

# Research Brief

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# Corporate Bond Liquidity During the COVID-19 Crisis

## **Mahyar Kargar**

University of Illinois at Urbana-Champaign

## **Benjamin Lester**

Federal Reserve Bank of Philadelphia

## **David Lindsay**

University of California, Los Angeles

## **Shuo Liu**

University of California, Los Angeles

## **Pierre-Olivier Weill**

University of California, Los Angeles, NBER, and CEPR

## **Diego Zúñiga**

University of California, Los Angeles

# Corporate Bond Liquidity During the COVID-19 Crisis

by Mahyar Kargar; Benjamin Lester; David Lindsay; Shuo Liu; Pierre-Olivier Weill; Diego Zúñiga

## Introduction

The COVID-19 virus has wrought havoc on the global economy. In mid-March, as both the scope of the pandemic and the duration of its effects became apparent, financial markets around the world entered a period of turmoil. As the price of equities and debt plummeted, reports of illiquidity in key financial markets emerged.<sup>1</sup> In the United States, the Federal Reserve responded with a variety of interventions aimed at different markets within the financial sector.

In this note, we attempt to shed some light on recent trading conditions in one such market: the market for US corporate bonds. This market, nearly \$10 trillion in size, serves as a primary source of funding for large US corporations. However, with the prospect of widespread downgrades and possible defaults, the cost of issuing debt increased dramatically in mid-March, and investors withdrew their money from corporate bond funds in record numbers.<sup>2</sup> In the midst of this turmoil, former Federal Reserve chairs Bernanke and Yellen described the corporate bond market as “under significant stress” (Bernanke and Yellen (2020)), while a March 18 report from Bank of America deemed the market “basically broken” (Idzelis (2020)).

In response, the Federal Reserve introduced several facilities to lower the costs of intermediating corporate debt and to bolster liquidity. For example, on the evening of March 17, the Federal Reserve introduced the Primary Dealer Credit Facility (PDCF), which offers overnight and term lending to primary dealers that can be collateralized with a variety of assets, including investment grade (IG) corporate bonds. By allowing dealers to borrow against a variety

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MANAGER

<sup>1</sup> In fact, reports of trading difficulties even reached the market for Treasuries, in what one journalist described as a “stunning lack of liquidity in what’s often billed as the world’s deepest and most liquid bond market.” Chappatta (2020)

<sup>2</sup> For example, between March 5 and March 20, the ICE Bank of America AAA US Corporate Index Option-Adjusted spread increased by about 160 basis points (bps), while the corresponding spread for high yield corporate debt (HY) increased by more than 500 bps. See Ebsim, Faria-e-Castro, and Kozlowski (2020) for a comprehensive analysis of credit spreads during this time period. In addition, between March 5 and March 26, funds investing in investment-grade bonds faced withdrawals of almost \$100 billion. Scaggs (2020)

of assets on their balance sheets, this facility should reduce the costs associated with holding inventory and intermediating transactions between customers. On the morning of March 23, the Federal Reserve proposed even more direct interventions in the corporate bond market through the Primary and Secondary Market Corporate Credit Facilities (PMCCF and SMCCF, respectively). These facilities were designed to make outright purchases of corporate bonds issued by investment grade US companies, along with US-listed exchange-traded funds (ETFs) that invested in US investment grade corporate bonds.

We focus our analysis on corporate bond market liquidity, an important determinant of bond prices and, thus, firms' issuance and default decisions.<sup>3</sup> Moreover, to the extent that intermediaries in all debt markets face the same costs associated with funding and expanding their balance sheets, liquidity conditions in the corporate bond market may also provide insights into the markets for Treasuries, municipal bonds, and asset-backed securities. All of the empirical observations below are based on dealers' reports to the Trade Reporting Compliance Engine (TRACE) through the end of March 2020, which is made available by the Financial Industry Regulation Authority (FINRA) on the WRDS platform. We describe the data in greater detail, along with the specifics of our calculations, in an Appendix.

