Does Secondary Market Liquidity affect the Economy?

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ABSTRACT

We use the Federal Reserve's Secondary Market Corporate Credit Facility (SMCCF) to examine whether secondary market liquidity has real economic effects. In response to COVID-19, the SMCCF committed the Federal Reserve to buy corporate bonds in secondary markets. Using a difference-in-differences analysis, we compare firms with bonds purchased by the SMCCF to similar firms that did not have bonds purchased. We find the SMCCF improved secondary liquidity and yields on newly issued bonds, however this did not impact firm's overall cost of capital and had no effect on investment, employment, or PP&E. The results suggest secondary market liquidity has limited economic effects.

Keywords: Bond Markets, Federal Reserve, Liquidity, Real Effects, Secondary Markets

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I. Introduction

On an average trading day in the United States, over $1 trillion in stocks and bonds are traded on secondary markets. This high volume of trading activity stands in contrast to many rational models of trading behavior (Odean, 1999), yet it is generally believed that secondary market liquidity is crucial to the functioning of capital markets (e.g., Bencivenga, Smith, and Starr (1996)). Without it, investors may be hesitant to participate in primary market transactions and capital might be allocated less efficiently in the economy. However, despite the perceived importance of secondary market liquidity, there is relatively little empirical evidence connecting secondary market liquidity to real economic outcomes. In this paper, we provide novel evidence on the relation between secondary market liquidity and a variety of real outcomes including capital structure, investment, cash management, and employment.

We use the Federal Reserve's Secondary Market Corporate Credit Facility (SMCCF) as a laboratory to study the impact of secondary market liquidity. In response to market turmoil in the early days of the COVID-19 pandemic, the Federal Reserve established the SMCCF to buy corporate bonds and bond exchange traded funds (ETFs) in secondary markets. The stated goal of the SMCCF was "to support credit to employers by providing liquidity to the market for outstanding corporate bonds."[1] In other words, the program was designed to increase liquidity in the secondary market under the assumption that this would then benefit the real economy. We use this setting to examine whether, and how, secondary market liquidity impacts real economic outcomes. We find the SMCCF did improve secondary market liquidity, as designed, however it had only minimal effects on firm behavior. We find no evidence the program changed stock issuance, and while treatment firms did issue bonds at lower yields, this newly issued debt was a small component of overall firm funding. As a

[1] See https://www.federalreserve.gov/monetarypolicy/smccf.htm

result, the program did not significantly change firm cost of capital.[2]

We find some evidence that firms responded to improved bond market liquidity by using more aggressive cash and inventory management policies, consistent with improved liquidity in external capital markets allowing them to have a lower liquidity buffer in their internal capital markets. However, we find no evidence that improved liquidity affected firm investment decisions or firm-level employment. Overall, our results suggest that secondary liquidity has limited effects on real economic behavior.

Importantly, our non-results on real economic outcomes are not due to low statistical power. To show that our tests have enough statistical power, we calculate the minimum detectable effect size ("MDES") for each of our estimates (Bloom, 1995). The MDES measures the smallest effect that, if true, could be reliably detected given a certain significance level. The MDES of our tests are significantly lower than the corresponding sample standard deviation of our dependent variable of interest, which suggests that our tests do have the power to detect small effects even if they are only a small fraction of the sample variation. Put differently, our non-results are not due to poor power, there is simply no evidence the SMCCF changed firm behavior.

The primary challenge to examining the relation between secondary market liquidity and real economic outcomes is that these variables may be jointly determined. In other words, secondary liquidity may respond to firm production and/or firm production may respond to secondary liquidity. Moreover, it is also possible that an omitted variable jointly affects both secondary market liquidity and firm production. As a result, there is concern of reverse

[2]See Table IV for a calibration analysis that illustrates the mechanism: although the intervention did change the cost of debt on newly issued bonds, these bonds represented just 13.9% of the outstanding debt for treatment firms, and these firm's assets were financed with 53% debt to begin with. As a result, the intervention only affected 7% (13% $\times$ 53%) of the typical treatment firm's capital structure and thus led to small changes in overall cost of capital.

causality, omitted variable bias, and simultaneity bias in this setting. We use the start of the SMCCF to design an identification strategy to address these concerns.

Our identification strategy uses a differences-in-differences regression that compares economic outcomes for treated and control firms in a window around the start of the SMCCF. The Federal Reserve provides detailed guidelines about the SMCCF program, including information on which bonds were eligible to be purchased and precise data on which bonds were actually purchased. We define our treatment group as those firms that had bonds purchased as part of the SMCCF. Importantly, there are a number of firms that issued bonds that were eligible to be purchased, but were not actually purchased by the Federal Reserve. We use these firms as our control group. Absent the Federal Reserve's intervention in credit markets, our identification strategy assumes treated firms would have evolved in a similar manner to these control firms.

Of course, it remains possible that treatment firms are somehow different than control firms. Even though the bonds of both sets of firms satisfy the eligibility requirements, the Federal Reserve *chose* to purchase some eligible bonds, and not others. Our identification strategy assumes that the Federal Reserve's choice was not driven by some firm characteristic that could lead to selection on firm characteristics that are related to our outcome variables. We conduct a number of tests to examine this possibility. We find no evidence the Federal Reserve selected certain bonds based on firm characteristics.[3] Specifically, we show that treatment firms and control firms look similar ex-ante a long a variety of financial dimensions. Moreover, all financial measures of treatment and control firms exhibit similar trends prior to March of 2020. The results suggest that our control firms are a valid counterfactual for the treatment firms, absent the Federal Reserve's intervention.

[3]We do find evidence they selected certain bonds based on bond characteristics (such as time to maturity), but these characteristics appear to be unrelated to firm characteristics. We discuss this more in Section III.B.

Overall, our paper makes a number of contributions. We contribute to the literature exploring the effects of the SMCCF program. Importantly, we note there are two related, but *distinct*, questions about the impact of the SMCCF. First, it is important to understand whether the SMCCF had an effect on financial markets. Several papers examine whether the Federal Reserve's intervention affected bond prices and yields (Kargar et al. (2020), O'Hara and Zhou (2020), Li and Momin (2020), Gilchrist, Wei, Yue, and Zakrajsek (2020)), Falato, Goldstein, and Hortaçsu (2021), Becker and Benmelech (2022), Haddad, Moreira, and Muir (2022). Most of the evidence suggests the SMCCF lowered yields and raised bond prices. We confirm these findings, and provide novel evidence that the Federal Reserve's interventions changed secondary market liquidity, consistent with the program's stated goal. The paper most closely related to ours is likely Darmouni and Siani (2022). While our paper preceded their paper by several months, they also examine whether the intervention by the Federal Reserve impacted firm borrowing and investment. While their main analysis focuses on issuance behavior for all firms following the intervention, our analysis exploits quasi-random variation in the Federal Reserve's purchase of eligible bonds to identify whether secondary market liquidity changes firm behavior. In other words, their paper examines whether the Federal Reserve's intervention has an impact, while our paper specifically examines whether secondary market liquidity has an impact.

Second, it is important to understand whether changes in secondary market liquidity lead to changes in real economic outcomes at the firm-level. Our paper provides novel evidence on this question. While it is clear the SMCCF did change secondary market outcomes (as discussed above), our identification strategy exploits variation in secondary market liquidity to see if it changes real firm behavior. A large existing literature examines the relation between liquidity and asset prices (e.g., Amihud and Mendelson (1986), Amihud (2002)). Moreover,

several papers focus specifically on the liquidity of corporate bond markets. For example, Bao, Pan, and Wang (2011) examine liquidity in the secondary market for corporate bonds and they find that corporate bonds tend to be relatively illiquid, and this illiquidity affects transaction prices. Our paper builds on this literature by exploring the connection between secondary market liquidity and economic outcomes. We show some of the first evidence that secondary market liquidity can affect asset prices without changing firm investment behavior. As such, our results add an important dimension to the debate on the importance of secondary market liquidity.

In a complementary sense, our work also relates to recent work on the rise of private equity markets (e.g., Ewens and Farre-Mensa (2022)). Private equity markets are generally regarded as less liquid than public secondary markets. Our findings suggest that secondary market liquidity may not be that important for firm performance, which helps explain the recent success of firms financed by private equity.

Finally, we contribute to the real effects literature. A large theoretical and empirical literature examines whether there is a feedback effect from secondary market prices to real economic decisions.[4] While several papers document evidence that firm decisions do change as a result of changes to the information in secondary prices (Chen, Goldstein, and Jiang (2007), Foucault and Fresard (2012), Edmans, Goldstein, and Jiang (2012), Dessaint, Foucault, Fresard, and Matray (2016), Zuo (2016), and Edmans, Jayaraman, and Schneemeier (2017)), our results suggest that secondary market liquidity is less likely to have real effects. Our findings suggest the policy goal of improving secondary market liquidity may not be optimal. Future research should continue to explore this key topic.

[4]See, for example, Stein (1987), Acharya, Lochstoer, and Ramadorai (2013),Goldstein and Yang (2014)). Dow and Gorton (1997), Subrahmanyam and Titman (2001), Goldstein and Guembel (2008), Sockin and Xiong (2015), and Goldstein and Yang (2017)).

The rest of the paper proceeds as follows. Section II explains the Federal Reserve's Secondary Market Corporate Credit Facility and discusses the existing literature, including theoretical effects. Section III describes the data and our identification strategy. Section IV presents our main findings. Finally, Section V discusses possible implications from our findings and Section VI concludes.

II. Background

A. Secondary Market Corporate Credit Facility

In early March 2020, driven by concerns about the sudden outbreak and rapid spread of the COVID-19 global pandemic, corporate bond markets began to exhibit a strong pattern of "flight to safety." The yields of both investment-grade and high-yield bonds soared significantly when compared to their levels at the beginning of the year. Meanwhile, the 10-year Treasury yield fell to a historic low.[5] On March 23, in response to the deterioration of credit markets and worsening liquidity in corporate bond markets, the Federal Reserve announced the establishment of the Secondary Market Corporate Credit Facility (SMCCF). The program committed the Federal Reserve to buying a significant amount of outstanding corporate debt in secondary bond markets.

Initially, the SMCCF was set up to purchase corporate bonds issued by investment-grade U.S. companies with remaining maturities of five years or less and U.S.-listed exchange-traded funds (ETFs) whose investment objective is to provide broad exposure to the market for U.S. investment-grade corporate bonds. On April 9, 2020 the scope of the program was extended to "fallen angels" – issuers that were rated investment-grade as of March 22 but

[5]See Figure 1 in Mizrach and Neely (2020) for details.

were subsequently downgraded to BB-/Ba3 or better. The SMCCF started its first corporate bond ETFs purchase on May 12 and individual corporate bonds purchased started on June 16. On July 28, the Federal Reserve announced an extension of the SMCCF from its original expiration date September 30, 2020 to December 31, 2020.[6]

When purchasing corporate bonds, the SMCCF developed the Broad Market Index in order to track a broad, diversified market index of U.S. corporate bonds, as required in its Term Sheet.[7] The index will be recalculated at least every 4-5 weeks to reflect changes in bonds eligibility. Each time the index is refreshed, the SMCCF will first identify all of the secondary market bonds that meet the Term Sheet criteria. Then, the contributions of individual bonds will be aggregated at the issuer level to form each issuer's weight in the index. During the aggregation process, for each issuer, the total amount of its bonds being purchased cannot exceed 10 percent of its maximum historical outstanding bonds and 1.5 percent of the maximum combined PMCCF and SMCCF facility size. On June 28, the Federal Reserve Bank of New York published the initial composition of the SMCCF Broad Market Index, which was effective as of June 5 and included 794 eligible issuers in 12 broad sectors.

Other than the Broad Market Index, the Federal Reserve also discloses the SMCCF monthly progress report on its website.[8] These transaction-specific disclosures include the transaction-level data of the SMCCF purchase on individual bonds and ETFs, such as trade date and purchase amount. Throughout the policy period, the SMCCF made 2,670 transactions and purchased $5.83 billion spanning 1,353 individual bonds, and made 926 transactions

[6]The program was not renewed after this date, and thus purchases as part of the SMCCF ceased as of December 31, 2020.

