

Monetary policy responses to Covid-19: a comparison with the 2008 crisis and implications for the future of central banking

Matheus R Grasselli

Department of Mathematics and Statistics

McMaster University, Hamilton, ON, Canada

Abstract: The policy responses of major central banks to the Covid-19 financial and economic crisis were faster, larger, and broader in scope than those in response to the 2008 global financial crisis. This article explain in detail the conventional and unconventional measures adopted by the U.S. Federal Reserve and reviews similar measures adopted by the Bank of England, the Bank of Canada, the European Central Bank and the Bank of Japan. Apart from lowering interest rates and acting as lenders of last resort to financial institutions, these central banks embraced large scale asset purchases as a core crisis fighting tool, with the corresponding expansion in balance sheet that they entail. The article connects this change in emphasis in central bank intervention to the normalization of shadow banking, or market-based financial intermediation, that happened between the two crises. Other extensions of the role of central banks made possible by the scope of the policy responses to Covid-19, including direct support to sectors beyond the financial industry, are also explored.

Keywords: Covid-19, central banking, monetary policy, quantitative easing, dealer of last resort, shadow banking.

JEL codes: E02; E42; E52; E58

1 – Introduction

The Covid-19 pandemic triggered a global economic crisis that is still developing at the time of writing of this article (December 2020). The chronology of the crisis to date is well known: faced with exponentially increasing number of cases and deaths for outbreaks that started at the beginning of the year, in March 2020 countries around the world began to impose lockdown measures that halted large parts of their economies. Mobility restrictions and mandatory closures of non-essential businesses caused an unprecedented surge in unemployment and contraction in output. In the United States alone, this amounted to weekly job losses in excess of 6 million per week for several weeks in March and April, peaking at about 25 million unemployed, or 15% of the workforce, in early summer¹. Forecasts for the annualized contraction of output for 2020 ranged from 5% for the world as a whole to 8% for advanced economies², surpassing all previous recessions since World War II and more than double the contraction experience in 2008.

Both the magnitude and the nature of the Covid-19 shock present deep challenges for economic theory and policy. Mandating a large portion of the workforce to stay at home to prevent the spread of a deadly virus does not fit easily into traditional classifications of demand or supply shocks. Accordingly, fiscal policy responses showed significant variations, with most countries adopting several combinations of income support, tax relief, and lending to businesses. Using the United States as an example again, this was the mix included in the emergency \$2 trillion³ package approved by Congress in late March in the form of the Coronavirus Aid, Relief, and Economic Security (CARES) Act. As emphasized by New York Times columnist and Nobel laureate Paul Krugman, calling it a ‘stimulus packages’ is a misnomer, as the overt goal of lockdown as a public health policy is to slow contagion, with fiscal policy playing a role akin to disaster relief to keep

¹ Source: U.S. Employment and Training Administration, Continued Claims (Insured Unemployment) [CCSA], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/CCSA>, August 24, 2020.

² See <https://www.imf.org/en/Publications/WEO/Issues/2020/06/24/WEOUpdateJune2020>

³ Throughout the text, I use \$ to denote U.S. dollars and ISO 4217 three-letter codes for other currencies.

the economy from collapsing⁴. Viewed in this way, countries with more extensive automatic stabilizers turned out to be more adept to the task of effectively paying people to stay at home.

While it is too early to evaluate the long-term effectiveness of lockdown measures, the evidence suggests that countries that adopted aggressive physical distancing and other restrictions to mobility and contact were successful in suppressing their initial epidemics and bringing transmission rates down to levels where testing, tracing, and isolation can manage the spread of the disease until a vaccine is developed (Roser et al 2020). Similarly, the economic impact of the lockdown is only beginning to be fully appreciated. It will take months after the gradual reopening of the economy before we know which businesses will survive and how quickly unemployment will be brought down. Fiscal policy will undoubtedly have to play as extensive a role in the recovery as it did during the lockdown, and fears of premature withdrawal of fiscal support are at least as great as the related fears of premature reopening and relaxation of public health measures. A deeper downturn caused by a misguided pivot to fiscal austerity is the economic counterpart to a second wave of disease outbreak.

