Economic Analysis

Fed: Infinity War or Endgame?

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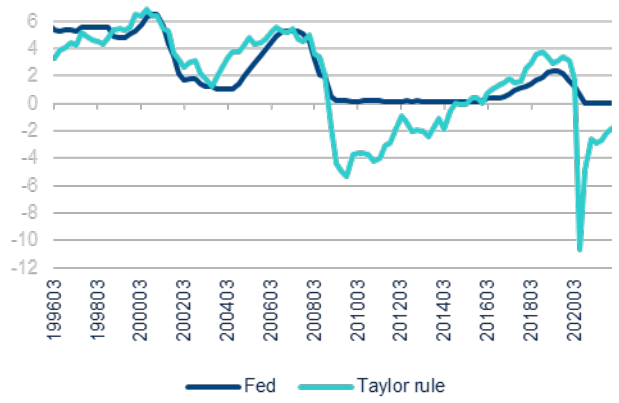
Fed's marvel power

On February 25, the Federal Reserve's (Fed) Vice Chair R. Clarida gave a speech on the economic outlook and monetary policy, conveying the positive assessment from the central bank: "In its 11th year of a record expansion, the U.S. economy is in a good place. The labor market remains strong, economic activity is increasing at a moderate pace, and the Federal Open Market Committee's (FOMC) baseline outlook is for a continuation of this performance in 2020."

However, he also highlighted downside risks: "In particular, we are closely monitoring the emergence of the coronavirus, which is likely to have a noticeable impact on Chinese growth, at least in the first quarter of this year." Moreover, he acknowledged the elevated uncertainty around what later became the worst Pandemic in modern times: "The disruption there [China] could spill over to the rest of the global economy. But it is still too soon to even speculate about either the size or the persistence of these effects, or whether they will lead to a material change in the outlook."

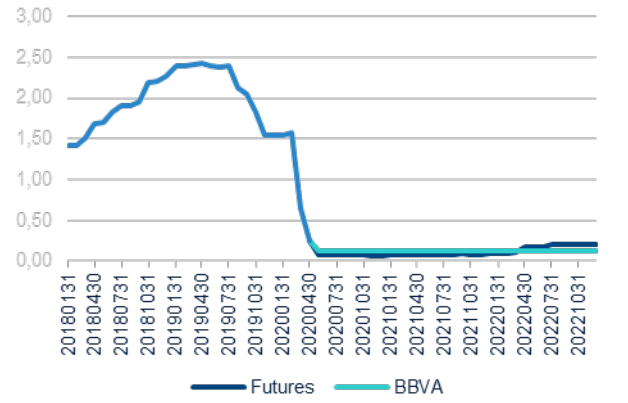
Just seven days later, the Fed cut interest rates by 50bp. This was the beginning of sweeping conventional and unconventional actions, sometimes labeled as "big bazookas" or "going nuclear". The Fed expects that these measures will mitigate the fallout of economic activity induced by the health crisis, government restrictions and disruptions in the financial market. These include lowering interest rates, committing to maintain low rates for a long period, promoting the well-functioning of financial markets, encouraging bank lending, supporting borrowing by corporations, small- and mid-sized businesses, households and state and local governments, and alleviating the pressures on foreign demand for USD (see Appendix for more details). The combined support from asset purchases, liquidity measures and emergency programs could reach around $10Tn, of which $2.3Tn has been rolled out.

Figure 1. **Fed Funds Rate** (effective, %)



Source: BBVA Research and Haver Analytics

Figure 2. **Fed Funds Expectations** (effective, %)



Source: BBVA Research and Haver Analytics

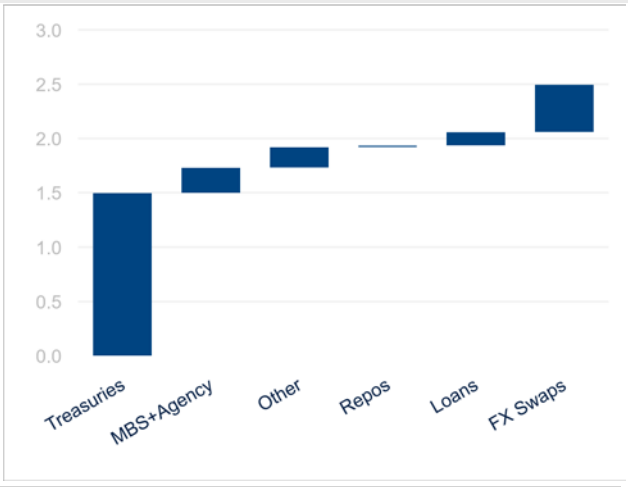
Balance sheet shield

Even before the start of the crisis, the Fed was actively managing its balance sheet policy. After increasing the size of its balance sheet by $3.5Tn in the aftermath of the financial crisis, the Fed was in the process of winding down its balance sheet up until September 2019. While there was no explicit target for bank reserves, the Fed wanted to reduce the size of its balance sheet while still being able to conduct monetary policy with ample reserves (floor system) and let the assets grow organically in line with the increase in currency in circulation.

However, the volatility that stemmed from the September 2019 tax filing deadline and settlement of Treasury auctions showed that in risk-off episodes, when reserves are not believed to be abundant and regulation encourages hoarding of highly-liquid assets, money markets face unnecessary frictions. By then, the balance sheet reached $3.8Tn, around $600bn lower than the peak. However, due to the disruption in money markets and perceived lack of liquidity, the Fed decided to first increase repo operations and later the purchases of Treasury bills for "liquidity management purposes". By the end of February 2020, before the health pandemic escalated into an economic crisis, the balance sheet had already returned to $4.2Tn.

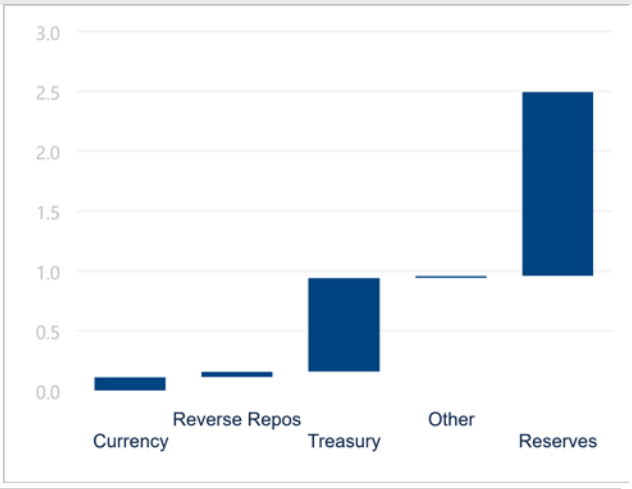
Since the end of February 2020, the balance sheet has increased by $2.5Tn reaching $6.7Tn. On the assets side, 60% are Treasuries, which have grown in one month more than in any 12-month period during QE1, QE2 or QE3. USD swaps with foreign central banks account for 18%, highlighting the severity of dollar shortage outside the U.S. The rest is comprised of MBS (9%), loans (5%), money markets and through the discount window, and other assets (8%).

