, and 0 otherwise. *t*-statistics reported in parentheses account for time-series autocorrelation and heteroskedasticity using Newey-West (1987) standard errors with four lags. *p < 0.1; **p < 0.05; ***p < 0.01.

Table VIII. Time-Series Granger Causality

	Panel A. TRACE Bond Index Returns					Panel B. TRACE Bond Yields			
	(1) R_t^S	(2) R_t^B	(3) R_t^S	(4) R_t^B		(5) R_t^S	(6) Δy_t	(7) R_t^S	(8) Δy_t
R_{t-1}^S	-0.040	0.053***	-0.030	0.053***	R_{t-1}^S	-0.023	-0.014***	-0.002	-0.017***
	(-1.08)	(6.55)	(-0.81)	(6.38)		(-0.61)	(-3.92)	(-0.07)	(-4.81)
R_{t-2}^S	-0.071	0.010	-0.073	0.013	R_{t-2}^S	-0.049	0.003	-0.047	0.002
	(-1.27)	(0.70)	(-1.33)	(0.89)		(-0.98)	(0.63)	(-0.97)	(0.45)
R_{t-1}^B	-0.173	-0.026	-0.209	-0.048	Δy_{t-1}	0.951	0.097	1.327	0.012
	(-1.19)	(-0.44)	(-1.45)	(-0.95)		(1.11)	(0.93)	(1.63)	(0.20)
R_{t-2}^B	-0.142	-0.012	-0.140	-0.018	Δy_{t-2}	0.702	0.013	0.649	0.025
	(-1.02)	(-0.26)	(-1.01)	(-0.38)		(1.19)	(0.17)	(1.08)	(0.29)
Δfff_{t-1}	0.150	-0.525*	0.069	-0.599*	Δfff_{t-1}	0.174	0.051	0.091	0.072
	(0.15)	(-1.71)	(0.07)	(-1.88)		(0.17)	(0.55)	(0.09)	(0.77)
Δfff_{t-2}	2.226**	-0.145	2.364**	-0.147	Δfff_{t-2}	2.309**	0.008	2.444***	0.006
	(2.34)	(-0.77)	(2.52)	(-0.77)		(2.47)	(0.12)	(2.65)	(0.10)
$\mathbb{1}_{FOMC}\, R_{t-1}^S$			-0.398	0.076	$\mathbb{1}_{FOMC}\, R_{t-1}^S$			-0.501	0.005
			(-1.12)	(0.92)				(-1.34)	(0.37)
$\mathbb{1}_{FOMC}\, R_{t-2}^S$			0.210	-0.031	$\mathbb{1}_{FOMC}\, R_{t-2}^S$			0.211	-0.022
			(1.01)	(-0.44)				(0.92)	(-1.48)
$\mathbb{1}_{FOMC}\, R_{t-1}^B$			2.755***	1.305**	$\mathbb{1}_{FOMC}\, \Delta y_{t-1}$			-5.767***	1.098***
			(3.09)	(2.54)				(-3.12)	(11.50)
$\mathbb{1}_{FOMC}\, R_{t-2}^B$			0.036	0.178	$\mathbb{1}_{FOMC}\, \Delta y_{t-2}$			-0.353	-0.221
			(0.07)	(0.76)				(-0.18)	(-0.95)
$\mathbb{1}_{FOMC}\, \Delta fff_{t-1}$			-0.708	-0.110	$\mathbb{1}_{FOMC}\, \Delta fff_{t-1}$			-1.362	0.148
			(-0.39)	(-0.11)				(-0.81)	(1.01)
$\mathbb{1}_{FOMC}\, \Delta fff_{t-2}$			-32.579***	-4.857	$\mathbb{1}_{FOMC}\, \Delta fff_{t-2}$			-28.965***	2.118***
			(-3.35)	(-1.50)				(-3.14)	(3.78)
$\mathbb{1}_{FOMC}$			0.761***	0.082	$\mathbb{1}_{FOMC}$			0.764***	-0.019*
			(5.11)	(1.56)				(4.93)	(-1.78)
c	0.012	-0.001	-0.011	-0.002	c	0.011	0.001	-0.012	0.001
	(0.40)	(-0.12)	(-0.37)	(-0.26)		(0.36)	(0.21)	(-0.40)	(0.23)
$N_{Obs.}$	1,885	1,885	1,885	1,885	$N_{Obs.}$	1,885	1,885	1,885	1,885

This table shows the results of the regression of a daily 2 p.m.-to-2 p.m. period of SPY ETF returns and bond market returns, or yield changes, on past SPY and corporate bond market movements. The lagged changes in federal funds futures are included to control for information besides the corporate bond market movements. $\mathbb{1}_{FOMC}$ is a dummy variable that equals 1 for the 2 p.m.-to-2 p.m. period ending on an FOMC announcement day and 0 otherwise. Panel A (B) shows the results for bond market returns (yield changes). *t*-statistics reported in parentheses account for the time-series autocorrelation and heteroskedasticity using Newey-West (1987) standard errors with four lags. *p < 0.1; **p < 0.05; ***p < 0.01.