This article will focus instead on the parallel developments concerning financial markets and central bank interventions. I will show that the monetary policy responses to the Covid-19 crisis were faster, larger and broader than during the most recent historical precedent of the 2008 financial crisis. I will then argue that the nature of the responses, in particular the predominance of a dealer-of-last-resort role, correspond to the consolidation of a structural shift associated with the acceptance of shadow banking, or more precisely market-based finance, as the dominant form of banking. Consequently, these measures have the potential for long-lasting impacts on the future of central banking and the role that these institutions play in a modern, financialized economy.

I begin in Section 2 with a detailed overview of the policy response of the U.S. Federal Reserve System to Covid-19, not only because they were by far the largest and most significant measures adopted by all of the world's central banks, but also because they were the best documented through official press and data releases. These include measures that were conventional in format

⁴ See, for example, <https://www.nytimes.com/2020/04/02/opinion/coronavirus-economy-stimulus.html>

if not in scope and magnitude, such as interest-rate cuts and emergency lending to the financial systems, as well as some of the unconventional measures that came to the forefront of financial crisis management during the 2008 crisis, such as swap lines and quantitative easing. This is followed in Section 3 by a comparatively shorter survey of similar measures adopted by other central banks, primarily to show that the Fed was an outlier only in the size and sheer variety of its interventions, but not in its intent. In Section 4, I discuss the normalization of shadow banking, that is to say, the acceptance of market-based financial intermediation as a primary form of banking, and its role in the evolution of the policy responses to the 2008 and Covid-19 crises. Section 5 presents examples of alternative uses of monetary policy beyond propping up fragile banks and financial markets and Section 6 concludes the article.

2 – The Response by the Federal Reserve System

When it became clear in late February 2020 that the Covid-19 pandemic would cause widespread disruptions in the world economy, key indicators of financial distress began to head into crisis territory. The TED spread, namely the difference between the 3-month LIBOR rate and the interest rate on a 3-month U.S. Treasury bill, is a widely used indicator of credit risk in the global economy, whereas the VIX, namely the Chicago Board Options Exchange volatility index, is a broad measure of expectations of near term volatility in stock markets conveyed in option prices. As shown in Figure 1, both measures rose sharply at the start of March, approaching combined levels last seen in 2008.

[Insert Figure 1 here]

Accordingly, stock markets experienced exceedingly volatile trading days, with price movements so extreme that even automatic circuit breakers were not fast enough to halt the declines they were designed to prevent. The financial press ran out of imagination for naming crash days: Black Monday I (March 9) was followed by Black Thursday (March 12) and then Black Monday II (March 16) – each breaking records for losses set in previous crises. Figure 2 shows cumulative losses in the Dow Industrial Average and the S&P 500 index of approximately 35% in the 6-week

period from mid-February to end of March 2020. By comparison, it took well over 6 months for stock market declines of this magnitude to be realized in the 2008 crisis.

[Insert Figure 2 here]

Financial instability of this scale pushed central bankers into action much faster than the executive branches of their corresponding governments. By the time the American Congress had passed the CARES Act on March 27, the Federal Reserve had already gone through the entire playbook of measures used during the 2008 financial crisis and was well on its way to expand it even further.

2.1 Interest-Rate Policy

Traditionally, the first line of defence for central banks during an economic downturn consists of lowering their corresponding policy rates. The typical rationale for this policy response is that it leads to lower borrowing rates for businesses and households, which in turn results in higher investment and consumption spending. While there is strong evidence that interest rates in the broader economy (such as mortgage rates and corporate lending rates) do respond to changes in the policy rate as expected, even in a low interest-rate environment⁵, the sensitivity of private sector spending with respect to these interest rates has long been a point of contention (Rochon 2007). A more realistic rationale for lower rates during downturns is that they make it easier for struggling economic units to meet their survival constraint, that is to say, to satisfy previous cash-flow commitments in the face of less favourable market conditions (Mehrling 2013). Whatever