Figure 3. **Fed Assets** (Chg. since 2/26/20, US$TN)



Source: BBVA Research and Haver Analytics

Figure 4. **Fed Liabilities** (Chg. since 2/26/20, US$TN)



Source: BBVA Research and Haver Analytics

Purchases of Treasuries, MBS and CMBS are unlikely to continue at the same pace. In fact, the Fed has slowed down Treasury and MBS purchases every week from a daily average of $75bn and $50bn on March 23-27 to $15bn and $10bn on April 20-24, respectively. However, they will continue in the coming months. The rationale for large-scale asset purchases assumes that Treasury purchases help restore a smooth functioning of financial markets, keep interest rates low and redirect private savings to riskier assets. MBS and CMBS purchases help support residential and commercial mortgage market activity, which is just beginning to feel the effects of the economic fallout.

As in the 2008 global financial crisis, the current response includes liquidity and lending facilities such as the Commercial Paper Funding Facility (CPFF), the Primary Dealer Credit Facility (PDCF) and the Term Asset-Backed Facility (TALF). However, the scope of measures provided to deal with the current crisis extend beyond those implemented during that period. These include large-scale repo operations, the Money Market Mutual Fund Liquidity Facility (MMLF), the Foreign and International Monetary Authorities (FIMA), the Paycheck Protection Program Liquidity Facility (PPPLF), the Primary Market Corporate Credit Facility (PMCCF), the Secondary Market Corporate Credit Facility (PMCCF) and the Municipal Liquidity Facility (MLF).

As the emergency facilities become operational, there will be another boost to the balance sheet depending on the uptake. Assuming that the Fed maxes out the capital provided by the Treasury ($454bn) with an average leverage ratio of 10 to 1, assets would increase by at least $4.5tn, beyond the large-scale asset purchases, repos and FX swaps. In addition, if the PPPLF reaches 100% coverage, assets would increase by another $670bn ($349bn under the CARES Act and $321bn under the PPPHCE Act).

However, the more success the Fed has in stabilizing financial markets, the lower the need for asset purchases and emergency lending. In other words, the pace of monthly asset growth could be stabilizing. Meanwhile, many of the facilities are unlikely to reach their thresholds while the drawdown of discount window borrowing, PDCF, MMLF, FIMA and FX swaps could occur in a relatively short period. For example, between December 2008 and June 2009, the emergency FX swaps declined from almost $600bn to slightly above $100bn.

The expansion of the asset side of the balance sheet is financed with currency in circulation, reverse repo operations, the Treasury account at the Fed and bank reserves. The increase from the Treasury account can be seen as a one-off transaction, mainly related to the CARES Act. Reverse repo operations are likely to slow down in line with regular repos. Meanwhile, the increase in currency is a reflection of the panic in financial markets and is already stabilizing. Thus, going forward, the vast majority of the emergency lending and security purchases will be financed through increases in bank reserves. The rationale to increase bank reserves is to support borrowing and lending activity. Between the end of February and the end of April, bank reserves increased from $1.6Tn to $3.2tn, reaching a new record high last set in October 2014.

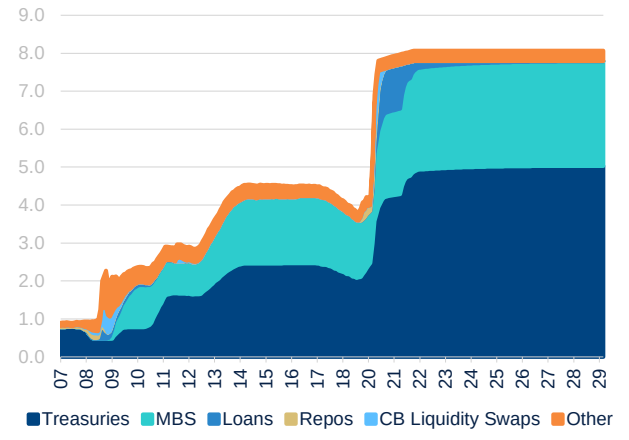
While the $1.6Tn increase in reserves is substantial, we have always argued that the equilibrium level of bank reserves is a moving target and operating in an ample reserve regime is not free from bouts of volatility. This means that the demand for reserves, even during “normal” times, could be significantly higher than what was estimated less than a year ago, particularly if banks perceive that these types of risks will be more common.

Considering different specifications for the monetary policy rule (Taylor rule) and our estimates for inflation, the unemployment rate, GDP and the equilibrium real interest rate, we find that, in all specifications, the increase in resource slack yields highly negative rates. In order to compensate for the lack of capacity to lower interest rates further at the Zero Lower Bound (ZLB) and assuming the Fed continues to observe the ZLB as a binding constraint –no negative interest rates-, there has to be a significant expansion in the M2 monetary aggregate and bank reserves. Borrowing from shadow policy rate analysis, a 3% increase in M2 is equivalent to around 100 basis point decline in the policy rate. The increase in bank reserves is around 2 times larger as households (and hedge funds) are counterparts to around 50% of bank reserves. Alternatively, a 1% increase in long-term bond holdings lowers the Fed funds rate by 0.018%. As such, the increase in bank reserves would have to be around $4Tn while asset purchases would have to increase $6Tn.

However, since forward guidance also influences interest rates expectations and emergency lending programs affect borrowing and lending decisions, the increase in reserves and asset purchases could be lower than the estimates above. In addition, assuming that the government lifts the restrictions sooner rather than later and the economy begins to grow in the second half of 2Q20, the expansion of the balance sheet is likely to slow down significantly.