Table IX. Default Expectation and the Cross-Section of Granger Causality before an FOMC Announcement

	(1) $R^S_{i,t}$	(2) $R^S_{i,t}$	(3) $R^S_{i,t}$
$R^S_{i,t-1}$	-0.077	-0.050	-0.096**
	(-1.21)	(-0.83)	(-2.05)
$R^S_{M,t-1}$	-0.649	-0.618	-0.550
	(-1.28)	(-1.27)	(-1.19)
$\Delta y^B_{M,t-1}$	-6.085***	-5.955***	-5.413***
	(-3.84)	(-3.96)	(-3.62)
$EDF_{i,t-1}$		5.922***	5.888***
		(3.46)	(4.32)
$\Delta y^B_{M,t-1} EDF_{i,t-1}$			-17.492***
			(-8.62)
c	0.921***	0.837***	0.826***
	(3.77)	(4.12)	(4.10)
$N_{\text{Obs.}}$	11,385	11,376	11,376
N_{Stocks}	325	325	325

This table provides the results of the panel regression of individual stock returns before FOMC announcements on the past yield changes of the corporate bond market, as specified in Equation (11). The label $R^S_{i,t}$ refers to the 2 p.m.-to-2 p.m. individual stock return ending on the FOMC announcement day, and $R^S_{M,t-1}$is the lagged SPY return. $\Delta y^B_{M,t-1}$ refers to the lagged change in the corporate bond index yield, and $EDF_{i,t-1}$ refers to the Merton (1974) expected default frequency, which is further explained in Equation (9). The panel regression includes fixed effects for every bond, and t-statistics are robust to comovement of the residuals using Driscoll and Kraay (1998) standard errors. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Appendix. Additional Tables and Figures

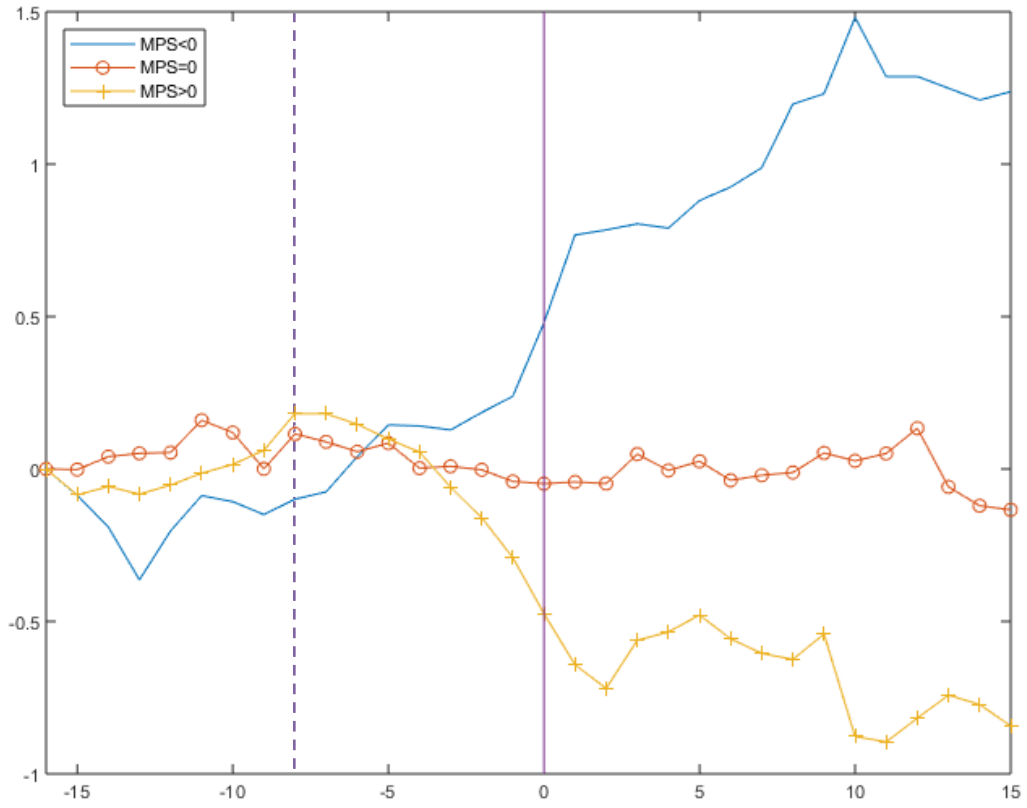

Figure A.1. Evolution of the constructed TRACE price index around FOMC surprises
This figure shows the average cumulative returns starting at 2 p.m. 16 days before FOMC meetings between July 2002 and December 2009. MPS<0, MPS=0, and MPS>0 represent the return averages around the FOMC meetings with expansionary, zero, and contractionary monetary policy surprises, respectively, identified by the sign of the change in the federal funds futures rate around the FOMC announcement day. The solid vertical line represents 2 p.m. of the FOMC announcement day, and the dashed one shows 8 days before the announcement day, which is the starting point for Figure 2.