## Imputed Roundtrip Trading Costs

Perhaps the most common measure of market liquidity is the cost of transacting: the spread between the price at which dealers are willing to buy an asset (immediately) and the price at which they are willing to sell. Unfortunately, while the cost of transacting is straightforward to calculate in markets where dealers continuously post their "bid" and "ask" prices, it is far more complicated in the corporate bond market, where prices are quoted privately and bonds trade relatively infrequently.

One popular approach for computing the cost of transacting is the Imputed Roundtrip Costs (IRC) measure of Feldhütter (2012). Loosely speaking, this approach attempts to identify the difference in the price paid by a dealer to purchase a bond from a customer and the price charged by a dealer to sell the same amount of the same bond to a customer within a short period of time. By minimizing the time between trades, this measure can be particularly informative in volatile markets, as it mitigates the concern that the arrival of news creates a large discrepancy between the buy and the sell price that is unrelated to trading cost.

To construct this measure, we first identify roundtrip trades, defined as two (or more) trades in a given bond with the same trade size that take place within 15 minutes of each other. A roundtrip trade involves a sale from a customer to a dealer and a purchase by a different customer from a dealer, perhaps with additional interdealer trades in between. For a given roundtrip

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<sup>3</sup> See for example He and Xiong (2012) and He and Milbradt (2014) for analyses of the interplay between secondary market liquidity and default risk.

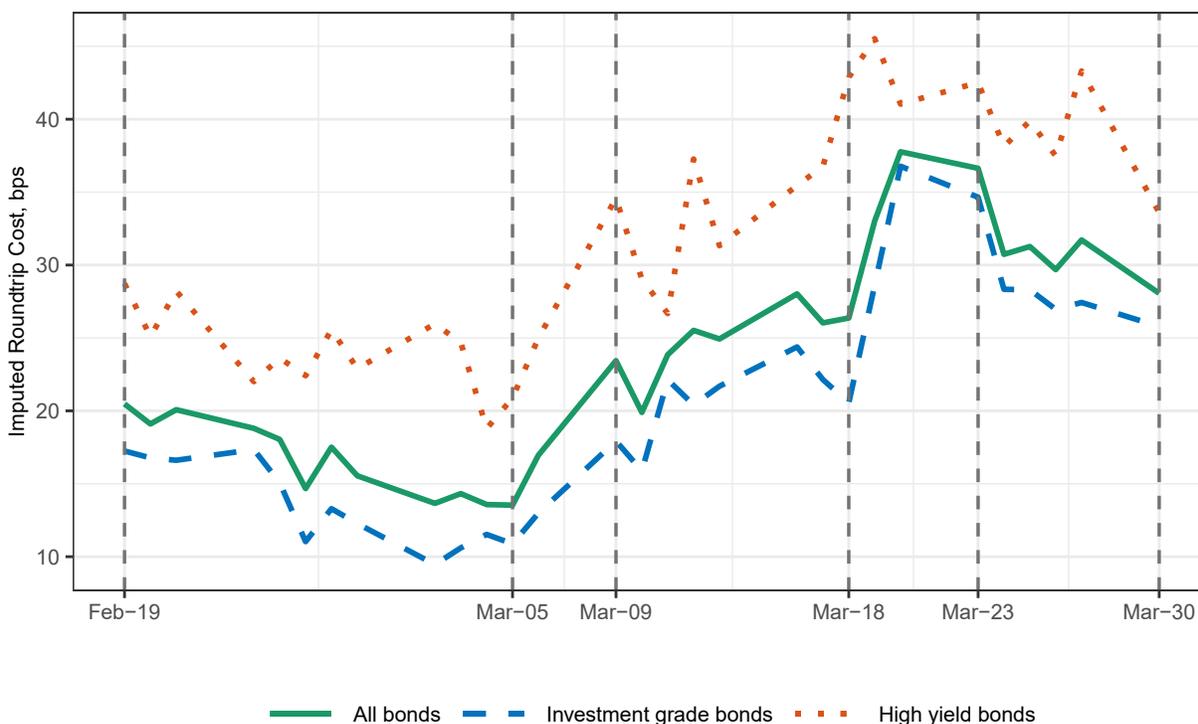
trade, we calculate the IRC as the percentage difference between the maximum and minimum prices contained in this roundtrip trade. A daily estimate of average roundtrip costs is the average IRC on that day across bonds, weighted by the value of each trade.

