

GLOBAL ECONOMIC GOVERNANCE INITIATIVE

The Fed in the Corporate Bond Market in 2020¹

ROBERT N MCCAULEY²**ABSTRACT**

The Federal Reserve interventions in private securities markets in the spring of 2020 extended its 2008 playbook from buying high quality short-term paper to bonds, and departed from it by buying junk bonds. In March 2020, the Fed reprised its last-resort lending to primary dealers, accepting private securities as collateral, and its last-resort underwriting and buying of commercial paper. Given the reliance of nonfinancial firms on corporate bonds, some were not surprised when the Fed then extended last-resort underwriting and buying to corporate bonds. In April, however, the Fed departed from its playbook with its announcement that it would buy junk bond exchange-traded funds (ETFs): it set no minimum quality criterion for its credit extension.

The Fed's announced intervention in corporate bond markets succeeded before the buying even started. It raised prices of corporate bonds, narrowed both trading and fund valuation spreads, reversed investor runs and encouraged record-setting corporate bond issuance. ETF prices jumped on announcement, flipping a flashing market "billboard" from sell to buy, and underlying bond prices, spreads and flows subsequently improved across a broad range of dollar credit markets.



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This paper raises two policy questions. First, could the Fed have reduced the conflict between buying junk bonds and its previous efforts to reduce supervised banks' involvement in leveraged loans? The Fed could have bought only junk bond funds holding a smaller weight of the lowest quality bonds issued by firms that private equity deals had leveraged up. Second, should the Congress authorize the Fed to do open market operations in corporate bonds? Such authority could avoid the legal awkwardness of using emergency lending powers to buy corporate bonds and could allow the Fed to develop operational capacity in this important market. Similar issues of role conflict and legal powers arise in any market, including emerging markets, when the central bank buys private securities.

Introduction

The Federal Reserve announced on 23 March that it would buy outstanding investment grade corporate bonds through exchange-traded funds (ETFs) and directly. LQD, the largest US investment grade corporate bond ETF, jumped 7.4% that day.

In acquiring private securities, the Fed in some ways would come full circle back to its founding in 1913. At that time, the City of London financed international trade through bills. The original Federal Reserve Act embodied an ambition for national financial development: to repatriate the financing of US trade (Eichengreen and Flandreau (2010)). To this end, the Fed exempted so-called bankers' acceptances (BAs), short-term corporate IOUs carrying a bank payment obligation, from the costs of its reserve requirements. And in the 1920s, the Fed bought and held BAs along with gold as an asset.

In the Great Depression and WWII, US Treasury securities displaced BAs in the Fed's portfolio. Most viewed US Treasury securities as "risk free", and many took the view that the Fed should avoid favoring one private IOU over another by buying only Treasuries, maintaining so-called "market neutrality" (Cecchetti and Schoenholtz (2020); Hetzel (2020); van 't Klooster and Fontan (2019)).

Fed officials have now and then over the years suggested that the Fed's authority to buy domestic securities in the open market be expanded from US Treasuries and agencies (and BAs) to corporate bonds. In the 1930s, Chairman Marriner Eccles urged the Congress to grant the Fed such authority for high quality corporate bonds. A few years ago, Chair Janet Yellen mused that in a future downturn the Fed could find it useful to buy corporate bonds whose yields bear more directly on spending decisions than do Treasury yields (Lange and Dunsmuir (2016)). Most recently, President Rosengren (2020) of the Federal Reserve Bank of Boston urged that Congress grant the Fed authority to buy corporate bonds as part of its open market operations with indemnification against losses from the US Treasury.

Without such authority, in March 2020 the Federal Reserve Board employed its extraordinary lending powers in a work-around. It approved the Federal Reserve Bank of New York (FRBNY) lending through its discount window to its own special purpose vehicle (SPV) that would buy corporate bonds. In effect, this Bank's discount window, set up to lend to banks, not its open market desk, would finance corporate bond purchases at one remove. The US Treasury would cover losses up to 10% of the operation out of funds appropriated by the Congress.³

Desan and Peer (2020) suggest that in March 2020, the Fed took a new step in extending credit to particular nonfinancial firms, and so entered into distributional choices previously left to private decisions. Like Menand (2020), Desan and Peer interpret the Fed's 2008 commercial paper (CP) facilities as having backstopped credit to "shadow banks", nonbank financial firms, but not nonfinancial firms.

³ Selgin (2020) argues that this backstop is an appropriate device to keep the Fed out of fiscal policy; Desan and Peer (2020) suggest that it creates a muddle.

This paper argues to the contrary that the Fed set telling precedents in its 2008 interventions in the CP market. To be sure, it in effect bought outright outstanding asset-backed CP, which is generally considered to be a “shadow bank” liability. But it also underwrote CP issuance not only for finance companies (eg GE Credit) but also for nonfinancial firms (eg Verizon). This precedent matters: the US Congress subsequently reviewed the Fed’s emergency lending powers and the Dodd Frank Act left intact the Fed’s capacity to buy corporate securities through an SPV, as long as it sought to break even and had US Treasury approval. In 2008 the combination of the emergency lending power with the SPV to buy corporate paper was as audacious as it was powerful (Alvarez et al (2020)). In 2020 the combination retained its power but had lost its audacity, having passed Congressional muster.

One can debate whether picking which corporations deserved help in selling CP was appropriate policy in 2008. In practice, the Fed delegated this choice to private credit rating agencies, and such delegation raises issues in itself, as argued below. But one cannot argue that picking which corporations deserve Fed support of their bonds is an entirely new Fed undertaking in 2020.

Thus, on 23 March 2020, the Fed merely took the principle of 2008’s intervention in the CP market and extended out the yield curve to buy corporate bonds. The intervention succeeded in improving prices, trading liquidity, investor flows and primary market issuance. In mid-June when the Fed turned from buying ETFs to buying individual bonds in a bespoke index, it faced Congressional questions whether further purchases were necessary. Such is the cost of success.

The Fed broke new ground on 7 April 2020 by announcing purchases of noninvestment (aka speculative) grade (aka high yield or junk) corporate bond ETFs. Although junk bond prices had already risen and their trading liquidity had already improved in the wake of the March announcement, the April announcement surprised market participants. Junk ETF prices jumped 5-7%.

The new element was not just that the Fed was extending down the credit spectrum into riskier securities. It was in addition that the Fed was prepared not to draw any credit distinction, as it had in 2008 and in March 2020. Instead, it left the choice of its credit allocation in junk bonds to index providers concerned with such characteristics as size of issues and form of SEC registration.

The deployment of discount window credit to a credit blind, broad index leads to several problems discussed below. The most difficult is that it put the Fed’s credit into leveraged firms whose buyout loans the Fed as bank regulator had warned banks not to underwrite. At writing, the limited Fed purchase of noninvestment grade ETFs makes this a practically small problem: not all that much Fed credit has flowed into bonds of firms that went through highly leveraged buyouts. The principle that the Fed as buyer of last resort does not take its own advice as bank regulator is troubling, however.

In light of the Fed’s now repeated intervention into corporate securities markets, the US Congress could usefully provide the Fed a new legal framework for such interventions. Nonfinancial firms have shifted from borrowing from banks to issuing CP and bonds in the money and capital markets. Fed operations that could backstop bank-dominated corporate finance do not work anymore, and the Fed’s new operations need proper authority. An option worth considering is to extend the authority for normal open market operations to corporate bonds.

This paper’s review of the Fed’s purchases of corporate bonds should interest policy-makers in emerging markets. If the central bank adds breadth, depth and market liquidity to any market in which it operates, then such policy-makers’ ambitions for financial market development should guide operational choices (McCauley (2006)). What is more, several emerging market central banks have recently bought private securities denominated in domestic currency in response to market dislocations (Arslan et al (2020)). Common questions arise. Whose securities qualify for central bank

purchase? How should the central bank resolve any tension between bank supervision policies and its role as a buyer of last resort of private securities?

These questions arise in relation to how central banks and treasuries can intervene in securities markets, how the Fed has intervened in private markets past and present, and how to make sense of the Fed's new interventions. Below, the second section outlines five ways in which central banks and treasuries can intervene in securities markets subject to investor runs and firesales, highlighting the important precedents that the Fed set in 2008 with its CP facilities. The third section then profiles the Fed's purchase of corporate bonds in 2020, assessing the impact on prices and flows. The fourth section focuses on the later Fed extension of its corporate bond purchases to junk bonds, highlighting the departure from its previous reliance on private sector credit raters and acceptance of index providers as the gate-keepers of its credit. The fifth section discusses the case for adding corporate bonds to the Fed's authority to do open-market operations. The sixth section sums up the implications of the preceding sections for the two policy questions raised.

How Can a Central Bank Stabilise Securities Markets? 2008 Precedents and March 2020⁴

Four months on, it is time to catch our breath and to put central bank measures to stabilise securities markets into some order. Their motivation is clear: in the face of runs on such markets, the real economy faces threats of disruption of credit flows, unnecessary defaults and fire sales.

Fifty years ago, the Fed could respond to the seizing up of the CP market after the default of a large issuer, the railroad Penn Central, by opening the discount window to banks. With easy access to Fed credit, banks could lend to industrial firms that were unable to roll over maturing CP. (In March 2020 we saw firms drawing down formal bank credit lines that the rating agencies began to require of CP issuers after the Penn Central episode.) Then, corporate loans of the big weekly reporting banks could expand by 3% in order to offset a rapid 10% decline in CP (Schadrack and Breimyer (1970)). Ultimately, banks provided a backstop as outstanding CP shrank by about a third (Timlin (1977)). A bank lender of last resort could backstop, at one remove, a substantial securities market. Hetzel (2020) cites this precedent but capital rules did not bind bank assets then.