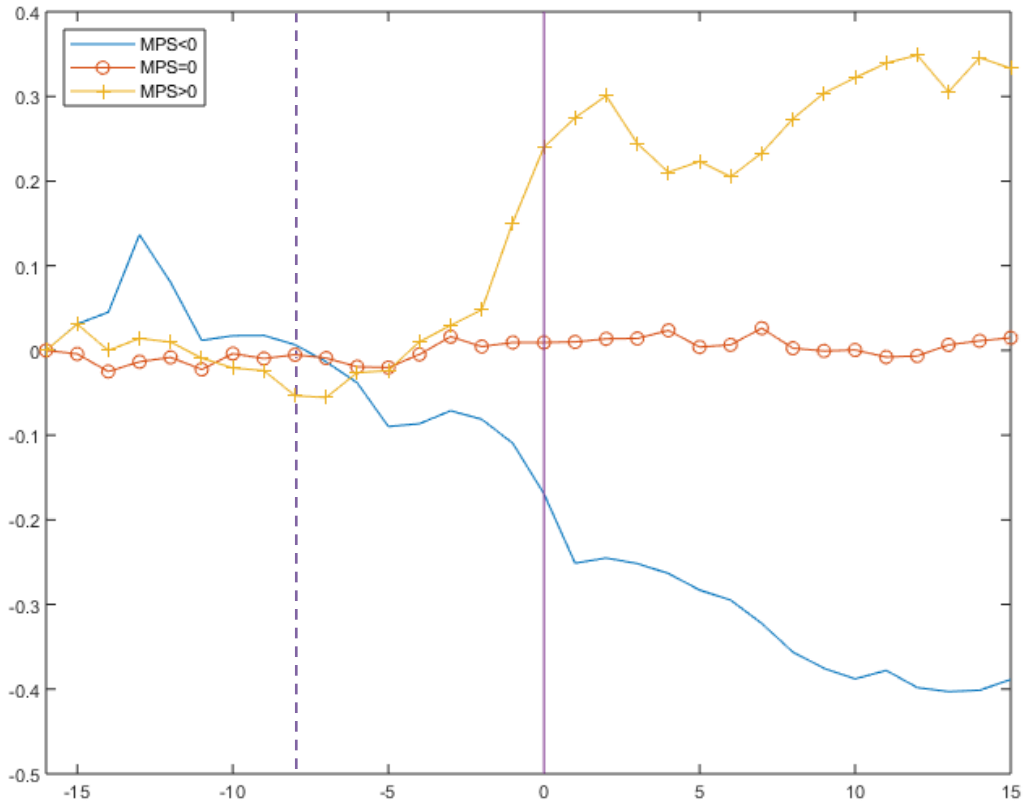

Figure A.2. Evolution of average TRACE corporate bond yields around FOMC surprises
This figure shows the average change in cumulative yield starting at 2 p.m. 16 days before FOMC meetings between July 2002 and December 2009. MPS<0, MPS=0, and MPS>0 represent the change in the cumulative yield around the FOMC meetings with expansionary, zero, and contractionary monetary policy surprises, respectively, identified by the sign of the change in the federal funds futures rate around the FOMC announcement day. The solid vertical line represents 2 p.m. of the FOMC announcement day, and the dashed one shows 8 days before the announcement day, which is the starting point for Figure 3