⁵ As a response to persistent low inflation and slow growth in the years following the 2008-09 crisis, several central banks began experimenting with negative interest rates policy (NIRP) in 2014-15, including the ECB, the Bank of Japan, and the central banks of Sweden, Denmark, Bulgaria and Switzerland. According to the comprehensive review presented in Jobst and Lin (2016), these rate cuts worked as expected, in the sense that they led to lower lending rates across the economy and a corresponding easing of credit conditions. Unsurprisingly, the overall effects of NIRP were modest, given that the policy rates were reduced to only modestly negative values in the range of -0.25 to -0.75%, whereas to stimulate a depressed economy they would need to be lowered much further, possibly in the range of -1 to -2% (see Grasselli and Lipton 2019 for a full discussion). Because this is lower than the so-called “physical lower bound”, namely the rate at which, taking into account storage costs, it becomes more advantageous to withdraw cash than to keep bank deposits, it is improbable that such rates will be ever implemented, unless cash itself is replaced by central bank digital currencies (CBDC). In view of that, NIRP are likely to remain confined to a footnote in monetary policy.

the motivation, it is difficult, though not impossible (see Lee and Werner 2018), to find monetary economists that do not recommend a reduction in policy rates as the correct policy in a crisis.

And reduced they were during the Covid-19 crisis. As news on climbing number of cases signaled the prospect of a severe downturn, the central banks that had room to cut rates brought them down to their lowest historical levels, whereas those that were already against the effective zero lower bound (namely slightly negative values below which rates are deemed operationally too difficult to move) kept their rates unchanged. For example, in two consecutive rate cuts on March 3 and March 16, 2020, the Federal Reserve reduced the U.S. Fed Funds rate by 150 basis points to its lowest possible corridor above zero. By comparison, it took the Fed 9 months and 4 rate cuts between March and December 2008 to lower the policy rate from 2.25% to effectively zero, as shown in Figure 3.

[Insert Figure 3 here]

2.2 – Lender of Last Resort

When financial instability continues to increase and low interest rates are not enough to alleviate the pressures on distressed borrowers, the next conventional line of defence in a crisis consists of a central bank assuming the role of lender of last resort (LOLR) for solvent banks and financial institutions facing immediate funding liquidity shortages. This aspect of central banking was famously summarized by Walter Bagehot with the dictum ‘lend freely at a high rate, on good collateral’, although, as well will see next, it is debatable whether this prescription has been consistently applied (Thornton 2008).

The traditional discount window at the Federal Reserve, dating back from its inception in 1913, falls into this category. Originally intended as the main instrument for the U.S. central bank to conduct monetary policy through lending of reserves to depository institutions, the discount window was superseded when open market operations⁶ were formalized as the Fed’s principal tool

⁶ Discovered almost by accident in 1922 (see <https://www.minneapolisfed.org/article/1988/discovering-open-market-operations>), open market operations turned out to be a very effective way to conduct monetary policy in

by the Bank Act of 1933, but continued to play an important role as a lending facility. Starting in the 1980s, however, banks showed increased reluctance to borrow from the discount window because of the stigma associated to it, after it was heavily used by troubled banks at the time. The facility was then renamed and subdivided in 2003 as Primary, Secondary, and Seasonal Credit facilities, depending on the institutions that have access to it and the rates charged to them. These facilities remained essentially unused until the market turmoil in early 2007, when relatively few institutions began accessing the Primary Credit facility. In an effort to further reduce the stigma associated with emergency lending, the Fed reduced the rates for Primary Credit dramatically from August 2007 onwards, bringing it from a 100 basis points premium over market rates (measured, for instance, by the 1 month Certificate of Deposit rate) to a deep discount of 2.5% by September 2008, thereby explicitly contradicting Bagehot's dictum. In addition, under standard discount window lending authority, the Fed created the Term Auction Facility (TAF) in December 2007, whereby banks could bid on loans offered by the Fed, rather than request them. As the financial crises worsen throughout 2008, the use of these facilities increased significantly and spiked immediately after the Lehman weekend in September 2008, hovering around a combined total of \$500 billion from October 2008 to March 2009, until dropping to negligible levels by mid-2010. With the exception of the Seasonal Credit facility, which lends to small depository institutions subject to seasonal swings in loans and deposits and tends to remain well below \$500 million, the discount window at the Fed was not used again until March 2020, when the Primary Credit facility peaked at \$50 billion, as shown in Figure 4.