However, in March of 2020, the Fed confronted runs on relatively larger securities markets. At the end of March 2020, according to the Fed's financial accounts, US nonfinancial corporate business had corporate bonds, commercial paper and other debt securities outstanding of \$6.7 trillion, but only \$1.3 trillion of bank loans outstanding. The Fed's opening the discount window wide open to banks to onlend to firms would not suffice to stem a run on securities markets.⁵

If the securities markets have outgrown their bank backstops, the central bank can itself stabilise securities markets in five different ways. These are as 1) lender of last resort to securities firms, 2) lender of last resort to investment funds, 3) securities dealer of last resort, 4) securities underwriter of last resort and 5) securities buyer of last resort. By Monday 23 March, the Fed had put in place programs under the first, fourth and fifth rubrics.

⁴ For an earlier version, see Kaminska (2020).

⁵ For a contrary view that relaxing leverage constraints would allow banks to replace \$1.5 trillion in CP and bond market credit in a matter of months, see Cecchetti and Schoenholtz (2020). Closest to the Penn Central playbook is banks providing funding to their money market mutual funds to counter investor runs. In March the Bank of New York and Goldman Sachs reportedly bought \$3 billion in paper from their money market funds, backstopping securities markets. If the bank holding company could not have raised the funds necessary to buy the CP, the Fed Board would have to waive the (remaining Glass Steagall) restrictions on bank trades with affiliated investment companies. In 2007-08, the Board granted waivers for banks to fund affiliated securities firms.

The Fed returned to its 2008 playbook in mid-March to reprise its role as **last resort lender to securities firms**. The Primary Dealer Credit Facility funnels collateralised Fed credit for up to 90 days to its designated primary dealers. Collateral can include corporate bonds, municipal securities and equities, all no-goes for the bank discount window. Outstanding Fed credit to securities firms peaked in mid-April at \$36 billion, with corporate and municipal securities forming the bulk of the collateral (Martin and McLaughlin (2020)). Bank capital and liquidity rules bound dealers.

There is no precedent for the Fed serving as **lender of last resort to investment funds**. However, the Treasury's Exchange Stabilization Fund (ESF)⁶ guarantee of the par value of money market fund liabilities after the Lehman default in September 2008 set a recent precedent for official support of investment funds.⁷ This, in combination with the Fed's in effect purchasing and underwriting of CP (see below), stopped the run on money market funds. Like the expansion of the discount window to securities dealers, central bank lending of last resort to investment funds requires a big step in central banking (eg, in the United States, it would require the use of emergency Section 13.3 powers with Treasury approval).

The Bank of England set the precedent for the central bank's serving as a **securities dealer of last resort** in 2010. Having bought a limited amount of corporate bonds under its "quantitative easing", it started to buy and to sell bonds in 2010. The intention was to add market liquidity and to encourage private firms to deal more at narrower spreads (Fisher (2010), Tucker (2009, 2014, 2018), Mehrling (2010)). In March, the Systemic Risk Council (2020) urged central banks to revisit this role. It is possible to imagine the Fed similarly backing into this role by trading its corporate bond portfolio, but to date it has not done so. Despite the Fed's large participation in the repurchase market as both cash provider and cash borrower, the separate histories of the two sides and the Fed's motivation suggest that it has not taken on the role of dealer of last resort.⁸

On 18 March the Fed reprised its role as **underwriter of last resort** for CP in 2008-09. For a small underwriting fee of ten basis points, firms can sell CP directly to the Fed if they cannot sell it in the market at less than 2% over overnight rates. This time the ESF is providing a layer of Treasury equity to shield the Fed from losses. In 2008-9 the Fed made a tidy profit on the facility. Thus far, the Fed has extended much less credit under this facility than it did in 2008 (Collins (2020)).

On 23 March the Fed extended its underwriting out the yield curve, supporting the issuance of investment grade corporate bonds or loans of up to four year's maturity. Again, the ESF takes the first losses on 10% of outstanding credit. This intervention in the primary corporate bond market, along with the one in the secondary market below, takes central bank support for securities markets from short-term funding markets to medium-term capital markets. That said, while the Fed had made substantial purchase of corporate bond ETFs by mid-June, and then had begun to buy individual bonds, it rolled out the primary market facility only at the end of June to expectations of little use given the by then well-oiled market.

As noted above, the precedent for **securities buyer of last resort** occurred in 2008-09 when the Federal Reserve Bank of Boston responded to investor runs on money market funds. It made non-recourse loans to custodians to finance the purchase of asset-backed CP from mutual funds. The

⁶ For the origins and uses of the ESF, see Osterberg and Thomson (1999), Wallach (2015) and Menaud (2020).

⁷ Among central banks, the Bank of Japan seems to have set the precedent here when it funded investment companies in the mid-1960s during the Yamaichi crisis. See Adams and Hoshii (1972).

⁸ On 18 March, the Fed was on both sides of the repo market to the extent of \$234 billion, which has the look of a dealer's "matched book" of repo. The Fed has long taken in large sums of cash from foreign central banks and a lesser sum from money market funds. In late 2019, it resumed lending cash in size after a long hiatus in order to control short-term rates. So the Fed has not really taken in and lent out cash simultaneously to keep the repo market going as would a true dealer of last resort. By July 2020, the Fed had run its cash lending repo down to zero.

non-recourse feature of the loans made them a legal fig leaf for outright purchases. On 18 March 2020, the Fed announced a similar but broader program under which the Boston Fed would make non-recourse loans to any bank secured by CP bought from money market mutual funds. Thus the 2020 programme broadened the paper to be bought from the “shadow bank” liability of asset-backed CP to CP in general, including that issued by nonfinancial firms. On 20 March, the Fed added municipal paper to the program. As noted, on 23 March the Fed announced that it would buy US investment grade corporate bonds or ETFs in the secondary market. For both CP and corporate bond facilities, the ESF is providing a slice of equity risk.

Stepping back, between them the Fed and Treasury pulled out all but one stop as they sought to stabilise securities markets in 2008. With the 2008 CP programs, the Fed crossed an important line in being prepared to buy and in buying private securities issued by nonfinancial firms in the primary market. Whereas the Fed had successfully refused to lend to Penn Central in 1970, letting the firm default on its CP (Calomiris (1993)), in 2008 it designed a broad programme available to many firms, an approach which Dodd Frank endorsed while proscribing deals for individual firms.

While the 2008 CP facilities set important and often overlooked precedents, the Fed’s practice changed in important ways in 2020. In setting the criteria for which individual corporate securities that it would underwrite or buy in 2020, the Fed excluded classes of borrowers who participated in the 2008 CP facilities. It also improved on its delegation of credit decisions to private rating agencies.

The Fed restricted the residence/nationality of bond issuers in 2020 as it had not done with the CP issuers in 2008. The bond issuer has to have significant operations in the United States and most of its employees based there. However, the operations and employee tests apply to the immediate issuer rather than the ultimate beneficial owner, so it does not exclude US subsidiaries of foreign-headquartered firms, eg BMW (Federal Reserve Bank of New York (2020)).⁹ However, the Fed will not buy the bonds of issuers that are majority-owned or controlled by foreign governments, as it bought CP of eg the Korean Development Bank. The Fed’s practice broadly resembles that of the Bank of England, which required a substantial contribution to the UK economy.

The Fed also excluded bank-affiliated issuers. The 2008 CP facility had a very strong representation of US bank and especially foreign bank funding affiliates.¹⁰

On the credit front, the Fed improved on its practice in 2008 of delegating its credit decisions to the private sector. In both cases, it limited the credit risk posed by corporate issuers with no bank guarantee by limiting its underwriting support to more credit-worthy firms as identified by recognised rating agencies. But in 2020 the Fed improved its treatment of firms with multiple credit ratings in order not to reward the practice of shopping for good ratings. If a firm has multiple ratings, two must agree on the Fed’s minimum rating. In 2008, by contrast, the Fed’s minimum rating could be satisfied by a single rating agency even if the firm had multiple ratings.

On 9 April, it accepted so-called fallen angels, firms that had been investment grade on 22 March, alongside investment grade credits for its corporate bond purchases. But the angels could have only fallen so far, to BB-/Ba3, and still be bought. And again, if multiple rating agencies provided ratings, at least two had to give the firm this minimum rating.

If one of the lessons drawn after the last crisis was that public policy should not entrench rating agencies in law and administrative practice, the need to draw credit distinctions in the midst of a

⁹ US financing subsidiaries must have funded US operations to qualify.

¹⁰ This limit reaches foreign bank operations incorporated in the United States, including securities affiliates, owing to a provision in the Dodd Frank Act that required foreign banks to organise their nonbank firms in the United States under an intermediate holding company.

crisis led the Fed again to delegate credit calls to the rating agencies. The termsheet, however, leaves the Fed in principle able to override those judgements: “In every case, issuer ratings are subject to review by the Federal Reserve”.

The Fed continued through March 2020 in drawing credit distinctions. For a to-date limited amount of buying of non-investment grade bond ETFs, however, the Fed dropped its credit standards in April, as described after the next section.

How Did the Fed’s Buying of Investment Grade Corporate Bonds Affect the Market?

This section reviews evidence of both prices and quantities and finds that the Fed’s announcement and subsequent purchases of corporate bonds succeeded. They succeeded in raising prices, restoring trading liquidity, and narrowing spreads. Regarding flows, they succeeded in reversing the trend of redemptions of bond mutual funds and boosting corporate bond issuance. Indeed, despite many corporate treasurers, securities dealers and institutional investors working from home, March through June 2020 saw record issuance of US corporate bonds. The market recovered so well that, after the Fed announced its home-rolled index to guide individual bond purchases on 15 June, a senator asked the Fed Chair whether purchases were really warranted. Chairman Jay Powell answered that the Fed was just switching from ETFs to direct purchases, and would taper its purchases if the market were to show sustained improvement in functioning.

