US Viewpoint

The Fed's toolkit: what is next?

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United States

Table of Contents

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Order of operations

Markets are in crisis mode and the economic outlook is deteriorating. In these highly uncertain times clients are asking: "what can the Fed do?" We expect the Fed's monetary policy easing playbook to be the following: cut to zero, employ forward guidance, "twist" UST holdings, and launch UST & MBS QE (Table 1). The next step would be to consider even more nontraditional tools.

The balance sheet

The good news is that we see plenty of firepower to purchase – $9tn of USTs, $8.5tn of agency MBS, and over $1tn of agency debt (market functioning considerations notwithstanding). The relatively flat UST yield curve would limit effectiveness of UST purchases and likely encourage the Fed to move more rapidly into agency MBS where the economic stimulus would likely be larger. The question is whether the Fed attempts to broaden their purchases beyond "direct obligations" that are fully guaranteed by the US and target credit or equity obligations of private sectors entities. This would require an act of Congress and would be a significant – and unlikely – step.

Look at other central banks

There is global precedent for utilizing more nontraditional tools. Just look at other central banks. Major CBs have brought rates into negative territory and have introduced "tiering" systems. The BOJ has already adopted yield curve control (YCC) and has an inflation-overshooting commitment (QQE). The ECB has introduced targeted loan programs (TLTRO) where banks can borrow in order to fund non-financial corporates.

Fed speeches: then and now

We review the recent commentary from Fed officials. The commentary about negative rates stood out with a general resistance to negative rates but not an outright rejection. A flexible inflation target and stronger forward guidance seem to be the consensus with a growing support for yield curve control. We also comb through the transcripts during the 2008 period to draw lessons from the discussion of policymakers then.

Table 1: BofA expectations for the Fed's toolkit in order of usage

	Monetary Policy	Liquidity / Credit
Most Likely	Cut Target Rate to Zero	Temporary / Reserve Management OMOs; Central Bank FX Swap Line Adjustments; Discount Window Adjustments
	Employ Forward Guidance	
	"Twist" UST Holdings	Term Auction Facility; Term Securities Lending Facility
	UST QE	
	MBS QE	
	UST Yield Curve Control	Primary Dealer Credit Facility; Targeted Lending Under 13-3 Authority; Other "Unusual & Exigent Measures"
	Negative Rates	
Least Likely	Expanded QE (Credit / Equities)*	

Source: BofA Global Research

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Fed action plan: a different playbook

Markets are behaving like a crisis and the economic outlook is deteriorating. In these highly uncertain times clients are asking: "what can the Fed do?" We answer this question along two lines: (1) monetary policy tools (2) liquidity / credit tools. We review our expected order of operations for each set of tools and provide relevant background below. Our conclusion: the Fed is not out of monetary policy ammunition but its non-conventional easing playbook is thinner vs post Global Financial Crisis (GFC); it also has a number of liquidity & credit tools at its disposal in strained market conditions.

We expect the Fed to act rapidly and creatively in addressing any economic slowdown + deterioration in market conditions. However, it seems increasingly likely the Fed won't act alone; fiscal policy will need to play a larger and more active role in addressing downside risks to the outlook.

Fed monetary policy playbook: limited by a flat curve

We expect the Fed's monetary policy easing playbook to be the following: cut to zero, employ forward guidance, "twist" UST holdings, and launch UST & MBS QE (Table 2). Recent Fed communications have also raised the possibility of the Fed engaging in yield curve control and considering negative rates as a last resort.

We think the Fed is close to employing this playbook; we now expect the Fed to have rates at zero by April (50 bps cuts at both March & April meetings). However, the effectiveness of the Fed's playbook is limited by the relatively flat UST curve originally discussed in "Negative rates in the US", 04 February 2016. The flat UST curve limits the impact of UST "twist" or UST QE since each of these programs was originally designed to compress longer-dated UST "term premium" to stimulate the economy via lower borrowing costs. A relatively flat UST yield curve once the fed funds target is at zero limits the Fed's unconventional easing capacity. As a result, we expect the Fed will need to be more reliant on MBS QE and place consideration on other "outer rim" easing tools, such as negative rates. The most "outer rim" easing options involve changes to the Federal Reserve Act, such as expanded QE for corporate credit & equities; we expect the Fed will have a strong aversion to any Federal Reserve Act changes since it risks legal adjustments that could challenge its independence.

Table 2: Fed toolkit in order of usage

	Monetary Policy	Liquidity / Credit
Most Likely	Cut Target Rate to Zero	Temporary / Reserve Management OMOs; Central Bank FX Swap Line Adjustments; Discount Window Adjustments
	Employ Forward Guidance	
	"Twist" UST Holdings	Term Auction Facility; Term Securities Lending Facility
	UST QE	
	MBS QE	
	UST Yield Curve Control	Primary Dealer Credit Facility; Targeted Lending Under 13-3 Authority; Other "Unusual & Exigent Measures"
	Negative Rates	
Least Likely	Expanded QE (Credit / Equities)*	

Source: BofA Global Research

Fed liquidity & credit tools: best suited for financial crisis

The Fed also has a number of liquidity and credit providing tools at its disposal. These tools were vital in stabilizing the banking system during the '07-'08 period and could be relied on to stabilize the financial sector today (see Appendix). The Fed's tools are designed to provide liquidity directly to borrowers and investors in key credit markets; they are not designed to support the macro economy but can assist in that effort to support market liquidity and to keep credit flowing.