[7]https://www.newyorkfed.org/markets/secondary-market-corporate-credit-facility/secondary-market-corporate-credit-facility-broad-market-index

[8]https://www.federalreserve.gov/monetarypolicy/smccf.htm

and purchased $8.43 billion spanning 16 ETFs.

B. Existing Literature

A large literature examines the relation between liquidity and asset prices for equities and bonds (e.g., Amihud (2002), Bao et al. (2011)). A number of papers, both theoretical and empirical, argue for a connection between secondary market liquidity and asset prices (e.g., Amihud and Mendelson (1986)). It is less clear, however, whether liquidity affects economic activity.

Arseneau, Rappoport, and Vardoulakis (2015) model the relation between liquidity in secondary markets and issuance activity in primary markets. In their model, secondary market liquidity determines the liquidity premium in prices, which in turn affects issuance in the primary market, which in turn affects secondary market liquidity. The results suggest a possible rational for the Federal Reserve's intervention in markets via the SMCCF.

Indeed, comments by Federal Reserve officials about the SMCCF indicate the Federal Reserve did consider real economic effects. In a speech about the SMCCF, Daleep Singh (2020), Executive Vice President at the Federal Reserve Bank of New York stated, "Large companies rely on capital markets to secure ongoing financing to maintain their businesses and meet payrolls. By supporting companies' access to funding, firms employing millions of Americans are in a better position to keep workers on payrolls and to hire them back as the economy continues to recover."

Other theories provide mixed predictions on the relation between secondary market liquidity and economic activity. Bencivenga et al. (1996) develop an overlapping generations model that relates secondary market liquidity to allocative efficiency in the economy. In their model, investors allocate capital based on investment returns net of transaction costs.

They show that changes to liquidity will tend to affect the choice of long-term vs. short-term investment projects however, they may or may not affect real economic activity.

To date, there is relatively little empirical evidence on this important topic. Gilchrist and Zakrajšek (2012) document a link between secondary market credit market spreads and economic conditions, including changes to unemployment, non-farm payroll, and industrial production. However, their paper does not establish whether liquidity in secondary credit markets causes changes in economic conditions. More recently, Holden, Lin, Lu, Wei, and Yang (2020) use the peer-to-peer lending market to show that secondary market liquidity can affect primary market liquidity. Our findings present some of the first evidence on the relation between secondary market liquidity in bond markets and real economic activity.

III. Methodology

To examine the relation between secondary market liquidity and real firm outcomes, we combine data from TRACE, Compustat, the Center for Research in Security Prices (CRSP), and the Federal Reserve, as discussed below. We then use the SMCCF to develop an identification strategy that compares the economic performance of firms with bonds purchased by the Federal Reserve to the performance of firms that were eligible to have bonds purchased by the Federal Reserve, but did not actually have any bonds purchased.

A. Data

Corporate bond transaction data such as bond price, yield, and trading volume come from the Trade Reporting and Compliance Engine (TRACE). Given that a non-trivial portion of corporate bonds are issued under Rule 144A and many of them are 144A-for-life, we use

both BTDS and BTDS 144A categories in TRACE. Following common practice, TRACE Standard data are cleaned according to Dick-Nielsen (2009). Daily volume-weighted bond prices and yields are then calculated by only including trades of institutional size (i.e., greater than or equal to $100,000).

Corporate bond characteristics data such as credit rating, maturity date, and bond type indicators come from Mergent Fixed Income Securities Database (FISD). Credit ratings from Moody's, Standard & Poor's (S&P), and Fitch are mapped to their corresponding numeric values according to the ratings scales reported in Table B1 of the Internet Appendix. We define an issue's rating as the maximum rating issued by one of these two rating agencies on a given date. Following previous literature, we restrict the sample to senior unsecured bonds with fixed coupon schedules that were issued by U.S. companies.

SMCCF identification files come from the Federal Reserve's website. We first use the SMCCF Broad Market Index to identify eligible firms for direct corporate bond purchases in secondary markets. We then use the SMCCF Transaction-specific Disclosures to identify eligible firms that actually have bonds purchased during the policy period as well as the purchase amount.

Stock data, such as stock returns, come from CRSP. Firm-level financial data such as total assets, cash holding, and inventory come from the CRSP and Compustat merged database and all financial measures are calculated according to definitions discussed in detail in Section A of the Internet Appendix. All financial measures are observed at a quarterly frequency except data on the number of employees, which is at an annual frequency.

B. Identification Strategy

To identify the real effect of the Federal Reserve's Secondary Market Corporate Credit Facility, we use the following difference-in-differences (DiD) regression:

$$y_{i,q} = \alpha + \beta Purchase\_Amount_{i,q-1} + \delta_i + \delta_q + \epsilon_{i,q}, \tag{1}$$

where the variable $y_{i,q}$ is our dependent variable of interest, such as investment, leverage ratio, and dividends, of firm i in quarter q. The variable $Purchase\_Amount_{i,q-1}$ is a multi-valued treatment variable equal to the aggregate amount of corporate bond of firm i purchased by the Federal Reserve in quarter $q-1$, and 0 for the remaining firm-quarters. In all regressions examining the real effect of the SMCCF, firm fixed effects (δ_i) and quarter fixed effects (δ_q) are included, and standard errors are double clustered at the firm and year-quarter level.

The estimation sample for equation (1) consists of all treatment and control firms over the quarters 2018Q1 to 2021Q4. Treatment firms are firms with bonds that are eligible for the SMCCF bond purchase program and actually have some of their bonds purchased during the policy period, while control firms are firms with bonds that are eligible for the SMCCF bond purchase program that do not have any of their bonds purchased during the policy period.

The key assumption necessary to estimate the treatment effect (measured by β in equation (1)) in our setting is the parallel trends assumption. We assume that the change in the conditional average outcomes of treatment firms in the absence of treatment would be equal to the change in the conditional average outcomes of control firm. In other words, we assume that eligible firms that did not have bonds purchased are a valid counterfactual for eligible firms that did have bonds purchased, if the SMCCF had not occurred. In this setting, there are two main concerns that could threaten our identifying assumptions.

First, it is possible that the Federal Reserve bought (or avoided) certain bonds because of firm characteristics (i.e., reverse causality). For example, if the Federal Reserve chose to purchase certain bonds because it anticipated changes to firms' operational and financial performance, then our estimates could be biased. Given the policy goal of stabilizing and providing liquidity to corporate bond secondary markets, it seems unlikely that the Federal Reserve choose to buy certain bonds based on future firm performance (indeed, nothing in the extensive documentation about the program suggests bond purchases were based on predicted future financial performance). However, to alleviate this concern, we lag the treatment variable by one quarter in all regressions examining the real effect of the SMCCF. Moreover, we find no observable differences between the financial performance of treatment and control firms prior to the intervention (and in most cases, no evidence after the intervention either). As such, we find no evidence that the Federal Reserve focused their purchases on firms with observably different financial performance.

Second, there could be unobservable heterogeneity between the treatment and control groups. The parallel trends assumption requires that unobservable heterogeneity, if it exists, is evolving similarly among the two groups. However, even though both treatment and control firms are eligible for the SMCCF bond purchase, the Federal Reserve may still have used unobservable rules (other than the stated rules about credit rating and remaining maturity) to make decisions about purchasing specific corporate bonds. In other words, our assumption is that the Federal Reserve's decision to purchase some eligible bonds and not others was as good as random with respect to *firm* characteristics.[9] To the extent that this is not true, it could bias our treatment effects.

[9]Our main analyses are at the firm level, so even if the Federal Reserve selected bonds based on *bond* characteristics, our identifying assumptions are supported as long as *firm* characteristics are not different between treatment and control firms.

Although this identification assumption is inherently untestable, Figure 1 provides visual evidence suggesting that treatment firms were evolving in a similar manner to control firms, prior to treatment. Figure 1 plots the daily average corporate bond prices and yields of treatment and control firms. Both groups evolve in a similar manner before and during the outbreak of COVID-19. After the announcement of the SMCCF, the bond price of treatment firms increases significantly relative to that of control firms, while bond yields for treatment firms decreases significantly relative to control firms, and these differences remain elevated until the end of our sample period. The results support the parallel trends assumption, and show evidence the intervention did change secondary prices (and yields).

To examine whether the Federal Reserve *selected bonds* with different characteristics, Figure B1 in the Appendix plots the distribution of treatment bonds versus control bonds for five variables including issue credit rating, coupon rate, amount outstanding, remaining time to maturity, and duration. The figure shows treatment and control bonds look similar, not just in means, but for the entire distribution of issue credit rating, coupon rate, amount outstanding. The figure does show evidence of two possible selection effects: it looks like the Federal Reserve had a preference for buying bonds with more time to maturity (Panel D) and higher duration (Panel E). However, in Panel F of Figure B1, we show that these differences do not aggregate to the firm level. In other words, the remaining maturity (and duration) of bonds issued by treatment *firms* is not meaningfully different from the remaining maturity of bonds issued by control firms. Overall, the visual evidence supports our identification assumptions and suggests that treatment firms were similar to control firms in all dimensions prior to the start of the SMCCF, both in levels and trends.

C. Statistical Power and the Minimum Detectable Effect Size

In order to generate a valid counterfactual for the treatment firms, our identification strategy focuses only on firms that were eligible to have bonds purchased by the Federal Reserve. Among those SMCCF-eligible firms, we further split the sample into treatment firms (those that actually have their bonds purchased) and control firms (those that do not have their bonds purchased). As a result, our sample is smaller than the population of firms and bonds, which could affect the statistical power of our tests. Because many of our main findings are non-results, it is important establish whether our tests are adequately powered. To address this, in each regression table we report the minimum detectable effect size ("MDES") as defined by Bloom (1995)[10] along with the corresponding sample standard deviation. The MDES provides information about the statistical power for each estimate and each dependent variable of interest and we consistently find evidence that are tests are adequately powered.

D. Summary Statistics

Table I reports the summary statistics for all of the dependent variables used in our analyses as well as variables used to determine eligibility for the Federal Reserve's Secondary Market Corporate Credit Facility including issue credit rating and remaining time to maturity.

The sample consists of 319 treatment firms and 89 control firms. As shown in Table I, control firms are generally smaller than treatment firms in terms of market capitalization. There are still some big firms in terms of total assets in the control group. Except for

[10]We assume that for each of our estimates, the main treatment coefficient follows a t-distribution with the appropriate degrees of freedom. We then calculate the MDES under a two-sided test with significance level $\alpha = 0.05$ and power level $\beta = 0.2$.

firm size, treatment firms are statistically and economically similar to control firms along observable financial dimensions. And as would be expected, bonds issued by treatment and control firms have similar distributions of credit rating and remaining maturity.

IV. Results

We examine the effect of the Federal Reserve's Secondary Market Corporate Credit Facility (SMCCF) in several dimensions. We first examine whether the SMCCF affected secondary market conditions, including prices, yields, and measures of liquidity. We find that it did. We then explore whether the SMCCF affected real economic outcomes measured at the firm level, including employment, investment, and cash management. We find the SMCCF did change how firm's use internal capital markets, however, there is little evidence it changed real economic variables like investment and employment.

A. Secondary Market Conditions

We start by examining whether the SMCCF affected secondary market conditions. The Federal Reserve's stated goal was "to support credit to employers by providing liquidity to the market for outstanding corporate bonds." This goal suggests the program was intended to affect secondary liquidity and credits terms (like bond prices and yields).

To test this, for daily level data, we examine regressions of the form:

$$y_{i,d} = \alpha + \beta Purchase\_Post_{i,d} + \delta_i + \delta_d + \epsilon_{i,d}, \tag{2}$$

where the variable $y_{i,d}$ is either bond prices, bond yields, or stock returns. $Purchase\_Post_{i,d}$

is an indicator variable equal to 1 if firm i is SMCCF-eligible firms that have their bonds been purchased and day d after Mar 31st, 2020, and 0 otherwise.

For quarterly level data, we examine regressions of the form:

$$y_{i,q} = \alpha + \beta Purchase\_Amount_{i,q-1} + \delta_i + \delta_q + \epsilon_{i,q}, , \tag{3}$$

where the variable $y_{i,d}$ either Amihud (2002) price impact for bond prices or average cost of debt for firm i in quarter q. As discussed above, $Purchase\_Amount_{i,q-1}$ is a multi-valued treatment variable equal to the aggregate amount of corporate bond of firm i purchased by the Federal Reserve in quarter $q-1$, and 0 for the remaining firm-quarters.