Prices after 23 March

Turmoil in financial markets in March 2020 poses big challenges to any assessment of policy moves. The US Treasury market itself was in turmoil, particularly between 9 and 23 March, as leveraged players unwound futures-cash arbitrage and relative value trades and met cash calls with selling of US Treasuries (Fleming and Ruela (2020), Fleming (2020), Schrimpf et al (2020) and Cheng et al (2020)). The ten year yield plunged to 0.52% on 9 March but jumped up to 1.18% on 18 March, only to drop again to 0.76% by 23 March. Fed purchases of Treasuries at unprecedented rates sought to absorb less liquid Treasuries and limit volatility. With such volatility, and corporate trading generally responding with some lag to Treasury moves, the assessment below analyses *prices* of bond ETFs before *spreads* of bond yields over those on US Treasuries.

The Fed’s intervention in corporate bonds came after big interventions in the CP market and on behalf of money market funds. As in 2008, investors fled from riskier prime funds into government funds, now fearing delays in redemption (“gating”) as well as redemptions priced below par (“breaking the buck”). In response, the Fed rolled out a facility on the morning of 17 March to underwrite CP to facilitate rollovers of maturing paper (the CPFF). And late on 18 March (11pm), the Fed launched a facility to in effect buy CP from money market funds through banks.¹¹

Moreover, the Fed’s intervention in corporate bonds came on the heels of its offer to finance dealer’s inventories of corporate bonds. The Fed announced the Primary Dealer Credit Facility, which allowed dealers to borrow against corporate bond collateral, on Tuesday evening 17 March, and it extended 90-day credit under the facility starting Friday 20 March. Martin and McLaughlin (2020) report that corporate and municipal securities account for the bulk of the collateral offered by dealers. Kargar et al (2020) find that dealer inventories shrank from late February to mid-March and only rose significantly on 19-25 March. Recognising the difficulty of distinguishing the effect of different Fed

¹¹ Aramonte and Avalos (2020) suggest that the Fed’s support of the short-term credit market led to shifts of funds from the shortest duration bond funds, leading to wide discounts of ETF prices against net asset values in this market segment (see below).

facilities,¹² Martin and McLaughlin (2020) argue that the Fed’s extension of credit to primary dealers helped to break the widening of spreads. The price of the largest bond ETF, LQD, rose modestly in price on 20 March, and the number of its shares outstanding rose by over 2% on both 19 and 20 March.

Whatever the role one assigns to the Fed’s earlier extension of credit to primary dealers, there is no doubt that the Fed’s announcement that it would buy corporate bonds on 23 March pushed up corporate bond prices and brought down corporate yields. This is despite some voices having predicted and others having called for such purchases,¹³ which means that the announcement was not a complete surprise. The largest ETF, LQD, gained 6.6% at the opening of trading and 7.4% on the day.¹⁴ Table 1 shows that the other investment grade ETFs that the Fed had bought into by 19 May also enjoyed tidy one-day gains.

Table 1: Investment grade corporate bond ETFs held by Federal Reserve, 19 May and 19 June 2020

Ticker	Fund name	Holding, 19 May 2020, \$m	Holding, 19 June 2020, \$m	Size of fund, \$b	Price change, 23 March	Price change, 9 April	Price change 22 March to 11 May	Price change, 12 May	Non-US share %
LQD	iShares iBoxx US Dollar Inv Grade Corporate Bond ETF	326	1,783	53.5	7.4%	4.7%	17.62%	0.96%	18.8
VCIT	Vanguard Intermediate-Term Corporate Bond ETF	228	1037	35.4	5.4%	2.7%	14.44%	0.48%	17.3
VCSH	Vanguard Short-Term Corporate Bond ETF	226	1308	28.6	3.5%	1.5%	10.80%	0.18%	35.4
IGSB	iShares Short-Term Corporate Bond ETF	88	608	17.8	3.9%	1.7%	11.17%	0.54%	37.9
SPIB	SPDR Portfolio Intermediate Term Corporate Bond ETF	69	405	6.2	4.8%	2.3%	13.22%	0.34%	33.4
IGIB	iShares Intermediate-Term Corporate Bond ETF	58	398	10.7	4.7%	2.5%	13.45%	0.54%	30.0
SPSB	SPDR Portfolio Short Term Corporate Bond ETF	42	237	6.6	3.9%	0.7%	10.17%	0.13%	27.3
USIG	iShares Broad US Dollar Inv Grade Corporate Bond ETF	36	150	4.8	5.2%	2.8%	14.08%	0.65%	27.7
SLQD	iShares 0-5 Year Investment Grade Corporate Bond ETF	10	44	2.2	2.9%	1.0%	10.48%	0.18%	26.9
Total		1,084	5,970						

Sources: Federal Reserve; New York Stock Exchange ARCA; Fidelity; size as of 25 June.

¹² There was just a day between the Fed’s first discount window advance to dealers on 20 March and the corporate bond purchase announcement in the early morning of Monday 23 March.

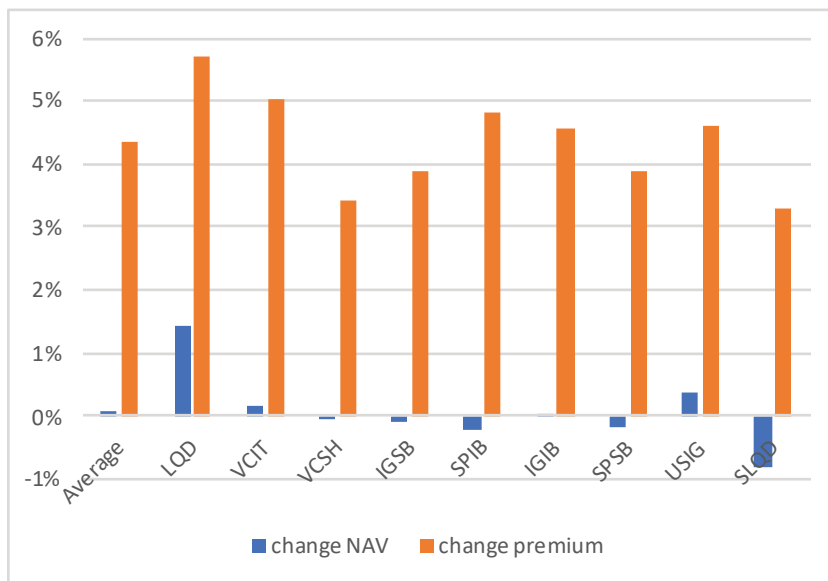
¹³ See Norton (2020) for a prominent economist’s prediction in *Barron’s*, and the op-ed piece in the *Financial Times* by Bernanke and Yellen (2020) from 18 March.

¹⁴ Haddad et al (2020) show that intraday movements point to the effect of the Fed’s announcement before the market opened.

These are big moves by the standards of the market response to the ECB's Outright Monetary Transactions announcements, more popularly known as President Draghi's "whatever it takes" speech and its follow-ups. As Haddad et al (2020) note, the long-duration LQD showed about a 75-basis-point decline in yield, while the shorter duration funds in Table 1 showed larger declines in yields of around 200 basis points, consistent with the Fed's focus on bonds of less than five year's maturity. It took three ECB announcements in July, August and September of 2012 to move the 2-year bonds of Italy and Spain a like amount (Altavilla et al (2014)).

A remarkable feature of this price gain on 23 March is how much of it took place in the discount/premium of the ETF vis a vis the fund's NAV. In the case of the largest fund LQD the ETF discount of 2.8% at the close on 20 March flipped to a premium of 2.9% at the close on 23 March, for a swing of 5.7% leaving the change in the NAV playing second fiddle with a 1.4% gain (Graph 1).¹⁵ For the other 8 funds that the Fed would buy, the rise in the premium accounted for all of the 4.3% price gain, as the NAV actually showed an average loss of 0.1% on 23 March.

Graph 1: Fed corporate bond announcement 23 March raises ETF premia more than NAVs



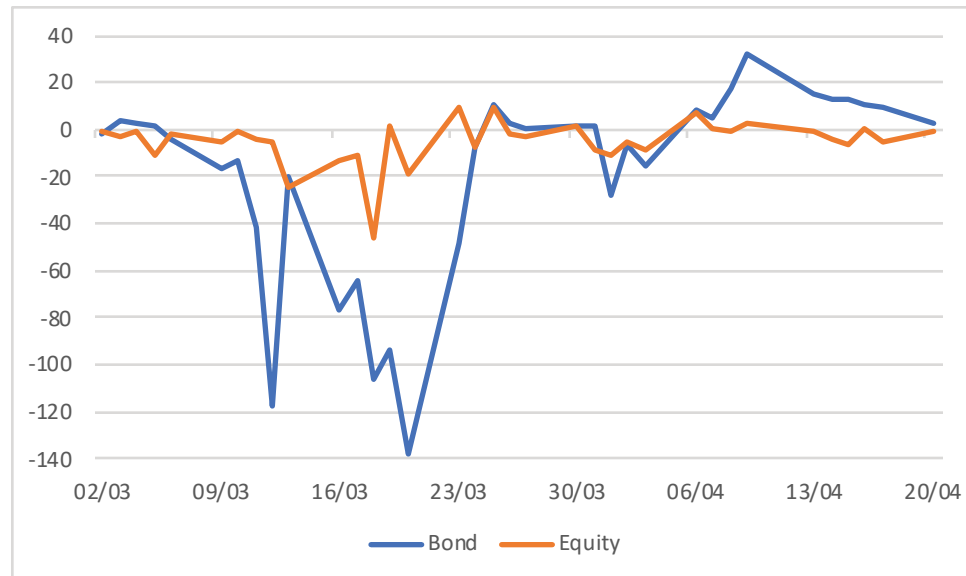
Source: Refinitiv.