We generally think of the Fed's liquidity and credit tools as spanning three areas: (1) traditional liquidity providing operations (2) term lending activity (3) "unusual & exigent" actions. A bit more detail on each:

- **Traditional liquidity operations**: these include overnight and term repo operations, central bank swap lines, & standard discount window activity
- **Term lending actions**: these include term discount window lending for depositories via a "Term Auction Facility" & term collateralized lending for dealers via a "Term Securities Lending Facility"
- **Unusual & exigent actions:** these include non-traditional activities to facilitate lending to corporations under the "unusual & exigent" clause of Federal Reserve Act section 13(3). The Fed might also consider employing Federal Reserve Act section 10B which allows for "back to back" lending via advances to depository institutions in certain circumstances.[1]

These tools can be deployed to ensure that short-term funding markets remain in relatively stable condition, facilitate liquidity and lending against a range of collateral, and support corporate and financial institutions whose operations have been significantly disrupted by external forces. However, the Fed's tools are not as wide ranging as prior to the financial crisis since some of the "unusual & exigent" actions are now subject to greater legal limitations & oversight (see here).

Expected playbook: cut to zero, support MBS & liquidity

In the **monetary policy** sphere, we now expect the Fed to cut rates to zero by April and put in forward guidance which shows a commitment to low rates given the shock that has hit the economy. At the April meeting, we also expect the Fed to shift existing MBS paydowns away from the Treasury market and back into agency mortgages. The next step will be to consider further LSAPs or QE in both USTs & MBS. However, we think we are quite some time away from those policies being enacted.

For **liquidity operations**, we expect that the Fed will keep providing large amounts of funding in the overnight and term repo markets; the Fed will keep increasing the sizes on these operations as necessary and will not taper them until markets stabilize. To lessen some of the upward pressure on short-term unsecured USD funding markets we expect the Fed and other global central banks will expand the tenors and eligibility for the FX swap lines in coming days or weeks (see here).

Depending on the depth and severity of market strain and credit availability we would look for the Fed to potentially lower the discount window in relation to the top of the fed funds target range (current spread = 50 bps, historical tight = 25 bps), employ term lending actions, and potentially engage in targeted lending under their "unusual & exigent" or 10B authority. In an extreme scenario we could envision the Fed invoking these "unusual & exigent" measures and lend to entities most adversely impacted by COVID-19. We think there is a high hurdle for the Fed to engage in another Term Asset Backed Lending Facility style program that could lend in hard hit markets (Appendix).

In sum, we expect the Fed to engage in a number of steps to support the economy and credit markets via easier monetary policy & liquidity tools. The Fed doesn't have a vaccine for the virus but they do have a toolkit to support liquidity & their dual mandate.

We address a number of frequently asked questions about the Fed's monetary policy & liquidity toolkit below. Specifically, we address: Fed comments on unconventional policies, steps other global central banks have taken, Fed QE capacity, negative rates, FX swap lines, 13(3) authority, & the role of fiscal policy in complimenting the Fed.

[1] Section 10B of the Federal Reserve Act allows for "advances to any member bank on its time or demand notes having maturities of not more than four months". This was used to facilitate the JPMorgan takeover of Bear Stearns in March 2008.

Fed speak: now and then

Fed officials have been thinking carefully about the toolkit. Much of the talk has been abstract in nature – at some point in the future rates will return to zero which means other tools will need to be employed. However, the abstract has now turned into reality. We review the recent commentary from Fed officials. The bottom line is that there is resistance to negative rates but not an outright rejection. A flexible inflation target and stronger forward guidance seem to be the consensus with a growing support for yield curve control. There has been some discussion about expanded QE.

We also comb through transcripts and memos from the Global Financial Crisis which provide useful insight to the discussion of tools back in 2008. Many of the tools under discussion today were debated back then even those that weren't implemented.

Yield curve control

Currently being implemented in Japan, YCC works by setting interest rate caps along the yield curve, only allowing interest rates to rise up to a certain level. In order to ensure that yields do not exceed the caps, the Fed would step into the market and buy Treasuries at that maturity. YCC would be reminiscent of quantitative easing but provides the Fed greater flexibility in purchases since it would be targeting a price/yield versus a set nominal amount of bonds. The risk, however, is that the balance sheet could become significantly larger, which could attract unwanted political attention and that this tool only works when the yield curve is relatively steep.

Fed Governor Brainard recently spoke about YCC and how it could reinforce the credibility of forward guidance:

> *"Based on its assessment of how long it is likely to take to achieve full employment and target inflation, the Committee would commit to capping rates out the yield curve for a period consistent with its expectation for the duration of the outcome-based forward guidance."*
>
> *"Once target inflation and full employment are achieved, and the caps expire, any short-to-medium-term Treasury securities that were acquired under the program would roll off organically, unwinding the policy smoothly and predictably."*

Brainard is one of many Fed officials who seem open to the idea of using YCC in the future, including Chair Powell and Vice Chair Clarida. Former Fed Chairs Yellen and Bernanke have also voiced support.

What did they say during the crisis?

In a memo to the FOMC in 2011, the Committee discussed YCC outlined three approaches: (1) targeting near zero rates for all maturities up to the point at which the FOMC believes it is likely to wish to raise short term rates, (2) taking an incremental approach of targeting near-zero rates further and further out the yield curve until the desired policy goals are met, (3) targeting a long-term rate, perhaps at a rate above zero. They note that there is historical precedent for the third approach where the Fed and Treasury capped rates between 1942 and 1951.