Table II displays results for bond prices and yields. To assess the stable unit treatment value assumption (SUTVA), we also examine the impact on bond trading volumes scaled by amount outstanding. We include a variety of fixed effects depending on the outcome, including issue rating fixed effects, time to maturity fixed effects, firm fixed effects, and quarter fixed effects.

Across all the specifications, we find evidence the SMCCF did change bond prices and yields for treatment firms, relative to control firms. For example, in column (3) the statistically significant coefficient of 2.4559 suggests that having bonds been purchased by the SMCCF leads to a 2.5% increase in bond prices and in column (6) the statistically significant coefficient of -.4671 suggests that having bonds been purchased by the SMCCF leads to a 47 basis point decrease in bond yields. Notably, the sign of these effects is stable across a wide variety of fixed effect specifications, which supports our identification assumptions. More specifically, when we compare column (2) and (3) and column (5) and (6), the results are similar with and without issue rating fixed effects and time to maturity fixed effects. This

suggests that our treated and control groups are similar along the observable dimensions the Federal Reserve used to determine eligibility for the program. In addition, we find no significant effect on scaled bond volume after controlling for firm and day fixed effects, which suggests that the Federal Reserve's bond purchase program did not cause trading volume to migrate from treatment bonds to control bonds (or vice-versa), consistent with SUTVA.

While our identification strategy is novel, we note that these findings are consistent with the findings in several other papers that focus on secondary market outcomes (e.g., Kargar et al. (2020), O'Hara and Zhou (2020), Li and Momin (2020), Gilchrist et al. (2020)). Thus, the evidence in our paper and the existing literature points to the same conclusion: the SMCCF led to higher bond prices and lower bond yields.

We then examine whether the SMCCF changed firm's cost of capital. In other words, the results from Table II and the existing literature suggest the SMCCF changed secondary market conditions – in Table III we examine whether secondary market changes significantly impacted stock market prices and/or bond prices in the primary market.

Table III examines stock returns (in column (1)), offering yield of newly issued debt (in column (2)), and total cost of debt (in column (3)). We again use the difference-in-differences specification shown in equation (2) and (3)and we measure cost of debt as each firm's interest expense expressed as a fraction of debt outstanding (long-term debt plus current liabilities).[11] In column (1), we find an insignificant negative impact on stock returns and in column (3) we find an insignificant positive impact on overall cost of debt. The results show the SMCCF did not impact cost of equity or overall cost of debt. But in column (2), we find a significant negative impact on offering yield of newly issued debt. The results suggests that the SMCCF

[11]Since the interest amount is determined at the time of issuance, the numerator in the cost of debt calculation likely cannot change because of the SMCCF, but the denominator could possibly change in response to the program.

did improve firm-level cost of debt for newly issued debt, even though it did not change overall cost of equity or cost of debt.

To further explore these results, we conduct a simple calibration exercise to examine the possible impact of the SMCCF on total cost of capital. The results are shown in Table IV. We use the average cost of debt for control firms as the counterfactual for cost of debt for treatment firms without intervention. Then, we use the average weight of newly issued debt relative to total debt and the treatment effect estimate from Table III to estimate the cost of debt with the intervention. Finally, we estimate the weighted average cost of capital (WACC) with and without intervention effects, respectively. We find that even though the cost of debt decreased by 0.23% for newly issued debt for treatment firms, the WACC of treatment firms only decreases by one basis point. In other words, the results suggest that a short term decrease in yields for newly issued bonds is unlikely to significantly change a firm's overall cost of capital. Put differently, because newly issued debt is small relative to total debt, and total debt is just one part of a firm's total cost of capital, the SMCCF did not significantly improve overall firm-level cost of capital.

It is important to note that our finding of no effect on firm-level cost of capital is not due to a lack of statistical power. For example, in column (1), the sample standard deviation of daily stock return is 0.0227, while the MDES under this regression setting is 0.000770, so our research design has the ability to reliably detect a treatment effect on the order of (0.000770 / 0.0227) = 3.4% of one standard deviation. Yet we find no effect. The MDES is similar for the treatment effect estimate on cost of debt.

Moreover, consistent with this, Figure B4 in the Appendix plots the daily average stock returns of treatment firms (Panel A), control firms (Panel B), and their difference (Panel C). From Panel C, it is clear that not only did stock returns not differ *on average*, they are nearly

identical for treatment firms and controls firms throughout the entire sample period. This result provides two important pieces of evidence: (1) it indicates the SMCCF did not change equity investor's assessment of the value of the firm. This result is important – it suggests that equity investors did not expect the SMCCF to change real economic performance for firms. (2) It also supports our identifying assumptions: there is little evidence that treatment and control firms differ in dimensions besides their treatment status.

Next, we examine whether the SMCCF changed secondary market liquidity. To do this, we examine price impact for bonds using our differences-in-differences specification. Specifically, we construct the quarterly Amihud (2002) price impact measure following Dick-Nielsen, Feldhütter, and Lando (2012). It measures the price impact of a trade per unit traded. For each corporate bond, the measure is the daily average of absolute returns r_i divided by the trade size Q_i ($Millions) of consecutive transactions:

$$Amihud_t = \frac{1}{N_t}\sum_{i=1}^{N_t}\frac{|r_i|}{Q_i} = \frac{1}{N_t}\sum_{i=1}^{N_t}\frac{|\frac{P_i - P_{i-1}}{P_{i-1}}|}{Q_i}, \tag{4}$$

where N_t is the number of returns on day t. At least two transactions are required on a given day to calculate the measure, and we define the quarterly Amihud measure by taking the median of daily measures within the quarter. The results are shown in Table V and Figure 2.

In Table V, the negative and statistically significant coefficient of -0.0001 indicates the SMCCF did lead to lower price impact. Put differently, the program did improve bond market liquidity for treatment firms, relative to control firms – this finding is consistent with the stated goal of the program. Moreover, Figure 2 shows the dynamics of the treatment effect: the figure suggests the program did improve liquidity. Moreover, the dynamics strongly support our identification assumptions. In the figure, the difference between the Amihud

measure for treatment versus control firms is centered at zero and always strongly insignificant prior to the start of the SMCCF. Then, after the start of the SMCCF, the difference becomes negative indicating the SMCCF led to a decrease in price impact for treatment firms, relative to control firms. In sum, the results in this section show the SMCCF led to significant improvements in secondary market measures: bond prices became higher, bond yields became lower, and bond liquidity improved for treatment firms relative to control firms. However, we find little evidence that secondary market changes affected firm's primary market financing costs. We also find no evidence that equity investors expected the program to change the real economic performance of the firm. To further explore this, in the next section we focus on several different measures of real economic firm performance.

B. Real Economic Outcomes

While the evidence in Section IV.A makes clear the SMCCF changed secondary market conditions, it remains unclear whether these changes affected firm behavior or performance. In this section, we examine a variety of firm-level measures.

We begin by examining whether the secondary market changes we documented in the previous section led firms to change their use of external capital markets. In particular, Table VI examines firm capital structure. In it, we examine a variety of measures as well as the lagged effects to test whether firms changed their use of debt in response to the SMCCF.

In column (1), the dependent variable is the leverage ratio, defined as ratio of debt to debt plus equity. The coefficient of -.0004 is statistically insignificant at the usual levels, and the sign is in the wrong direction. If anything, the result suggests that treatment firms used less debt, relative to control firms, as a result of the program. In column (2), we examine the ratio of interest to earnings, to see if firms paid more or less interest. Again, the result

is insignificant.

Finally, in columns (3) and (4) we directly examine whether firms changed their use of external capital markets by examining their issuance of equity and debt. In column (3) we examine the Net Issuance of Equity Ratio which measures the relative change in equity over time within a firm. We find a significant negative lagged effect on net issuance of equity three quarters after the bond purchase. In column (4) we examine the Net Issuance of Debt Ratio which measures the relative change in debt over time within a firm. We find a significant positive effect on net issuance of debt. The results suggest that firms did slightly change their use of external capital markets in response to the SMCCF by issuing more debt and less equity. However, in columns (5) through (12), we lag the independent variable by one or two quarters to examine the persistence of these results. While the result in column (8) is not quite statistically significant at the usual levels, it suggests the effects do persist for two quarters, but we see little evidence they persist longer than that.

In light of these findings, we then examine whether firms changed how they deployed capital. Specifically, we examine several measures of firm investment as well as their use of labor. The results are shown in Table VII.

In column (1), the dependent variable is the ratio of investment to assets at the firm level. The coefficient is 0.0000 and not statistically different from zero. The results show strong evidence that treatment firms did not invest more, relative to control firms, as a result of having their bonds purchased by the SMCCF. But two quarters after the bond purchase (in column (5)), there is a slight increase in treatment firm's investment level (the result is statistically significant at the 10% level, but the magnitude is incredibly small which suggests it is not economically meaningful). Yet the effect disappears at a horizon of three quarters (column (9)), suggesting treatment firms did not change their investment policies as a result

of the SMCCF.

Similarly, in column (3) the dependent variable is property, plant, and equipment (PP&E) scaled by assets. Again, the result is close to zero and statistically insignificant. Treatment firms did not invest more in property, plant, and/or equipment as a result of the program. Interestingly, in columns (2) and (4) we do see evidence of a statistically significant effect (although in column (2) the result is only significant at the 10% level). Specifically, column (2) shows a slight increase in total assets, while column (4) shows that this increase comes from an increase in inventories. Thus, the results indicate that firms that had their bonds purchased by the SMCCF adopted more aggressive inventory management policies, which is persistent for as least 3 quarters after the bond purchase (columns (6) and (10)). This result is largely consistent with the literature on internal versus external capital markets.

Existing literature (e.g., Alchian (1969), Williamson (1975)) argues that firms have more information about their projects than outside investors; as a result, internal capital markets will tend to be more efficient at allocating capital than external capital markets. However, if firms are worried about their ability to access external financing, they may use their internal capital markets to build a liquidity buffer instead of optimally deploying their capital. In this case, the SMCCF may have allowed firms to deploy their capital more aggressively (by building products and increasing inventory instead of keep the money in cash) because the program increased the firm's confidence that it could access external capital if necessary.

Finally, in column (13) we examine labor market conditions. Specifically, we examine the number of employees. The coefficient of 0.0000 is statistically insignificant and shows that treatment firms did not change their labor force at all relative to control firms as a result of the program. In sum, the results in Table VII show that firms did not change how they invested in long-term assets nor did it change how they interacted with the labor

market. This result may seem surprising in light of existing statements by Federal Reserve officials that suggest the program was designed to benefit labor markets.[12] However, we do see evidence that firms increased their inventories, which could be related to a change in the way they use internal capital markets. In the next section, we test for additional evidence on this channel by exploring whether firms change their use of cash.

In Table VIII we examine cash management and firm payout decisions. In columns (1) and (3) we examine whether firms paid out capital, either via buybacks (column (1)) or dividends (column (3)). In both cases, the estimates are small and statistically insignificant at the usual levels. The results suggests firms did not view the SMCCF as an opportunity to pay-out capital to investors. However, the results in Table VII suggested that firms may be using the internal capital markets more aggressively in response to the program. Consistent with this, in column (2) we see a negative and statistically significant estimate on the ratio of cash to assets, which is persistent for as least 3 quarters after the bond purchase. In other words, firms reduced their cash buffer and used this to increase their inventories.[13]

Figure 3 confirms this finding. The figure plots the coefficient estimates from dynamic regressions of total assets, inventory to asset ratio, and the cash to asset ratio. As before, the figure provides additional evidence in support of our identifying assumptions. Prior to the start of the SMCCF, the coefficients are close to zero and not statistically significant. However, after the program starts, treatment firms experience an increase in assets and inventories, and a decrease in cash, relative to control firms.

Once again, for all insignificant results in Table VI, VII, and VIII, the MDES are significantly lower than one standard deviation of their corresponding dependent variables of

[12]For example, see Singh (2020) and https://www.federalreserve.gov/monetarypolicy/smccf.htm

[13]Note: we find evidence that total assets increased, so this effect may be driven by the denominator, not the numerator. Nonetheless, it still resresents a choice by firm managers to hold *relatively* less cash.

interest. So, our finding of zero impact is not due to a lack of power.