A broader market-wide view of ETFs gives the same result qualitatively but a rather different picture quantitatively (Graph 2). Aramonte and Avalos (2020a) report discounts on a sample of corporate bond ETFs of 5.3% on 19 March, and 6.9% for the short-term funds.¹⁶ These discounts were five times wider than the market median around 1% on that day. On 23 March the market median discount jumped up by 0.9%. The average of the 9 funds in Graph 1 showed an average swing from discount to premium that was 5 times larger. Evidently, the pricing dislocations were much larger in corporate bond funds than in other bond funds, and perhaps wider in the larger, more traded funds.

¹⁵ The fact that LQD and USIG show the best NAV performance points to price gains in longer maturity bonds on 23 March.

¹⁶ For the larger investment grade ETFs on Table 1, discounts then were wider at 5.7% and 7.1%, respectively.

Graph 2: Median ETF premium (+) or discount (-) relative to net asset values
In basis points



Source: Collins (2020), citing Bloomberg.

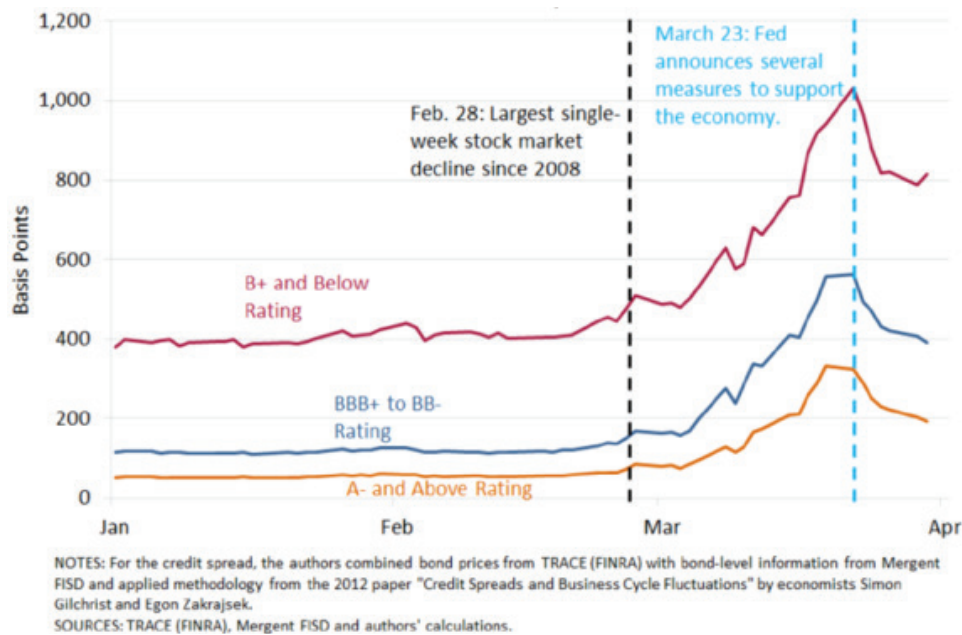
The most liquid corporate bond instrument trading at a big discount can send an important signal. Something similar occurred in the equity market in October 1987 when a big discount opened up between the most liquid instrument, namely S&P futures traded in Chicago, and cash equities traded in New York. The Brady Commission (Presidential Commission (1988)) found that the “billboard” effect of the futures’ discount to cash prices sent the signal that cash equity prices were going to fall, discouraging would-be purchasers of them. Similarly, big corporate bond ETFs trading at a 5.7% discount to the NAV on 19 March could discourage would-be purchasers of cash bonds.¹⁷ Market participants surely understood that the largest ETFs serve as the locus of price discovery so that their price returns predict NAV returns, especially in volatile markets (Aramonte and Avalos (2020a)).

On this view, the Fed’s promise to buy ETFs turned the price on the biggest billboard, LQD, from substantial discount—“SELL”—to the opposite—“BUY”. The Fed did not, as a dealer of last resort might quietly do, force consistency between ETF prices and NAV. Instead, its announcement coordinated expectations in a way that flipped the discount to premium, sending a signal to buy.

The minor role played by the NAV gain in the big jump in corporate bond ETF prices on 23 March has by now prepared us for the unspectacular performance of investment grade spreads that day (Graph 3). The graph measures very carefully spreads based on actual trades of individual bonds and shows nothing very striking to have happened on 23 March. Spreads on bonds rated A- and above narrowed against the backdrop of a 20-basis-point decline in the benchmark US Treasury 10-year yield.

¹⁷ Hasan et al (2020) allude to the arbitrage view, according to which the ETF price discount should induce dealers to buy ETF shares in the market, to exchange them with the ETF for the underlying bonds and to sell the bonds to pocket the price difference. The failure of arbitrage view ascribes the big discount to balance sheet constraints on dealers, which the Fed’s Primary Dealer Credit Facility and later its 1 April exclusion of Treasury securities from supplementary leverage ratio rule sought to relax. However, LQD data shows sizeable creation of 2% more shares on 19 and 20 March, despite the discount, which seems to contradict the arbitrage view.

Graph 3: Median credit spreads on corporate bonds by rating



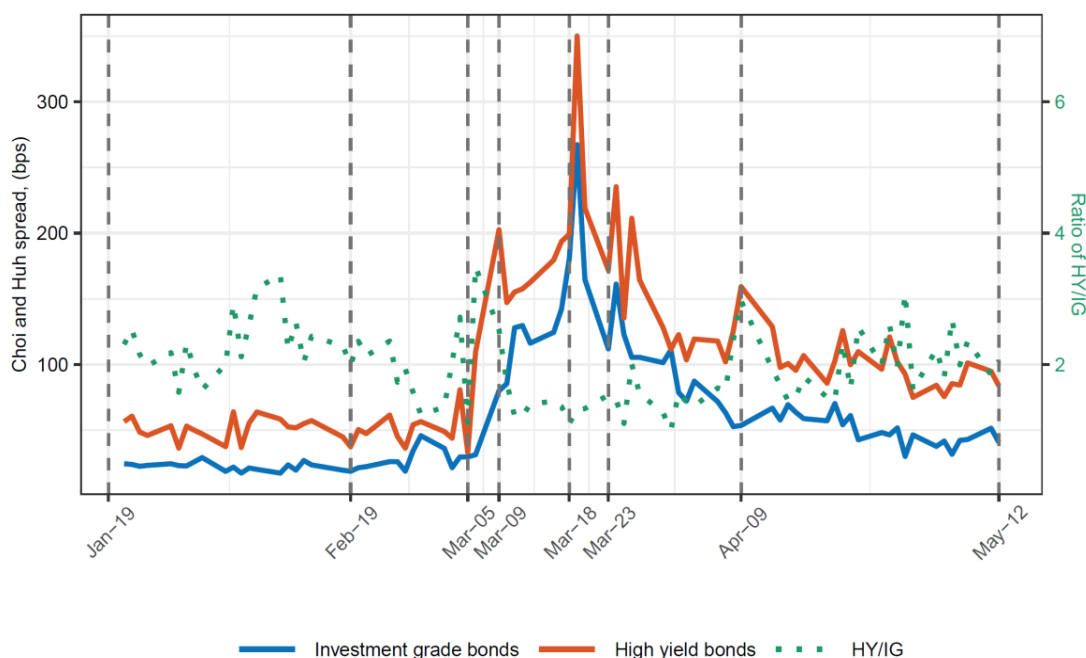
Source: Faria-e-Castro et al (2020).

The big decline in spreads on quality bonds started a day later, and this lagged decline diffused across credit markets in the dimensions of duration, quality and nationality. The news that the Fed would buy short-duration bonds pushed down yields in the short-term commercial paper market from 0.54% on 23 March to 0.13% on 26 March. As discussed below, junk bond ETFs as well as cash junk bonds showed losses on the day that the Fed announced that it would buy investment grade bonds (Graph 2's red line). Then the largest junk ETF, HYG, gained 11.9% over the next three trading days and, in the market for cash bonds, spreads narrowed rapidly then. Turning to dollar bonds issued by borrowers outside the United States, the largest emerging market ETF, VWO dropped by 1% on 23 March, but then gained 14.2% over the next 3 days.¹⁸ An event study with a narrow one-day window ignores these subsequent gains on cash investment grade, CP, junk and emerging market bonds, but it is reasonable to read them, and the evidence on trading spreads below, as a delayed response to the 23 March announcement.

One observes a similar pattern in measures of trading liquidity in individual bonds (Graph 4). Trading spreads had widened in early March but narrowed as the Fed started to lend to dealers on 20 March and narrowed further albeit unevenly after the 23 March announcement. And, as with credit spreads, they narrowed for high-yield bonds in broad parallel to those for investment grade bonds.

¹⁸ Thus, the Fed's intervention in the US corporate bond market had an effect on the market for dollar bonds outstanding of non-US residents (other than banks), which the BIS counts as having grown from \$2.5 trillion at end-2008 to \$6.3 trillion at the end of 2019 (<https://stats.bis.org/statx/srs/table/e2?m=USD&f=pdf>).

Graph 4: Measured trading spreads for US corporate bonds



Source: Kargar et al (2020).

Note: Choi and Huh spread measures the weighted average price difference between dealer purchases and dealer sales of a security as a percent of the interdealer price, where such transactions are separated by more than 15 minutes.