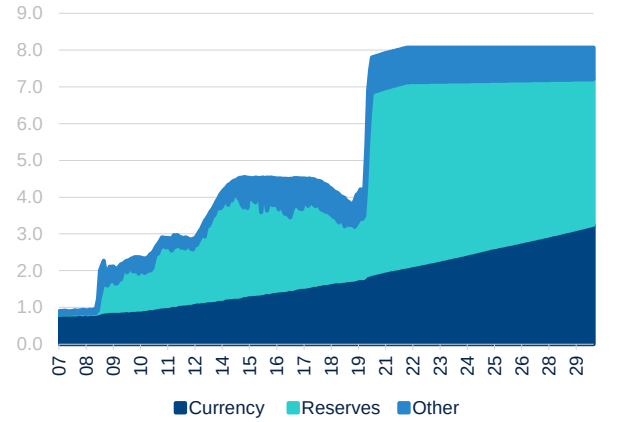
Therefore, we expect the balance sheet to grow at an average monthly pace of 100bn for the next 12 months, reaching $7.9Tn by year-end 2020 and $8.1Tn by the end of 2021. This scenario assumes that Treasury holdings will contribute with around 70% of the increase and will be distributed to roughly match the maturity composition of Treasury securities outstanding. The Fed will also continue reinvesting all principal payments of maturing Treasury securities with a similar distribution. The purchases of MBS will remain concentrated in coupons in 30-year and 15-year fixed rate agency MBS including reinvestment of principal payments from agency debt and agency MBS.

Figure 5. **Fed Balance Sheet: Assets**
(US$ TN)



Source: BBVA Research and Haver Analytics

Figure 6. **Fed Balance Sheet: Liabilities**
(US$ TN)



Source: BBVA Research and Haver Analytics

By choosing to operate in an ample reserve regime or floor system, the Fed can manage its balance sheet independently from its target interest rate, in what has been described as the “great divorce” between the balance sheet and interest rates. In this setting, when the time comes, the Fed could maintain ample reserves and lift interest rates at the same time, just as it did until mid-2019. In this scenario, bank reserves would remain well above levels that prevailed before the Fed actively drained reserves from the financial sector.

The initial unwinding of reserves will be determined by the organic growth in money in circulation so that total liabilities remain relatively stable. Once the Fed decides to accelerate the unwinding, however, the demand for reserves could be significantly higher, and thus the net unwinding may turn out to be very small. In other words, much of the increase in the balance sheet that the Fed is doing now will be permanent, if the Fed wants to retain the floor system. Therefore, the Fed may not begin to unwind until many years from now, and even then, if they do begin to unwind the balance sheet they may do it at a slow pace.

Restoring balance

The large increase in the Fed's balance sheet and financial turmoil are boosting commercial banks' balances. Between the end of February and the middle of April, banks' assets have increased by $2.1Tn, of which almost $1.4Tn is due to cash assets -including bank reserves- and $0.5Tn is due to commercial and industrial loans (accounting for 80% of the $0.7Tn increase in total loans). The former reflects the impact of the Fed's asset purchases and emergency lending, financed by the creation of bank reserves. The latter represents firms and households drawing down credit lines. On the liabilities side, bank deposits have jumped $1.3Tn while the sum of borrowings and net due to foreign offices have increased $0.8Tn. The increase in deposits reflects the liquidation of large volumes of assets by market participants that deposit the proceeds with banks.

The large increase in bank assets has a significant impact on the largest institutions (GSIBs) that are subject to the supplementary leverage ratio (SLR), which acts as a backstop to risk-based capital requirements. The increase in total assets has a one-to-one effect on total leverage exposure thereby reducing the SLR and requiring a sudden and significant increase in regulatory capital. This could have a dramatic negative impact on lending supply as well as limiting holding companies' ability to own Treasuries outright and increase deposits at the Fed.

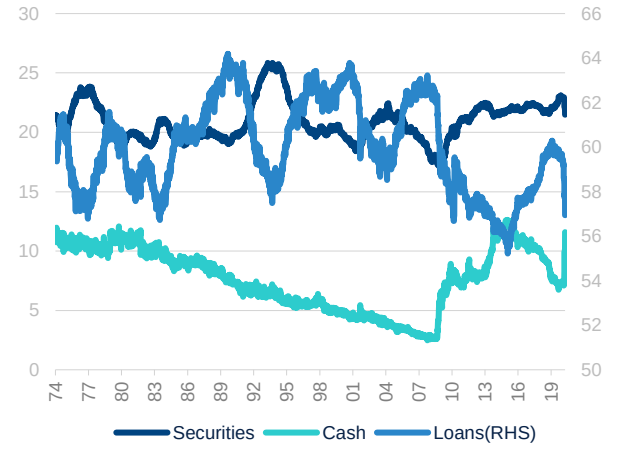
However, the Fed has issued a temporary exclusion of Treasury securities and deposits at the Fed from the SLR, to allow financial institutions subject to the SLR to continue their lending activities. According to the Fed, this action would temporarily decrease binding tier 1 capital requirements by around $17bn and the amount of tier 1 capital required to meet the SLR by around $76 billion for bank holding companies This is expected to increase leverage exposure capacity by around $1.6Tn and support financial market liquidity. Since Treasuries and deposits at the Fed are considered risk-free, and the tier 1 capital ratio will remain unaffected, the temporary exclusion is not expected to incentivize risk-taking.

In addition, the Fed has issued an interim final rule would permit banking organizations to exclude non-recourse exposures acquired as part of the MMLF from a banking organization's total leverage exposure, average total consolidated assets, advanced approaches-total risk-weighted assets, and standardized total risk-weighted assets, as applicable. This will allow bank to neutralize the effects of purchasing assets through the MMLF on risk-based and leverage capital ratios.

The Fed also reduced the reserve requirement to 0 percent effective on March 26, to free up liquidity and support lending. Although required reserves were around $200bn equivalent to 2% of total loans, about $80bn corresponded to vault cash, which banks will still need to hold, although to a lesser amount. In any case, this would have a positive impact on lending and deposits, as well as lowering transaction costs.

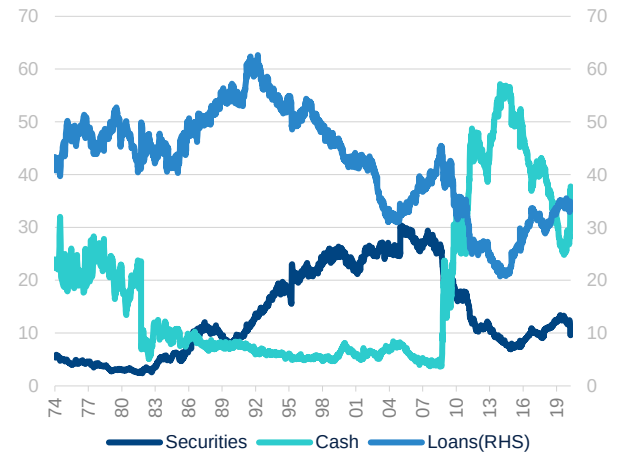
In spite of the actions, banks will still have to confront the potential negative effects of business closures and high unemployment, which will limit banks' ability to lend. According to 1Q20 data, the largest four banks in the country increased their provisions by 4.5 times the level in 1Q19. If this ratio remains for the whole year, total provisions would reach $226bn in 2020. This is slightly higher than the net operating income for 2019, suggesting a nontrivial impact to the bottom line. However, it is still highly uncertain how quickly and to what extent asset quality will deteriorate. Thus, total provisions may end up being much larger. Fortunately, banks' capital and liquidity ratios remain around historical peaks while asset quality was very strong going into the crisis.