Taking all of the evidence together, a clear picture emerges. The secondary credit facility did impact secondary market conditions, as expected. However, secondary market liquidity has a limited impact on actual firm behavior. Because the liquidity improvement did not change firm-level cost of capital, firms did not change their use of debt or equity, nor did they change their long-term investment decisions or employment decisions. However, the fact that secondary markets were more liquid did allow firms to use their internal capital markets more aggressively with the knowledge that they could access external markets if necessary. As a result, cash levels dropped and inventory levels increased. Overall, the results suggest that secondary liquidity has only a limited impact on firm behavior.

V. Discussion

We are careful to note that our findings come with several caveats. First, while the shock we examine did change secondary market liquidity, it is possible that a larger change in secondary market liquidity would lead to larger real economic effects. As such, the external validity of our findings remain unknown. More generally, we also note that our shock examined a relatively short time horizon. We show that, over a horizon of approximately one year, changes to secondary market liquidity do not substantially impact firm outcomes. It is possible that secondary market liquidity would have larger effects at longer horizons. Nonetheless, a large amount of academic research and regulatory work focuses on secondary market liquidity, especially in equity markets where issuance decisions are relatively rare events. If secondary market liquidity does matter for firm behavior, it seems likely it would matter more in credit markets than equity, since firms access credit markets more regularly.

Yet, even despite this, we find little evidence that secondary market liquidity affects firm behavior.

We also note that private equity has grown dramatically over the last two decades (e.g., Ewens and Farre-Mensa (2022)). Private equity markets are, almost by definition, less liquid than public secondary markets. While the rise of private equity is complicated, and likely related to many different economics forces, the mere fact that private equity has successfully grown suggests that secondary market liquidity may not be required for firm performance. While we believe our results provide important new information on this important debate, future research should continue to explore the relation between secondary market liquidity and firm performance.

VI. Conclusion

While secondary market liquidity is generally believed to be crucial to the proper functioning of capital markets, there is relatively little empirical evidence connecting secondary market liquidity to real economic outcomes. This paper fills this void. We use the Federal Reserve's Secondary Market Corporate Credit Facility (SMCCF) to examine whether secondary market liquidity has real economic effects. Using a difference-in-differences regression, we compare the economic performance of firms with bonds purchased by the SMCCF to those of similar firms with bonds not purchased. We find the SMCCF did improve secondary liquidity however this did not significantly change firm investment decisions. Firms adopt more aggressive cash and inventory policies, however, we find no change in a variety of measures including number of employees, investment, or PP&E. The results suggest that secondary market liquidity has small, but limited effects, on corporate behavior. A simple

calibration exercise sheds light on the possible mechanism: even though the program did significantly change primary and secondary market yields, because bonds issued during the SMCCF program were a small portion of overall firm funding, the SMCCF changed overall cost of capital by a minuscule amount (approximately 1 basis point). Such a change is highly unlikely to change firm investment decisions. In some sense, our results may not seem surprising. Privately funded firms are able to successfully operate without access to liquid secondary markets. But in light of this finding, future research should continue to explore the conditions under which liquid secondary markets are an important feature of capital markets.

References

Acharya, V. V., Lochstoer, L. A., & Ramadorai, T. (2013). Limits to arbitrage and hedging: Evidence from commodity markets. *Journal of Financial Economics*, *109*, 441-465.

Alchian, A. A. (1969). Corporate management and property rights. In *Economic policy and the regulation of corporate securities.* (pp. 337–360). Washington, D.C. : American Enterprise Inst. for Public Policy Research.

Amihud, Y. (2002). Illiquidity and stock returns: cross-section and time-series effects. *Journal of Financial Markets*, *5*, 31-56.

Amihud, Y., & Mendelson, H. (1986). Asset pricing and the bid-ask spread. *Journal of Financial Economics*, *17*(2), 223–249.

Arseneau, D. M., Rappoport, D. E., & Vardoulakis, A. (2015). Secondary market liquidity and the optimal capital structure. *FEDS Working Paper No. 2015-031*.

Bao, J., Pan, J., & Wang, J. (2011). The illiquidity of corporate bonds. *The Journal of Finance*, *66*(3), 911-946.

Becker, B., & Benmelech, E. (2022). The resilience of the u.s. corporate bond market during financial crises. *Working Paper*.

Bencivenga, V. R., Smith, B. D., & Starr, R. M. (1996). Liquidity of secondary capital markets: Allocative efficiency and the maturity composition of the capital stock. *Economic Theory*, *7*(1), 19–50.

Bloom, H. S. (1995). Minimum detectable effects: A simple way to report the statistical power of experimental designs. *Evaluation Review*, *19*(5), 547-556.

Chen, Q., Goldstein, I., & Jiang, W. (2007). Price informativeness and investment sensitivity to stock price. *Review of Financial Studies*, *20*, 619-650.

Darmouni, O., & Siani, K. Y. (2022). Bond market stimulus: Firm-level evidence. *Working*

Paper.

Dessaint, O., Foucault, T., Fresard, L., & Matray, A. (2016). Ripple effects of noise on corporate investment. *Working Paper*.

Dick-Nielsen, J. (2009). Liquidity biases in trace. *The Journal of Fixed Income*, *19*(2), 43–55.

Dick-Nielsen, J., Feldhütter, P., & Lando, D. (2012). Corporate bond liquidity before and after the onset of the subprime crisis. *Journal of Financial Economics*, *103*(3), 471-492.

Dow, J., & Gorton, G. (1997). Stock market efficiency and economic efficiency: Is there a connection? *Journal of Finance*, *52*, 1087-1129.

Edmans, A., Goldstein, I., & Jiang, W. (2012). The real effects of financial markets: The impact of prices on takeovers. *Journal of Finance*, *67*, 933-971.

Edmans, A., Jayaraman, S., & Schneemeier, J. (2017). The source of information in prices and investment-price sensitivity. *Journal of Financial Economics*, *126*, 74-96.

Ewens, M., & Farre-Mensa, J. (2022). Private or public equity? the evolving entrepreneurial finance landscape. *Working Paper*.

Falato, A., Goldstein, I., & Hortaçsu, A. (2021). Financial fragility in the covid-19 crisis: The case of investment funds in corporate bond markets. *Journal of Monetary Economics*, *123*, 35-52.

Foucault, T., & Fresard, L. (2012). Cross-listing, investment sensitivity to stock price, and the learning hypothesis. *Review of Financial Studies*, *25*, 3305-3349.

Gilchrist, S., Wei, B., Yue, V. Z., & Zakrajsek, E. (2020). The fed takes on corporate credit risk: An analysis of the efficacy of the smccf. *Working Paper*.

Gilchrist, S., & Zakrajšek, E. (2012). Credit spreads and business cycle fluctuations. *American Economic Review*, *102*(4), 1692–1720.

Goldstein, I., & Guembel, A. (2008). Allocation role of prices. *Review of Economic Studies*, *75*, 133-164.

Goldstein, I., & Yang, L. (2014). Market efficiency and real efficiency: The connect and disconnect via feedback effects. *Working Paper*.

Goldstein, I., & Yang, L. (2017). Commodity financialization: Risk sharing and price discovery in commodity futures markets. *Working Paper*.

Haddad, V., Moreira, A., & Muir, T. (2022). When selling becomes viral: Disruptions in debt markets in the covid-19 crisis and the fed's response. *Working Paper*.

Holden, C. W., Lin, M., Lu, K., Wei, Z., & Yang, J. (2020). The effect of secondary market existence on primary market liquidity: Theory and evidence from a natural experiment in peer-to-peer lending. *Working Paper*.

Kargar, M., Lester, B., Lindsay, D., Liu, S., Weill, P.-O., & Zuniga, D. (2020). Corporate bond liquidity during the covid-19 crisis. *Working Paper*.

Li, J. S., & Momin, R. (2020). The causal effect of the fed's corporate credit facilities on eligible issuer bonds. *Working Paper*.

Mizrach, B., & Neely, C. J. (2020). Secondary market corporate credit facility supports main street. *Economic Synopses*, *No. 17*.

Odean, T. (1999). Do investors trade too much? *American Economic Review*, *89*(5), 1279–1298.

O'Hara, M., & Zhou, X. A. (2020). Anatomy of a liquidity crisis: Corporate bonds in the covid-19 crisis. *Working Paper*.

Singh, D. (2020, October 20). The federal reserve's corporate credit facilities: Why, how, and for whom. *Speech*.

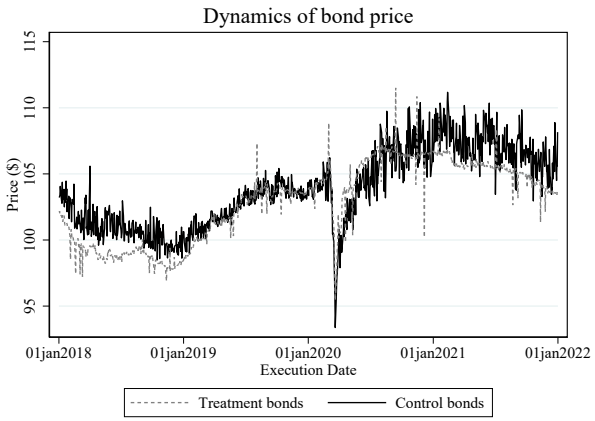
Sockin, M., & Xiong, W. (2015). Informational frictions and commodity markets. *Journal of Finance*, *70*, 2063-2098.

Stein, J. C. (1987). Informational externalities of welfare-reducing speculation. *Journal of Political Economy*, *95*, 1123-1145.

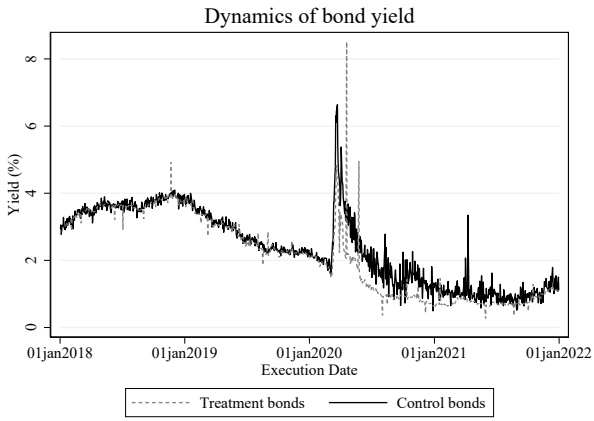
Subrahmanyam, A., & Titman, S. (2001). Feedback from stock prices to cash flows. *Journal of Finance*, *56*, 2389-2413.

Williamson, O. E. (1975). *Markets and hierarchies: Analysis and antitrust implications: A study in the economics of internal organization*. New York, NY: Free Press.

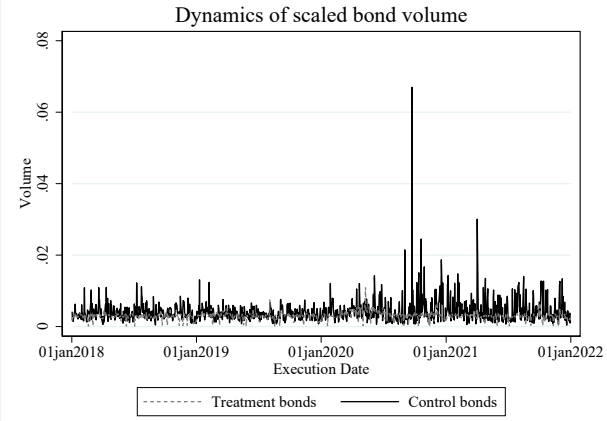
Zuo, L. (2016). The informational feedback effects of stock prices on management forecasts. *Journal of Accounting and Economics*, *61*, 391-413.



(a) Panel A



(b) Panel B



(c) Panel C

Figure 1.Dynamics of prices and yields

The figure plots the daily average corporate bond prices (Panel A), yields (Panel B), and volumes scaled by amount outstanding (Panel C) of treatment and control bonds between Jan 1st, 2018 and Dec 31st, 2021. Treatment bonds refer to SMCCF-eligible bonds issued by SMCCF-eligible firms and purchased by the Federal Reserve, while control bonds refer to SMCCF-eligible bonds issued by SMCCF-eligible firms that do not have their bonds been purchased. For each bond, daily volume-weighted bond price, yield, and daily bond scaled volume are calculated by only including trades greater than or equal to $100,000.