[Insert Figure 4 here]

normal times, that is, outside of crisis periods. In the course of their daily operations, banks use reserves (essentially deposit accounts at the Fed) to settle payments between their clients. Banks with reserves in excess of the required amount have an incentive to lend them to banks that need them in order to fulfill their reserve requirements. The average interest rate prevailing for this type of interbank lending is called the Effective Fed Funds Rate. Whenever the effective rate is above the policy rate, the Fed purchases government securities from banks in exchange of reserves, thereby increasing the total amount of reserves in the banking system and bringing the effective rate down. Conversely, whenever the effective rate falls below the policy rate, the Fed sells government securities, thereby draining reserves from the banking system and bringing the effective rate back up to the level of the policy rate. Absence of arbitrage in these market guarantees that the yield on short-term government securities remains close to the Effective Fed Funds Rate, and consequently to the Fed policy rate. As we will see, market disruptions can lead these rates to diverge from each another.

Another significant development in the 2008 crisis was the expansion of the LOLR role beyond depository institutions through the use of emergency lending under the authority of Section 13(3) of the Federal Reserve Act. This fabled clause stipulates that, in ‘unusual and exigent circumstances’, the Fed can lend to individuals, partnerships, and corporations. On March 16, 2008, the Primary Dealer Credit Facility (PDCF) was created under this authority in response to the stress in triparty repo markets following the collapse of Bear Stearns the previous week and was extensively used later that year to lend, among others, to subsidiaries of Goldman Sachs, Morgan Stanley, and Merrill Lynch, peaking at \$150 billion in lending. The PDCF was closed on February 1, 2010 and reopened again during the Codiv-19 crisis, with lending peaking at \$30 billion in April 2020.

Similarly, the Fed used Section 13(3) in September, 2008 to create the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF), offering non-recourse loans to depository institutions, bank holding companies and their broker-dealer subsidiaries, and U.S. branches and agencies of foreign banks for the explicit purpose of purchasing asset-backed commercial paper from Money Market Mutual Funds (MMMF). In other words, the direct purpose of this facility was to provide liquidity to support these mutual funds, which at the time were being subject to a large amount of withdraws from investors and consequent pressure to sell assets. This facility made a comeback in 2020 under the similarly named Money Market Mutual Fund Liquidity Facility (MMLF) with broadly the same objectives. Observe that, in both cases, these facilities also indirectly supported the market for the asset-back securities purchased from the MMMFs and pledged as collateral for the loans. Moreover, the non-recourse nature of the loans meant that the credit risk for these assets was borne by the Fed.

When credit conditions further deteriorated, the Fed used Section 13(3) again to create the Term Asset-Backed Securities Loan Facility (TALF) in November 2008, offering non-recourse loans to a much larger set of borrowers and accepting much broader set of collateral in the form of newly issued asset-backed securities (ABS). In other words, the purpose of this facility was to encourage issuance of ABS by creating demand for them through the loans provided. This facility also made

a comeback in 2020 with a few modifications⁷, including an announced maximum lending of \$100 billion.

The use of these emergency lending programs through the 2008 and 2020 crisis is shown in Figure 5. Through them, the Fed greatly expanded its role as lender of last resort, moving closer to the spirit of ‘lend freely’ in Bagehot’s dictum, albeit not at penalty rates.