Figure 7. **Domestic Banks Assets** (% share)



Source: BBVA Research and Haver Analytics

Figure 8. **Foreign Banks Assets** (% share)



Source: BBVA Research and Haver Analytics

Ultimately, the impact on bank lending to the private sector depends more on the magnitude and duration of the economic contraction, rather than the pace and size of the Fed's balance sheet expansion. Providing ample liquidity, restoring the functioning of financial markets, and relaxing some regulations support lending supply, but demand for loans depends on how quickly and robust businesses and households can regain confidence and support spending and investment. Once this process is underway, low interest rates and QE will help to bring about a stronger and more sustainable recovery. For more information, see U.S. Banking Outlook Amid Covid-19.

In other words, the sooner the restrictions can be safely lifted, the quicker and stronger the recovery will be. A less intense and protracted recession will allow more businesses to remain afloat and individuals to quickly leave the painful status of unemployment. This in turn will help to limit the deterioration in asset quality and support the flow of credit. To this end, a successful implementation and effective progress of the core programs to support businesses and households will be crucial to support bank lending.

Hammer or shield?

Although the Fed has committed to essentially provide a backstop across almost every sector in the economy, the rollout of some facilities may take time and some may not be as effective as expected. Therefore, the Fed may introduce additional actions to continue mitigating the risks of contagion and avoiding a systemic crisis.

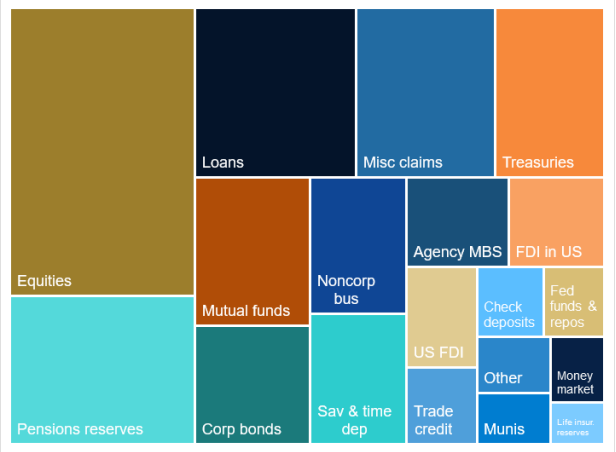
Initially, the Treasury pledged $50bn from the Exchange Stabilization Fund to protect the Fed from losses. Later, under the CARES Act, Congress granted $454bn to the Treasury to be used to backstop the Fed's programs. Thus far, the Fed has used around $215bn. In part, this reflects the Fed's intention to leave some dry powder given the uncertainty of which measures will be more effective or if financial stress in other sectors will require new programs.

Besides increasing the firing power of the emergency lending facilities by boosting risk capital, the Fed could widen the coverage of participants that have access, the scope of assets that are being purchased, or lower the pricing. For

example, the Fed could allow other intermediaries like hedge funds to get access to the primary dealer credit facility, or provide liquidity to non-bank mortgage providers that could face significant pressures if borrowers suspend payments. In addition, the Fed could restart the Term Auction Facility, which was used during the GFC as an alternative to provide liquidity to a broad range of counterparties without the stigma of the discount window.

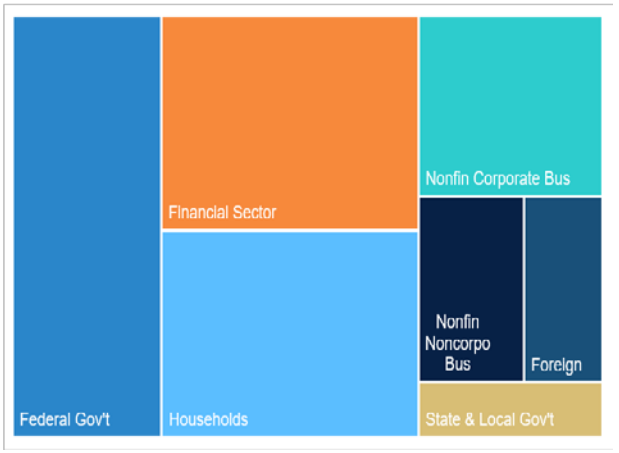
In addition, the Fed could grant access to nontraditional lenders and adjust the limits. For example, although the SBA PPP program has no minimum loan amounts, the Fed's MSLP has a $1M minimum. In addition, the MSLP program was only open to banks but the Fed recently announced that it is considering expanding it to other SBA-qualified lenders. While this is positive, it could also trigger other types of concerns related to financial stability or oversight.

Figure 9. **Outstanding Debt by Instrument** (2019, US$TN)



Source: BBVA Research and Haver Analytics

Figure 10. **Outstanding Debt by Sector** (2019, US$TN)



Source: BBVA Research and Haver Analytics

The Fed could also redirect asset purchases to target the mid- and long-end of the curve, to keep these yields below a certain threshold. This was done during WWII to reduce the cost of financing the war. In today's environment, this would help reduce the cost of massive fiscal stimulus, while incentivizing risk taking.

The Fed has taken steps that seemed unthinkable in the past such as purchasing municipal debt without restriction on the rating, investment grade and non-investment grade (junk) corporate bonds, non-agency CMBS, and collateralized loan obligations. The Fed could extend the reach to lower rated securities by extending the list of eligible securities including equities. The latter seems implausible for now although former Chair Yellen proposed it back in 2016 and again last month. The Bank of Japan, for example, has been buying stocks through ETFs for more than a decade and is set to become the largest holder of domestic stocks by year-end.

Although interest rates are at 0%, the Fed could consider negative interest rates. In the past, the Fed has maintained a constructive ambiguity given the elevated uncertainties on their efficacy and unintended consequences -political, financial, legal and economic. However, under current conditions, it cannot be completely ruled out. In fact, other major central banks, like the ECB, the Bank of Japan and the Swiss National Bank already have their policy rate below 0%. This option

becomes even more important in a disinflationary environment as ultimately, what matters the most for monetary policy is the real interest rate. If inflation were to turn negative, nominal rates at 0% would imply a restrictive policy stance.