Figure 1 plots this value-weighted IRC measure across all bonds, along with separate measures for investment-grade (IG) and high-yield (HY) bonds. We start the series on February 19, when stock markets reached their all-time peaks. One can see that transaction costs for all bonds began to rise significantly between Thursday, March 5, and Monday, March 9; over these three trading days, the S&P 500 Index declined more than 12%. Transaction costs continued to rise through the tumultuous week of March 16–20, despite the announcement of the PDCF (along with additional facilities on March 18), but fell after the March 23 announcement of the Primary and Secondary Market Corporate Credit Facilities. Interestingly, these facilities appear to have reduced transaction costs for both IG and HY bonds, even though the Federal Reserve’s purchases were restricted to IG bonds only.

In all of the plots that follow, we introduce vertical dashed lines to highlight several of the important dates noted above: March 5, which marks the beginning of the extended fall in equity prices and rise in corporate credit spreads; March 9, the first day of trading after Saudi Arabia initiated an oil price war with Russia; March 18, the first day of trading after the announcement of the PDCF; and March 23, the day that the PMCCF and SMCCF were announced.

FIGURE 1

**Imputed Roundtrip Trading Costs**



## Principal vs. Agency Trades

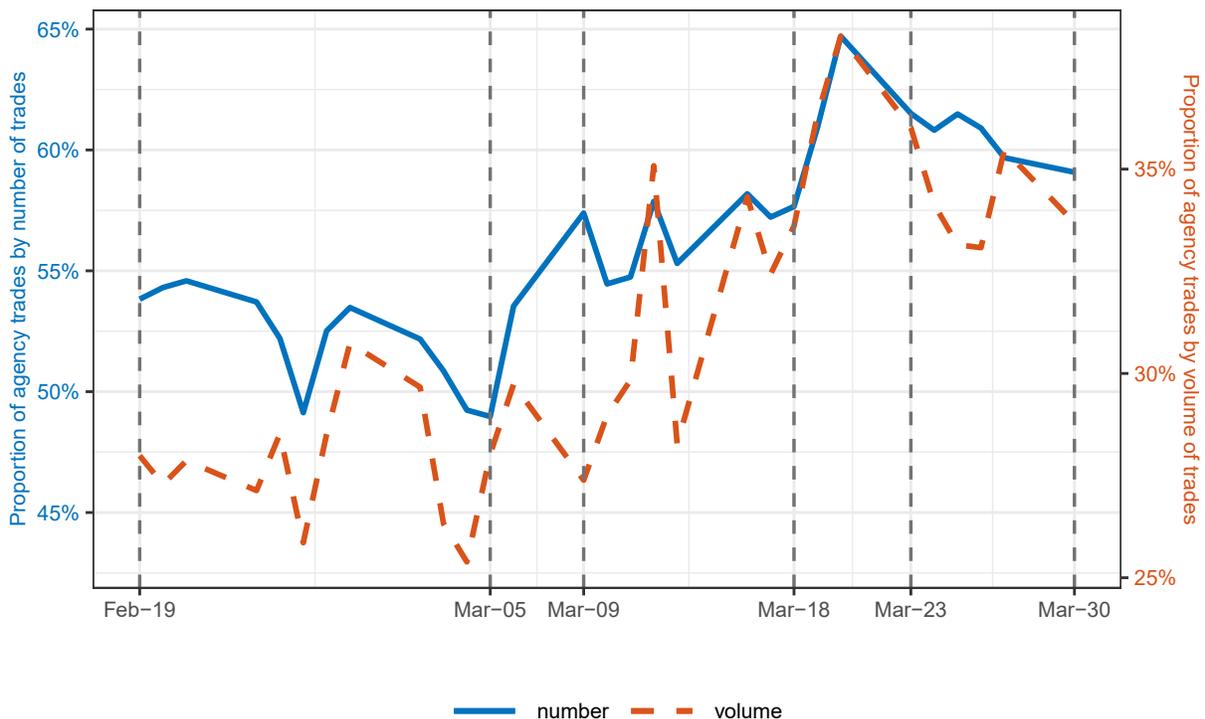
Dealers can intermediate trades between customers in two ways. First, they can buy a bond from a customer using their own capital and hold it on their balance sheet, as inventory, until they sell it to a different customer. This is called a “principal” trade. Alternatively, dealers can simply act as match-makers, locating a customer to buy bonds directly from a customer who wishes to sell. This is called a riskless principal or “agency” trade.

