

# Corporate Bond Market Dysfunction During COVID-19 and Lessons from the Fed's Response

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**Abstract:** Changes in the financial sector since the global financial crisis appear to have increased dramatically the demand for liquidity by holders of corporate bonds beyond the ability of the markets to provide it in stress events. The March market turmoil revealed the costs of liquidity mismatch in open-end bond mutual funds. The surprisingly large redemptions of investment-grade corporate bond funds added to stresses in both the corporate bond and Treasury markets. These conditions led to unprecedented Fed interventions, which significantly reduced risk spreads and improved market functioning, with much of the improvements occurring right after the initial announcement. The improved conditions allowed companies to issue bonds, which helped them to maintain employees and investment spending. The episode suggests several areas for further study and possible reforms.

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## 1. Introduction

As concerns about the pandemic's effect on economic activity in early March escalated, asset prices began to move in unusual ways—including the prices of investment-grade corporate bonds. Equity prices fell. Treasury prices fell, too, rather than benefitting from the typical investor flight to safety. Bid-ask spreads on Treasury securities jumped. Corporate bond spreads rose proportionately more for investment-grade bonds than for high-yield bonds—surprising, as high-yield bonds are riskier and less liquid and usually more sensitive to a deterioration in the economic outlook; transaction costs for investment-grade bonds spiked and were as high or higher than those for high-yield bonds that traded.

The dysfunction in the corporate bond market prompted the Federal Reserve to intervene aggressively. It established two facilities to support credit to large employers, under the authority of Section 13(3), with approval of the Treasury Secretary, and funded ultimately with capital from the CARES Act. The Primary Market Corporate Credit Facility (PMCCF) initially offered new credit to investment-grade corporations for a term of up to four years. The Secondary Market Corporate Credit Facility (SMCCF) offered to purchase corporate bonds on the secondary market. The PMCCF might be viewed as a natural extension of the Commercial Paper Funding Facility, introduced in 2008 and re-introduced on March 17, to purchase new 90-day commercial paper from investment-grade corporations to ensure firms had access to funds. But purchasing corporate bonds in the secondary market was unprecedented. It was not directly providing funds to companies, but purchasing bonds to increase prices so that firms could issue new bonds to the PMCCF (or to the market) without significant discounts due to market dysfunction.

The programs, combined with an expanded commitment by the Fed to purchase more Treasuries and agency mortgage-backed securities, calmed the corporate bond market. Risk spreads and costs of trading fell sharply after the announcement, and again after the program was expanded in early April. Issuance of new bonds to public investors more than rebounded over the following months, and there was no issuance to the PMCCF. Nearly all of the improvement occurred before the Fed made any actual purchases, which totaled only \$12.5 billion as of August 31. The two programs were established to purchase up to \$750 billion.

This paper presents evidence that significant structural changes in the financial sector since the global financial crisis have increased dramatically the demand for liquidity by holders of corporate bonds beyond the ability of the markets to provide it in stress events. The investment-grade corporate bond market, which functioned well in 2008, did not in this crisis. This paper draws on a rich set of new research papers to document the turmoil in the corporate bond market and the market's response to the Fed's actions. One contributor to the dysfunction was the very substantial redemptions in investment-grade corporate bond mutual funds in March, as investors sought liquidity at a time when the capacity of markets to provide that liquidity had diminished sharply.

The paper then suggests areas for further study to increase the resilience of corporate bond markets to future shocks, by reducing the systemic consequences of liquidity mismatch of corporate bond mutual funds and improving dealers' market-making capacity. A more resilient and efficient corporate bond market is important for companies to be able to access credit for spending and investment.

Regulators for some time have worried about the “phantom” liquidity offered by bond mutual funds that offer daily liquidity when the underlying assets are less liquid, but they have focused mainly on this liquidity mismatch in high-yield bond or bank loan funds. But a lesson from March suggests that investment-grade bond mutual funds warrant additional study, given the surprisingly large redemptions and whether they are viewed as “near-cash products,” as they collectively have become sizable and their behavior is highly correlated. Actions of these funds appeared to have affected both the corporate bond and Treasury markets.