The Fed could also be more explicit on its commitment to maintain interest rates at low levels and its strategy around QE. Transparency and credibility will allow the economy to regain enough strength and minimize the downside risks of a double-dip. This can be done through more aggressive forward guidance, tying the strategy to some date in the future, to economic conditions or to thresholds for specific variables. All options have pros and cons, and there is no magic bullet. However, given the current environment, it seems that the Fed needs to provide more clarity on how it plans to proceed. In the past, the Fed always granted itself enough flexibility and ended up making significant changes. While the most pressing issues in the short-term remain regaining control and stabilizing financial markets, participants will continue asking how far the Fed is willing to go.

Infinity stones

Critics contend that for a smooth functioning of monetary policy, in this case the floor system, the Fed needs to set interest on excess reserves (IOER) at or above market rates so that demand for reserves are perfectly elastic with respect to the federal funds rate. This was the case between 2008 and 2018, when the Fed expanded its balance sheet allowing changes in the quantity of reserves supplied to create identical movements in the quantity demanded, other things being equal.

However, this generates two potential problems. First, that the IOER may be set above the natural interest rate, constraining the pace of expansion of aggregate demand and second, that it can lead to a rebalancing of bank portfolios whereby supply of loans ends up being lower than what it would have been otherwise. If the Fed were to set IOER below market rates, there would be an opportunity cost to banks holding reserves and the demand for reserves would no longer be perfectly elastic. In this case, the floor system could be under pressure, as was the case in September of last year.

In addition, moving to a floor system all but eliminated the interbank market, which served banks to be informed about their counterparts and thus an indicator of the health of each participating institution. As evidenced by the recent bouts of money market volatility while capital, liquidity and reserve requirements have succeeded in safeguarding the financial system they have also shown to be impediments to smooth transmission of benchmark interest rates in times of financial stress. Moreover, although theoretically the floor system can function with very low levels of reserves, in practice this has not been the case.

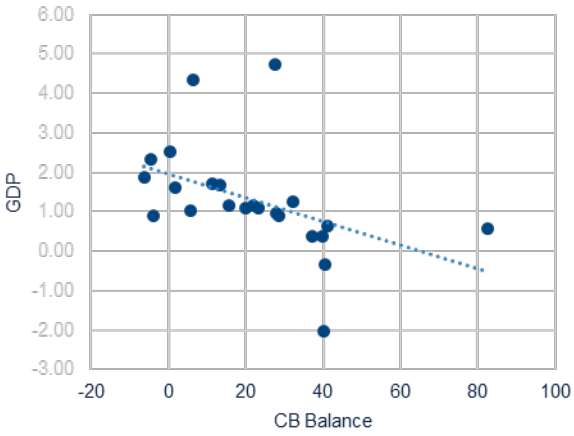
Going forward, if the system requires elevated levels of reserves it could encourage a reallocation of resources into the public sector over private-sector borrowers, which in turn could result in lower growth rates. Finally, since the level of reserves is not directly correlated with the stance of monetary policy and there are no rules regarding reserves, the Fed runs the risk of political interference from those interested in either using the balance sheet for debt monetization or as an excuse to limit the Fed's independence.

The Fed will again be confronted with how quickly it can raise interest rates and return them to a level that, in case of another crisis, can be cut enough to provide support to the economy. If the next cycle is not far away, the Fed could be caught with rates at or near the ZLB and a large balance sheet that would have to be expanded once again. This scenario resembles something that is referred to as the *Japanization* of U.S. monetary policy.

In fact, the Fed's balance sheet increased from 6% of GDP before the GFC to 25% in 2014, at the peak of the QE expansion. Given the recent increase in the Fed's balance and the decline in GDP, this ratio will be around 29% in 1Q20 and could reach more than 35% by year-end. However, relative to other countries this ratio is not unusual. For example, in the U.K. total central bank assets account for around 28% of GDP. In the Euro Area it is 39%, whereas in Japan and Switzerland it is 104% and 123%, respectively. While elevated, these still seem small compared to 300% in Norway. In contrast, this ratio is below 10% in Australia, Canada and New Zealand.

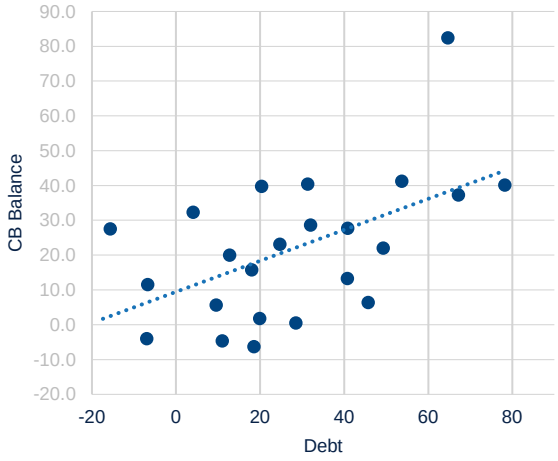
Interestingly, there is a negative correlation between the size of central banks' balance sheets and GDP growth. This implies that aggressive expansion of balance sheets is not associated with higher economic performance. In addition, there seems to be a positive correlation between the growth in public debt and central banks' balances. However, economic performance remains essentially the same regardless of which increases faster. This confirms that except for financial stabilization purposes, there are no long-term advantages from expanding the balance sheet or from changing the operational framework from a corridor to a floor system. However, the data does suggest nontrivial risks of debt monetization.

Figure 11. **Developed CB Balances & GDP Growth** (difference 2007-2019 & % change 2008-2019)



Source: BBVA Research and Haver Analytics

Figure 12. **Developed CB Balances & Public Debt** (difference 2007-2019)



Source: BBVA Research and Haver Analytics

Although most economists would agree that aggressive Fed intervention was needed to provide a backstop to the economic fallout, some would argue that the Fed has gone too far while others that it has not gone far enough. On the one hand, it seems the Fed is being cautious not to lend against bad collateral, although they have already crossed the line. For example, under the PMCCF the Fed is extending credit to so-called "fallen angels" while the SMCCF will purchase ETF's with exposure to high-yield corporate bonds. Meanwhile, the MLP, which supports municipal debt, has no rating restrictions on the securities it can purchase.

Stepping into riskier assets creates a moral hazard problem, as many firms or governments rated below investment grade are not generating enough revenue or have accumulated unsustainable debt levels. In many cases, increased

leverage helped finance stock buybacks or other activities rather than investment. Critics would argue that risk takers should have planned for darker economic times and that the taxpayer should not be responsible for bailing them out.