To summarise prices and spreads after the 23 March Fed announcement that it would buy investment grade corporate bonds: most of the action on the announcement day took place in the discount/premium of investment grade ETFs relative to their NAVs. Subsequently, prices rose and spreads narrowed not only the targeted intermediate term US investment grade corporate bonds but also in CP, junk bonds and emerging market bonds.

Prices in April and May

As discussed in the next section, the Fed announced on 9 April that it would include a limited amount of speculative grade corporate bond ETFs among its purchases of corporate ETFs. Since the Fed announced no increase in the overall facility for corporate bond buying, one might have hypothesised that this would not be good news for investment grade bond ETFs, which the Fed might well buy less of. But instead the corporate ETFs that had risen in price on 23 March rose again by substantial amounts (Table 1). It is as if the announcement of buying of junk bonds reinforced market participants' view of the seriousness of the central bank's purpose in bringing bond yields down. Be that as it may, it is remarkable that over half, ie 12.1% of the 17.4% gain in LQD between its closing trough of 20 March and the day before the Fed started buying, 11 May, occurred on the two days of the Fed announcements, overwhelmingly at the outset of trading.

Turning back to the price gap between ETF prices and NAVs, the 9 April announcement that the Fed would buy junk bond ETFs saw a jump in the median bond ETF premium by about 15 basis points. Thus the April Fed announcement registered with market participants as a clear buy signal like the March announcement, albeit at a lower volume. But the move into substantial premium differed: it

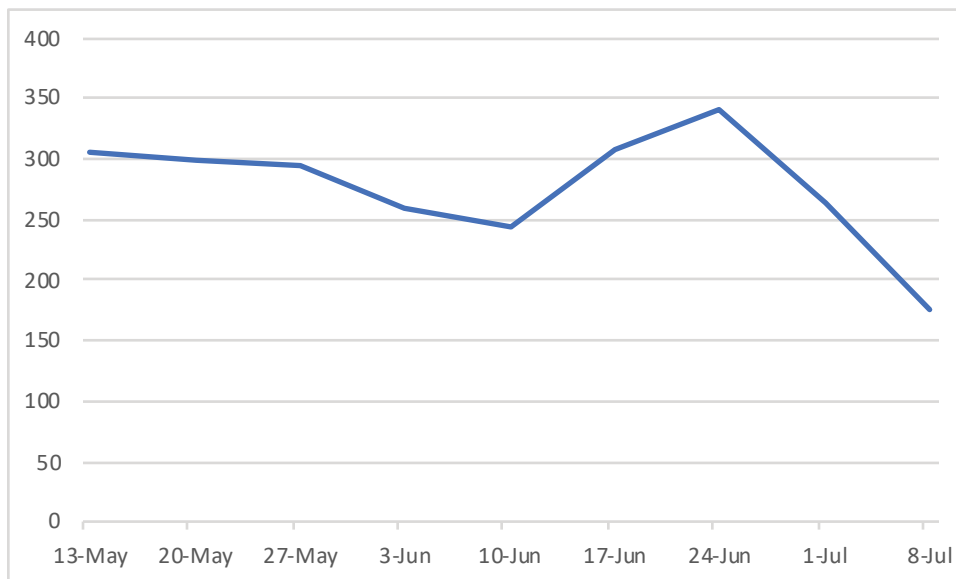
was not a return to the normal, as in late March, but pushed ETF prices into very abnormal territory. It is worth recalling that the first purchases were still a month away.

The Fed actually started to buy corporate ETFs on 12 May, seven weeks after the announcement, and sustained its purchases. It chose ETFs to balance investment grade and junk issuance, to focus on short- to intermediate-term bonds, to focus on US related obligors and to avoid ETFs selling at premia to the value of the underlying bonds.

Since the Fed's original announcement set a notional amount over a six-month period, market participants could have learned something from the pace of the Fed's actual buying starting 12 May. However, without time-stamped transactions, one cannot measure price action over a suitably narrow window. The most that can be said is that LQD rose by almost 1% that day, and the other ETFs by less. In short, the first day of buying saw no outsized price action in a still-volatile market. (See Table 2 below for negative returns on junk bond funds on the first day of buying.)

The pace of Fed buying has fluctuated around \$300 million per day. Through 18 May, it purchased around \$300 million in bond ETFs per day, a pace that would fall well short of the notional \$250 billion for the secondary market facility by its scheduled terminus at the end of September.¹⁹ The Fed's weekly balance sheet report shows that the pace of buying slackened in early June to about \$250 million per day, then picked up in the two weeks after the transition from buying ETFs to buying individual bonds and then slackened again (Graph 5). In the most recent week, purchases have eased to a pace of below \$200 million a day, reflecting the improvements in the underlying markets (Singh (2020b)).²⁰

Graph 5: The Fed's corporate ETF and bond purchases
Daily amount, week ended the date shown in millions of dollars



Source: Federal Reserve, "Factors affecting reserve balances", H4.1 release; author's estimates.

Note: Effect of the addition of 85% of the US Treasury equity to the Corporate Credit Facilities LLC is removed.

¹⁹ Back in mid-May, according to the monthly report to Congress, the Fed made 30+ individual fund purchases a day, buying 15 different funds repeatedly.

²⁰ Singh (2020b): "For context, \$300 million of ETFs purchases a day represented about 10 percent of average daily volumes for ETFs that were eligible for purchase at the time. Purchases are currently a bit under \$200 million a day across ETFs and cash bonds, around 5 percent of the average daily volume of eligible cash bonds, and less than 1 percent of ETF average daily volume".

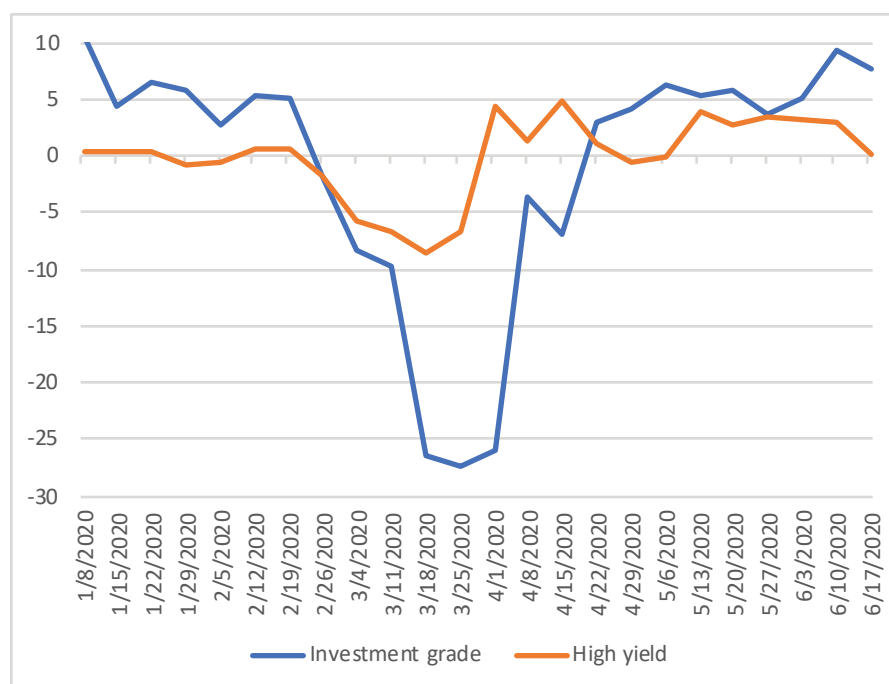
Flows: mutual fund flows and corporate bond issuance

By early March, investors and firms engaged in a dash for cash, selling money funds with private securities for ones with safer public securities, drawing down corporate credit lines (Acharya and Steffen (2020); Banerjee et al (2020); Darmouni and Siani (2020)). Investors on net were cashing in various categories of risky bonds (Graph 6). By the middle of the month, selling had turned into a run. In this environment, the Fed's 23 March announcement signalled that it would not allow the run by households on corporate bond funds to burn itself out or to proceed so far as to induce vulture funds to buy. Just as the sight of boxes being unloaded from a truck could break a run on a bank, so too the Fed's announced intention to buy corporate bonds could lead to a reversal of investor flows.

Yet the sequence of the end of the run was surprising in view of the Fed's announcement. Investor flows to bond mutual funds show that, notwithstanding the Fed's promise to buy, large redemption of investment grade bonds continued into the last week of March. Oddly, net investor redemptions of junk bond shares turned to net buying in the week after the Fed's announcement that it was buying investment grade bonds. It took a couple of weeks, until the latter half of April, for investors to return to modest net buying of better-rated bonds.

Graph 6: Flows to US corporate bond mutual funds

In billions of dollars, week ending the indicated day



Source: Investment Company Institute; Collins (2020).