History lesson: YCC is likely only effective once the balance sheet is already quite large and the commitment in QE needs to be strengthened through YCC.

Flexible inflation averaging

Part of the Fed's policy review has been a discussion about amending the inflation target. The idea is to move forward with a "flexible" inflation target which emphasizes the desire for inflation to run above 2% during expansions after running below during downturns. If successful, the Fed could use this flexible inflation target to strengthen its forward guidance for low rates. In the July 2019 FOMC minutes it stated:

"many participants further noted that longer-term inflation expectations could be somewhat below levels consistent with the Committee's 2 percent inflation objective, or that the continued weakness in inflation could prompt expectations to slip further."

A shift to a flexible inflation averaging framework would imply that rates would remain at the effective lower bound for longer during the next downturn, with the hope of spurring stronger inflation pressures and supporting a turn higher in inflation expectations. The Fed has already been implicitly moving in this direction, with Fed officials voicing comfort in allowing inflation to exceed the 2% target for some time. With plans to conclude the policy framework by mid-2020, the Fed is likely to make a more formal change. Importantly, Vice Chair Clarida noted last September that:

"As a practical matter, our current strategy shares many elements with the policy framework known as "flexible inflation targeting."

This change would therefore reflect evolution, not revolution, which Chair Powell foretold would be the likely result of the framework review early last year.

What was discussed during the crisis?

Two options discussed in 2011 were strict price level targeting and nominal income targeting. With the exception of Evans, there was pushback to an explicit overshoot of inflation. For example:

Bullard: *"So, yes, it is very important to stress that we will counter inflation below target—I guess that is the second part of this question—and the idea of, well, you could say we are going to accept higher inflation later, perhaps much later. Although being a theory guy I like that because you are playing on rational expectations, it doesn't seem as credible to me with the private sector."*

Dudley: *"With respect to price level targeting, I find the regime potentially attractive as a device to anchor inflation expectations better, but I do worry about our ability to communicate the framework"*

Yellen: "*The Committee's objectives are already pretty well understood by markets, so they'll probably get the message without the numbers. I would not pursue either price level targeting or nominal GDP targeting at this time, although I understand the attractions."*

History lesson: In 2011, there was still hope of a true inflation cycle. But after a period of disinflation, the mentality has changed.

Purchases of a broader range of assets or securities

The Federal Reserve Act allows the Fed to buy and sell "any obligation which is a direct obligation of, or fully guaranteed as to principal and interest by, any agency of the United States," as noted in this piece. By comparison, the European Central Bank (ECB) has intervened in the corporate bond market and the Bank of Japan (BoJ) in equities. Last week, Boston Fed President Rosengren noted:

"there would be little room for the Federal Reserve to lower rates through large purchases of long-term Treasury Securities — like it did to make like it did to make conditions more accommodative in and after the Great Recession – if a recession occurred in this rate environment."

As such, *"…we should allow the central bank to purchase a broader range of securities or assets. Such a policy, however, would require a change in the Federal Reserve Act… it should possess an explicit agreement with the U.S. Treasury Department to indemnify the Fed against losses. Alternatively, the Federal Reserve could consider a facility that could buy a broader set of assets, provided the Treasury agreed to provide indemnification."*

What was discussed during the crisis?

There was quite a lot of caution about how much the Fed can / should interfere in the credit markets. But also there was a general acceptance that the Fed was the lender of last resort.

Lockhart: *""The more we migrate with these facilities in the direction of general corporate debt and other nonfinancial issuers' markets, the more our policy actions involve contentious issues of moral hazard, possible distortion of the necessary process of relative price discovery, and the appropriate division of labor between the central bank and the Treasury."*

Krosner: *"Just because the other markets are not improving as these are, we have to be careful about drawing conclusions that it must mean that we need to intervene in market Y and market Z and A, B, C down the line. That's not to say that I think that what we've done so far has not been helpful. I do believe that it has been, but I think we just have to be very, very careful about those unintended consequences.*

Kohn: *"I agree that credit allocation is very uncomfortable for the central bank. We are into that. We have been into that for a while. I wish we didn't have to be there. But I don't see any evidence that the private sector is going to start lending anytime soon on its own."*

History lesson: Fed officials have been uncomfortable with interfering in credit markets. But they accept that they may not have a choice.

Negative interest rates

Fed officials are not sold on the idea of setting policy rates into negative territory, a tool being tested by other central banks around the world. Indeed, the sentiment in the October 2019 FOMC minutes was unanimous:

> *"All participants judged that negative interest rates currently did not appear to be an attractive monetary policy tool in the United States. Participants commented that there was limited scope to bring the policy rate into negative territory, that the evidence on the beneficial effects of negative interest rates abroad was mixed, and that it was unclear what effects negative rates might have on the willingness of financial intermediaries to lend and on the spending plans of households and businesses. Participants noted that negative interest rates would entail risks of introducing significant complexity or distortions to the financial system. In particular, some participants cautioned that the financial system in the United States is considerably different from those in countries that implemented negative interest rate policies, and that negative rates could have more significant adverse effects on market functioning and financial stability here than abroad."*

However, they were also careful not to completely dismiss it for consideration:

> *Notwithstanding these considerations, participants did not rule out the possibility that circumstances could arise in which it might be appropriate to reassess the potential role of negative interest rates as a policy tool."*

Never say never, but at least in the near term it seems unlikely that the Fed would resort to negative rates. And it would most likely be more of a last resort option once all other policy tools were tapped out and the economy was in need of greater stimulus.