During periods of intense selling pressure, like those observed in mid-March, maintaining market liquidity typically requires dealers to “lean against the wind” and absorb inventory onto their balance sheets; that is, it requires dealers to engage in principal trades as opposed to agency trades. In this light, a disadvantage of the Feldhütter (2012) measure is that it focuses on transactions in which dealers ultimately don’t hold the bonds that they purchase in their inventory. Hence, this measure may capture the cost of agency trades—which typically require that a customer-seller waits for a dealer to locate a customer-buyer—but not necessarily the cost of trading with a dealer immediately.

In our data, we identify agency trades by matching a customer-sell trade with a customer-buy trade (or an interdealer trade) for a given bond with the same trade size that happen within 15 minutes of each other. For all other trades, we identify them as principal trades. We plot the results below, in Figure 2, with the fraction of agency trades by number (volume) corresponding to the left (right) axis.

FIGURE 2

### Proportion of Agency Trades, all bonds



The distinction between principal and agency trades is particularly relevant during the turbulent periods caused by COVID-19. As financial markets reeled in mid-March, dealers became increasingly unwilling to engage in principal trades, as funding costs soared and balance-sheet space became more valuable.<sup>4</sup> As a result, the fraction of transactions that were executed as agency trades—measured by volume or by number of trades—increased significantly. For example, the fraction of agency trades by volume increased by about 10 percentage points, from a baseline of approximately 25% before the current crisis to a peak exceeding 35% in the height of the market turmoil.

## Dealers' Inventory Accumulation

A different way to infer dealers' willingness to provide liquidity is to measure the (cumulative) quantity of bonds that are absorbed over time by the dealer sector as a whole in the secondary market. In principle, one can do this by subtracting the value of bonds that dealers sell to customers from the value of bonds that they buy from customers each day. Unfortunately, the data provided by TRACE does not report trade size for trades above certain thresholds (\$5m for IG bonds, and \$1m for HY bonds), which introduces a bias because the size and number of dealers' purchases and sales above the threshold differ systematically.<sup>5</sup>

We make a preliminary attempt to correct for these potential biases by fitting a simple forecasting model of the actual daily net inflow of bonds into the corporate sector. Specifically, we exploit an older data series in which trades are not topcoded, the Enhanced TRACE data that is available through June 2019, to regress the actual daily net inflow of bonds on the current and lagged topcoded values of net inflow. We then use this regression as a forecasting model for the actual daily net inflow from January 1 to March 31, 2020. Figure 3 plots our results for the period starting February 19, 2020.

The figure reveals that dealers absorbed some inventory in late February, before financial markets began to fall rapidly on March 5. At that point, dealers stopped absorbing bonds, and even began to shed some of their inventory despite immense selling pressure. This trend continued until after the implementation of the PDCF, at which point dealers' cumulative inventory began to grow, and continued to grow after the introduction of the Primary and Secondary Market Corporate Credit Facilities. As a point of reference, according to the Flow of Funds, security brokers and dealers' average holdings of corporate and foreign bonds in 2019Q4 was just over \$50 billion. Hence, our calculation suggests that dealers' aggregate corporate bond holdings increased by more than 16% between mid-February and the end of March.