On the other hand, by setting too many restrictions the Fed is leaving out some asset classes, thereby choosing winners and losers. For example, TALF will only purchase legacy non-agency CMBS and static-only CLOs. Likewise, the MSLP sets the minimum loan level at $0.5M, lending is done only through banks, and the maximum loan size is four times EBITDA for new and six times EBITDA for both priority and expanded loans. This approach may seem reasonable, as clearly there is a strategy to avoid tail risks like microfinancing or supporting private-equity deals. However, it could generate market distortions or reduce the effectiveness of the programs. Still, one could argue that by supporting some sectors directly, the Fed is also supporting others indirectly.

Criticism also extends to the potential impact on federal, state and local finances. The backstop from the Fed sends a signal to policymakers that there are few consequences to the size of the fiscal stimulus, and thus proving which party is more generous is taking precedent. Ultimately, increasing the deficit and the public debt by $2Tn or $6Tn is irrelevant for elected officials if the Fed is going to purchase a large share of the these securities and minimize the potential negative effects -higher interest rates, crowding out of private investment, higher taxes and lower discretionary spending - and push the cost to future generations. Moreover, this “permanent” demand for government securities favors public debt issuance over private issuers, potentially distorting the allocation of resources and economic efficiency.

For state and local governments, the pandemic will create serious problems if tax revenues plunge. However, funding support from the Fed and the government without proper incentives to change weakens the willingness of these governments to improve their finances, redirect resources to areas with higher returns or make tough choices to boost economic fundamentals. Finally, in a floor system where reserves have to remain abundant and without limits or guidelines, there could be serious concerns on the role of the Fed and its independence. This could prompt the Fed to rethink its current operational framework.

Bottom Line

In response to the COVID-19 pandemic, the Fed has announced sweeping conventional and unconventional actions. Based on the uptake in the Fed offerings to date and our expectations for the path economic activity, the Fed’s balance sheet is poised to rapidly increase to around $8Tn, before stabilizing around that level. Although the Fed’s aggressive response to the unprecedented crisis seems adequate, only time will tell if these actions were sufficient and effective enough. In the meantime, the boost to the balance sheet will help stabilize financial markets and support lending conditions. The level of effectiveness will depend on the duration of the restrictions and the confidence of consumers and firms to spend and invest robustly. In terms of monetary policy, if anyone was still hoping for a return to the corridor system, the Covid-19 crisis has all but assured that the Fed will operate in a floor system of abundant reserves and a large balance sheet for many years to come. This will neither be more or less beneficial to the economy, all else being equal. What will ultimately determine the efficacy is for the Fed to maintain its independence and credibility, and to continue focusing on its dual mandate of maximum employment and price stability.

Appendix

Interest Rates at the Zero Lower Bound

On March 3, the Fed cut interest rates by 50bp to a range between 1% and 1.25%. On March 15, the Fed cut rates by 100bp to 0% to 0.25%. The Fed remains reluctant to move policy rates into negative territory as done by other major central banks.

Quantitative Easing (QE)

On March 12, the Fed announced that it was redirecting $60bn of monthly Treasury bill purchases -implemented on October 11, 2019 for “reserve management” purposes- to Treasury securities across a range of maturities. On March 15, the Fed announced it would purchase at least $500bn of U.S. Treasuries and $200bn of agency mortgage-backed securities “over coming months.” On March 23, the Fed suspended these limits and said it would buy assets “in the amounts needed” to support the economy, including agency commercial mortgage-backed securities.

Repurchase Agreements (Repo)

Since last September, the Fed has offered repurchase agreements (repos) to alleviate pressures in the market for interbank short-term loans. On March 9, the Fed increased its daily overnight repo operations from $100bn to $150bn and again on March 11 to $175bn, and instituted three one-month term repo operations of $50bn each. On March 16, the Fed announced an additional $500bn of overnight repos, which were extended the next day to twice-daily operations through March 20. On March 20, it extended the $500bn of twice-daily overnight repos through April 13. In addition to increasing overnight repo operations, the Fed instituted one-month term operations. On March 11, it announced it would hold three one-month operations of $50bn each. The following day, it established another $500bn one-month operation and stated that it would hold weekly one-month operations of $500bn each through April 13. The Fed also conducted three-month term operations. On March 12, it announced two $500bn three-month operations and weekly three-month operations of $500bn each through April 13. On April 13, the New York Fed announced an extension of weekly operations through May 4, after which operations would be held every other week rather than weekly. The combined aggregate limit increased to $6.1Tn during the week of March 23-27; however, the uptake never reached this level.

U.S. Dollar Swap Lines

On March 15, the Fed announced the enhancement of USD liquidity via standing swap line arrangements to guarantee availability of the world’s reserve currency. The agreement with the Bank of Canada, the Bank of England, the Bank of Japan, the European Central Bank, and the Swiss National Bank, lowered the pricing by 25bp to OIS (overnight index swap) rate plus 25 basis points. In addition, the foreign central banks began offering weekly auctions with an 84-day maturity, on top of the 1-week maturity operations offered since October 31, 2013. The new pricing and maturity offerings will remain in place as long as appropriate to support the smooth functioning of U.S. dollar funding markets. On March 19, the Fed expanded USD swap lines for up to $60 billion with the Reserve Bank of Australia, the Banco Central do Brasil, the Bank of Korea, the Banco de Mexico, the Monetary Authority of Singapore, and the Sveriges Riksbank and up to $30bn for the Danmarks Nationalbank, the Norges Bank, and the Reserve Bank of New Zealand. These arrangements will be in place for at least six months. On March 20, the Fed increased the frequency of 7-day maturity operations of its previously announced swaps with the five major central banks, from weekly to daily at least until the end of April.

Regulatory Easing

On March 15, the Fed encouraged banks to tap into their capital and liquidity buffers to lend out into the economy. The Fed also lowered the reserve requirements to zero effective on March 26. On March 17, it announced an interim final rule that revises the definition of eligible retained income to make any automatic limitations on capital distributions that could apply under the agencies' capital rules more gradual. On March 19, it announced an interim final rule to modify

the agencies' capital rules so that financial institutions receive credit for the low risk of their MMLF activities, reflecting the fact that institutions would be taking no credit or market risk in association with such activities. On March 23, it tweaked bank capital regulations to more loosely allow banks to lend out retained income. On March 27, it allowed early adoption of a new methodology to measure counterparty credit risk derivatives contracts, and provided an optional extension of the regulatory capital transition for the new credit loss accounting standard.