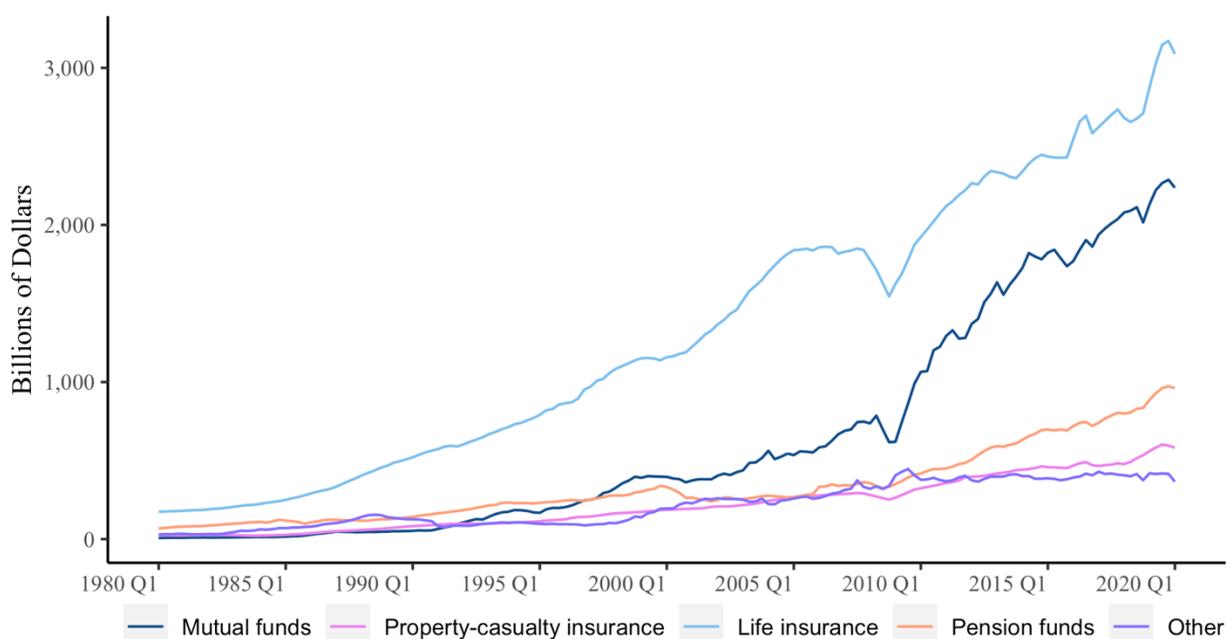
Another lesson is that the success of the Fed’s corporate bond program to date should not be interpreted to suggest that reforms are not needed. Instead, the reforms are even more critical since they likely raised expectations of such interventions again in the future. But less intervention in private credit markets is important for the efficiency of financial markets: Financial markets will perform better without an expectation of future government support and interference. Less intervention is also important for preserving central bank independence for monetary policy. In the near-term, there may also be risks that arise from possible ambiguity about the Fed’s objectives. With an uncertain economic outlook, bond prices may well fall again if fundamentals were to deteriorate. Investors might be surprised if the Fed were not to accelerate purchases because it would purchase only if markets were to become dysfunctional again—an objective consistent with the traditional lender of last resort role. They instead might have come to the view that the Fed would respond to falling prices, an objective closer to monetary policy. While purchases could achieve both objectives, the ultimate success of the corporate credit program will be helped if investors know what to expect.

## 2. Corporate bond market

The corporate bond market has grown rapidly in the past decade, reaching about \$9.6 trillion in 2019, up from \$5.5 trillion in 2008. The investment-grade (IG) bond sector is about six times the size of the high-yield (HY) sector (Ohara and Zhou, 2020). Corporate bonds provide well over half of the debt financing for domestic nonfinancial corporate businesses, similar to the share in the UK and much higher than elsewhere in Europe.

As the corporate bond market has grown, ownership has changed dramatically. While insurance companies remain the largest holder, mutual funds increased their holdings more quickly and exceeded \$2.2 trillion in 2020 Q1 (Figure 1). Net assets of long-term mutual funds that invest primarily in corporate bonds have risen substantially since 2008: investment-grade corporate bond mutual funds rose to \$2.159 billion in 2019 from \$738 billion in 2008, and net assets of high-yield corporate bond mutual funds rose to \$337 billion in 2019 from \$116 billion in 2008 (Investment Company Institute).

**Figure 1. Corporate bond market by holders**



Source: Financial Accounts of the United States, Corporate and Foreign Bonds (Table L.213)

This rise has significant implications for corporate bond market functioning during stress because investors in open-end mutual funds—equity claimants on the pool of bonds—are offered daily liquidity. However, because the net asset value of a fund is set at the end of each day, without factoring in the impact on prices of investor redemptions, investors have incentives to redeem before others when prices are falling to avoid bearing the illiquidity costs from high redemptions.

Mutual fund managers, of course, have liquidity risk management practices that factor in the liquidity of the underlying asset, and the Securities and Exchange Commission (SEC) requires funds to have some minimum liquidity risk management practices, which should mitigate the incentive for investors to run. Investment-grade bond mutual funds tend to have lower liquidity buffers than high-yield bond mutual funds, reflecting better market liquidity of the underlying bonds in normal times. Liquid asset ratios, weighted by fund size, in February 2020 were estimated to be 2.5 percent for investment-grade funds, 3.8 percent for high-yield funds, and 5 percent for bank loan funds (Ma, Xiao, and Zeng, 2020).