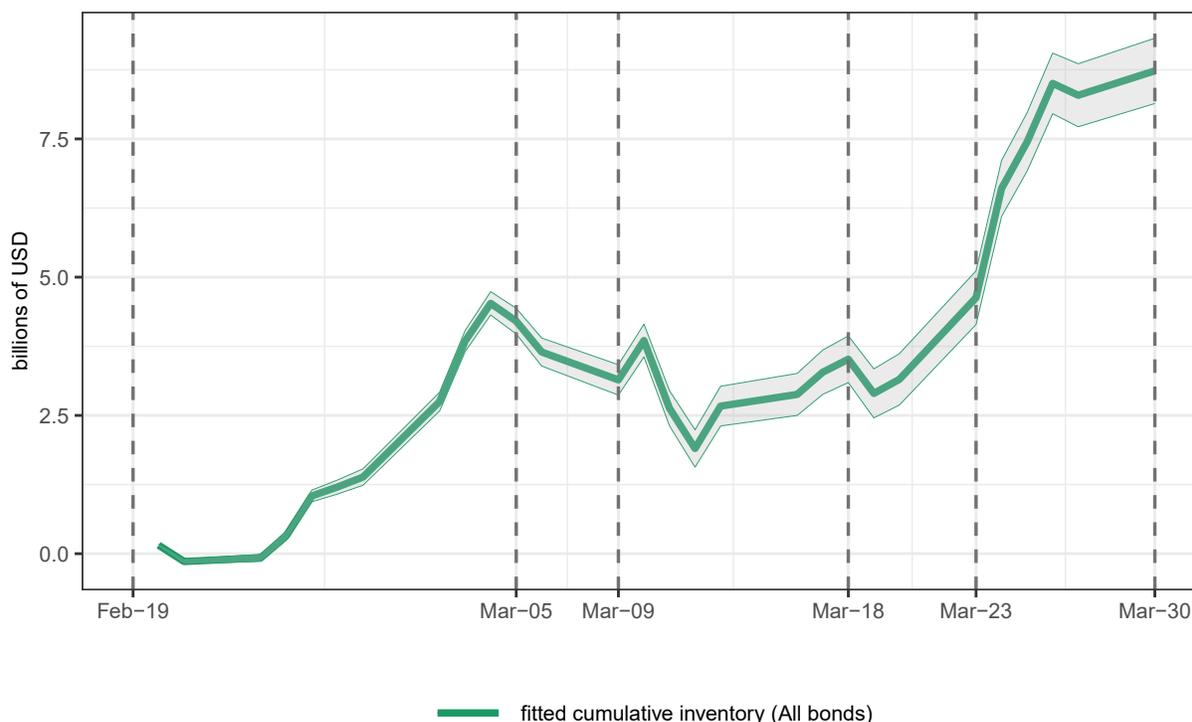
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<sup>4</sup> As one market participant described it, widening spreads were “a sign that dealer balance sheets were full, and [the dealers] were having difficulties taking more.” Domm (2020)

<sup>5</sup> Indeed, in the Enhanced TRACE data, which is available through June 2019 and which is not topcoded, one can observe that customer sells tend to be larger than customer buys. This implies that, when using topcoded data, one tends to underestimate the total volume of customer sells by more than the total volume of customer buys, and so to underestimate the net inflow of bonds in the dealer sector.

FIGURE 3

**Cumulative Inventory Change in the Dealer Sector, USD billions (shaded area represents 95% confidence bands)**



## The Cost of Trading Immediately

A liquid market is typically defined as one in which customers can trade quickly at a low cost. Given the two dimensions of this definition—time and price—it is informative to study the cost of trading with a dealer immediately, out of (or into) the dealer’s own inventory. To do so, we calculate the measure of spreads proposed by Choi and Huh (2018), which is meant to capture the average transaction cost for principal trades alone.