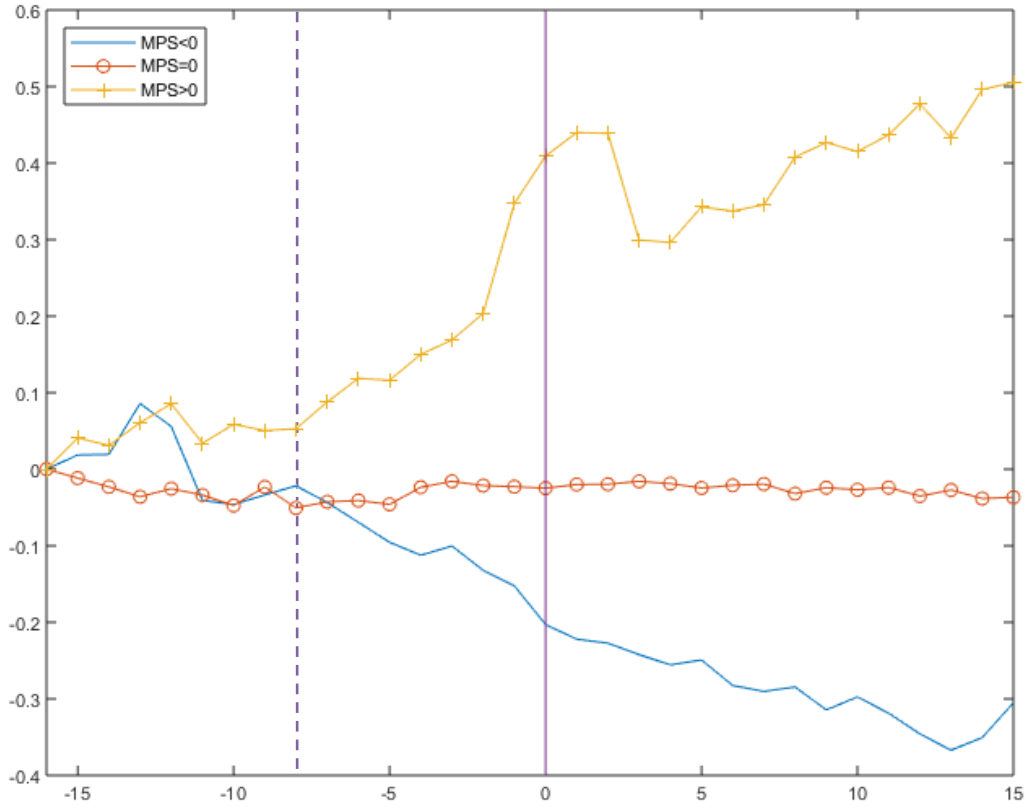

Figure A.3. Evolution of average TRACE corporate bond yield spreads around FOMC surprises
This figure shows the average change in cumulative yield spread starting at 3:30 p.m. 16 days before FOMC meetings between July 2002 and December 2009. MPS<0, MPS=0, and MPS>0 represent the change in the yield spread around the FOMC meetings with expansionary, zero, and contractionary monetary policy surprises, respectively, identified by the sign of the change in the federal funds futures rate around the FOMC announcement day. The solid vertical line represents 2 p.m. of the FOMC announcement day, and the dashed one shows 8 days before the announcement day, which is the starting point for Figure 4.

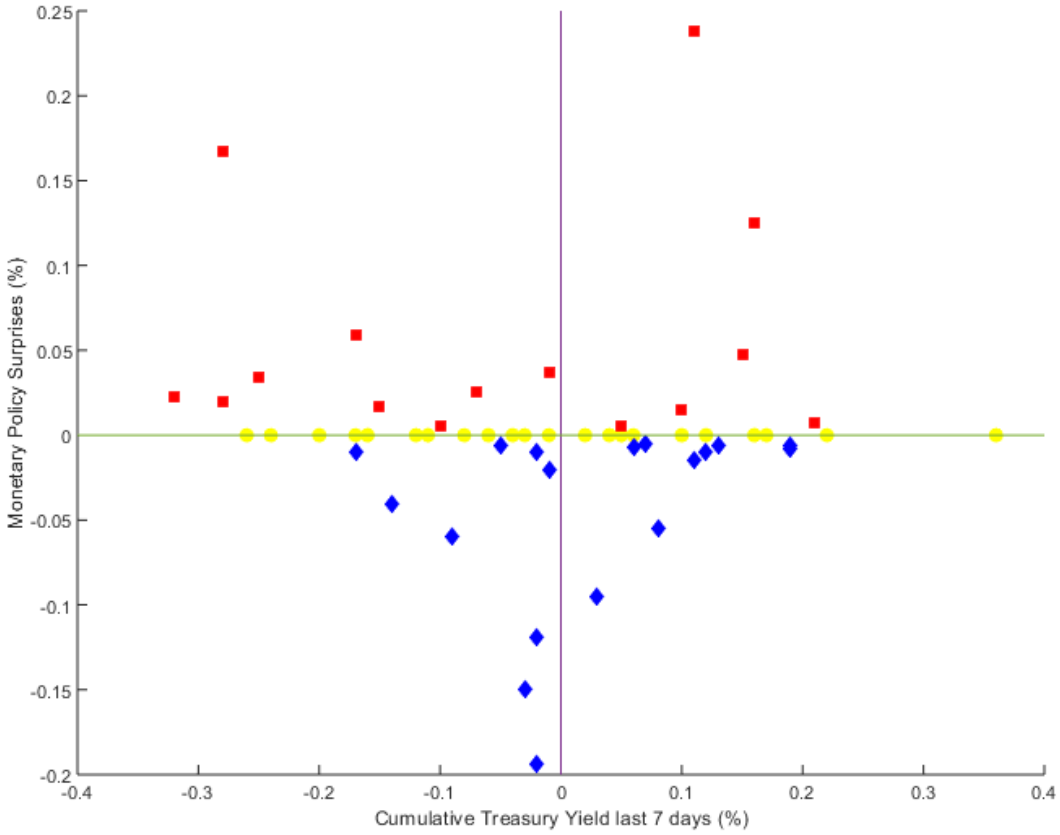

Figure A.4. FOMC surprises versus the cumulative Treasury yield movements before an FOMC announcement day
Analogous to Figure 5, this figure provides a scatterplot of the Kuttner (2001) FOMC surprise, that is, the adjusted change in the federal funds futures rate on the FOMC announcement day (*y*-axis) versus the change in the 10-year Treasury yield rate during the 2 p.m.-to-2 p.m. period starting 8 days before an FOMC announcement and ending 1 day before the FOMC announcement (*x*-axis). Expansionary, zero, and contractionary surprises are represented, respectively, by blue diamonds, yellow circles, and red squares.