Central bank unconventional tools

Following the 2008 financial crisis, major central banks started to adopt various unconventional monetary tools as interest rates hit zero in many economies. There were four major categories of unconventional monetary tools: 1) negative interest rates, 2) expanded lending operations, 3) asset purchase programs and 4) forward guidance.

Negative interest rates. In July 2009, the Riksbank became the first central bank to adopt negative rates. A few years later between 2014 and 2016, the European Central Bank (ECB), the Swiss National Bank (SNB) and the Bank of Japan (BoJ) all introduced negative rates (Table 3). To cushion the blow to bank profits from negative rates, the ECB also introduced a "tiering" system. Under this system, part of the bank reserves is exempt from negative remuneration. The BoJ similarly has a tiered system where it charges a very small interest on a portion of excess reserves banks deposit at the BoJ.

Expanded lending operations. Central banks also created new or expanded the existing lending facilities to boost liquidity. These facilities allow for lower quality collaterals and longer time horizons at a low cost. A good example is the longer-term refinancing operations (LTRO) and targeted LTRO (TLTRO) introduced by the ECB in 2011 and 2019, respectively. Under LTRO, the ECB injected more than one trillion euros into the commercial banks of Eurozone countries. Meanwhile TLTROs are more "targeted", meaning that the amount banks can borrow is directly linked to their loans to non-financial corporations and households (real economy).

Large-scale asset purchase programs. Following the financial crisis, major central banks including the Fed, BoJ and ECB all engaged in large-scale asset purchase programs, also known as Quantitative Easing (QE). The BoJ went a step further with what is called as Quantitative and Qualitative Monetary Easing (QQE) with Yield Curve Control. Under yield curve control, the BoJ targets a longer-term interest rate and purchases however much assets necessary to reach the target. QQE also had an inflation-overshooting commitment where the BoJ commits itself to expanding the monetary base until inflation exceeds 2% on a year-over-year basis and stays stable above the target for a period of time. As a result, the BoJ's balance sheet is the largest as a share of GDP among G4 central banks (Table 4).

Forward guidance. The Fed was among the first to adopt forward guidance following the 2008 financial crisis and the ECB followed in 2013. Forward guidance statements started as being relatively vague but have gradually changed over time. In 2015, the ECB introduced outcome-based guidance where policy actions are contingent on inflation expectations. Then in 2018, the ECB began using both calendar-based and outcome-based forward guidance for the expected path of key policy rates.

Table 3: List of central banks with negative interest rates

Central Bank	Current policy rate	Date of negative rate	Note
Riksbank	-0.10%	July 2009	
Danmarks Nationalbank	-0.75%	July 2012	
European Central Bank	-0.5%	June 2014	ECB introduced a "tiering" system, under which part of the bank reserves is exempt from negative remuneration
Swiss National Bank	-0.75%	December 2014	
Bank of Japan	-0.10%	January 2016	The BoJ has used combinations of exemption thresholds in computing the negative remuneration on reserves

Source: BofA Global Research, Bloomberg

Table 4: Central bank balance sheet size and composition

CB	Current B/S as % of GDP	Type of asset holdings
Fed	19%	Agency MBS Government securities
ECB	39%	Government bonds Bonds issued by agencies and European institutions
BoE	22%	Government bonds Corporate bonds
BoJ	104%	Government bonds, commercial paper, Corporate bonds, ETF and REIT

Source: BofA Global Research

What is the Fed's QE capacity?

After taking rates to zero the Fed will consider employing QE, buying both UST and agency MBS. The good news is that we see plenty of firepower to purchase – $9tn of USTs, $8.5tn of agency MBS, and over $1tn of agency debt (market functioning considerations notwithstanding) (Table 5). The relatively flat UST yield curve would limit effectiveness of UST purchases and likely encourage the Fed to move more rapidly into agency MBS where the economic stimulus would likely be larger.

UST purchases

The Fed currently holds 15% of marketable UST debt excluding bills, and holds a large portion of 15-22yr debt in particular (Chart 1). The Fed sets a limit on holding 70% per issue to help maintain market liquidity. This is a self-imposed limit and could be raised, but doing so could risk market functioning and UST liquidity issues.

With the 70% limit, the Fed can theoretically purchase another ~8tn in outstanding USTs excluding bills. However, they are limited to $1.5tn in USTs with 15y+ maturity. Note that the Fed cannot purchase in the primary market. If the Fed purchased USTs we expect they would focus purchases across the curve and likely overweight the long end but the impact of these purchases would be limited given the already flat yield curve.

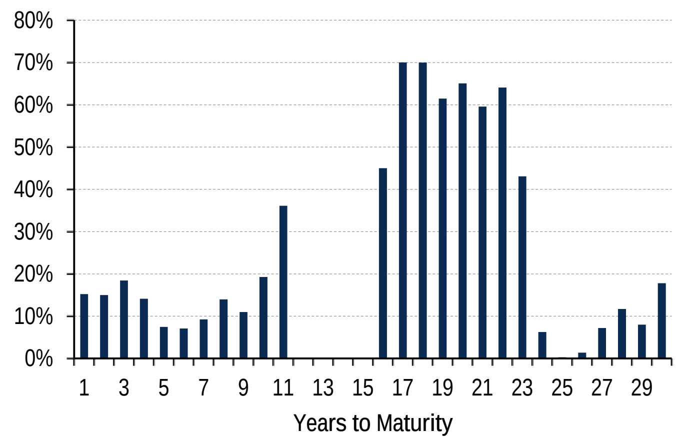
The Fed has been careful to define their current bill purchases as "not QE." The Fed may extend these purchases past Q2 2020 to help maintain funding market liquidity, but we expect they would continue to differentiate these bill purchases from any broader LSAP or QE program.