Discount Window

On March 15, the Fed lowered the interest rate on discount window loans by 150bp (100bp cut to the fed funds rate and a 50bp reduction in the spread with the top range of the target rate) to 0.25%. The Fed also announced that depository institutions might borrow from the discount window for periods as long as 90 days, prepayable and renewable by the borrower on a daily basis.

Commercial Paper Funding Facility (CPFF)

On March 17, the Fed established a special purpose vehicle (SPV) with $10 billion of equity investment from the U.S. Treasury to buy three-month high-rated (at least A-1/P-1/F-1) commercial paper, including U.S. issuers with a foreign parent company. The facility will remain effective through March 17, 2021. Pricing will be based on the then-current 3-month overnight index swap (OIS) rate plus 110bp. On March 23, the Fed expanded the CPFF to include some short-term municipal bonds. The SPV will make one-time purchases of commercial paper (up to the amount outstanding on March 17, 2020) from issuers that met the criteria as of March 17, 2020 and were rated at least A-2/P-2/F-2 as of the purchase date. These purchases will be subject to the then-current 3-month overnight index swap (OIS) rate plus 200bp. In addition, each issuer must pay a facility fee equal to 10bp of the maximum amount of its commercial paper the SPV may own. The Treasury will provide $10bn of credit protection.

Primary Dealer Credit Facility (PDCF)

On March 17, the Fed announced a Primary Dealer Credit Facility to offer overnight and term funding with maturities up to 90 days. It will be in place at least until September 2020 but may be extended as conditions warrant. Credit extended under this facility may be collateralized by securities pledge in open market operations, investment grade corporate debt securities, international agency securities, commercial paper, municipal securities, mortgage-backed securities, and asset-backed securities (AAA-rated) for commercial mortgage-backed securities (CMBS), collateralized loan obligations (CLOs), and collateralized debt obligations (CDOs). Other eligible securities are accepted if rated investment grade (BBB- securities and above) like commercial paper rated both A1/P1 and A2/P2. Equity securities are also accepted except exchange-traded funds and mutual funds. The interest rate charged will be the primary credit rate, or discount rate, and there is no limit on the size of this facility.

Money Market Mutual Fund Liquidity Facility (MMLF)

On March 18, the Fed established the Money Market Mutual Funds Facility to lend to eligible borrowers, taking as collateral certain types of assets purchased by the borrower from prime money markets. The maturity date of an advance will equal the maturity date of the eligible collateral pledged to secure the advance but in no case will it exceed 12 months. The eligible collateral includes U.S. Treasuries & Fully Guaranteed Agencies, securities issued by U.S. Government Sponsored Entities, asset-backed commercial paper and unsecured commercial paper rated no lower than A1/F1/P1. On March 20 announced that it would expand the MMLF to take on short-term (with maturities of a year or less) by certain high-quality assets purchased from single state and other tax-exempt municipal money market mutual funds. Advances secured by Treasuries & GSEs will be made at a rate equal to the primary credit rate. All other advances will be made at the primary credit rate plus 100 bps. The Treasury will provide $10bn of credit protection.

Primary Market Corporate Credit Facility (PMCCF)

On March 23, the Fed established the Primary Market Corporate Credit Facility to purchase investment-grade corporate bonds (with maturities of four years or less) directly from eligible issuers and offer them a loan. Companies accessing the PMCCF would pay the Fed interest on the loan but would be allowed to hold off on interest payments for up to six months, during which it would not be allowed to pay dividends or buyback shares. The facility will remain effective through at least September 30. On April 9, the Treasury expanded its support from $10bn to $50bn as the Fed expanded the scope of the program to cover "fallen angels" corporate debt with below investment-grade ratings of BB-/Ba3. Pricing for corporate bonds will be based on market conditions plus a 100 bps facility fee. For syndicated loans, it will be the same pricing as other syndicate members plus a 100 bps facility fee on the share of the syndication. To be an eligible issuer, it must not have received specific support pursuant to the CARES Act or any subsequent federal legislation.

Secondary Market Corporate Credit Facility (SMCCF)

On March 23, the Fed established the Secondary Market Corporate Credit Facility to provide a backstop in the secondary market for investment-grade and some high-yield corporate debt targeted by the PMCCF (with maturities of five years or less). The SMCCF can also take on some U.S.-listed ETFs with "broad exposure" to the market for U.S. investment-grade corporate bonds, and some ETFs with exposure to high-yield corporate bonds. Eligible issuers must be rated at least BBB-/Baa3 as of March 22, 2020, or if it was subsequently downgraded, at least BB-/Ba3 as of the date the purchase. The Facility will cease purchases no later than September 30, 2020, unless it is extended. On April 9, the Treasury expanded its support from $10bn to $25bn.

Term Asset-Backed Securities Loan Facility (TALF)

On March 23, the Fed established the Term Asset-Backed Securities Loan Facility to provide loans to companies via primary dealers, in exchange for collateral in the form of asset-backed securities (ABS) with a credit rating in the highest category. The exposure of the ABS includes auto loans and leases, student loans, credit card receivables, equipment loans and leases, floorplan loans, insurance premium finance loans, certain small business loans that are guaranteed by the Small Business Administration, leveraged loans and commercial mortgages. On April 9, the Fed expanded the TALF to accept collateral with underlying credit exposures to leveraged loans (such as collateralized loan obligations) and commercial mortgages. The facility remains effective through at least September 30. The Treasury will provide $10bn of credit protection.

Foreign and International Monetary Authority (FIMA) Repo Facility

On March 31, the Fed announced a U.S. dollar swap arrangement with over 200 foreign and international monetary authorities (FIMA) that have accounts at the New York Fed. Through FIMA, these institutions will be able to temporarily exchange their U.S. Treasury securities held with the Federal Reserve for U.S. dollars, which can then be made available to institutions in their jurisdictions. The facility will remain effective through at least the beginning of October.