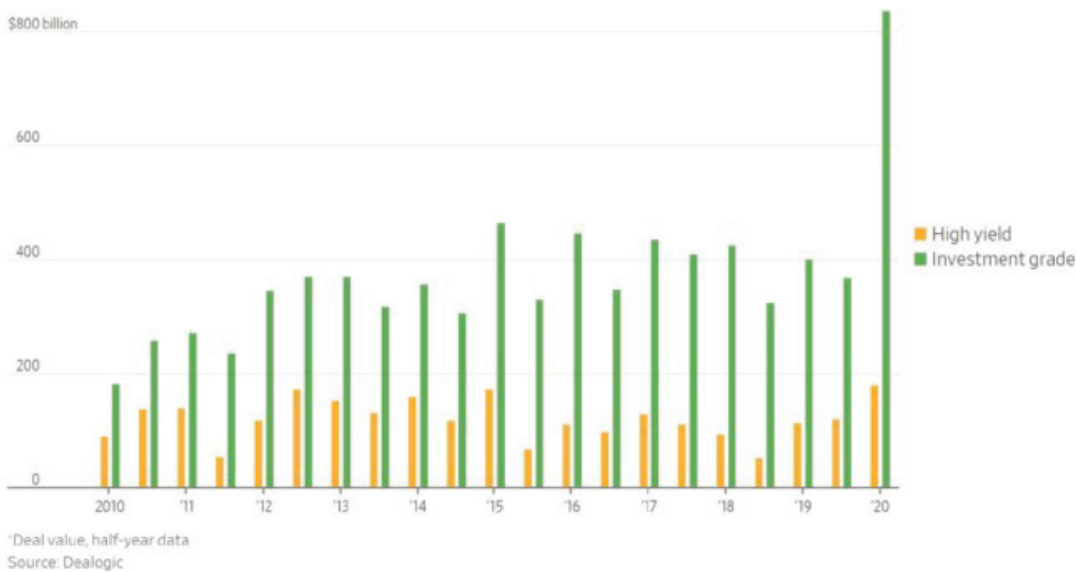
In early March, even as investors were redeeming shares in bond mutual funds and spreads were rising, some well-regarded firms sold bonds to demonstrate that they enjoyed access to the market and to reassure stakeholders that their cash holdings would see them through the pandemic. A corporate treasurer selling a bond in this market could not be too picky about the yield paid or too worried about comparisons with the terms of her last bond issue. Berkshire's utility was among these early bond sellers.

Against this backdrop of very large issues marketed by bankers working at home, Yum Brands, the owner of KFC and Pizza Hut brands, braved the junk market on March 30. It sold an oversubscribed issue yielding 3 per cent more than its previous offering. Indeed, as we have just seen, in the last

week of March, investors returned to net buying of junk bond funds. Thus, the demonstration that big deals could be done at the right price spilled over into the junk market.

In the event, corporate treasurers racked up record sales of bonds from mid-March in investment grade, setting a record for first half of fund-raising (Graph 6, lifted from Wirz (2020)). A precautionary rush to build liquidity gave way to an opportunistic rush to lock in low yields. Some of the bonds sold in March have risen in the process to hefty premiums over par. Even though there remains a well-founded concern about the vulnerability of leveraged firms (Board of Governors (2020a)), many firms have been able to top up their liquidity and increase their room for manoeuvre.

Graph 7: US corporate bond sales, first half of the year, 2010-2020



Source: Wirz (2020), citing Dealogic.

It must be recalled that monetary policy played an important role. Corporate bond issuance set records in March through June 2020 as monetary easing and low Treasury yields reconciled relatively cheap funding for firms and relatively attractive spreads for investors. In addition, huge Fed purchases of Treasuries and mortgage backed securities cleared the decks in Wall Street and private portfolios for new corporate issues.

The boom in corporate debt issuance ultimately led to questions whether the corporate bond-buying was necessary. The Fed only outlined its plan to buy individual corporate bonds on 15 June. At a hearing that week, Senator Toomey of Pennsylvania of the Banking Committee asked whether continued purchases were necessary. Chairman Powell repeated what he had said on other occasions, namely that the Fed had to validate the expectations that it had created, describing the move as “out of an excess of caution”.²¹ He also noted that the individual bond buying would replace rather than add to the ETF buying: the Fed was not “wanting to run through the bond market like an elephant ... snuffing out price signals”. If conditions in the market improved, purchases would be reduced, if they deteriorated, purchases would step up.²² He cited no demand for the primary market facility, which was also announced on 23 March.

²¹ <https://www.youtube.com/watch?v=qOOPzkHF6yc> at 3-5 minutes.

²² The FRBNY (2020, p 4) FAQ reported that the pace of buying depends on “an array of measures of corporate bond market functioning, the rate of change of such measures and other indicators...includ[ing] transaction cost estimates, bid-ask spreads, credit curve shape, spread levels and volatility, trading volumes, and dealer inventory”. These criteria mix market liquidity measures and pricing.

Stepping back, the effect of the Fed's announcement recalls the characterisation of "whatever it takes" line of President Draghi of the ECB in the summer of 2012 (Committee on the Global Financial System (2019, p 34)). Its "outsized effect, and the critical timing at which it occurred, point to the possible role that monetary policy ... can play in ruling out adverse self-fulfilling outcomes, at least in some circumstances". In the event, the ECB never made any purchases under the programme. One can only wonder how market participants would have reacted to a Fed announcement that it would buy corporate bonds if their prices remained depressed, and their trading liquidity remained impaired.

The Fed in the Junk Bond Market²³

This section reviews the argument for the central bank intervening in the speculative portion of the corporate bond market. It questions whether the sympathetic response of this market to the Fed's announcement that it would buy investment grade corporate bonds had made the case for buying junk less than compelling. Finally, it asks whether, given the intention to buy noninvestment grade debt, the popular market index ETFs were an appropriate vehicle for the central bank.

In a move that surprised many, the Federal Reserve announced on April 9 that it would buy junk bonds by purchasing exchange-traded funds (ETFs). This expanded the March 23 pledge to buy investment grade bonds, directly and through ETFs. On April 9, the Fed also extended the March 23 investment grade programmes to bonds of issuers that had been rated as investment grade on March 22, but had since been downgraded, so-called fallen angels like Ford.

Why would the Fed buy junk bonds? It can be argued that the junk bond market is particularly subject to substantial periods of closure that can be economically costly in an economic downturn.

Thus, one argument for buying them is to break perverse market dynamics. Wide spreads on outstanding bonds per se may be borne by refinancing firms' deleveraging. But if losses from wider spreads lead to investor redemptions, they can lead to a spiral of lower prices and redemptions. Such a run on the market can close the market for new issues. Given the high leverage and lack of liquidity buffers, a closed market can in turn lead to defaults, as well as reduced hiring and investment. Corporate defaults impose dead-weight losses on creditors, suppliers, customers and owners that are not limited to legal costs.

Since the emergence of original-issue junk bonds in the 1980s, the primary market for them has closed for a stretch on three occasions. It closed in 1990, around the failures of Campeau, a leveraged Canadian store chain, and junk underwriter Drexel. On that occasion, the market re-opened only after leveraged buyout (LBO) firm KKR invested more equity in RJR Nabisco, defusing a ticking bond bomb. This was a "par re-set" bond that was supposed to pay a yield high enough to trade at par, but would have instead blown up RJR's finances. The market also closed in 2000 following the fraud-related collapse of WorldCom, an aggressive telecommunications firm. And finally, it closed again in 2007-08 during the Great Financial Crisis (GFC).

This time around, amid growing apprehension of the pandemic, investor redemptions of junk bond funds and rising secondary market yields, the primary market closed in the first week of March 2020. It remained closed for over three weeks as investors dumped junk bond funds. But the Fed's March 23 announcement that it was going to underwrite and buy investment grade bonds led to big issuance by investment grade firms willing to pay up to demonstrate access. As noted above, this spilled into the junk bond market, as higher bond prices, improved market liquidity and a return of investor flows did as well.

²³ This section draws on McCauley (2020).

Thus, the Fed's decision to buy junk bonds came before a sustained closure of the market as seen in earlier episodes. The decision came after the Fed's promise to underwrite and to buy investment grade bonds had been followed by higher prices, better trading liquidity and a reversal of investor redemptions of junk bond mutual funds. It is not a criticism to say that the Fed acted before the primary junk bond market disappeared for months or after investor flows had returned to junk bonds. But it is fair to say that by 9 April the case for extending the bond buying to junk had weakened.

Despite the way that junk bond prices and trading spreads had improved after the 23 March announcement, the 9 April announcement evidently surprised market participants. The 6 junk bond ETFs that had been purchased by 19 May gained 5-7% on 9 April (Table 2).

Table 2: Speculative grade corporate bond ETFs held by the Federal Reserve, 19 May and 19 June

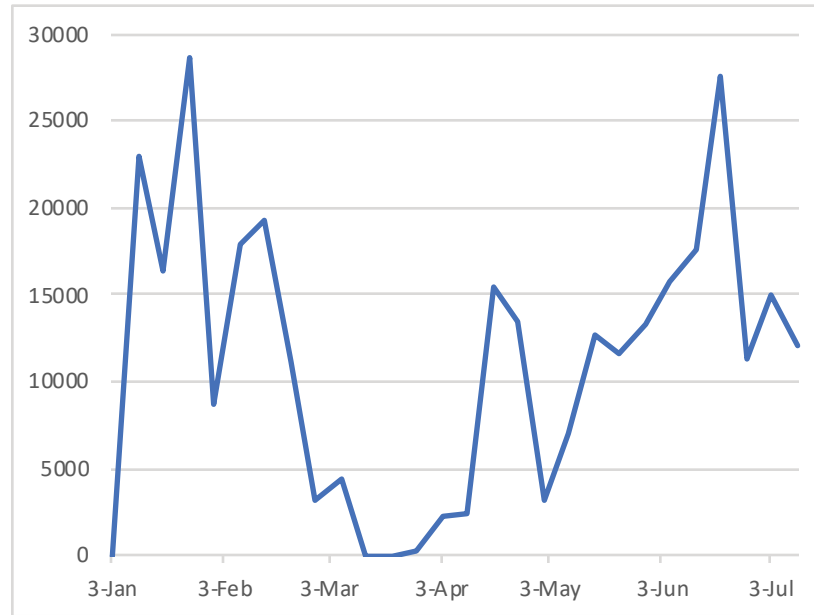
Ticker	Fund name	Holding, 19 May 2020, \$m	Holding, 19 June 2020, \$m	Size of fund, \$b	Price change, 23 March	Price change, 9 April	Price change 22 March to 11 May	Price change, 12 May	Non-US share %
HYG	iShares iBoxx High Yield Corporate Bond ETF	101	246	27.9	-1.6%	6.5%	13.82%	-0.13%	20.6
JNK	SPDR Bloomberg Barclays High Yield Bond ETF	90	412	11.9	-1.8%	6.7%	13.75%	-0.05%	21.1
ANGL	VanEck Vectors Fallen Angel High Yield Bond ETF	11	29	2.2	-0.3%	5.1%	20.04%	0.07%	21.5
HYLB	Xtrackers US Dollar High Yield Corporate Bond ETF	11	56	5.0	-2.1%	6.2%	14.25%	0.00%	20.6
SHYG	iShares 0-5 Year High Yield Corporate Bond ETF	7	23	4.3	-1.4%	5.5%	9.25%	-0.14%	20.0
USHY	iShares Broad US Dollar High Yield Corporate Bond ETF	4	49	5.3	-0.7%	6.1%	12.77%	0.69%	22.1
SJNK	SPDR Bloomberg Barclays Short Term High Yld Bond ETF	0	21	3.4	-1.8%	5.9%	9.95%	-0.25%	21.8
Total		223	836						

Sources: Federal Reserve; New York Stock Exchange ARCA; Fidelity; size as of 25 June.