Because open-end bond mutual funds rely significantly on Treasury securities for liquidity risk management, they tie together the functioning of the investment-grade bond market to the Treasury market. As these funds have become substantial, their liquidity risk management has increasing potential to affect the Treasury market. According to the Financial Accounts of the United States, the share of marketable Treasury securities held by long-term mutual funds increased from 3 percent in 2008 to 8 percent in 2019—slightly more than the amount held by banks and broker-dealers.<sup>1</sup>

Over the past decade, as well, dealer capacity to intermediate corporate bonds (to offer market liquidity) has shrunk notably. Dealer net positions in corporate bonds have fallen dramatically from a peak of nearly \$300 billion in late 2006, to less than \$50 billion in 2019 (Federal Reserve Financial Stability Report, November 2019). While customer-to-customer trading in electronic venues has been growing, it remains small.

Trading volumes for corporate bonds also indicate limited liquidity, relative to the offer of daily liquidity of the bond funds. O'Hara and Zhou (2020) report that in 2019, the average daily trading volumes were \$22.1 billion and \$7.8 billion for investment-grade and high-yield segments, respectively. In stark contrast, average daily trading volumes for Treasury securities is roughly \$530 billion (TPMG, 2018). Boyarchenko, Kovner, and Shachar (2020) report a skewed distribution of trading: the average number of days a bond is traded is 49 of 100 days, with nine times per day conditional on trading, and the top fifth percentile of bonds trade all 100 days.

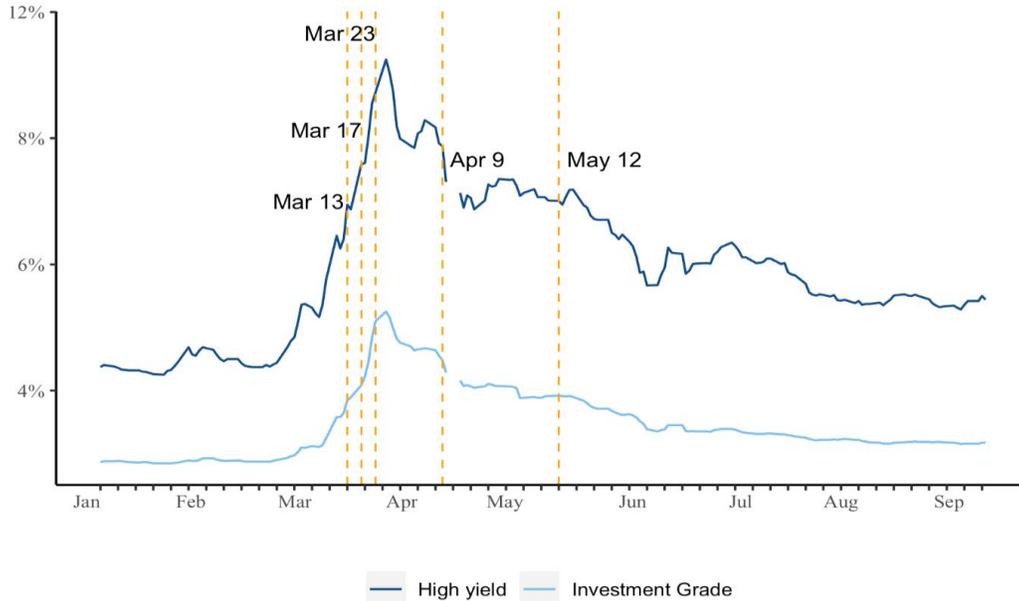
### **3. What went wrong in March?**

Corporate bond spreads began rising sharply in early March as concerns about the virus began to escalate. The Fed's announcement on March 13 to purchase Treasuries and to repo Treasuries did little to halt the rise in spreads; neither did the announcement of the PDCF on March 17 and its implementation on March 20. In the days before the PMCCF/SMCCF announcement on March 23, spreads of IG bonds were up by 3.5 percentage points from the beginning of the year, and spreads on HY bonds were up 6.5 percentage points. The ratio of the IG-to-HY spread was 25 percent higher, a highly unusual occurrence, suggesting some significant dislocations in investment-grade bond market pricing that were not related to rising credit risk.