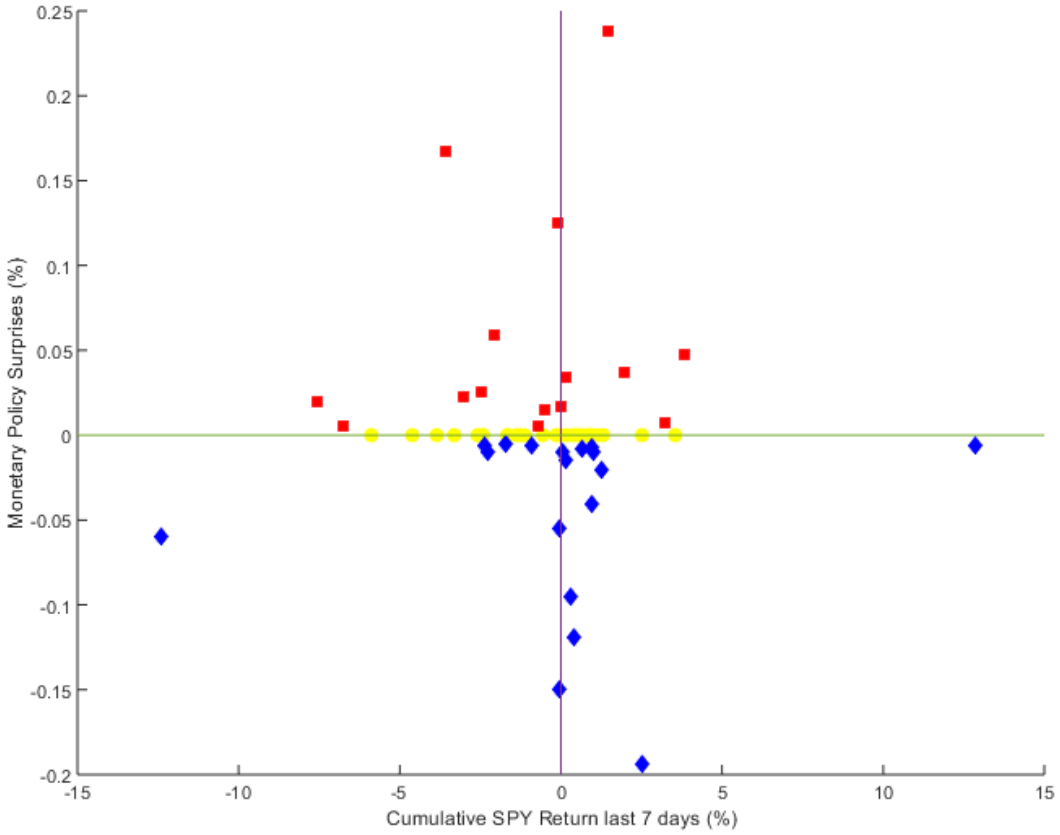

Figure A.5. FOMC surprises versus the cumulative S&P 500 movements before an FOMC announcement day
Analogous to Figure 5, this figure provides a scatterplot for the Kuttner (2001) FOMC surprise, that is, the adjusted change in the federal funds futures rate on the FOMC announcement day (*y*-axis) versus the cumulative S&P 500 SPY return during the 2 p.m.-to-2 p.m. period starting 8 days before an FOMC announcement and ending 1 day before the FOMC announcement (*x*-axis). Expansionary, zero, and contractionary surprises are represented, respectively, by blue diamonds, yellow circles, and red squares.

Table A.I. Prediction of FOMC Surprises Using Readily Available Bloomberg TRACE Indices

	(1) MPS_t	(2) MPS_t	(3) MPS_t	(4) MPS_t
Panel A. Bloomberg Investment-Grade TRACE Index				
$\Delta y_{t-1,t-8}^{Corporate}$	0.180***			0.229***
	(3.10)			(2.92)
$R_{t-1,t-8}^{S\&P\ 500}$		-0.000		0.002
		(-0.19)		(1.43)
$\Delta y_{t-1,t-8}^{Treasury\ 10\ yr}$			-0.002	-0.126*
			(-0.04)	(-1.99)
c	-0.000	-0.001	-0.001	0.000
	(-0.03)	(-0.12)	(-0.10)	(0.01)
N	58	58	58	58
Panel B. Bloomberg High-Yield TRACE Index				
$\Delta y_{t-1,t-8}^{Corporate}$	0.046*			0.056**
	(1.94)			(2.30)
$R_{t-1,t-8}^{S\&P\ 500}$		-0.000		0.003*
		(-0.19)		(1.71)
$\Delta y_{t-1,t-8}^{Treasury\ 10\ yr}$			-0.002	0.003
			(-0.04)	(0.07)
c	0.000	-0.001	-0.001	0.002
	(0.04)	(-0.12)	(-0.10)	(0.25)
N	58	58	58	58