[Insert Figure 5 here]

2.3 – *Swap Lines*

Whereas each central bank can act as a lender of last resort to banks and financial institutions facing liquidity shortages in their own currencies, a key feature of global financial markets highlighted by the 2008 crisis was that global funding liquidity shortages are essentially shortages of U.S. dollars. This dates back to the creation of the so-called Eurodollar market in the 1970s, when banks domiciled in Europe began acquiring assets and liabilities denominated in U.S. dollars. What started as a form of regulatory arbitrage to avoid the then stricter requirements for banks operating in the U.S. grew into a global phenomenon with the U.S. dollar playing a disproportionate role in the balance sheets of foreign banks, well beyond what could be expected from the relative size of the American economy. Because these banks do not have access to the lending facilities available to U.S. banks, the Federal Reserve addressed their liquidity needs during the 2008 financial crisis through the use of currency swaps with a select group of central banks. Through the use of these facilities, which peaked at slightly less than \$600 billion in 2008, the ECB, the Bank of England and the central banks of Canada, Japan, and Switzerland were able to swap their own currency with the Fed in exchange of U.S. dollars that could then be lent to banks in their jurisdictions. These swap lines were used again during the Euro crisis in 2012-13,

⁷ The 2008 TALF specified that ‘All U.S. persons that own eligible collateral’ could borrow from the facility, whereas in the 2020 version this has been restricted to ‘All U.S. companies that own eligible collateral and maintain an account relationship with a primary dealer’, presumably for operational expedience. On the other hand, eligible collateral for TALF loans has been expanded from asset-backed securities based on ‘auto loans, student loans, credit card loans, or small business loans guaranteed by the U.S. Small Business Administration’ in the 2008 version to much larger set of credit exposures in 2020. By contrast, Primary, Secondary, and Seasonal credit facilities are restricted to depository institutions and require government securities as collateral.

although less extensively, peaking at around \$100 billion. After that, swap lines were formalized as unlimited standing facilities between these group of six major central banks, but were rarely used in the intervening years. Correctly interpreting stress signals in dollar funding across the world as an indication of an even more generalized liquidity shortage in global market, the Federal Reserve expanded its swap lines in March 2020 to an addition group of eight central banks, albeit with specified limits for the maximum amount of U.S. dollars that could be swapped by these second-tier currencies⁸. As shown in Figure 6, these facilities were then drawn to the maximum of \$450 billion in a matter of days and achieved the objective of alleviating the global liquidity shortage for U.S. dollars, while consolidating the position of the Federal Reserve as a lender of last resort for the world.

[Insert Figure 6 here]

Important as they were in both recent crises, swap lines had been in place at least since 1960s, albeit under the original guise of helping central banks in the task of currency stabilization rather than emergency lending in U.S. dollars. It is therefore reasonable to classify them as conventional policy tools, remarkable only because of their scale. After all, there is in principle nothing new and extraordinary about leading central banks holding other major currencies in their balance sheets.

I now turn to a set of policy measures that, both in scale and nature, deviated significantly from conventional monetary policy and have the potential to permanently redefine the role of central banks in modern economies.

2.4 – Dealer of Last Resort

⁸ The full list of additional countries with their corresponding maximum amounts is: the Reserve Bank of Australia Banco Central do Brasil, Bank of Korea, Banco de Mexico (\$60 billion), Monetary Authority of Singapore, and the Sveriges Riksbank at \$60 billion each; the Danmarks Nationalbank, Norges Bank (\$30 billion), and Reserve Bank of New Zealand at \$30 billion each.

One of the key developments in the early stages of the 2008 crisis was the rescue package of Bear Stearns in March of that year, which involved several steps culminating in the creation of a new facility, inventively named Maiden Lane LLC⁹, with the purpose of acquiring the portion of Bear Stearn's mortgage trading portfolio that was deemed too risky to be absorbed by JPMorgan Chase, its only viable buyer. Established under Section 13(3) authority, this facility inaugurated a distinctively new role for the Fed during a financial crisis, namely that of a dealer of last resort, or in other words, an entity with the capacity to use its balance sheet to absorb assets that no other market participant is able to buy at prevailing prices. This was followed by Maiden Lane II and III, established along similar lines in November 2008 with the purpose of buying, respectively, residential mortgage-back securities (RMBS) from subsidiaries of the American International Group (AIG) and multi-sector collateralized debt obligations (CDO) on which AIG had written credit default swap. Once again, these were assets for which no functioning market existed at the time.