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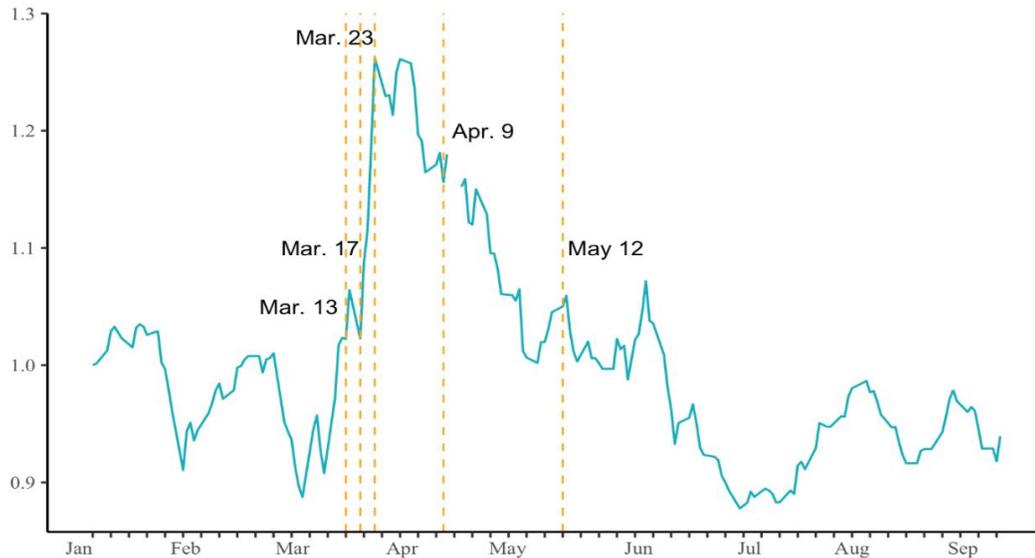
<sup>1</sup> This share is held by long-term mutual funds, not only corporate bond mutual funds. Data from the Investment Company Institute indicate that corporate bond mutual funds and hybrid funds accounted for 65 percent of assets held in all long-term mutual funds.

**Figure 2. Investment-grade and high-yield corporate bond spreads**



Source: Ice Data Indices, LLC, ICE BofA BBB US Corporate Index Option-Adjusted Spread and ICE BofA US High Yield Index Option-Adjusted Spread, retrieved from FRED, Federal Reserve Bank of St. Louis.  
 Event lines: Fed announced Treasury and MBS purchases (March 13), PDCF (March 17), PMCCF, SMCCF, and additional Treasury and MBS purchases (March 23), Fed expanded PMCCF and SMCCF (April 9), first purchases of bond ETFs (May 12)

**Figure 3. Ratio of investment-grade to high-yield corporate bond spreads**



Note: Index = 1.0 Jan. 1.  
 Source: Ice Data Indices, LLC, ICE BofA BBB US Corporate Index Option-Adjusted Spread and ICE BofA US High Yield Index Option-Adjusted Spread, retrieved from FRED, Federal Reserve Bank of St. Louis.  
 Event lines: Fed announced Treasury and MBS purchases (March 13), PDCF (March 17), PMCCF, SMCCF, and additional Treasury and MBS purchases (March 23), Fed expanded PMCCF and SMCCF (April 9), first purchases of bond ETFs (May 12).

The dislocation in investment-grade bond prices is also evident in a number of other measures. The CDS-bond basis spreads for IG bonds widened notably during this period, though not for HY bonds (Ma, Xiao, Zeng, 2020). Haddad, Muir, and Tyler (2020) show that the increase in bond spreads was significantly greater than the increase in CDS for the same investment-grade firm, but this pattern was not found for high-yield bonds. The wider CDS-bond basis spreads for IG corporate bonds indicate that spreads were widening for reasons other than increased credit risk, whereas the usual relationship for CDS and bond spreads for HY bonds was still intact. In addition, IG bond ETFs were trading at sharp discounts to their NAV—as large as 5 percent—but there was no discount for HY bond ETFs (Haddad et al, 2020). Conversations with fund managers suggest sizable discounts in this range for IG corporate bonds at that time, an indication of extremely unusual selling pressures for investment-grade bonds.

In addition, market liquidity measures, such as transaction costs and bid-ask spreads, rose much more notably for IG bonds than HY bonds, suggesting that it was as expensive or even more expensive to trade an investment-grade bond than a high-yield bond for several days in March (Table 1). Right before the Fed announced the corporate bond programs, the average transaction cost, measured by the price impact, for an investment-grade bond transaction was 82 basis points, nearly matching that for a high-yield bond of 90 basis points on March 20, and with higher costs for block trades (Ohara and Zhou, 2020). Moreover, transaction costs for IG bonds nearly tripled after controlling for bond and trade characteristics in regressions, and transactions volumes. Bid-ask spreads for IG bonds in early February were lower than those for high-yield bonds, but they increased by more before the announcement. In particular, bid-ask spreads for investment-grade bonds rose to 172 basis points right before the announcement of the CCF, while bid-ask spreads for HY bonds rose to 102 bps (Boyarchenko, et al, 2020). Similar patterns for bid-ask spreads, with substantially higher bid-ask for investment-grade than high-yield (220 basis points to 150 basis points, respectively) are documented by Gilchrist et al, (2020).