Despite the reopening of the junk bond primary market in late March, the 9 April announcement kicked issuance higher. "While investment-grade issuance recovered at a strong pace following the March Federal Reserve announcement on corporate credit funding facilities, high-yield issuance began to pick up only after the April announcement to expand the facilities to include support for some recent "fallen angels"[...] and high-yield exchange-traded funds" (Board of Governors of the Federal Reserve (2020b)). This is evident in weekly sales of junk bonds in the United States (Graph 8). The week ending 3 April included the Yum Brands issue on 30 March, but issuance took off in the week ending 17 April, following the announcement on Thursday 9 April.

Graph 8: US junk bond issuance by week, 2020

In millions of dollars in the week ending on the date indicated



Source: Refinitiv.

Should the Fed buy junk bond ETFs that track broad indices? The \$28bn HYG or the \$12bn JNK funds track competing dollar junk indices. Buying into them appears an attractive option, allowing the Fed seemingly not to choose what to buy. Consider three possible drawbacks from least to most serious.

First, such indices include bonds of non-US issuers—you might say Yankee junk. One of HYG's biggest holdings for example is a highly leveraged French-headquartered telecom firm, Altice, with 1.8 per cent weight on April 23. It is easier to argue for buying home-grown telco Sprint, with a 2.1 per cent weight, even though it is now owned by Deutsche Telekom's T Mobile.

Other foreign firms include an Israeli-American drug company, three other European telecom companies, and a couple of European banks. Fidelity's website features "third-party analytics" that show the non-US exposure of HYG at 21 per cent of the portfolio. Most of the non-US based issuers probably have US operations large enough to qualify under the equivalent of the Bank of England's criterion for buying bonds of non-UK firms. That is, they "make a material contribution to [US] economic activity". Perhaps the completely foreign component of the high-yield ETFs is not a big drawback.

A second drawback is more serious. A low-quality bond index weighted by market capitalisation is a crazy idea. In principle, the shakier the bonds that other investors accept, the riskier one's investment. In practice, as investors reached for yield in the long upswing after the GFC, the index shovelled funds down the rating spectrum, away from hedge finance, to speculative finance and then to Ponzi finance. Now, as sales have shrunk and fallen angels like Ford join the index, the index reallocates funds toward the top end of junk, the Ba/BB bonds. Should the Fed buy into this sort of pro-cyclical dynamic?

The third drawback is most serious. The Fed as buyer of last resort should strive for consistency with the Fed as bank supervisor.

Since 2013, US bank regulators including the Fed have urged banks to steer clear of highly leveraged loans that burden firms with debt in excess of six times cash flow (Board of Governors (2013)). The bank supervisors struggled to get the banks to respond to the guidance, but ultimately their efforts managed to produce a substantial decline in the largest banks' market share in leveraged loan underwriting (Kim et al (2017)).

In the event, securities and private equity (PE) firms stepped in to underwrite such loans, while collateralised loan obligations (CLOs) and junk loan mutual funds stepped in as holders of them. While the activity scooted from the banks into shadow banks, thanks to this policy bankers find themselves in a stronger position today. Less burdened with a pipeline of unsalable loans, they are more able to absorb losses in credit cards and elsewhere. It is awkward for the Fed to buy junk bonds of firms that resulted from deals that it prudently discouraged banks from joining.

PE firms, including LBO firms, have systematically leveraged the firms that they own above the supervisory guidance. Moody's published a prescient study in October 2018 entitled "LBO credit quality is weak, bodes ill for next downturn" (Chursin et al (2018)). The average leverage of firms owned by PE firms exceeded 6 times cash flow for 13 out of the top 16 PE firms. The overall average for speculative grade debt was 5.3 times. Three of the 13 averaged a ratio over 7 of debt to cash flow.

When the Fed bought JNK or HYG, what fraction of its investment went into bonds of highly leveraged firms owned by PE firms? It is easier to pose this question than to answer it. Over half of HYG was rated B or lower by Moody's at end-February 2020, according to the fund's annual report. Moody's found that of 699 junk-rated firms owned by PE, 643 or 92% were B2-rated or below. For the 848 junk-rated firms not owned by PE, only 339 or 40 per cent were rated so low. Could as much as 20-30 per cent of HYG consist of bonds issued by firms that are owned by PE firms? Even if the share is lower because PE firms have found the leveraged loan market more accommodating, should the Fed buy such junk bonds? Groucho Marx refused to join any club that would let him in. Should the Fed join a club that it wouldn't let banks in?

Moreover, highly leveraged firms owned by PE funds have potential access to funding that ordinary highly leveraged firms do not have. PE firms are sitting on plenty of "dry powder" to deal with their own progeny, as KKR dealt with financial distress at RJR Nabisco.

Could the Fed have bought junk bond funds differently? A first alternative is that the Fed could have instead bought a fund like Vanguard's big open-ended fund that overweights Ba/BB-rated credits. With its low fees, the memorably named VWEAX at \$22bn exceeded HYG's \$16 billion size in April. Bonds rated B2 or below amounted to only 31.4 per cent of the fund at end-March 2020. In buying this fund, the Fed would have put much less money into the bonds of highly leveraged PE-owned firms

Are there technical objections to the Fed buying a non-exchange-traded junk bond fund in an end-day transaction? It is possible that the Fed worried that its order to purchase a fund at the conventional 4pm pricing of holdings could be disclosed to market participants. The immediacy of purchase of an ETF may seem to offer less opportunity for disclosure and front-running. A related concern might be that in buying a standard open-ended fund, the Fed would choose a fund counterparty, whereas with an ETF it deals with an exchange (although it ultimately discloses a holding of a fund from a particular fund family).

Whatever the argument against buying into a conventional open-ended fund, they lose force when one considers legitimate and articulated public policy reservations about how ETFs for junk bonds (and even more so for leveraged loans) offer intraday liquidity for aggregates of illiquid assets (eg, Financial Stability Board (2017)). That is, junk ETFs offer investors seemingly free and instantaneous intraday trading for bonds that often trade by appointment only. This gap can make for vicious circles in market dynamics that can impose externalities through primary market closure or firesales.²⁴ By ultimately buying into VWEAX rather than HYG and others, the Fed could have had much the same desired effects on market prices, trading liquidity and the primary market without backstopping the promise of instant liquidity for not so liquid underlying assets.

The second alternative is that the New York Fed's traders could have rolled up their sleeves to buy individual bonds that meet defensible criteria. This is how European central banks have bought corporate bonds, and indeed how the Fed has bought investment grade bonds and fallen angels since 15 June.

In short, Fed purchases of junk bonds through indexed ETFs posed problems of the consistency between the Fed as securities buyer of last resort and the Fed as bank regulator. Instead, the Fed could have bought into a thoughtfully constructed junk bond fund or could have bought into selected underlying bonds themselves. This latter option would have been easier for a Fed that had the authority to do open market operations in corporate bonds, as discussed in the next section.

Corporate Bond Purchases and Sales as Open Market Operations

Experience suggests that the shift of corporate finance away from banks and to the money and bond markets leads the Fed to intervene in first one then both of these markets. However, Congress has not given the Fed the authority to do open market operations in corporate paper, even in the CARES Act that anticipated corporate bond buying. Lacking such authority, the Fed has, as described above, used a legal work-around. This section considers the case for authorising straightforward Fed open-market operations in corporate bonds.

Running open market operations through what were designed as emergency lending facilities has at least three serious drawbacks. These only start with legal awkwardness bordering on incoherence, as pointed out by legal scholars. Second, buying corporate bonds as an emergency works against the Fed investing operational resources and research into these markets, which makes a troubling outsourcing of operations more attractive. Third and worst of all, the combination of the emergency lending power and SPVs, unlike an explicit expansion of the instruments of open market policy, leaves the Fed in a position to buy anything. If the Fed has the power to buy corporate bonds, might it not, with the consent of the US Treasury, buy other bonds, even equities?

Buying corporate bonds using its emergency lending powers puts the Fed into a legally awkward position. The Section 13.3 law and the Fed's 2015 rule-making require the Fed to "obtain evidence" that the participants (ie borrowers) are "unable to secure adequate credit accommodations from other banking institutions". In principle, Menand (2020) argues that it is not clear how the Fed can obtain such evidence, "especially with regard to ETFs".²⁵ The Fed's immediate borrower is its own SPV, which buys an ETF that holds corporate bonds of hundreds of issuers. Regarding individual

²⁴ See Chernenko and Sunderam (2020). Anadu and Cai (2019) note that junk bond ETFs overwhelmingly redeem in kind, rather than in cash. Nevertheless, when investors sell on net, they can bring in dealers as buyers of the ETF and sellers of the underlying bonds. In the investor's perception, the difference in how the net redemptions are met with cash is probably less important than the difference between intraday and once a day trading liquidity.