Table 5: Fed holdings of USTs, MBS and agency debt as % of outstanding

$bn	UST	MBS	Agency
Q1 2008			
Market	4732	9460	2983
Fed	612	0	0
	13%	0%	0%
Current*			
Market	16919	9881	1826
Fed	2503	1533	2
	15%	16%	0%

*Current UST data as of end Feb 2020, MBS as of end June 2019, Agency as of end Dec 2019; Source: Bloomberg, SIFMA

Chart 1: Fed holdings as % of debt outstanding, excluding bills (%)



Source: Bloomberg, Federal Reserve

MBS & agency purchases

After the Fed cuts rates to zero a likely first step is to stop the MBS roll-off, which is currently running at about $20bn per month. This would reduce MBS supply in the secondary market and at the margin help support MBS spreads to UST (Chart 2). As a next step, the Fed could begin purchasing MBS securities as it did in prior QE episodes (QE1 and QE3)

While this should help lower MBS yields in the secondary trading markets, it has only an indirect impact on consumer costs to finance or refinance a home, which is determined by the primary mortgage rate set by banks and which depends in part on overall bank capacity to process potentially large volumes of loans. The primary-secondary spread, which represents the difference between MBS security yields and actual borrowing costs, has widened to 150bp in the last few weeks which is about 50bp higher than its typical level. Despite the Fed's inability to directly control primary mortgage rates, we think the Fed would still decide to target the MBS market in its next LSAP operation given that any reduction in mortgage expenses should help partially offset a potential uptick in jobless rates if the health threat continues and the economy slows. We would expect to see an open ended purchase plan, like the $40bn per month of QE3, rather than a fixed target size like the initial $600bn plan of QE1.

Chart 2: Mortgage vs UST spread

Source: Bloomberg

Table 6: Eligible agency debt includes notes, bonds, debentures, obligations, certificates of interest & participation certificates from:

- Federal Intermediate Credit Bank	- Federal Housing Administration
- Federal Home Loan Bank	- District of Columbia Armory
- Federal Land Bank	- Tennessee Valley Authority
- Bank for Cooperative	- Local urban renewal or public housing agencies
- Fannie Mae	- Commodity Credit Corporation
- GNMA	- Federal Home Loan Mortgage Corporation
- Merchant Marine	- US Postal Service
- Export-Import Bank	- General Services Administration
- Farmers Home Administration	- Secretary of Health, Education and Welfare
- Small Business Administration	- Overseas Private Investment Corp

Source: Federal Reserve

Other assets: credit or equities

The Federal Reserve Act grants the Fed power to purchase securities that is direct obligations of, or fully guaranteed as to principal and interest by, the United States. Table 6 has the specific obligations that can be purchased. The act states the Fed can purchase:

"any bonds, notes, or other obligations which are direct obligations of the United States or which are fully guaranteed by the United States as to the principal and interest may be bought and sold without regard to maturities but only in the open market"

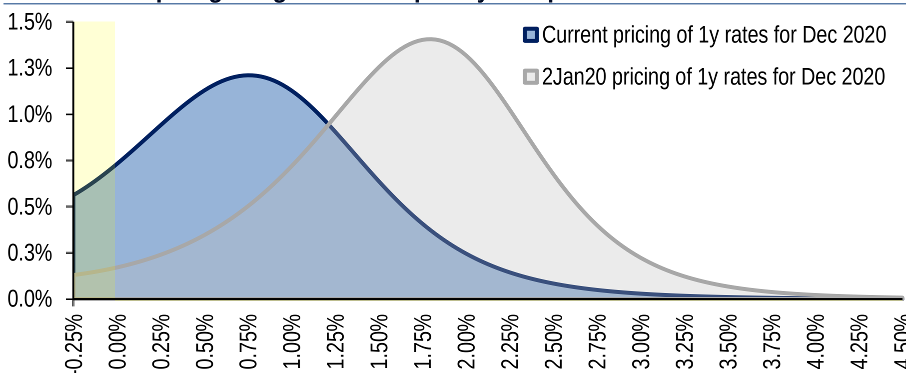
The Fed is currently unable to purchase credit or equity obligations of private sector entities. The Fed could have their QE purchase authority expanded only via an act of Congress and formal change to the Federal Reserve Act.

Would the Fed implement negative rates?

The last resort for the Fed after other easing options have been exhausted is negative rates. Although the Fed has resisted the idea of negative rates the market is pricing this outcome with a higher degree of probability. The probability distribution for 1y rates implied by the OTC options market suggests 26% probability of negative rates by year-end which is up from 5% at the start of the year (Chart 3).

We address frequently asked questions on negative rates below.

Chart 3: Market pricing of negative rates implied by OTC options market



Source: BofA Global Research

Could US MMFs exist in a negative rate environment?

We expect that US MMF and other front end investors (ex securities lenders) would need to implement large changes to their operating systems but that they could operate in an environment of negative rates. These front end investors would likely need at least one year's worth of notification from the Fed that negative rates are likely be implemented so that they could properly adjust their systems. However, once these changes are implemented we believe front end investors would likely adopt a business model similar to EU MMF, involving share cancellation or additional charges to clients to pass along negative rates. We believe the industry can adapt if given enough lead time.

What are other externalities of negative rates?