Paycheck Protection Program Lending Facility (PPPLF)

On April 6, the Fed announced the Paycheck Protection Program Lending Facility to provide term financing backed by PPP loans. On April 9, the Fed detailed the program whereby it will lend to eligible borrowers on a non-recourse basis, taking Paycheck Protection Program (PPP) loans of the Coronavirus Aid, Relief, and Economic Security Act ("CARES Act") as collateral. Only PPP loans guaranteed by SBA are eligible to serve as collateral. The maturity date of an extension of credit will equal the maturity date of the PPP loan and will be accelerated if the underlying loan goes into default and the eligible borrower sells the loan to the SBA to realize the guarantee. The maturity date of the extension of credit will also be accelerated to the extent of any loan forgiveness reimbursement received by the borrower. The extensions of credit will be made at a rate of 35 basis points and there are no fees. Under the CARES Act, a PPP loan will be assigned a risk weight of zero percent under the risk-based capital rules of the federal banking agencies. On April 9, 2020, regulators issued an interim final rule to allow banking organizations to neutralize the effect of PPP loans

on leverage capital ratios. On April 23, the Fed announced that it is working to expand access to additional SBA-qualified lenders as soon as possible. On April 30, the Fed formally expanded the facility to include non-depository institutions like credit unions, Community Development Financial Institutions and some fintech firms, as well as the collateral that can be pledged such as whole PPP loans purchased as collateral for the PPPLF. No new extensions of credit will be made after September 30, 2020, unless extended.

Main Street Lending Program (MSLP)

On April 6, the Fed announced the Main Street Lending Program to support small- and medium-sized firms. The program originally included two facilities (MSNLF & MSELF) to support medium-sized enterprises with up to $600bn. On April 30, the Fed added a third option (MSPLF) and expanded the scope of the program.

Main Street New Loan Facility (MSNLF)

On April 9, the Fed established the Main Street New Loan Facility to support loans to businesses from the $600 billion pool. On April 30, the Fed expanded the scope of the program to cover firms with less than 15,000 employees or up to $5 billion in annual revenues. The SPV will purchase 95% participations and banks will retain 5% of the loan. The Main Street Lending Facility will allow businesses to get a 4-year loan of at least $0.5 million with deferred interest payments for the first year, as long as they "make reasonable efforts" to retain employees. Companies will be allowed to take out a PPP loan at the same time they take a loan out through the Fed facility. The maximum loan amount will be the lesser of $25M or an amount that, when added to outstanding and undrawn available debt, does not exceed 4.0x adjusted 2019 EBITDA. The rate of the loan will be LIBOR (1 or 3 month) plus 300bp. An eligible lender will pay a fee of 100bp of the principal amount of the loan participation purchased by the SPV. The lender may require the borrower to pay this fee. An eligible borrower will pay the lender an origination fee of up to 100bp of the principal amount of the loan. The SPV will pay the lender 25bp for loan servicing. The facility will remain effective through at least September 30. MSNLF, MSELF and MSPLF are backed by $75 billion of equity from the U.S. Treasury.

Main Street Expanded Loan Facility (MSELF)

On April 9, the Fed established the Main Street Expanded Loan Facility to allow banks to upsize the tranche of existing loans to terms that would allow them to fund the loan from the $600bn pool. On April 30, the Fed expanded the scope of the program. The SPV will purchase 95% participations in the upsized tranche of Eligible Loans from Eligible Lenders. Eligible Lenders will retain 5% of the upsized tranche of each eligible loan. Borrowers will face the following eligibility requirements: having less than 15,000 employees or up to $5 billion in annual revenues. Whereas the MSNLF covers brand new loans to borrowers that may not have an outstanding loan, the MSELF will allow borrowers to work with their lender to restructure their existing loans. The MSELF will allow borrowers to get a larger loan: the lesser of $200M, 35% of existing outstanding and undrawn available debt, or an amount that, when added to outstanding and undrawn available debt, does not exceed 6.0x adjusted 2019 EBITDA. The rate of the loan will be LIBOR (1 or 3 month) plus 300bp. An eligible lender will pay a fee of 75bp of the principal amount of the loan participation purchased by the SPV. The lender may require the borrower to pay this fee. An eligible borrower will pay the lender an origination fee of 100bp of the principal amount of the loan. The SPV will pay the lender 25bp for loan servicing. The facility will remain effective through at least September 30. MSNLF, MSELF and MSPLF are backed by $75 billion of equity from the U.S. Treasury.

Main Street Priority Loan Facility (MSPLF)

On April 30, the Fed established the Main Street Priority Loan Facility as part of the expansion of the Main Street Lending Program, which provides up to $600bn to support small and medium-sized businesses. The new facility is intended to allow for larger maximum loans in exchange for lenders retaining a larger share of the loan. The SPV will purchase 85% participations in eligible loans from eligible lenders. Eligible lenders will retain 15% of each eligible Loan. The maximum loan amount will be the lesser of $25M or an amount that, when added to outstanding and undrawn available debt, does not exceed 6.0x adjusted 2019 EBITDA. The minimum loan amount is $0.5 million with a

four-year term. The interest rate will be LIBOR (1 or 3 months) plus 300bp. An eligible lender will pay a fee of 100bp of the principal amount of the loan participation purchased by the SPV. The lender may require the borrower to pay this fee. An eligible borrower will pay the lender an origination fee of 100bp of the principal amount of the loan. The SPV will pay the lender 25bp for loan servicing. The facility will remain effective through at least September 30. MSNLF, MSELF and MSPLF are backed by $75 billion of equity from the U.S. Treasury.

Municipal Liquidity Facility (MLF)

On April 9, the Fed established the Municipal Liquidity Facility to buy short-term municipal debt (with maturity of less than two years). On April 27, the Fed expanded the facility to boost the capacity to help states and municipalities to manage cash flow constraints caused by the pandemic. Eligible notes include tax anticipation notes (TANs), tax and revenue anticipation notes (TRANs), bond anticipation notes (BANs), and other similar short-term notes issued by eligible issuers provided that such notes mature no later than 36 months from the date of issuance. An Eligible Issuer that is not a Multi-State Entity must have been rated at least BBB-/Baa3 as of April 8, 2020, by two or more major nationally recognized statistical rating organizations ("NRSROs"). An Eligible Issuer that is not a Multi-State Entity and that was rated at least BBB-/Baa3 as of April 8, 2020, but is subsequently downgraded, must be rated at least BB-/Ba3 by two or more major NRSROs at the time the Facility makes a purchase. An Eligible Issuer that is a Multi-State Entity must have been rated at least A-/A3 as of April 8, 2020, by two or more major NRSROs. A Multi-State Entity that was rated at least A-/A3 as of April 8, 2020, but is subsequently downgraded, must be rated at least BBB-/Baa3 by two or more major NRSROs at the time the Facility makes a purchase. U.S. states, cities with more than 250,000 residents, and countries with more than 500,000 people will be eligible for the program, which will support up to $500 billion in loans backed by $35bnof equity from the Treasury. Each issuer must pay an origination fee of 10bp, which may be paid from the proceeds of the issuance. The Fed is considering to allow a limited number of governmental entities that issue bonds backed by their own revenue to participate directly in the MLF as eligible issuers. The facility will remain effective through at least December 31.