**Table 1. Costs of transacting in corporate bonds**

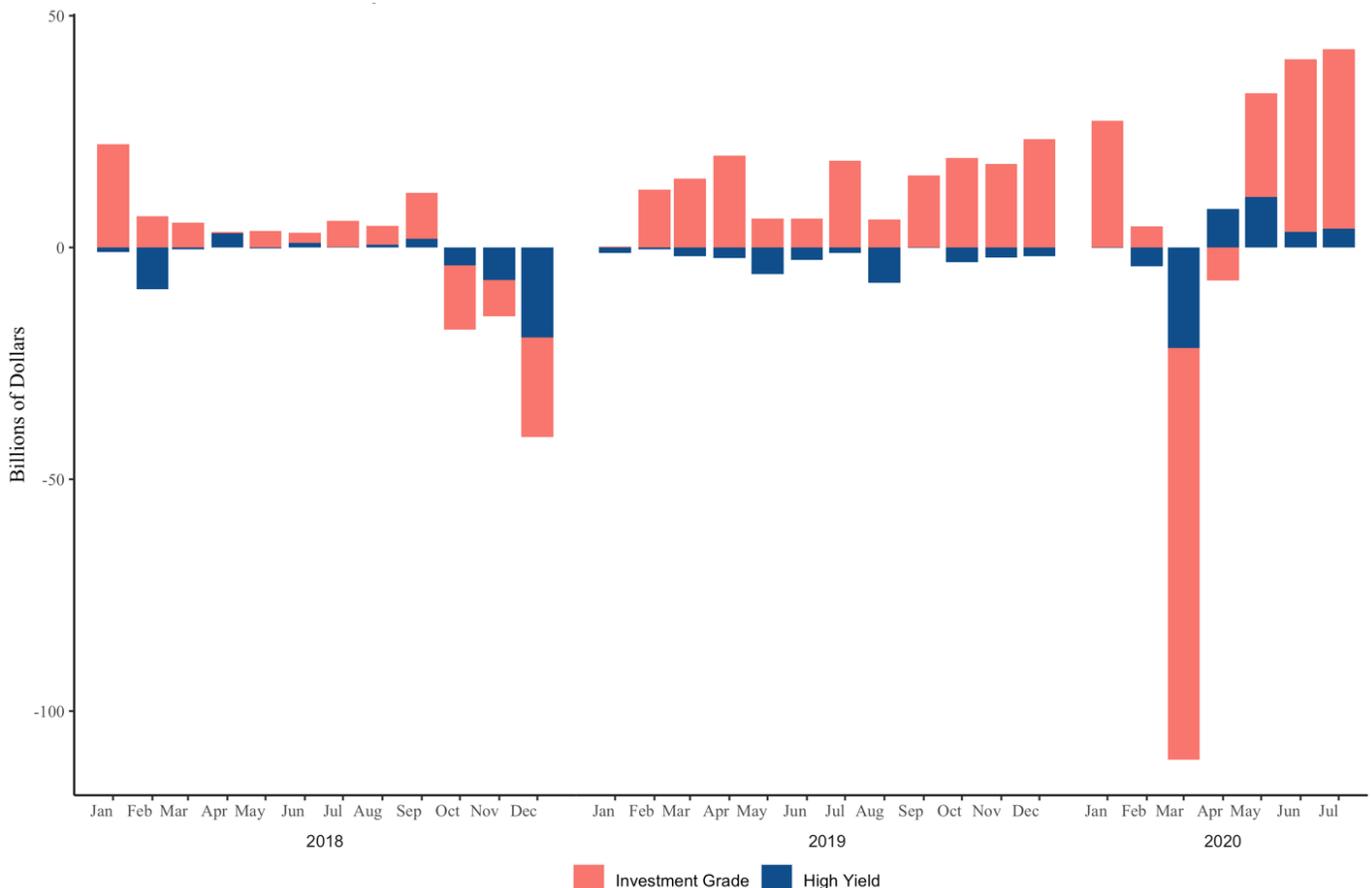
(basis points)	Investment-grade				
	Feb 3	Mar 20	Mar 27	$\Delta$ Feb 3 to Mar 20	$\Delta$ Mar 20 to Mar 27
Transaction costs, O'Hara and Zhou (2020)	29	82	65	+53	-17
Bid-ask spreads, Boyarchenko et al (2020)	10	172	47	+162	-125
Bid-ask spreads, Gilchrist et al (2020)	37	221	136	+184	-85
	High-yield				
Transaction costs, O'Hara and Zhou (2020)	50	90	97	+40	+7
Bid-ask spreads, Boyarchenko et al (2020)	23	102	60	+79	-42
Bid-ask spreads, Gilchrist et al (2020)	57	223	192	+166	-30
	Fallen angels				
Bid-ask spreads, Boyarchenko et al (2020)	21	185	205	+80	+20