This table provides the results for replicating the analysis of Table IV, using readily available TRACE indices, downloaded from Bloomberg. The sample period is between October 2002, when the Bloomberg TRACE index starts, and December 2009, when our main sample ends. The table shows the results for the regression of the Kuttner (2001) FOMC surprises on the past cumulative movements in different markets for a 7-day period starting 8 days before an FOMC announcement and ending 1 day before the FOMC announcement. *t*-statistics, which are reported in parentheses, account for the time-series autocorrelation and heteroskedasticity using Newey-West (1987) standard errors with four lags. Panel A (B) provides the results for the Bloomberg investment-grade (high-yield) TRACE index. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Table A.II. Prediction of FOMC Surprises Using Readily Available Moody's Average Corporate Bond Market Index

	(1) MPS_t	(2) MPS_t	(3) MPS_t	(4) MPS_t
$\Delta ys_{t-1,t-8}^{Corporate}$	0.176***			0.168**
	(2.83)			(2.54)
$R_{t-1,t-8}^{S\&P\ 500}$		-0.000		0.000
		(-0.23)		(0.03)
$\Delta y_{t-1,t-8}^{Treasury\ 10\ yr}$			-0.050	-0.009
			(-0.87)	(-0.13)
c	0.001	0.001	0.001	0.001
	(0.19)	(0.14)	(0.13)	(0.19)
N	128	128	128	128

This table provides the results analogous to those from Table IV, using readily available Moody's corporate bond market index, downloaded from Bloomberg. The sample period is between 1994 and December 2009, when our main sample ends. The table shows the results for the regression of the Kuttner (2001) FOMC surprises on the past cumulative movements in different markets for a 7-day period starting 8 days before an FOMC announcement and ending 1 day before the FOMC announcement. $\Delta ys_{t-1,t-8}^{Corporate}$ refers to the change in yield spread between Moody's index and the 10-year Treasury yield during the specified 7-day period. *t*-statistics, which are reported in parentheses, account for the time-series autocorrelation and heteroskedasticity using Newey-West (1987) standard errors with four lags. *p < 0.1; **p < 0.05; ***p < 0.01.

Table A. III. Predicting 30-Minute FOMC Surprises from Gilchrist, López-Salido, and Zakrajšek (2015)

	(1) MPS_t	(2) MPS_t	(3) MPS_t	(4) MPS_t
Panel A. Entire Sample Period				
$\Delta y_{t-1,t-8}^{Corporate}$	0.087***			0.087***
	(3.18)			(3.34)
$R_{t-1,t-8}^{S\&P\ 500}$		-0.002		0.000
		(-1.08)		(0.18)
$\Delta y_{t-1,t-8}^{Treasury\ 10\ yr}$			-0.018	-0.013
			(-0.48)	(-0.41)
c	-0.009	-0.008	-0.007	-0.009
	(-1.44)	(-1.26)	(-1.18)	(-1.35)
N	60	60	60	60
Panel B. 2002–2007				
$\Delta y_{t-1,t-8}^{Corporate}$	0.145**			0.164***
	(2.36)			(2.95)
$R_{t-1,t-8}^{S\&P\ 500}$		-0.003		-0.001
		(-1.23)		(-0.61)
$\Delta y_{t-1,t-8}^{Treasury\ 10\ yr}$			0.028	-0.051
			(0.70)	(-0.93)
c	-0.006	-0.006	-0.004	-0.008
	(-0.83)	(-0.74)	(-0.53)	(-0.97)
N	44	44	44	44
Panel C. 2008–2009				
$\Delta y_{t-1,t-8}^{Corporate}$	0.072***			0.072***
	(3.04)			(4.78)
$R_{t-1,t-8}^{S\&P\ 500}$		-0.001		0.002
		(-0.60)		(0.69)
$\Delta y_{t-1,t-8}^{Treasury\ 10\ yr}$			-0.108	-0.029
			(-1.00)	(-0.40)
c	-0.018	-0.014	-0.012	-0.016
	(-1.68)	(-1.60)	(-1.31)	(-1.30)
N	16	16	16	16

This table provides the results analogous to those from Table IV, but uses 30-minute FOMC surprises (Gilchrist, López-Salido, and Zakrajšek 2015) instead of Kuttner (2001) daily surprises. More specifically, this table shows the results for the regression of 30-minute FOMC surprises on the past cumulative movements in different markets for the 7-day period starting 8 days before an FOMC announcement and ending 1 day before an FOMC announcement meeting. *t*-statistics, which are reported in parentheses, account for time-series autocorrelation and heteroskedasticity using Newey-West (1987) standard errors with four lags. Panel A provides the results for the entire sample period. Panels B and C repeat the analysis for the period before the 2008 financial crisis and for the period during the 2008 financial crisis, respectively. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Table A. IV. Treasury Market Movements around FOMC Surprises