The scope of negative rates is limited. In a 2010 Fed memo,[2] it was noted that setting IOER lower than about -35bps would likely cause banks to reduce their reserve holdings and hold currency instead. However, other central banks such as the SNB and ECB have taken rates more deeply negative, suggesting that -35bp is not a firm floor.

As rates become negative there are also other behavioral shifts that could arise. If banks begin to charge depositors, it is possible that cash vault holdings would increase or that special banks could be formed to store physical currency. Consumers and businesses might also seek to pre-pay credit card, account payable, or tax bills in order to reduce their cash holdings. We do not expect the Fed would find such behavioral shifts particularly productive and might view them as a cost to negative rates.

Can the US Treasury auction negative yielding securities?

Yes, Treasury can auction both bill and TIPS securities at negative interest rates. Treasury worked on changes to its auction system over recent years to allow for the auctioning of negative bill rates and has been able to auction TIPS at negative yields at least since 2012. TIPS auction at negative real rates are technically zero coupon instruments issued above par. We believe Treasury has the same ability to offer nominal securities with a zero coupon above par but this has never been needed in practice. Note that Treasury floating rate notes can be offered with a negative discount margin but with coupon payments floored at zero.

[2] https://www.federalreserve.gov/monetarypolicy/files/FOMC20100805memo05.pdf

Fed liquidity options: FX swap lines

FX swap lines allow foreign central banks to access USD liquidity in unlimited size from the Fed. These central banks currently include the ECB, BoE, BoJ, BoC and SNB, but a broader list of banks had access during the financial crisis (Table 3). Each central bank can also access liquidity in any of the six currencies in each jurisdiction. These swap lines were first opened in December 2007 and were made permanent in October 2013. The FX swap lines were set at OIS +50bps in February 2013, and were historically OIS + 100bp. Ultimate pricing depends on the collateral type and haircut applied by the local central bank.

In recent history, the lines have seen little usage outside of quarter and year ends (Chart 4). Tenors of the swap lines have recently been 7 or 14 days but could be extended out to 1 or 3 months at the discretion of the various central banks and the pricing could be similarly adjusted as well. If funding stresses are to persist we expect global central banks to extent the terms of the FX swap lines and potentially consider reducing the cost associated with them. It is also possible the FX swap lines are expanded to include a wider range of central banks in order to contain any increase in USD funding stress.

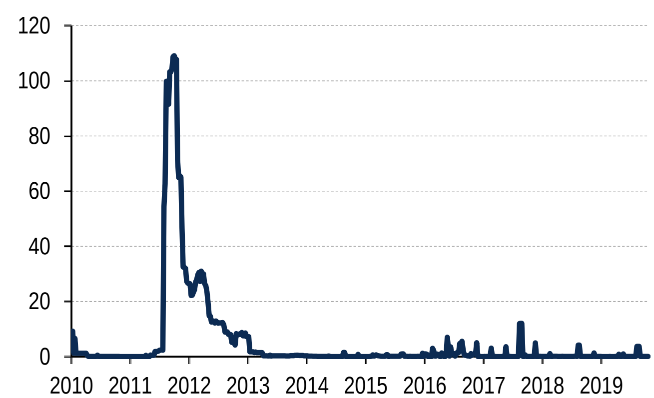
The swap lines result in a temporary increase in the size of the Fed's balance sheet where the Fed's asset is the increase foreign exchange holdings that are financed through the creation of excess reserves. The temporary increase in the size of the Fed's balance sheet will unwind after the swaps mature. More details in “Bilateral swap lines locked and loaded”, 22 June 2016.

Table 7: Central banks that can access FX swap lines in financial crisis

Reserve Bank of Australia	Bank of Korea
Banco Central do Brasil	Banco de Mexico
Bank of Canada	Reserve Bank of New Zealand
Danmarks Nationalbank	Norges Bank
Bank of England	Monetary Authority of Singapore
European Central Bank	Sveriges Riksbank
Bank of Japan	Swiss National Bank

Source: Federal Reserve

Chart 4: Liquidity swap operations outstanding ($bn)



Source: Bloomberg

13(3) and changes to Fed authority

The Federal Reserve used the "unusual and exigent circumstances" clause (i.e. "section 13(3)") of the Federal Reserve Act to extend credit to financial firms during the Global Financial Crisis in 2008. Using this broad authority, the Fed created and implemented five funding facilities to provide liquidity to primary dealers and act as a backstop to the commercial paper and asset-back securities markets (Table 8). In addition to general funding facilities, the Fed provided special assistance to four firms that the Fed deemed "too big to fail". The Fed purchased troubled assets off of these institutions' balance sheets through financial vehicles (i.e. Maiden Lane LLCs) to make sure the firms did not become insolvent and destabilized funding markets.

In the fallout, Congressional action has reined in some of the Fed's emergency lending powers. The new guidelines do not eliminate the Fed's lending authority but raise the procedural bar. The new law still allows the Fed act as the "lender of last resort" and create broad funding facilities to help market functioning. However, there are more hoops to jump. The Fed is also restricted from providing "tailored" help to individual firms. Specifically, the Dodd Frank Act of 2010 changed the Fed's 13(3) authority and requires programs established under this authority to have (See Table 9 for all changes):

- Approval from the US Treasury Secretary
- "Broad based eligibility" is meant to include a program or facility that is not designed for the purpose of aiding any number of failing firms and in which at least five entities would be eligible to participate. It also suggests programs should not be for the purpose of aiding specific companies to avoid bankruptcy or resolution.
- Limited risk of insolvency: the definition of insolvency to cover borrowers who fail to pay undisputed debts as they become due during the 90 days prior to borrowing or who are determined by the Board or lending Reserve Bank to be insolvent.