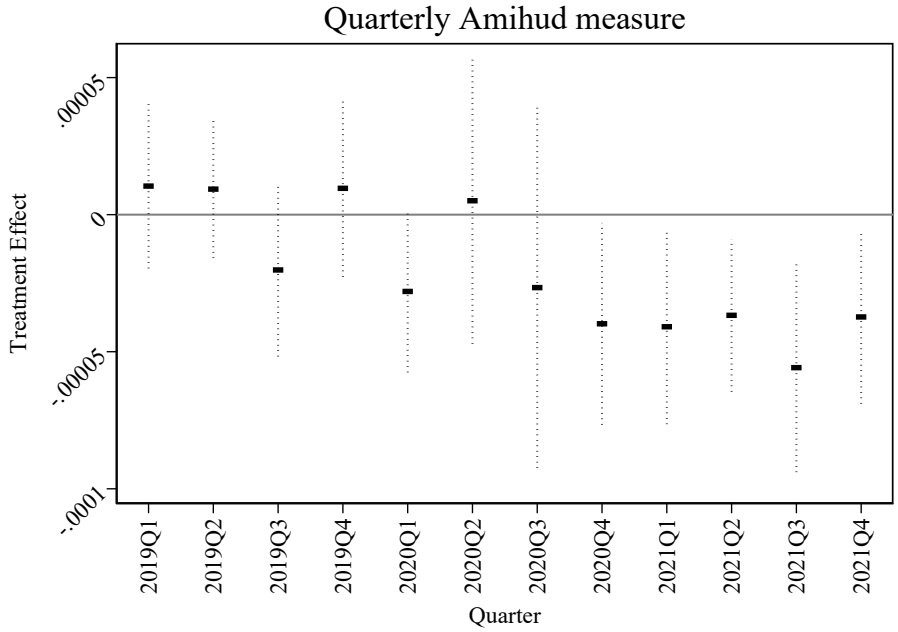
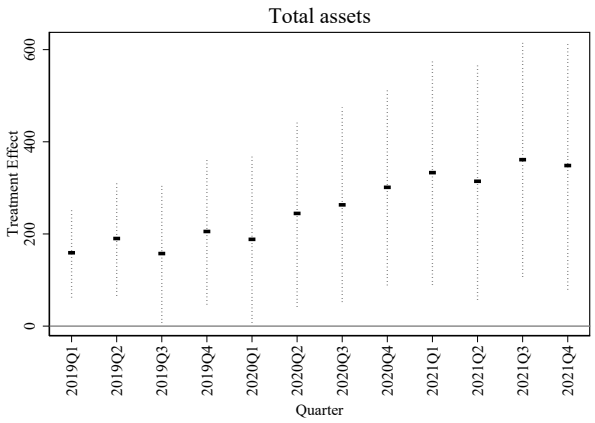
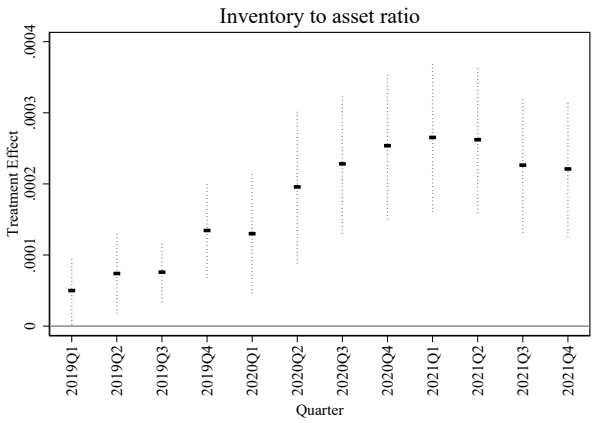


Figure 2.Dynamics of secondary market liquidity

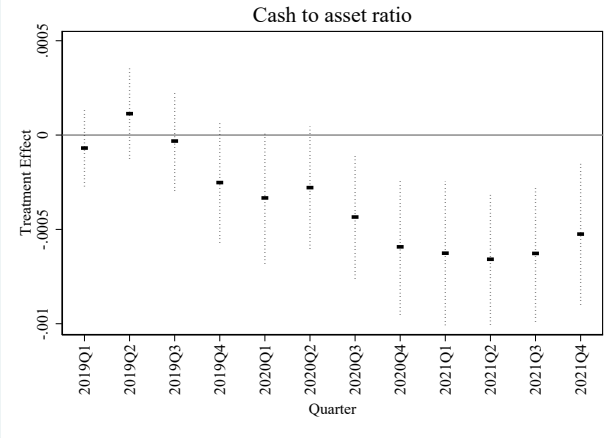
The figure plots the coefficient estimates from dynamic difference-in-differences regressions at bond-quarter level that examine the effect of the Federal Reserve's Secondary Market Corporate Credit Facility on liquidity in corporate bond secondary markets measured by quarterly Amihud measure. In the figure, the solid horizontal bars correspond to the coefficient estimates and the dotted vertical bars indicate 90% confidence intervals, where standard errors are clustered at firm level.



(a) Panel A



(b) Panel B



(c) Panel C

Figure 3.Dynamics of assets, inventory, and cash

The figure plots the coefficient estimates from dynamic difference-in-differences regressions at firm-quarter level that examine the effect of the Federal Reserve's Secondary Market Corporate Credit Facility on total assets (Panel A), inventory to asset ratio (Panel B), and cash to asset ratio (Panel C). In the figure, the solid horizontal bars correspond to the coefficient estimates and the dotted vertical bars indicate 90% confidence intervals, where standard errors are clustered at firm level.

Table I
Summary Statistics

The table presents summary statistics for all of the dependent variables used in our analyses, as well as several variables used to determine eligibility for the Federal Reserve's Secondary Market Corporate Credit Facility (SMCCF) including issue credit rating and remaining time to maturity. For each variable, we present the mean, the standard deviation (SD), the 1st percentile (p1), the median (p50), and the 99th percentile (p99) for two groups of firms. The first five columns show statistics for Treatment firms, which are SMCCF-eligible firms that had bonds purchased, while the last five columns show statistics for Control firms which are SMCCF-eligible firms that did not have their bonds purchased. Definitions and constructions for all variables are discussed in detail in Section A of the Appendix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Treatment					Control				
VARIABLES	Mean	SD	p1	p50	p99	Mean	SD	p1	p50	p99
Total Purchased Amount ($Millions)	12.097	16.223	1.021	6.363	88.391	.	.	.	.	.
Market Capitalization ($Billions)	63.085	149.487	1.845	26.059	471.339	17.791	27.812	0.788	7.646	130.532
Numeric Rating	8.020	1.700	2.000	8.140	10.791	8.558	1.464	5.000	9.000	11.578
Remaining Maturity (Years)	9.645	4.226	2.479	9.451	22.228	9.323	6.702	0.664	7.391	30.030
Average Cost of Debt	0.009	0.003	0.001	0.009	0.016	0.011	0.004	0.003	0.010	0.022
Average Tax Rate	0.186	0.120	0.000	0.196	0.618	0.181	0.137	0.000	0.189	0.769
Leverage Ratio	0.539	0.238	0.152	0.511	1.356	0.435	0.174	0.058	0.441	0.807
Interest Expense to Earnings Ratio	-0.184	35.609	-3.305	0.164	4.219	0.211	3.212	-8.217	0.164	5.125
Net Issuance of Equity Ratio	1.256	0.476	0.928	1.050	3.064	1.226	0.655	0.959	1.023	5.320
Net Issuance of Debt Ratio	0.035	0.242	-0.219	0.000	0.804	0.046	0.238	-0.349	0.000	1.064
Investment to Asset Ratio	0.009	0.010	0.000	0.005	0.049	0.008	0.009	0.000	0.005	0.042
Total Assets ($Millions)	57.696	104.695	2.124	23.953	551.622	32.659	114.998	1.853	7.055	811.826
PP&E to Asset Ratio	0.289	0.265	0.000	0.187	0.876	0.296	0.291	0.000	0.151	0.912
Inventory to Asset Ratio	0.068	0.102	0.000	0.021	0.451	0.062	0.082	0.000	0.023	0.448
Number of Employees (#Thousands)	60.858	157.159	0.000	19.100	504.800	22.874	36.799	0.000	11.000	181.000
Stock Buyback Ratio	0.007	0.015	0.000	0.002	0.051	0.004	0.010	0.000	0.000	0.035
Cash to Asset Ratio	0.091	0.107	0.001	0.054	0.507	0.072	0.075	0.000	0.049	0.316
Dividend Payout Ratio	0.722	10.066	-5.113	0.371	6.545	0.475	5.552	-10.792	0.323	10.833

Table II
Impact of SMCCF on Bond Price, Yield, and Volume

The table presents the coefficient estimates from static difference-in-differences regressions at bond-day level that examine the effect of the Federal Reserve's Secondary Market Corporate Credit Facility (SMCCF) on corporate bond price, yieldsand volume scaled by amount outstanding using regressions of the form:

$$y_{b,i,d} = \alpha + \beta Purchased\_Post_{i,d} + \delta_i + \delta_d + \epsilon_{b,d},$$

where the dependent variable $y_{b,i,d}$ is daily volume-weighted bond price, yield, and daily bond scaled volume for bond b issued by firm i in day d, calculated by only including trades greater than or equal to \$100,000. The variable $Purchased\_Post_{i,d}$ is an indicator variable equal to 1 if firm i is SMCCF-eligible firms that have their bonds been purchased and day d after Mar 31st, 2020, and 0 otherwise. MDES and Sample St. Dev. are the minimum detectable effect size and the sample standard deviation of each outcome variable. Firm fixed effects (δ_i) and day fixed effects (δ_d) are included in all regressions. t-statistics calculated using robust standard errors double clustered at the firm and day level are shown in parentheses below the estimates. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	(1) Price	(2) Price	(3) Price	(4) Yield	(5) Yield	(6) Yield	(7) Scaled_Volume	(8) Scaled_Volume	(9) Scaled_Volume
Purchased_Post	6.7688***	1.9920***	2.4559***	-1.5875***	-0.4949***	-0.4671**	-0.0000	0.0001	0.0002
	(21.75)	(2.66)	(3.12)	(-19.33)	(-3.28)	(-2.40)	(-0.37)	(0.25)	(0.46)
MDES	0.871	2.095	2.204	0.230	0.422	0.545	0.000266	0.00122	0.00132
Sample St. Dev.	17.31	17.31	17.31	11.63	11.63	11.63	0.0121	0.0121	0.0121
Observations	2,016,066	2,016,024	2,016,024	2,000,949	2,000,906	2,000,906	2,015,989	2,015,947	2,015,947
R-squared	0.090	0.143	0.179	0.014	0.019	0.027	0.005	0.076	0.079
Clustered S.E.	Y	Y	Y	Y	Y	Y	Y	Y	Y
Issue Rating F.E.	Y	N	Y	Y	N	Y	Y	N	Y
Remaining Maturity F.E.	Y	N	Y	Y	N	Y	Y	N	Y
Firm F.E.	N	Y	Y	N	Y	Y	N	Y	Y
Day F.E.	N	Y	Y	N	Y	Y	N	Y	Y