*Note: The transaction cost is a price impact measure from O'Hara and Zhou (2020), reflecting the trade price relative to the closest-in-time interdealer trade based on a sample of 12,323 bonds from TRACE. O'Hara and Zhou (2020) prefer the transaction cost measure when market activity is one-way. Bid-ask spread from Boyarchenko et al (2020) is the difference between the volume-weighted buy price and sell prices for dealer-client trades relative to*

par for a sample of 9,765 bonds from TRACE. Bid-ask spreads from Gilchrist et al (2020) is the difference between the average bid and ask price of dealer-client trades, divided by the average of dealer-to-dealer prices for transactions on that same bond, from TRACE. I thank the authors of these papers for providing the data for this table.

At the same time, net flows from open-end bond mutual funds were deeply negative. For the month of March, net outflows from IG bond funds reached \$89 billion, and from HY bond funds \$22 billion, representing roughly four percent and six percent of lagged assets, respectively. As seen in Figure 4, the net outflows from IG bonds were sizable, far exceeding outflows at any time in the past few years.

**Figure 4. Net new cash flow to corporate bond mutual funds**



Source: Investment Company Institute, "Trends in Mutual Fund Investing".

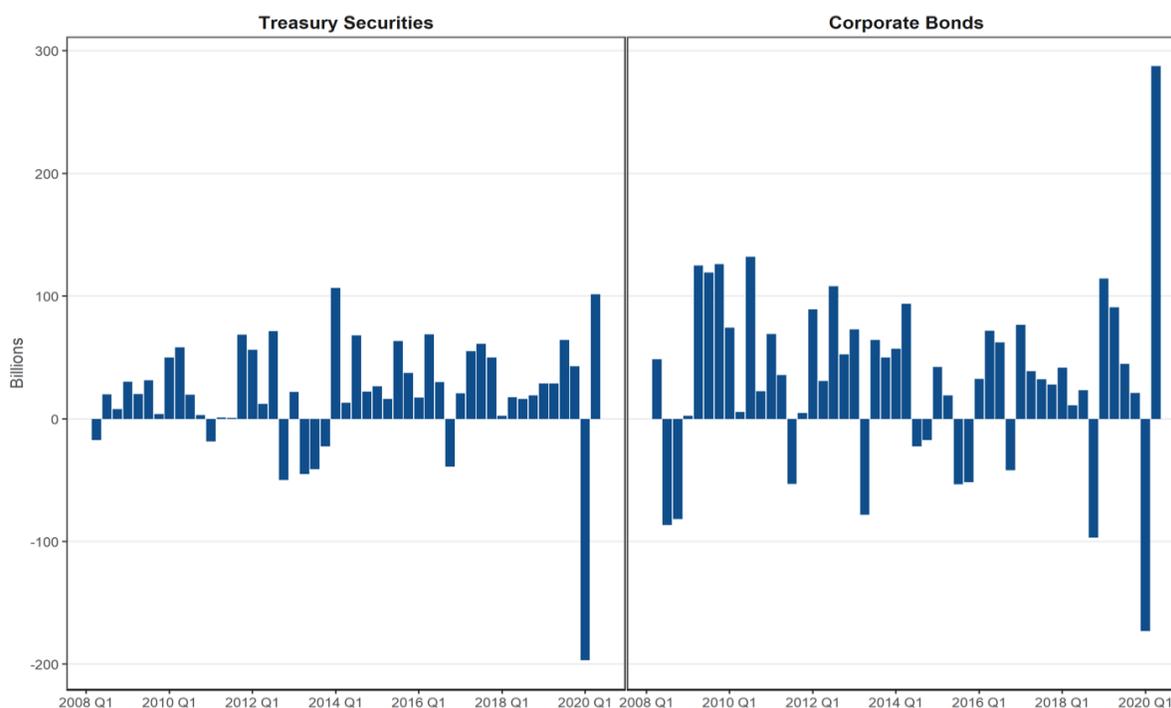
Daily net flows, from Falato et al, (2020), show that outflows for the investment-grade funds were especially large in the days before the corporate credit facilities were announced (see also Vissing-Jorgenson, 2020). The daily flows-to-net assets accelerated on Friday, March 13, and cumulated to -2.5 percent for investment-grade funds for the following week (March 16 to 20), greater than the -1.7 percent for HY funds for the same period. (Outflows were -3.2 percent and -4.2 percent for investment-grade and high-yield funds, respectively, for the two weeks of March 9 to 20.) The outflows for IG funds were outsized relative to historical deviations, making it likely that more IG funds went deeper into or through their liquidity buffers than HY bond funds.