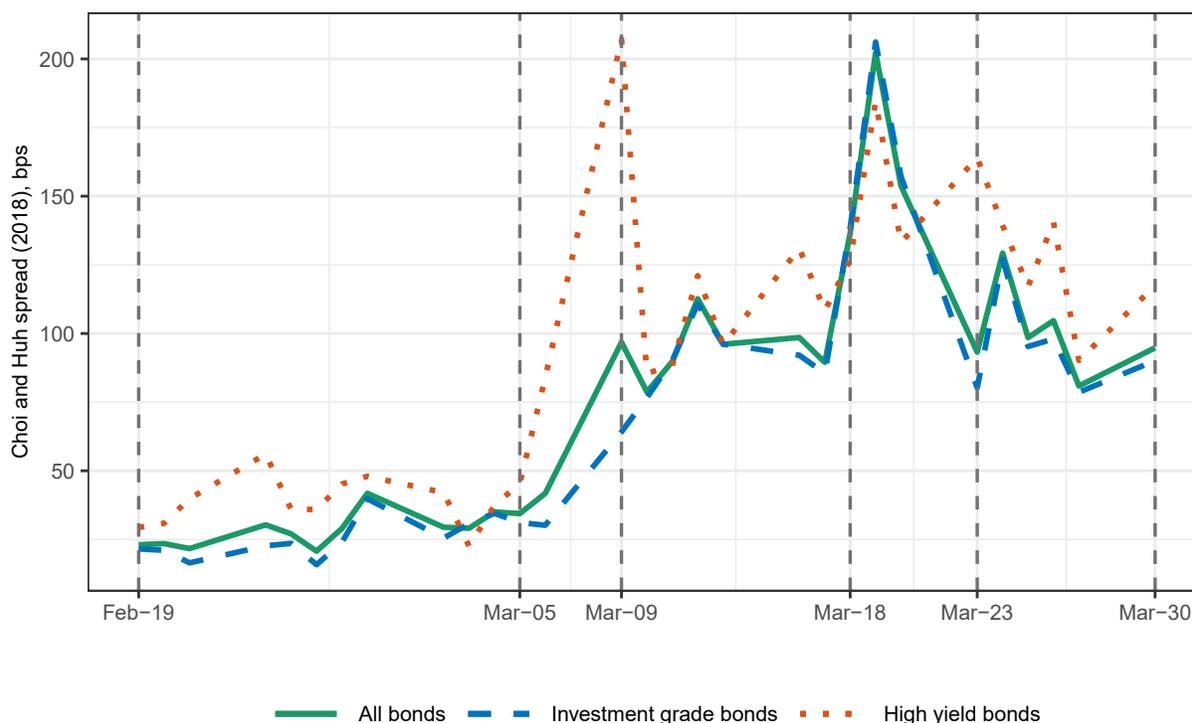
More specifically, we calculate the average spread between the price that customers pay or receive when trading with a dealer, relative to a reference interdealer price, calculated each day for each bond and weighted by value. Importantly, we do not include trades in which the dealer who buys the bond from a customer holds it for less than 15 minutes. In doing so, we leave out those trades where the dealer had pre-arranged for another party (either a customer or another dealer) to buy the bond immediately.

Relative to Feldhütter’s IRC measure, plotted in Figure 1, there are several noticeable properties of Choi and Huh’s measure, plotted in Figure 4. First, as one might expect, dealers charge larger spreads when they take the bond into their own inventory, i.e., when they provide liquidity directly. Second, and perhaps more importantly, Choi and Huh’s measure reveals a more dramatic increase in the cost of immediacy during the recent market turmoil. For example, the IRC measure of trading costs approximately doubled between mid-February and its peak in mid-March, before settling down at

the end of March approximately 50% higher than its initial value. In contrast, Choi and Huh's measure increased more than eightfold at its peak in mid-March and remained more than three times its initial value at the end of March. Lastly, Choi and Huh's measure for HY spreads experiences a more pronounced spike on March 9, capturing extremely high costs for principal trades in the oil and gas sector on that day. Spreads for investment grade bonds, however, experienced a more pronounced decline after the announcement of the PDCF. Since the PDCF only allowed primary dealers to borrow against IG bonds on their balance sheets, this naturally suggests that the facility had a larger effect on the cost of IG principal trades than it did on the cost of HY principal trades.