Table III
Impact of SMCCF on Stock Return and Cost of Debt

The table presents estimates from static difference-in-differences regressions that examine the effect of the Federal Reserve's Secondary Market Corporate Credit Facility (SMCCF) on stock returns, offering yields of newly issued debt, and cost of debt. For the firm-day analyses we examine regressions of the form:

$$y_{i,d} = \alpha + \beta Purchased\_Post_{i,d} + \delta_i + \delta_d + \epsilon_{i,d},$$

where the dependent variable y is $RET_{i,d}$ in column (1), defined as the daily stock return for firm i on day d, and $Offering\_Yield_{i,d}$ in column (2), defined as the offering-amount-weighted offering yield for firm i on day d. $Offering\_Yield_{i,d}$ remains the same if there is no newly issued debt. $Purchased\_Post_{i,d}$ is an indicator variable equal to 1 if the stock or new debt is issued by SMCCF-eligible firm i and day d after March 31, 2020, and 0 otherwise. For the firm-quarter level analyses in Column (3) we examine regressions of the form:

$$CoD_{i,q} = \alpha + \beta Purchase\_Amount_{i,q-1} + \delta_i + \delta_q + \epsilon_{i,q},$$

where the dependent variable is $CoD_{i,q}$ defined as the average cost of debt for firm i in quarter q. $Purchase\_Amounti, q-1$ is a multi-valued treatment variable equal to the aggregate amount of corporate bond of firm i purchased by the Federal Reserve in quarter $q-1$, and 0 for the remaining firm-quarters. MDES and Sample St. Dev. are the minimum detectable effect size and the sample standard deviation of each outcome variable. Firm fixed effects (δ_i) and quarter fixed effects (δ_q) are included in all regressions. t-statistics calculated using robust standard errors, double clustered at the firm and day level in columns (1) and (2) and the firm and quarter level in column (3), are shown in parentheses below the estimates. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variables		
Explanatory Variables	RET (1)	Offering_Yield (2)	CoD (3)
Purchased_Post	-0.0002	-0.3116**	
	(-0.59)	(-2.56)	
Purchase_Amount			0.0000
			(0.13)
MDES	0.000770	0.341	3.24e-05
Sample St. Dev.	0.0227	1.137	0.00304
Observations	398,850	377,881	5,037
R-squared	0.399	0.672	0.771
Clustered S.E.	Y	Y	Y
Firm F.E.	Y	Y	Y
Day F.E.	Y	Y	N
Quarter F.E.	N	N	Y

Table IV
Calibration of Treatment Effect on Total Cost of Capital

The table presents calibration results on the relation between firm's cost of capital and the treatment effect on the offering yield of newly issued debt. We examine the cost and composition of funding for firms in our sample to estimate how a change in the yield of newly issued bonds should impact the weighted average cost of capital for the typical firm. Cost of debt with no intervention is the mean of average cost of debt for treatment firms before the treatment. New debt percentage is the offering amount divided by total debt for treatment firms. New debt treatment effect is the point estimate brought from Table III. Cost of debt with intervention is then estimated using these numbers. Debt to asset ratio, equity to asset ratio, corporate tax rate, and cost of equity are the mean of their corresponding quarterly measure for treatment firms. WACC with and without intervention are then calculated respectively.

Cost of Debt (no intervention)	0.941%
New Debt % of Total Debt	11.874%
Treatment Effect on Cost of New Debt	-0.312%
Cost of Debt (after treatment)	0.904%
Debt to Assets Ratio	53.051%
Equity to Assets Ratio	46.949%
Corporate Tax Rate	18.744%
Cost of Equity	3.738%
WACC (no intervention)	2.161%
WACC (after treatment)	2.145%
Total Change in Cost of Capital	**-0.016%**

Table V
Impact of SMCCF on Liquidity in Secondary Markets

The table presents the coefficient estimates from static difference-in-differences regressions at bond-quarter level that examine the effect of the Federal Reserve's Secondary Market Corporate Credit Facility (SMCCF) on liquidity in corporate bond secondary markets using regressions of the form:

$$Amihud\_Quarterly_{b,i,q} = \alpha + \beta Purchase\_Amount_{i,q-1} + \delta_i + \delta_q + \epsilon_{b,q},$$

where the dependent variable $Amihud\_Quarterly_{b,i,q}$ is the median of daily average of price impact measure for bond b issued by firm i in quarter q. The variable $Purchase\_Amount_{i,q-1}$ is a multi-valued treatment variable equal to the aggregate amount of corporate bond of firm i purchased by the Federal Reserve in quarter $q-1$, and 0 for the remaining firm-quarters. MDES and Sample St. Dev. are the minimum detectable effect size and the sample standard deviation of each outcome variable. Firm fixed effects (δ_i) and quarter fixed effects (δ_q) are included in all regressions. t-statistics calculated using robust standard errors double clustered at the firm and quarter level are shown in parentheses below the estimates. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	(1) Amihud_Quarterly
Purchase_Amount	-0.0001**
	(-2.27)
MDES	7.51e-05
Sample St. Dev.	0.0179
Observations	70,118
R-squared	0.223
Clustered S.E.	Y
Firm F.E.	Y
Quarter F.E.	Y

Table VI
Impact of SMCCF on Capital Structure

The table presents the coefficient estimates from static difference-in-differences regressions at firm-quarter level that examine the effect of the Federal Reserve's Secondary Market Corporate Credit Facility (SMCCF) on capital structure using regressions of the form:

$$y_{i,q} = \alpha + \beta Purchase\_Amount_{i,q-a} + \delta_i + \delta_q + \epsilon_{i,q},$$

where the dependent variable $y_{i,q}$ is the leverage ratio (lev_ratio), the interest expense to earnings ratio (int_to_earn), the net issuance of equity to shares outstanding ratio (net_equity_ratio), or the percentage of new debt issuance (net_debt_ratio) for firm i in quarter q. $Purchase\_Amount_{i,q-a}$ is a multi-valued treatment variable equal to the aggregate amount of corporate bond of firm i purchased by the Federal Reserve in quarter $q-a$, and 0 for the remaining firm-quarters. Firm fixed effects (δ_i) and quarter fixed effects (δ_q) are included in all regressions. t-statistics calculated using robust standard errors double clustered at the firm and quarter level are shown in parentheses below the estimates. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	lev_ratio	int_to_earn	net_equity_ratio	net_debt_ratio	lev_ratio	int_to_earn	net_equity_ratio	net_debt_ratio	lev_ratio	int_to_earn	net_equity_ratio	net_debt_ratio
Purchase_Amount_Lag1	-0.0004	0.2819	0.0014	0.0015**								
	(-1.06)	(1.35)	(0.90)	(2.22)								
Purchase_Amount_Lag2					-0.0001	0.3908	0.0001	0.0010				
					(-0.23)	(0.90)	(0.06)	(1.57)				
Purchase_Amount_Lag3									-0.0003	0.2879	-0.0016*	-0.0001
									(-0.46)	(1.35)	(-1.79)	(-0.12)
MDES	0.000947	0.583	0.00440	0.00189	0.00137	1.217	0.00472	0.00171	0.00169	0.596	0.00246	0.00198
Sample St. Dev.	0.233	33.10	0.504	0.241	0.233	33.10	0.504	0.241	0.233	33.10	0.504	0.241
Observations	5,382	6,106	5,031	5,118	5,382	6,106	5,031	5,118	5,382	6,106	5,031	5,118
R-squared	0.903	0.142	0.940	0.094	0.903	0.142	0.940	0.094	0.903	0.142	0.940	0.094
Clustered S.E.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm F.E.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Quarter F.E.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table VII
Impact of SMCCF on Real Firm Behavior

The table presents the coefficient estimates from static difference-in-differences regressions that examine the real economic effects of the Federal Reserve's Secondary Market Corporate Credit Facility (SMCCF) using regressions of the form:

$$y_{i,q} = \alpha + \beta Purchase\_Amount_{i,q-a} + \delta_i + \delta_q + \epsilon_{i,q},$$

where the dependent variables $y_{i,q}$ is either the capital expenditure to total assets ratio ($invest\_to\_at$) in columns (1), (5), and (9), total assets ($assets$) in columns (2), (6), and (10), property plant and equipment to total assets ratio ($ppent\_to\_at$) in columns (3), (7), and (11), the inventory to total assets ratio ($invt\_to\_at$) in columns (4), (8), and (12), or the number of employees ($num\_emp_{i,y}$) in column (13) for firm i in quarter q (or year y for column (13)). $Purchase\_Amount_{i,q-a}$ is a multi-valued treatment variable equal to the aggregate amount of corporate bond of firm i purchased by the Federal Reserve in quarter q (or year y), and 0 otherwise. MDES and Sample St. Dev. are the minimum detectable effect size and the sample standard deviation of each outcome variable. Firm fixed effects (δ_i) and quarter (δ_q) or year fixed effects (δ_y) are included in all regressions. t-statistics calculated using robust standard errors double clustered at the firm and quarter level (or firm and year for column (13)) are shown in parentheses below the estimates. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	(1) invest_to_at	(2) assets	(3) ppent_to_at	(4) invt_to_at	(5) invest_to_at	(6) assets	(7) ppent_to_at	(8) invt_to_at	(9) invest_to_at	(10) assets	(11) ppent_to_at	(12) invt_to_at	(13) num_emp
Purchase_Amount_Lag1	0.0000	302.3373*	-0.0002	0.0003***									
	(1.32)	(1.94)	(-1.20)	(3.31)									
Purchase_Amount_Lag2					0.0000*	356.7663*	-0.0003	0.0004***					
					(2.09)	(2.04)	(-1.75)	(3.60)					
Purchase_Amount_Lag3									0.0000	400.9002*	-0.0001	0.0003***	
									(1.63)	(1.93)	(-0.49)	(3.49)	
Annual_Purchase_Amount													0.0000
													(1.72)
MDES	7.61e-05	436.1	0.000390	0.000275	6.07e-05	490.2	0.000473	0.000283	5.36e-05	580.8	0.000580	0.000262	4.97e-08
Sample St. Dev.	0.0101	106454	0.268	0.0995	0.0101	106454	0.268	0.0995	0.0101	106454	0.268	0.0995	156.9
Observations	6,151	6,221	5,559	6,029	6,151	6,221	5,559	6,029	6,151	6,221	5,559	6,029	1,351
R-squared	0.784	0.990	0.991	0.979	0.784	0.990	0.991	0.979	0.784	0.990	0.991	0.979	0.980
Clustered S.E.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm F.E.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Quarter F.E.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Year F.E.	N	N	N	N	N	N	N	N	N	N	N	N	Y

Table VIII
Impact of SMCCF on Firm Liquidity and Payout Policy

The table presents the coefficient estimates from static difference-in-differences regressions at firm-quarter level that examine the effect of the Federal Reserve's Secondary Market Corporate Credit Facility (SMCCF) on liquidity and payout using regressions of the form:

$$y_{i,q} = \alpha + \beta Purchase\_Amount_{i,q-a} + \delta_i + \delta_q + \epsilon_{i,q},$$

where the dependent variable $y_{i,q}$ is the shares repurchased to shares outstanding ratio (*buyback_ratio*), the the cash holding to assets ratio (*cash_to_at*), or the the dividends to assets ratio (*payout_ratio*) for firm i in quarter q. $Purchase\_Amount_{i,q-a}$ is a multi-valued treatment variable equal to the aggregate amount of corporate bond of firm i purchased by the Federal Reserve in quarter $q-a$, and 0 for the remaining firm-quarters. MDES and Sample St. Dev. are the minimum detectable effect size and the sample standard deviation of each outcome variable. Firm fixed effects (δ_i) and quarter fixed effects (δ_q) are included in all regressions. t-statistics calculated using robust standard errors double clustered at the firm and quarter level are shown in parentheses below the estimates. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	(1) buyback_ratio	(2) cash_to_at	(3) payout_ratio	(4) buyback_ratio	(5) cash_to_at	(6) payout_ratio	(7) buyback_ratio	(8) cash_to_at	(9) payout_ratio
Purchase_Amount_Lag1	0.0000	-0.0008**	-0.0306						
	(1.05)	(-2.38)	(-1.20)						
Purchase_Amount_Lag2				-0.0001	-0.0010**	-0.0545			
				(-1.17)	(-2.92)	(-0.82)			
Purchase_Amount_Lag3							-0.0001	-0.0010***	0.0072
							(-1.43)	(-3.05)	(0.49)
MDES	0.000131	0.000903	0.0714	0.000188	0.000957	0.186	0.000214	0.000903	0.0413
Sample St. Dev.	0.0145	0.103	9.596	0.0145	0.103	9.596	0.0145	0.103	9.596
Observations	5,276	6,221	6,129	5,276	6,221	6,129	5,276	6,221	6,129
R-squared	0.263	0.852	0.055	0.263	0.853	0.055	0.263	0.852	0.055
Clustered S.E.	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm F.E.	Y	Y	Y	Y	Y	Y	Y	Y	Y
Quarter F.E.	Y	Y	Y	Y	Y	Y	Y	Y	Y

Internet Appendix for "Does Secondary Market Liquidity affect the Economy?"