	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7
Panel A. 1-Year Maturity Treasury Yields, 3:30 p.m.-to-3:30 p.m.															
$\mathbb{1}_{\{MPS=0\}}$	0.011	0.009	0.001	0.020	0.020	0.047	0.068*	0.041	0.045	0.048	-0.006	-0.003	0.009	0.043	0.057
	(0.85)	(0.43)	(0.06)	(1.20)	(1.08)	(1.64)	(1.81)	(1.05)	(0.89)	(0.96)	(-0.17)	(-0.09)	(0.25)	(0.87)	(0.95)
$\mathbb{1}_{\{MPS<0\}}$	0.019	-0.024	-0.049	-0.020	-0.019	0.003	0.022	-0.048	-0.073	-0.082	-0.107*	-0.128**	-0.130**	-0.110	-0.097
	(0.63)	(-0.55)	(-1.08)	(-0.54)	(-0.48)	(0.08)	(0.44)	(-0.94)	(-1.14)	(-1.28)	(-1.87)	(-2.03)	(-2.07)	(-1.59)	(-1.22)
c	-0.015	-0.010	-0.003	-0.021	-0.017	-0.034	-0.047	-0.024	-0.031	-0.032	0.030	0.039	0.011	-0.021	-0.032
	(-1.40)	(-0.56)	(-0.21)	(-1.52)	(-1.22)	(-1.36)	(-1.35)	(-0.67)	(-0.65)	(-0.69)	(0.98)	(1.17)	(0.35)	(-0.47)	(-0.57)
N	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Panel B. 10-Year Maturity Treasury Yields, 3:30 p.m.-to-3:30 p.m.															
$\mathbb{1}_{\{MPS=0\}}$	0.015	0.021	0.007	0.011	-0.005	0.017	0.043	0.034	0.038	-0.001	-0.053	-0.023	-0.024	-0.023	-0.024
	(0.71)	(0.72)	(0.20)	(0.29)	(-0.11)	(0.32)	(0.78)	(0.57)	(0.51)	(-0.02)	(-0.71)	(-0.31)	(-0.31)	(-0.29)	(-0.28)
$\mathbb{1}_{\{MPS<0\}}$	0.035	0.028	0.004	0.027	0.033	0.043	0.081	0.042	0.006	-0.028	-0.052	-0.031	-0.033	-0.017	-0.028
	(1.56)	(0.79)	(0.11)	(0.64)	(0.72)	(0.87)	(1.54)	(0.72)	(0.08)	(-0.35)	(-0.64)	(-0.38)	(-0.41)	(-0.21)	(-0.31)
c	-0.029**	-0.041*	-0.020	-0.027	-0.012	-0.029	-0.057	-0.043	-0.045	-0.017	0.029	0.009	-0.005	-0.009	-0.005
	(-2.17)	(-1.91)	(-0.79)	(-1.00)	(-0.37)	(-0.70)	(-1.23)	(-0.87)	(-0.73)	(-0.27)	(0.44)	(0.13)	(-0.08)	(-0.13)	(-0.07)
N	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60

Analogous to Table II, this table shows the results for a regression of cumulative Treasury yield changes around the scheduled FOMC announcement day starting 8 days before the announcement day and ending on t days before or after FOMC announcement day, specified by the column labels, on a dummy variable for expansionary monetary surprise at the day of FOMC announcement day, $\mathbb{1}_{\{MPS<0\}}$, and a control dummy for the FOMC announcement with zero surprise, $\mathbb{1}_{\{MPS=0\}}$. The column labeled "0" includes the results for the regression of the change in cumulative yields for the period starting 8 days before FOMC and ending at 2 p.m. on the FOMC announcement day; all columns follow this setup but differ by t days. t-statistics reported in parentheses account for time-series autocorrelation and heteroskedasticity using Newey-West (1987) standard errors with four lags. Panel A (B) shows the results of the change in cumulative yields for 1-year (10-year) Treasury yields. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Table A.V. S&P 500 SPY Cumulative Returns around FOMC Surprises, 2 p.m. to 2 p.m.