Other provisions within the Dodd-Frank Act may make the funding facility less attractive to financial institutions. The rate charged at the funding facility must be a "penalty rate" defined as "a rate that is a premium to the market rate in normal circumstances. Also, any Fed actions taken under Section 13(3) of the Federal Reserve Act requires the Fed to provide disclosures to Congress within 7 days of creating the funding facilities with updates every 30 days which may or may not be kept confidential. Thereafter, public disclosures of the identities of borrowers, amount borrowed, rate charged and collateral pledged must be disclosed quarterly within one year after a credit facility is terminated.

Nonfinancial firms, if needed, would have access to the Fed's credit facility as the Dodd-Frank Act does not limit participants to financial firms. However, section 13(3) of the Federal Reserve Act limits the Fed to providing liquidity to the financial system. It excludes them from bailing out or supporting sectors outside financial markets, notwithstanding a change in the Fed's Charter or Congressional approval.

Table 8: Funding facilities created under Section 13(3) of the Federal Reserve Act

Facility	Loans Outstanding at peak	Number of participating institutions
Term Securities Lending Facility (TSLF)	$235.5bn	18
Primary Dealer Credit Facility (PDCF)	$146.6bn	18
Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF)	$152.1bn	11
Commercial Paper Funding Facility (CPFF)	$348.2bn	120
Term Asset-Backed Securities Loan Facility (TALF)	$48.2bn	177

Source: Federal Reserve, Labonte (2016) "Federal Reserve: Emergency Lending", Congressional Research Service.

Table 9: Changes to the Federal Reserve's emergency powers

Pre Dodd-Frank	Post Dodd Frank
• Fed may assist "any individual, partnership, or corporation"	• Fed may assist "participant in any program or facility with broad-eligibility"
• Borrower must provide collateral	• Collateral "sufficiently protect taxpayers from losses" and have "lendable value"
• Fed can charge interest rates consistent with the discount window	• Assistance is for liquidity purposes only and not to aid a failing financial company
• Fed must have evidence that the borrower has no private alternative	• Cannot move assets from the balance sheet of a single specific company
• Fed may not help insolvent firms	• Fed may not help insolvent firms
	• Program needs to be "terminated in a timely and orderly fashion"
	• Requires approval of the Treasury Sec

Source: Labonte (2016) "Federal Reserve: Emergency Lending", Congressional Research Service.

Can fiscal policy augment monetary?

The one-two punch of monetary and fiscal policy to combat this crisis can be the most effective. Consider a typical demand shock where policymakers can work in harmony to drive household and business spending via lower rates, credit extension, loan forgiveness etc. We would argue that everything should be on the table today.

Already implemented:

Congress and the White House approved an emergency supplemental budget totaling \$8.3bn on March 5th. The bipartisan package mainly allocates funding to health departments to fight the spread of COVID-19. The measure provides \$7.0bn to domestic health departments such as the Center for Disease Control and Prevention and channels funds to support state and local health departments in its response to the outbreak. Additionally, it allocates \$1.25bn to US Agency for International Development (USAID) to support efforts internationally to stem the outbreak and allows the Small Business Administration to administer loans domestically, if needed.

The lion's share of the budget is allocated to research and development of vaccines, therapeutics and diagnostics to treat or prevent the spread of COVID-19 and to reimburse state and local health departments for the costs of monitoring potentially infected patients. Consequently, the economic impact from the first emergency funding bill will be limited.

We have also heard from federal bank regulators who are urging US banks to work "constructively" with borrowers who have been affected by the virus. This might involve banks extending payments, offer new credit and avoid late fees.

Under review:

With the emergency response bill completed, discussions are underway to craft a robust stimulus plan to help offset any economic drag from COVID-19. Various options are on the table: temporary payroll tax cuts, paid sick leave, free COVID-19 tests, additional funds for unemployment insurance and temporary expansion of other social safety net programs (e.g. free school lunches, food stamps).

Payroll tax cuts were last used under President Obama in 2011-12 when the employee payroll tax rate was reduced to 4.2% from 6.2%. Roughly speaking, one percentage point reduction in the payroll tax would cost \$65bn per year. The full suspension of payroll tax would amount to ~\$400bn stimulus per year. The drawbacks of such tax cut is that it wouldn't help workers who lost their jobs and the benefits would accumulate over the year rather than all at once like a tax credit or rebate.

A more cost-effective and targeted approach would be to fund temporary paid sick leave for workers who have been affected by the outbreak and provide more generous unemployment insurance for those laid off by businesses that have been materially hurt by the outbreak. A back of the envelope calculation suggests that it would cost around \$40bn to pay for 14-days of leave to all workers who do not currently have access to paid sick leave and the CBO ranks assistance for unemployed workers as one of the most effective policies measures for supporting economic growth and job creation.

What else might be needed?

We suspect that it will get to the point that the Treasury and other federal agencies (e.g. Small Business Administration) will have to allocate funding well beyond health components. This will address those that have lost their livelihood as a result of the crisis and by no fault of their own. We believe that small business owners are most vulnerable. Consider a local restaurant or nail salon where traffic has fallen sharply – they may not have a large enough buffer especially if they have to service debt. If the government subsidizes these businesses or provides cheap financing, they can continue to pay their workers and be able to return to business once the crisis is over. Another possibility is mortgage payment deferrals for homeowners. Not only will it prevent a bigger downturn, it will allow for a faster recovery.