FIGURE 4

**Choi and Huh (2018) Transaction Costs (principal trades only)**



## Conclusion

In the wake of large shocks, the extent to which financial markets malfunction often depends on dealers' willingness to lean against the wind and absorb inventory. In this note, we calculate several measures of liquidity to shed light on trading conditions in one large and important market: the market for corporate bonds. As uncertainty surrounding downgrades and potential defaults grew during the first weeks of March, and withdrawals from corporate bond funds mounted, we find that dealers became increasingly unwilling to absorb inventory onto their balance sheets. As a result, dealers attempted to shift some activity from principal to agency trading and, among the remaining principal trades, they charged a significantly higher price to provide immediacy. After the Federal Reserve intervened, we find

that liquidity conditions improved, though not to the levels observed before the COVID-induced turmoil. Finally, we find that some traditional measures of market liquidity, such as imputed roundtrip costs, potentially underestimate the increase in trading costs that market participants have faced.

While this note provides an interesting first look, many important questions remain, which we expect to examine in future work. For one, while our analysis here provides a cursory look at the differential effects of shocks and interventions on bonds with different ratings, a more thorough examination would be interesting. In particular, since the Fed's credit facilities only lend against a subset of bonds—depending on their credit rating, maturity, and country of origin—it would be natural to study the effects on bonds that qualified under these guidelines, relative to the performance of those bonds that were excluded.<sup>6</sup> Second, as additional data becomes available, we intend to study the effects of more recent policy developments, such as the expansion of the PMCCF, SMCCF, and Term Asset-Backed Securities Loan Facility (TALF) on April 9, 2020. Third, to the extent that we can confirm that dealers absorbed inventories around the end of March, we intend to study whether and when they unwound them as the Secondary Market Corporate Credit Facility is deployed. Finally, it would be interesting to compare both credit spreads and transaction costs in March 2020 to those observed during the Great Financial Crisis of 2008, to examine whether the COVID-19 pandemic should be viewed more as a solvency crisis or a liquidity crisis. <sup>RB</sup>

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<sup>6</sup> See <https://www.federalreserve.gov/newsevents/pressreleases/files/monetary20200323b2.pdf> for the term sheet of the Secondary Market Corporate Credit Facility.



## Appendix

### Data Filtering

We first filter the report data following the procedure laid out in Dick-Nielsen (2014). We merge the resulting data set with the TRACE master file, which contains bond grade information, and with the Mergent Fixed Income Securities Database (FISD) to obtain bond fundamental characteristics. Following the bulk of the academic literature, we exclude bonds with optional characteristics, such as variable coupon, convertible, exchangeable, and puttable, etc., on-the-run bonds (issued less than 90 days ago), asset-backed securities, and private placed instruments. The final sample contains 3,236,988 transactions in 16,836 bonds, for a sample period running from January 1 to March 31, 2020.

### Imputed Roundtrip Trading Costs

We first construct pairs of Imputed Roundtrip Trades (IRT) as in Feldhütter (2012): sequences of two or three trades in a given bond with the same trade size that take place in a short time window of 15 minutes, starting with a customer sell, and ending with a customer buy. In each IRT we define the imputed roundtrip cost (IRC) as  $(P_{max} - P_{min}) / P_{max}$ , where  $P_{max}$  is the largest price in the IRT and  $P_{min}$  is the smallest price in the IRT. A daily estimate of average roundtrip cost is the average of roundtrip costs on that day across all bonds, weighted by trade size.

### Choi and Huh's Measure of Spreads

Following Choi and Huh (2018), we calculate  $spread_i = 2Q \times \frac{\text{traded price} - \text{reference price}}{\text{reference price}}$ , where  $Q$  is equal to +1 for a customer *buy* and -1 for a customer *sell*. For each customer trade, the reference price is taken to be the volume-weighted average price of interdealer trades larger than \$100,000 in the same bond-day, excluding interdealer trades executed within 15 minutes. The measure  $spread_i$  is calculated at the trade level for all customer principal trades (held in dealer inventories for more than 15 minutes) and is also calculated at the bond-day level by taking the volume-weighted average of trade level spreads.

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