	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7
Panel A. Between January 1994 and December 2009, 2 p.m. to 2 p.m.															
$\mathbb{1}_{\{MPS=0\}}$	0.004	0.081	0.116	0.251	0.174	0.271	0.408	0.289	0.677	0.702	0.468	0.817	0.836	0.848	1.185
	(0.02)	(0.27)	(0.39)	(0.62)	(0.47)	(0.54)	(0.77)	(0.53)	(1.06)	(0.99)	(0.72)	(1.31)	(1.31)	(1.19)	(1.44)
$\mathbb{1}_{\{MPS<0\}}$	0.124	0.294	0.101	0.329	0.512	0.775	0.732	0.810	1.624**	1.723**	1.430*	1.824**	1.575*	1.681*	1.966*
	(0.38)	(0.74)	(0.25)	(0.70)	(1.03)	(1.24)	(1.22)	(1.35)	(2.18)	(2.17)	(1.85)	(2.26)	(1.93)	(1.81)	(1.76)
c	-0.210	-0.243	-0.194	-0.371	-0.355	-0.576	-0.540	0.024	-0.380	-0.417	-0.199	-0.493	-0.455	-0.611	-0.870
	(-1.07)	(-0.89)	(-0.79)	(-1.10)	(-1.13)	(-1.41)	(-1.19)	(0.05)	(-0.64)	(-0.64)	(-0.35)	(-0.95)	(-0.92)	(-1.10)	(-1.26)
N	128	128	128	128	128	128	128	128	128	128	128	128	128	128	128
Panel B. Between July 2002 and December 2009, 2 p.m. to 2 p.m.															
$\mathbb{1}_{\{MPS=0\}}$	0.174	0.134	0.115	0.389	0.050	0.109	0.451	0.360	0.824	0.858	0.203	0.560	0.738	0.477	0.619
	(0.46)	(0.24)	(0.27)	(0.64)	(0.09)	(0.16)	(0.58)	(0.42)	(0.94)	(1.11)	(0.26)	(0.73)	(0.85)	(0.58)	(0.65)
$\mathbb{1}_{\{MPS<0\}}$	0.097	0.362	0.066	0.894	0.976	1.397	1.148	1.766	2.380*	1.892*	1.180	1.864	1.591	1.243	1.330
	(0.19)	(0.55)	(0.09)	(1.05)	(0.97)	(1.27)	(1.05)	(1.54)	(1.88)	(1.82)	(0.97)	(1.33)	(1.11)	(0.83)	(0.78)
c	-0.473	-0.512	-0.433	-0.886	-0.724	-0.894	-1.075	-0.487	-0.918	-0.875	-0.177	-0.560	-0.650	-0.652	-0.640
	(-1.42)	(-1.00)	(-1.06)	(-1.50)	(-1.42)	(-1.58)	(-1.58)	(-0.64)	(-1.15)	(-1.37)	(-0.27)	(-0.85)	(-0.91)	(-1.02)	(-0.76)
N	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60

Analogous to Table II, this table shows the results for a regression of cumulative SPY ETF returns around the scheduled FOMC announcement day starting 8 days before the announcement day and ending on t days before or after FOMC announcement day, specified by the column labels, on a dummy variable for expansionary monetary surprise at the day of FOMC announcement day, $\mathbb{1}_{\{MPS<0\}}$, and a control dummy for the FOMC announcement with zero surprise, $\mathbb{1}_{\{MPS=0\}}$. The column labeled "0" includes the results for the regression of cumulative returns for the period starting 8 days before FOMC and ending at 2 p.m. on the FOMC announcement day; all columns follow this setup but differ by t days. t-statistics reported in parentheses account for time-series autocorrelation and heteroskedasticity using Newey-West (1987) standard errors with four lags. Panel A (B) shows the results for FOMC announcements between January 1994 and December 2009 (July 2002 and December 2009). *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Table A.VI. Initial jobless claims surprises and corporate bond cumulative yield

	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7
$IJCS$	0.003	-0.006	-0.005	0.002	0.007	0.014	0.014	0.019	0.018	0.018	0.026	0.032	0.029	0.035	0.036
	(0.44)	(-0.54)	(-0.38)	(0.14)	(0.37)	(0.53)	(0.45)	(0.59)	(0.62)	(0.57)	(0.69)	(0.89)	(0.73)	(0.84)	(0.83)
c	-0.003	-0.005	-0.002	0.002	0.003	-0.002	-0.004	0.002	0.007	0.010	0.003	0.002	0.008	0.012	0.015
	(-0.46)	(-0.57)	(-0.14)	(0.17)	(0.16)	(-0.10)	(-0.17)	(0.09)	(0.22)	(0.31)	(0.08)	(0.07)	(0.19)	(0.28)	(0.34)
N	377	377	377	377	377	377	377	377	377	376	376	376	376	376	375

This this table shows the results for a regression of cumulative corporate bond yield changes around weekly initial jobless claims announcements, starting 8 days before the announcement day and ending on t days before or after announcement day, specified by the column labels, on the surprises in initial jobless claims reported the Thursday before the FOMC announcement. The surprises in the initial jobless claims are calculated following Andersen, Bollerslev, Diebold, and Vega (2003). More specifically, we take the surprises as the difference between announced and the median survey values, divided by standard deviation. We download the data from Bloomberg. The column labeled "0" includes the results for the regression of cumulative returns for the period starting 8 days before initial jobless claims announcement day and ending at 2 p.m. on the announcement day; all columns follow this setup but differ by t days. t-statistics reported in parentheses account for time-series autocorrelation and heteroskedasticity using Newey-West (1987) standard errors with four lags. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Table A.VII. FOMC Surprises, before and after 2009

Period	$\overline{\lvert MPS \rvert}$ (%)
July 2002–December 2009	0.027
January 2010–December 2017	0.005

This table provides further explanation for excluding the current decade from the analysis. It shows that after 2009, when the interest rate reached the zero lower bound and unconventional monetary policy started becoming a key factor for policy decisions, the magnitude of FOMC surprises shrunk to a fifth of its size in our sample period. The column labeled $\overline{\lvert MPS \rvert}$ shows the average monetary policy surprise, measured as the absolute value of Kuttner (2001) surprise.