Jixing Li and Matthew C. Ringgenberg[1]

This Internet Appendix provides additional information to supplement the analyses provided in the main paper.

- Section A provides detailed definitions of the variables used in our analyses.
- Section B provides additional analyses to supplement the main text.

[1]Citation format: Li, Jixing and Matthew C. Ringgenberg, Internet Appendix for "Does Secondary Market Liquidity affect the Economy?" 2022, Working Paper.

A. Data and Variable Definitions

All financial ratios are calculated at quarterly frequency using the firm-level financial data from the Center for Research in Security Prices (CRSP) and Compustat merged database. Their definitions are listed below. Item names refer to Compustat data items.

- Market Capitalization: Item CSHOQ × Item PRCCQ
- Average Cost of Debt: Item XINT / ((Item DLCQ + Item DLTTQ + lagged Item DLCQ + lagged Item DLTTQ) / 2)
- Average Tax Rate: Item TXTQ / Item PIQ, value is set to missing if it is above one or below zero
- Leverage Ratio: (Item DLCQ + Item DLTTQ) / (Item DLCQ + Item DLTTQ + Item SEQQ)
- Interest Expense to Earnings Ratio: Item XINTQ / Item IBQ
- Net Issuance of Equity Ratio: (Item CSHIQ - Item CSHOPQ) / Item CSHOQ
- Net Issuance of Debt Ratio: (Item DLCQ + Item DLTTQ - lagged Item DLCQ - lagged Item DLTTQ) / (lagged Item DLCQ + lagged Item DLTTQ))
- Investment to Asset Ratio: (Item CAPXY - lagged Item CAPXY) / ((Item ATQ + lagged Item ATQ) / 2)
- Total Assets: Item ATQ
- PP&E to Asset Ratio: Item PPENTQ / Item ATQ
- Inventory to Asset Ratio: Item INVTQ / Item ATQ

- Number of Employees: Item EMP
- Stock Buyback Ratio: Item CSHOPQ / Item CSHOQ
- Cash to Asset Ratio: Item CHEQ / Item ATQ
- Dividend Payout Ratio: (Item DVY - lagged Item DVY + Item DVPQ) / Item IBADJQ

To measure corporate bond liquidity, we construct the quarterly Amihud measure following Dick-Nielsen et al. (2012). It measures the price impact of a trade per unit traded. For each corporate bond, the measure is the daily average of absolute returns r_i divided by the trade size Q_i (\$Millions) of consecutive transactions:

$$Amihud_t = \frac{1}{N_t} \sum_{i=1}^{N_t} \frac{|r_i|}{Q_i} = \frac{1}{N_t} \sum_{i=1}^{N_t} \frac{|\frac{P_i - P_{i-1}}{P_{i-1}}|}{Q_i},$$

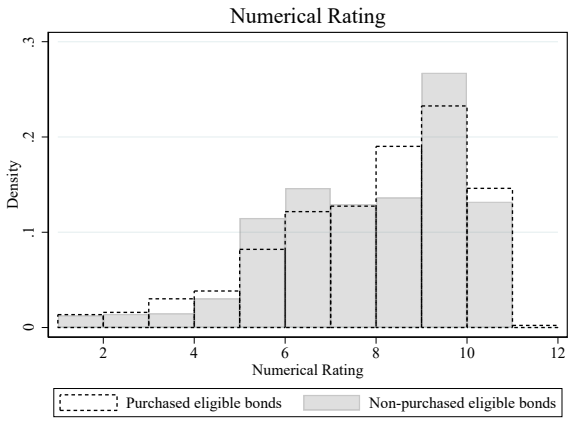
where N_t is the number of returns on day t. At least two transactions are required on a given day to calculate the measure, and we define the quarterly Amihud measure by taking the median of daily measures within the quarter.

B. Supplemental Analyses

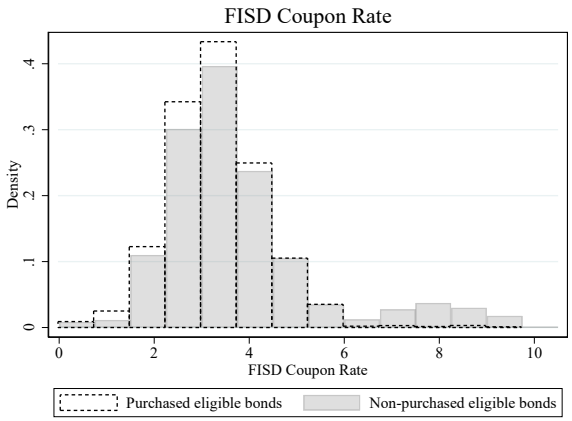
Table B1
Ratings scales

The table presents credit ratings scales and corresponding numeric values for Moody's, S&P, and Fitch.

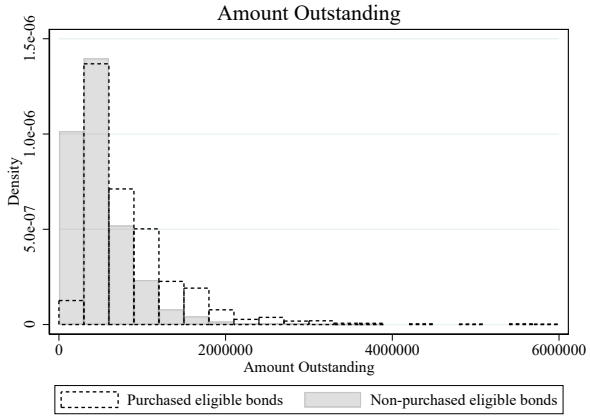
Moody's	S&P	Fitch	Value
Aaa	AAA	AAA	1
Aa1	AA+	AA+	2
Aa2	AA	AA	3
Aa3	AA-	AA-	4
A1	A+	A+	5
A2	A	A	6
A3	A-	A-	7
Baa1	BBB+	BBB+	8
Baa2	BBB	BBB	9
Baa3	BBB-	BBB-	10
Ba1	BB+	BB+	11
Ba2	BB	BB	12
Ba3	BB-	BB-	13
B1	B+	B+	14
B2	B	B	15
B3	B-	B-	16
Caa1	CCC+	CCC+	17
Caa2	CCC	CCC	18
Caa3	CCC-	CCC-	19
Ca	CC	CC	20
C	C	C	21
	D	D	22



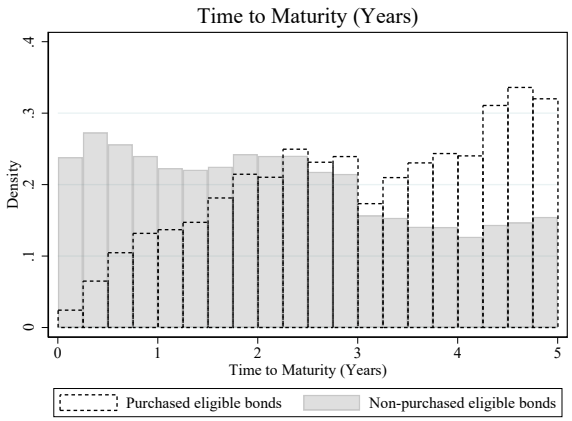
(a) Panel A



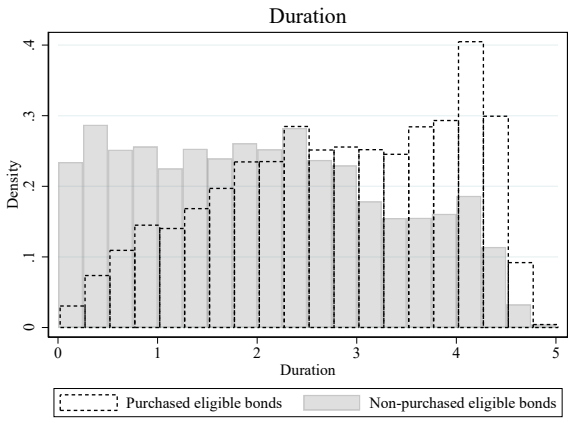
(b) Panel B



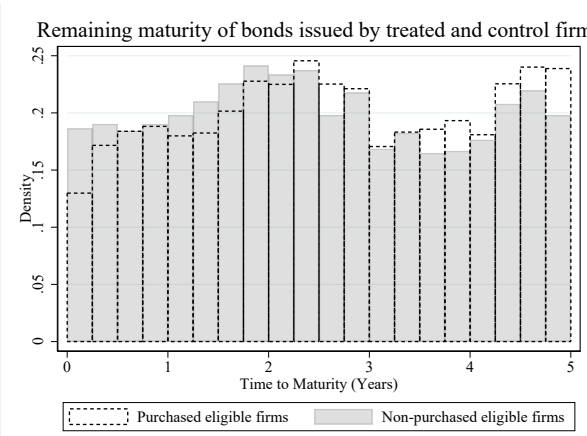
(c) Panel C



(d) Panel D



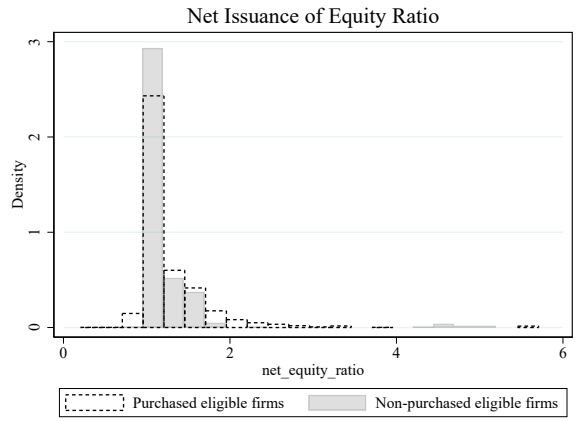
(e) Panel E



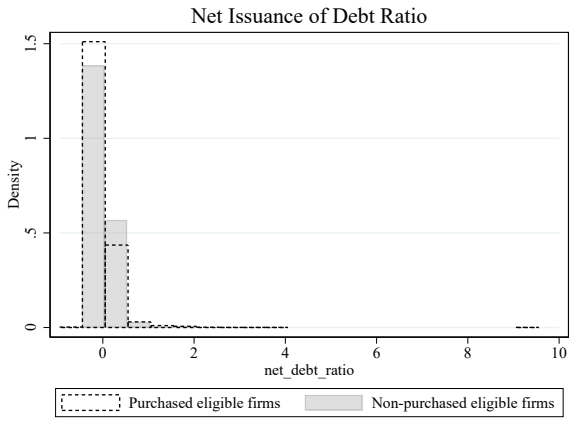
(f) Panel F

Figure B1.Bond characteristics distribution

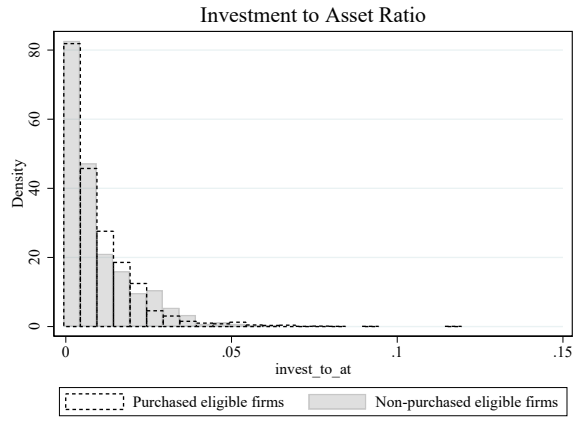
The figure plots the distribution comparisons between treatment bonds and control bonds on different bond characteristics, including issue credit rating (Panel A), coupon rate (Panel B), amount outstanding (Panel C), remaining time to maturity (Panel D), and duration (Panel E). Treatment bonds refer to bonds that were actually purchased by the Federal Reserve, while control bonds refer to bonds that were not purchased. Only those bonds that are eligible for SMCCF purchase are included (i.e., investment-grade bonds with remaining maturities of five years or less). Panel F plots the remaining maturity distribution comparison between bonds issued by treatment and control firms. Treatment firms refer to SMCCF-eligible firms that have their bonds been purchased, while control firms refer to SMCCF-eligible firms that do not have their bonds been purchased.