To meet redemptions, both Treasury securities and IG corporate bonds were sold. Ma, Xian, and Zang (2020) show that mutual funds follow a pecking order, selling Treasuries before less liquid corporate

bonds to pay redeeming investors (see similar findings in Chernenko and Sunderam, 2016). In their sample, the sale of Treasuries by corporate bond funds was about five times the amount of corporate bonds sold in March.<sup>2</sup> The growing reliance for liquidity from fixed-income mutual funds appeared to have turned an investor flight to liquidity into large concentrated sales of traditionally liquid assets, a behavior leading to a “reverse flight to quality,” as described by Ma, Xiao, and Zeng (2020).

In addition, aggregate data for the quarter show the net sales by long-term mutual funds of both Treasuries and corporates were unusually large in the first quarter (see Figure 5), with net sales of Treasuries of -\$197 billion exceeding the sale of corporate bonds of -\$172 billion. These data include corporate bond funds, as well as balanced mutual funds that may have sold bonds into equities after equity prices fell in response to COVID-19. The sales of Treasuries are comparable to sales by the official foreign sector of -\$182 billion, and greater than sales by the private foreign sector of -\$105 billion in the first quarter.<sup>3</sup>

**Figure 5. Change in long-term mutual fund holdings of Treasury securities and corporate bonds**



Source. Financial Accounts, Table L.122

<sup>2</sup> O’Hara and Zhou show that trading volumes for investment-grade bonds, which are more liquid in normal times, also rose, consistent with greater selling pressures for the more liquid corporate bonds. In contrast to normal times, when there is higher volume and lower transactions costs for larger issues, these bonds were trading at higher costs in the crisis. Bonds that are more liquid in normal times (lower transaction costs) had higher transaction costs (less liquid) in the crisis.

<sup>3</sup> The foreign sector sales are from the Bureau of Economic Analysis, based on the Treasury International Capital (TIC) System data. Net sales of private foreign entities domiciled in the Cayman Islands, a proxy for hedge funds, were -\$29 billion in the first quarter. Domestic hedge funds recorded net sales of -\$31 billion, based on estimates from the Financial Accounts of the United States.

## *Effects of Federal Reserve actions*

The effects of the announcement of the PMCCF/SMCCF were dramatic. Spreads on both IG and HY corporate bonds fell, and IG bonds which were eligible for purchase benefitted the most.<sup>4</sup> Boyarchenko, et al (2020) show declines of roughly 100 basis points for eligible IG bonds; spreads for HY bonds also declined but were larger when the program was expanded to “fallen angels” and high-yield bond ETFs on April 6. Gilchrist et al (2020) also evaluated the effects on different bonds for the same firm based on eligibility and found a significant decline in spreads.

The costs of transacting in corporate bonds fell dramatically for investment-grade corporate bonds (Table 1 above). Declines were much smaller for high-yield bonds. Boyarchenko et al (2020) also show that bid-ask spreads for “fallen angel” bonds, which had risen sharply, did not fall on the initial announcement of PMCCF/SMCCF, but declined when the program was expanded in April.

Investor outflows from bond mutual funds also eased in the last week of March, and flows turned positive for HY bond mutual funds in April. The reduction in outflows reduced the need to quickly liquidate assets, and the NAVs of the mutual funds rose. Ma, Xiao, and Zeng (2020) show that the Fed’s purchases of Treasury securities and offer of Treasury repo in early March did not improve the NAVs of government, investment-grade, or high-yield corporate mutual funds. But the announcement of the PMCCF/SMCCF, along with a commitment to purchase more Treasuries, increased the NAV of all three types of funds. They argue that by offering to purchase corporate bonds, and so raise the prices of risky bonds, the program reduced redemption pressures and the pressure to sell both corporate bonds and Treasury securities.

As of May, spreads and transaction costs were still higher than pre-crisis levels, but market functioning appeared on track to return to normal. The actual purchases starting with bond ETFs on May 12 had a small additional effect. Boyarchenko et al show the amount of purchases helps to reduce bid-ask spreads, and Gilchrist et al measure declines of 5 bps on spreads, and 2 bps on bid-ask spreads based on bonds of the same firm. Overall, the SMCCF purchased \$12.5 billion through August, and no bonds have been issued to the PMCCF.

The corporate credit programs may also have improved dealers’ willingness to provide liquidity, as they changed their perceived risks of inventory positions. In addition, the PDCF, which allowed primary dealers to repo with the Fed with collateral that included investment-grade corporate bonds but not speculative-grade bonds, may have supported the provision of liquidity. It is hard to confidently assess any effect of the PDCF, given it was implemented only one business day before the PMCCF/SMCCF were announced. But O’Hara and Zhou show the PDCF appeared to have eased balance sheet constraints for primary dealers, and daily net buying and inventory changes of corporate bonds began to turn up. Non-primary dealers that had been substantial net sellers in February and early March were not helped directly by the PDCF, but inventory changes turned positive after the PMCCF/SMCCF was announced and expanded in April.