²⁵ Menand (2020, footnote 141) considers the ETF and the bond issuers, but not the SPV. It is an interesting question whether, with the Treasury's equity participation, banks would be willing to lend to the SPV. Of course, approaching banks would consume time and would work against a powerful and timely intervention. Regarding the ETF, it may indeed have access to bank credit as a supplement to its own liquid resources. At FRBNY, Held (2020) cites Menand and anticipates: "I

firms whose bonds are held by an ETF or bought outright, the Fed would struggle to obtain evidence that they all were unable to access bank credit, especially at a time when many firms drew down committed lines of bank credit (Acharya and Steffen (2020); Darmouni and Siani (2020)).

In practice, the FAQ of FRBNY (2020) notes that firms do not need to certify any lack of access to credit to qualify for the Fed's direct purchase of their bonds. The Fed reportedly mooted requiring such certification but in the end accepted the argument that corporate treasurers might refuse to certify lest they stigmatise their own firms (Duguid and Davies (2020)). For the Primary Market Facility, the FRBNY (2020) FAQ defines a lack of "adequate credit accommodations from other banking institutions *and the capital markets*" [emphasis added] this way: "Credit may be available, but at prices or on conditions that are inconsistent with a normal, well-functioning market". The Fed's lawyers strain to use emergency lending power written for a bank-dominated financial system to intervene in the bond market in a capital-market dominated system.

If the first difficulty is legal, the second is operational. Without authorisation to do open market operations in corporate bonds, it is hard for the Fed to invest resources in operations in them. Outsourcing buying corporate bonds to Blackrock makes more sense if the operation is viewed as one-off. By contrast, the usual Bank of England open market staff implemented the purchase of corporate bonds in 2009, and bought and sold bonds when the operation morphed from quantitative easing to dealer of last resort in the course of 2010. Additions to staff to support this activity was not large, and took place more in the risk control function than in the open market desk. Similarly, staff at the national central banks in the Eurosystem carry out purchases of corporate bonds.

Outsourcing the corporate bond programme to a large asset manager poses its own problems. The need for swift action argues against a formal tendering procedure, but the absence of such casts a shadow.

Moreover, despite the outsourcing, developing the capacity to intervene in the corporate bond market with transparency and appropriate governance precluded swift action (Singh (2020)). In the weeks between 20 March and 11 May, in which the Fed announced purchases but did not make purchases, the ETFs that it would eventually purchase showed double-digit gains in prices. A Fed with ongoing operational experience in corporate bonds could have entered the market on 23 March. While the purpose of the buying was not to rack up profits for the Treasury and Fed, still a more timely intervention evidently would have improved the relation of reward to risk, and could have only accelerated the intended increases in prices and improvements in trading liquidity.

If the Fed developed its own operational capacity in corporate bonds on the open market desk, it could sell as well as buy them and serve as a dealer of last resort. The Fed is currently setting the pace for purchases with an eye on "transactions cost estimates, [and] bid-ask spreads", as well as credit "spread levels" (FRBNY (2020)). Fed buying and selling may better address the transactions costs than outright purchases. After all, parking corporate bonds in a Fed SPV does not add liquidity to corporate bonds. The law on which the Fed is relying, namely emergency powers to reduce the cost of credit, however, does not easily justify efforts to reduce the cost of securities transactions.

Finally, Congressional acceptance of open market operations done under emergency lending authority arguably leaves the Fed and Treasury too much discretion. Would Congress *ex ante* have accepted emergency credit-blind purchases of junk bonds, including those issued by firms controlled by private equity firms who pushed leverage to new highs?

look forward, in the fullness of time, to more theoretical discussions about the proper role of a central bank in administering emergency economic relief".

Would the Congress accept the Fed agreeing with the Treasury to use the same structure to support other credit markets, or even the equity market? It might at first sight seem that Congress holds the purse strings by virtue of the practice of using appropriated Treasury funds to provide a first loss tranche in the SPVs, which protects the Fed's balance sheet from possible losses. But it is not clear that the Congressional control would prevent an unanticipated use of appropriated funds. Moreover, when the Fed did not have the Treasury backing for its CP SPV in 2008, Board counsel argued that the interest spread built into the programme could be considered an adequate guarantee, with gains on performing assets offsetting losses (Alvarez et al (2009)).

So, if the Fed is to operate in bond markets, there is a case for authorising it to do so through open market operations rather than through a work-around that in principle allows the Fed to buy whatever the US Treasury would permit. But what about the market neutrality view, which argues against buying private securities even at times of great strain in markets?

A counterpoint is that the Fed is not neutral when it operates only in Treasury securities. Whatever instrument it operates in gains market liquidity and ends up yielding less. If the Fed operates only in Treasury cash and repo, it gives the government an extra funding advantage (Krishnamurthy and Vissing-Jorgensen (2012)). This advantage feeds the political impulse to bring essentially private financing, for example housing finance, under the government tent as government-sponsored agencies to benefit from the funding advantage. Given this political dynamic, the Fed's limiting operations to Treasury securities arguably has led to less neutrality in the long run. Operating in private instruments, as in the original Fed design, may force the Fed to make uncomfortable distinctions among private instruments but strikes a neutral pose between private and public sectors.

Debate over the Fed's authority to do open market operations must settle issues in several dimensions. Should the powers be available only to respond to runs, other threats to financial stability and market dysfunction or serve as a power to be used in calm times where already low yields lead to a search for another instrument (as suggested by former Chair Yellen and President Rosengren)? Should the policy use of such power be confined to buying bonds, with any subsequent disinvestment designed not to affect the market, or should the power be used to tighten as well as loosen corporate financial conditions? Should the Fed be authorised to sell and to buy as dealer of last resort, targeting dealing spreads rather than prices? Should operations in normal times seek to develop the corporate bond market's breadth, depth and liquidity?

Where should the credit quality line be drawn, at high quality securities as suggested by Chair Eccles, Bank of England practice and the Fed's own practice in the CP facilities in 2008? If the line is drawn lower, should the junkiest of junk be avoided to maintain consistency with bank supervisory and financial stability policies, as suggested above? Or does the exclusion of bonds associated with risky leverage open an otherwise closed door to demands for the exclusion of tobacco bonds, high carbon bonds and others?

It deserves emphasis that these are not issues that arise uniquely in any Congressional authorisation. In Europe, where courts have pondered the ECB's legal authority to buy government bonds but not corporate bonds, activists have objected to a lack of transparency in corporate bond purchases that allows central bank support for firms deemed to have climactically unsustainable business models (van 't Klooster and Fontan (2019)).²⁶ Rather, these issues arise once central banks operate in private securities. It is right that Congress decide such issues.

²⁶ See Khalaf and Arnold (2020) on the possible greening of the ECB's bond buying.

Conclusions

In 1970 the Fed could manage a run on the market for corporate commercial paper through the discount window and open market operations in Treasuries. The growth of securities markets has led the Fed to use its own balance sheet to serve as underwriter and buyer of last resort of corporate securities in both 2008 and 2020.

The Fed's announcement that it would buy investment grade corporate bonds on 23 March has arguably succeeded beyond any reasonable forecast. Indeed, in some respects the speed of the market effects even before any buying exceeded that of the ECB's "whatever it takes" announcements in 2012. The Fed's announcement itself lowered corporate yields, and trading spreads subsequently narrowed. Investors eventually ceased their run on bond mutual funds. Remarkably, the Fed announcement immediately boosted ETF premia much more than underlying bond prices, switching a sell sign to a buy sign. The announcement prevented the market from seizing up, and avoided fire sales at values below those that even a pandemic justifies. And corporate treasurers followed through with record issuance of US investment grade bonds.

Indeed, in the wake of the Fed's announcement to buy investment grade bonds, the junk bond market reopened after being closed for only a matter of weeks. In late March, with a lag, junk prices bounced higher and trading liquidity improved in parallel with developments in the investment grade market. New issues came to the market at a slow pace until 9 April, when the Fed's announcement that it would buy junk bonds ratcheted issuance upward. We will never know the trajectory of issuance absent the Fed's April announcement that it would buy junk bond ETFs. What is clear is that, the Fed has bought only a nominal amount of junk bonds, just \$836 million in junk ETFs vs \$5,970 million in investment grade ETFs, as of 19 June.

The decision to buy junk bond ETFs created friction between the Fed's role as security buyer of last resort and its role as bank supervisor. Buying junk ETFs in effect put Fed credit into bonds issued by firms whose highly leveraged syndicated loans the Fed had (along with other bank regulators) discouraged banks from underwriting. Other available junk bond funds, or a selection of individual bonds, could have reduced or eliminated the conflict of roles.

Interventions in the commercial paper and bond markets in 2008 and 2020 point to the Fed's authority to do open market operations having fallen behind market developments. One remedial approach is to widen the Fed's open market authority to put corporate bonds where the Federal Reserve Act put bankers' acceptances in 1913. The Fed might reserve that authority for emergency use when runs on the market threaten fire sales. Or it might do operations regularly in corporate bonds and seek to develop a more liquid and transparent market.

The Fed's responses to the 2008 Great Financial Crisis presaged its interventions in private securities markets in response to Covid's 2020 threat to the economy, but the Fed has undertaken new forms of intervention. The new interventions raise important issues relating to Fed responsibilities, Fed authority, and Fed tactics in market interventions. These issues need discussion and political input, preferably before the next financial crisis.

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