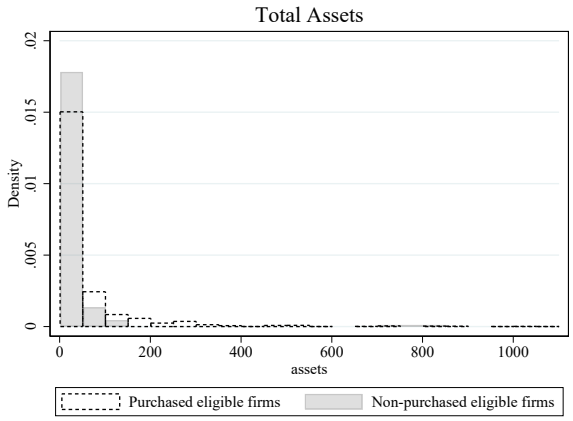
(a) Panel A



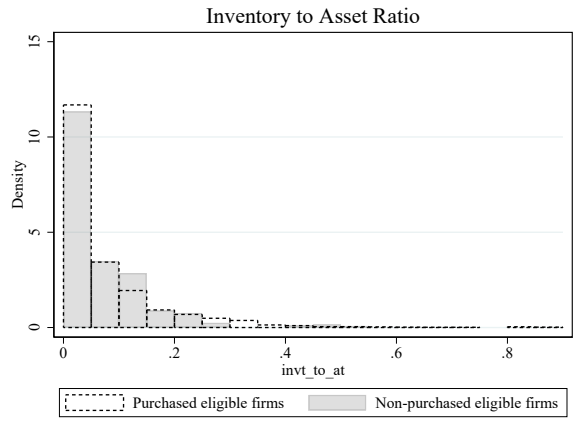
(b) Panel B



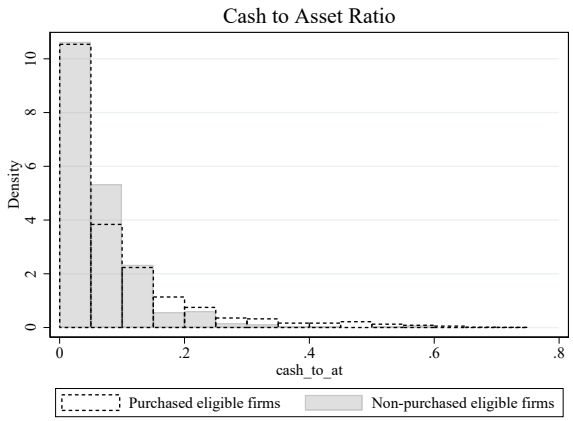
(c) Panel C



(d) Panel D



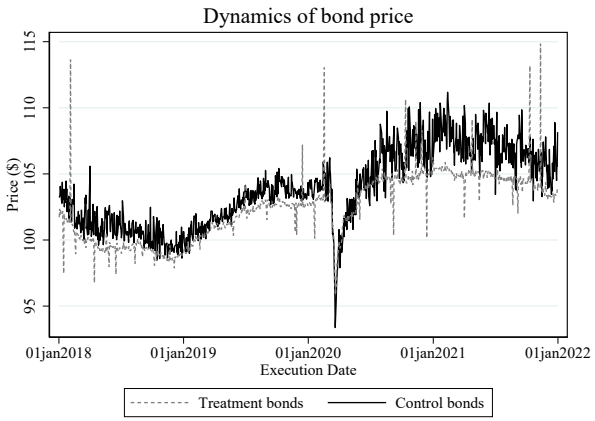
(e) Panel E



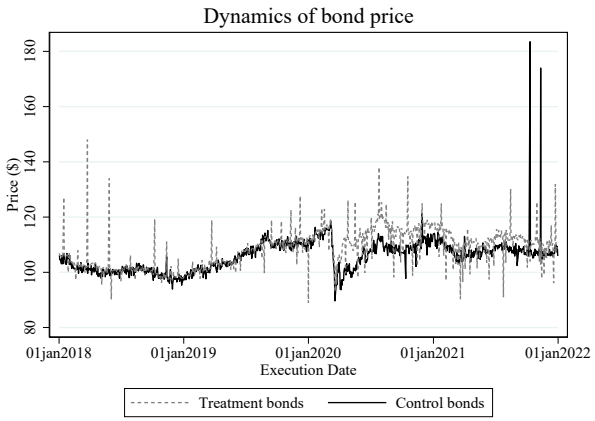
(f) Panel F

Figure B2.Firm characteristics distribution

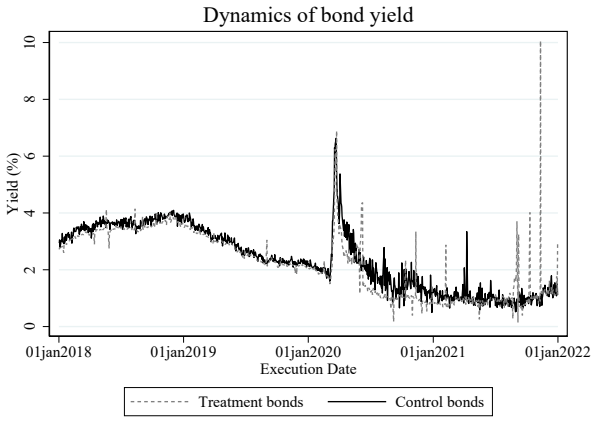
The figure plots the distribution comparisons between treatment firms and control bonds on selected firm characteristics, including net issuance of equity (Panel A), net issuance of debt (Panel B), investment to asset ratio (Panel C), total assets (Panel D), inventory to asset ratio (Panel E), and cash to asset ratio (Panel F). The sample period is from 2018Q1 to 2020Q1, before the Federal Reserve bond purchase program.



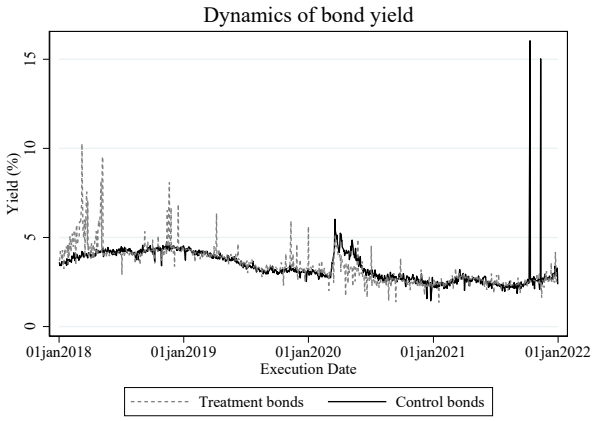
(a) Panel A



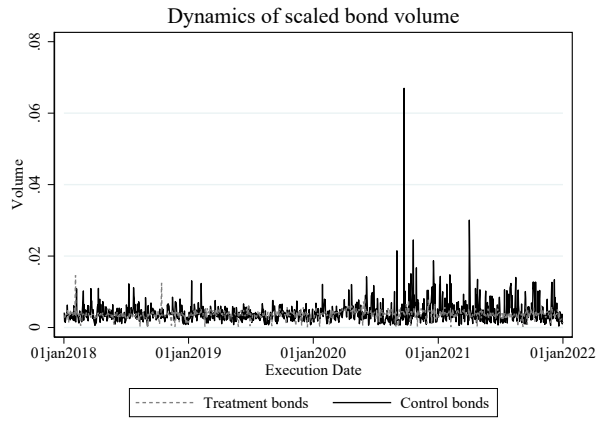
(b) Panel B



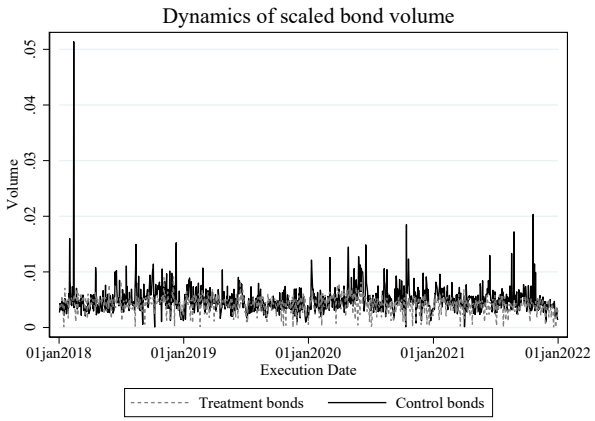
(c) Panel C



(d) Panel D



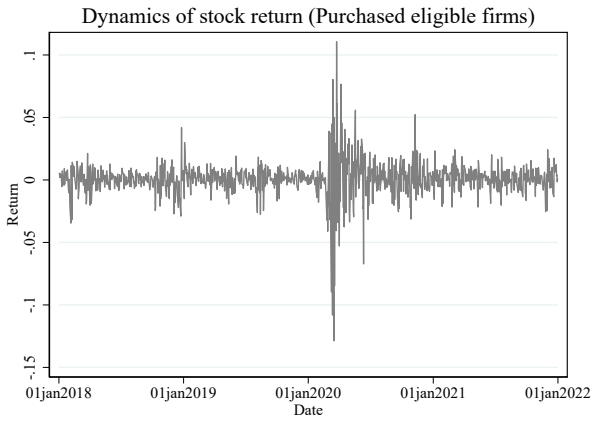
(e) Panel E



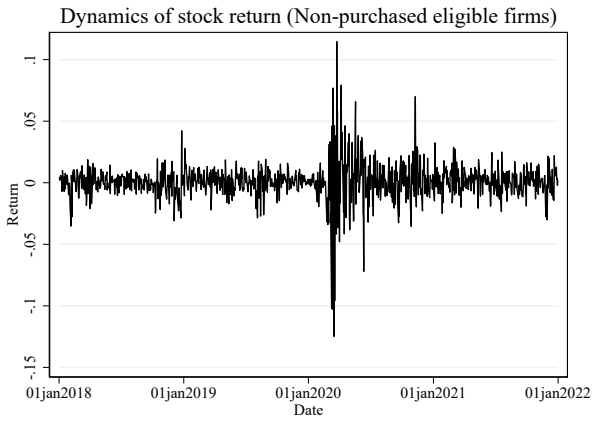
(f) Panel F

Figure B3.Potential spillover effect analysis

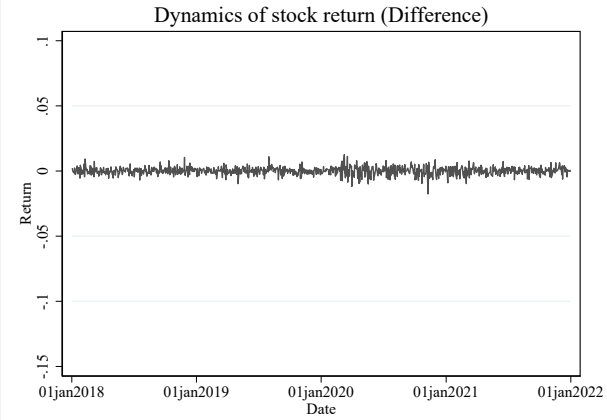
The figure plots the daily average corporate bond price (Panel A/B), yield (Panel C/D), and volume scaled by amount outstanding (Panel E/F) of treatment and control bonds between Jan 1st, 2018 and Dec 31st, 2021. In Panel A, C, and E, treatment bonds refer to SMCCF-eligible bonds not purchased by the Federal Reserve and issued by SMCCF-eligible firms that have other SMCCF-eligible bonds been purchased, while control bonds refer to SMCCF-eligible bonds issued by SMCCF-eligible firms that do not have their bonds been purchased. In Panel B, D, and F, treatment bonds refer to SMCCF-ineligible bonds issued by SMCCF-eligible firms that have their bonds been purchased, while control bonds refer to SMCCF-ineligible bonds issued by SMCCF-eligible firms that do not have their bonds been purchased. For each bond, daily volume-weighted bond price, yield, and daily bond scaled volume are calculated by only including trades greater than or equal to $100,000.



(a) Panel A



(b) Panel B



(c) Panel C

Figure B4.Supplement to Table III

The figure plots the daily average stock returns of treatment firms (Panel A), control firms (Panel B), and their difference (Panel C) between Jan 1st, 2018 and Dec 31st, 2021. Treatment firms refer to SMCCF-eligible firms that have their bonds been purchased, while control firms refer to SMCCF-eligible firms that do not have their bonds been purchased.