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<sup>4</sup> Note that no studies have tried to separate the effects of PMCCF and SMCCF, which would be difficult given they were announced at the same time. While no company has issued to the PMCCF, it could still be effective as a backstop. The municipal bond market might offer a contrast. In the Municipal Lending Facility, the Fed announced it would purchase a new issue with maturity up to two years, but did not create a secondary municipal bond purchase program.

## 4. What vulnerabilities were revealed?

Corporate bond market liquidity proved to be fragile in early March. Basically, the previous system where dealers were prepared or willing to buy or fund no longer existed. Investors looking to IG corporate bond mutual funds found less liquidity provision than expected.

The episode revealed several vulnerabilities that warrant study to determine if reforms could be taken to improve market liquidity.

First, investor redemptions and actions of open-end corporate bond mutual funds had substantial effects on both corporate bond and Treasury markets. Further study of redemption patterns across funds could provide insight into alternative motives, whether extrapolation, panic, or a rational incentive to run. Steps to reduce liquidity mismatch and reduce the incentive for investors to redeem early should be evaluated. This has become more urgent as these bond funds have become sizable. Redemptions triggered by a systemic shock and amplified by a first-mover advantage now can harm broad market functioning. For IG bond mutual funds, liquidity risk management needs should consider not just the liquidity mismatch of the underlying bonds and fund shares, but correlated trades among very similar portfolios and the sheer size of collective redemptions.

One route is to better align the offer of liquidity by the mutual funds to the liquidity of the underlying assets, which could be accomplished with some type of redemption restriction related to how quickly bonds can be sold without significant price impact. If the large redemptions are because shareholders who redeem early do not bear the cost of their actions, swing pricing could help. For swing pricing, end-of-day NAV would account for the price impact of redemptions—though without improvements in bond market liquidity, price marks could still be very judgmental. The objective of any reforms should not be to eliminate volatility in bond or mutual fund share prices that reflect changes in economic fundamentals, but to reduce the surges in the demand for liquidity by funds collectively in high-stress events.

Second, a review of regulations should be undertaken to determine if changes can be made to provide dealers with more flexibility to provide market-making without jeopardizing the greater safety and soundness of banks and dealers that has been achieved with the post-GFC reforms. In addition, concentration levels for the 10 largest dealers are high, about 70 percent in the corporate bond market, but there are hundreds of other dealers. Increasing the capacity of smaller dealers could also be beneficial, especially if smaller dealers do not face the same constraints as larger dealers at the same time to offer liquidity. Regulators could evaluate if there are impediments to entry that could be eased. Regulators could also evaluate if there are impediments for further use of electronic trading platforms to provide liquidity.

Third, there should be a study of mandated central clearing of Treasury securities, as proposed by Duffie (2020), and for Treasury repo. By allowing more netting, this could ease dealer balance sheet constraints, increase market-making capacity, and reduce selling pressure on the corporate bonds in funds if mutual funds can sell or repo Treasuries with dealers to meet redemptions.

Of course, a more general problem is the high leverage of debt financing among U.S. corporations, which creates more aggressive boom and bust credit cycles and surges in the demand for liquidity. The U.S. could reduce the advantages of corporate debt by reducing the tax advantages of interest payments over dividends, which could lead to a more resilient corporate sector. But that is beyond the scope of this paper.

## 5. Conclusion

Changes in the financial sector since the global financial crisis appear to have increased dramatically the demand for liquidity by holders of corporate bonds, beyond the ability of the markets to provide it in stress events. The March market turmoil revealed the costs of liquidity mismatch in open-end bond mutual funds. Investors appeared to be redeeming IG bond fund shares for liquidity, placing stress on both the corporate bond and Treasury markets. These conditions led to unprecedented Fed interventions. The corporate bond programs significantly reduced risk spreads and improved market functioning, with much of the improvements occurring right after the initial announcement. The improved conditions allowed companies to issue bonds, which helped them to maintain employees and investment spending.

The immediate success of the programs also likely has raised expectations of extraordinary Fed interventions under less extreme circumstances in the future, making reforms all the more critical to counter moral hazard incentives. There certainly is a case that the Fed discount window backstop for the financial system through the banks is no longer fit for purpose, with such a large part of financial intermediation not in the banking system. But even if an *ex post* Fed backstop in normal times were to be expanded, standards for access and use would need to be established. In particular, stronger *ex ante* standards for what are valued as near-cash products, such as investment-grade corporate bond mutual funds, and greater market-making capacity from well-capitalized dealers, are important to assure a resilient corporate bond market.

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