The government could also consider offering wage subsidies to those that are forced to stay at home. This might be because of school closing or inability to commute to work. The Trump administration has discussed more broad-based paid sick leave, but perhaps the policy could end up being broader.

We could also consider what was done in the past with loans or guarantees to industries struggling with solvency. Past congressional actions include TARP – the $700bn troubled asset relief program – in 2008 which allowed the US government to purchase bad bank assets, a $25bn auto sector package also in 2008 as well as a quasi-nationalization of Fannie Mae and Freddie Mac in 2008, a $15bn package to support airlines after the September 2001 attacks, and a nearly $300bn bailout in 1989 resulting from the savings and loan crisis.

The fiscal response tends to take longer than monetary but can prove to be more targeted and effective.

Appendix

Table 10: Fed tools during the crisis

Type of Tool	Purpose	Who?	13(3)?	Start	End
Short Term Liquidity					
Repos	Overnight and term repo operations	Primary Dealers	No		
Discount Window	Short term lending to depository institutions	Depository Inst	No		
TAF - term auction facility	1m USTs loans against eligible collateral	Depository Institutions	No	Dec 2007	Mar 2010
TSLF - term securities lending facility	1m USTs loans against eligible collateral including (1) OMO (2) IG corp, MBS, muni, ABS	Primary dealers	No - OMO collateral Yes - expanded collateral	March 2008	Feb 2020
PCDF - primary dealer credit facility	Overnight loan facility similar to discount window. Fully collateralized credit. Initially only IG securities, expanded to all instruments available in triparty repo system	Primary dealers	Yes	March 2008	Feb 2010
FX Swap Lines					
Central bank liquidity swap lines	Foreign central banks can access USD liquidity in unlimited size from the Fed. Each central bank can also access liquidity in any of the six currencies in each jurisdiction	Central Banks	No	Started Dec 2007 Made permanent Oct 2013	
Credit					
AMLF - Asset Backed Commercial Paper Money Market Mutual Fund Liquidity Facility	Provide nonrecourse loans to US depository & other institutions to purchase eligible ABCP from MMFs, as MMFs face ABCP redemptions. Loans collateralized by the ABCP purchased.	MMF investors	Yes	Sept 2008	Feb 2010
CPFF - commercial paper funding facility	Provides 3m loans to special LLC that purchases 3m, highly rated commercial paper directly from eligible issuers	CP Issuers	Yes	Oct 2008	Feb 2010
MMIFF - Money Market Investor Funding Facility	FRBNY provides senior secured funding to finance the purchase of eligible assets from eligible investors	MMF investors	Yes	Oct 2008	Oct 2009
TALF - term asset backed securities loan	FRBNY loaned up to $200bn to holders of certain AAA rated ABS on a non-recourse basis. Secured by the ABS	Holders of AAA ABS	Yes	Nov 2008	June 2010
Targeted loans					
Bear Stearns Loan	FRBNY extends credit to Bear Stearns through JPM Chase Bank	Bear Stearns	Yes	Mar 2008	
AIG Loan	FRBNY extends loan to AIG	AIG	Yes	Sept 2008	
POMO					
Agency & MBS	Purchases of agency securities and MBS	Primary dealers	No	Dec 2008	Oct 2014
USTs	Purchases of treasury securities, focused on longer maturity	Primary dealers	No	Mar 2009	Oct 2014

Source: BofA Global Research, Federal Reserve

Table 11: Fed tools during the crisis, chronological order

Fed cut	Liquidity tool	LSAP	Targeted Lending

Date	Tool	13(3)?
9/18/2007	50bp cut to 4.75% at Sept FOMC meeting	
10/31/2007	25bp cut to 4.5% at Oct FOMC meeting	
12/11/2007	25bp cut to 4.25% at Dec FOMC meeting	
12/12/2007	FX Swap Lines announced	
12/12/2007	Term Auction Facility announced	
1/22/2008	75bp cut to 3.5%, intermeeting	
1/30/2008	50bp cut to 3.0% at Jan FOMC meeting	
3/11/2008	Term Securities Lending Facility announced	N/Y
3/14/2008	Bear Stearns loan	Y
3/16/2008	Primary Dealer Credit Facility announced	Y
3/18/2008	75bp cut to 2.25% at March FOMC meeting	
4/30/2008	25bp cut to 2.0% at April FOMC meeting	
9/16/2008	AIG loan	Y
10/7/2008	Commercial Paper Funding Facility announced	Y
10/8/2008	50bp cut to 1.5%, intermeeting	
10/29/2008	50bp cut to 1.0% at Oct FOMC meeting	
11/25/2008	Term Asset Backed Securities Loan Facility announced	Y
11/28/2008	QE1 announced	
12/16/2008	75bp cut to ZLB at Dec FOMC meeting	
3/18/2009	QE1 expanded	
3/31/2010	QE1 ends	
8/10/2010	QE1 rollover program announced	
11/3/2010	QE2 announced	
9/21/2011	Operation twist announced	
6/30/2011	QE2 ends	
6/20/2012	Operation twist extended	
9/13/2012	QE3 announced	
12/12/2012	QE3 expanded	
12/31/2012	Operation twist ends	
5/1/2013	QE3 modified	
12/18/2013	QE3 taper commences	
10/29/2014	QE3 ends	

Source: BofA Global Research, Federal Reserve

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