As shown in Figure 7, the combined asset holdings of the Maiden Lane facilities was of the order of \$70 billion, but even this is much smaller than the dominant DOLR facility of 2008, namely the Commercial Funding Facility LLC. Created in October 2008 also under Section 13(3) authority, this facility had the purpose of buying commercial paper - that is short-term negotiable promissory notes issued by an industrial or commercial firm, or a financial company - directly from eligible issuers. It was deemed necessary when credit markets essentially froze as the crisis worsened and not even the previously announced AMLF and TALF facilities were effective in supporting them. The facility proved to be enormously popular, reaching a peak of \$350 billion in assets in early 2009, and was reinstated on March 17, 2020 as part of the response to the Covid-19 crisis. This time around, however, the Fed deemed conditions in credit markets to be even more dire than in 2008 and announced two brand new facilities, the Primary and Secondary Market Corporate Credit

⁹ Maiden Lane is the name of the street on the north side of the Federal Reserve Bank of New York (FRBNY) headquarters in Manhattan, where the details of the deal with JPMorgan Chase were being discussed during the frantic weekend of March 15-16, 2008. The acronym LLC means a limited liability corporation and, in this context, indicates that the facility was established as a special purpose vehicle (SPV), that is, a separate legal entity with a specific mandate. Specifically, the FRBNY and JPMorgan made loans of approximately \$29 billion and \$1 billion, respectively, to this SPV, which in turn used the loan to purchase the assets from Bear Stearns and managed them until they were sold over the next several years and the loan was fully repaid with interest. The use of SPV became a staple of unconventional measures by the Fed and also made a comeback in 2020.

Facilities (PMCCF and SMCCF). These facilities broke new ground by positioning the Fed as the DOLR for the multi-trillion dollar corporate bond market, and so far have proved to be much more popular than the CPFF, as shown in Figure 7.

In addition, the Fed announced on April 9, 2020 the creation of the Main Street Lending Program, which in the course of subsequent announcements took the form of five new facilities¹⁰ with the purpose of purchasing loans made to small and mid-size business and non-profit organizations. Under this program, eligible banks originate and retain 5% of the loans, with the remaining 95% being bought by a SPV funded by the facilities. The program is meant to complement other existing measures to support the economy during the Covid-19 crisis, being aimed at corporations that are too large to qualify for the Payroll Protection Program that was part of the CARES act and too small to issue bonds that can be purchased by the corporate credit facilities. It is hard to overemphasize, however, the significance of a central bank purchasing *non-traded* debt instruments from banks, only one step removed from direct providing loans to these corporations.

[Insert Figure 7 here]

2.5 – *Quantitative Easing*

In terms of long-term impact on the balance sheet of central banks, no other monetary policy response to the 2008 crisis was more significant than quantitative easing. Its stated rationale consists of reducing borrowing costs further when the policy rate cannot be reduced beyond the effective zero-lower bound by targeting other interest rates in the economy, for example those for longer maturities in the yield curve. Because of the inverse relationship between yields and bond prices, this can be achieved by the central bank purchasing long maturity bonds, thereby increasing the demand for these securities, and consequently their prices. A similar argument holds for other debt instruments, such as mortgage-back securities, which a central bank can purchase with the

¹⁰ Namely the Main Street New Loan Facility (MSNLF), the Main Street Priority Loan Facility (MSPLF), the Main Street Expanded Loan Facility (MSELF), the Non-profit Organization New Loan Facility (NONLF) and the Non-profit Organization Expanded Loan Facility (NOELF).

intent of putting downward pressure on mortgage rates. Interpreted in this way, quantitative easing can be viewed as an extension of conventional interest-rate policy via open market operations, which as we have seen is conducted by purchase and sale of short-term government debt securities by the central bank. The idea is not new, having been implemented for the first time by the Federal Reserve in 1932, albeit in a very moderate scale (Bordo 2014). In recent times, quantitative easing was implemented in 2001 by the Bank of Japan, the first major central bank to hit the zero-lower bound for conventional monetary policy. As a response to the 2008 crisis, quantitative easing was adopted by virtually every central bank that also saw their policy rate dropped to effectively zero, including the Federal Reserve, the Bank of England, and the European Central Bank.

Figure 8 shows the amount of securities held as assets by the Federal Reserve since the 2008 crisis, with each round of quantitative easing clearly corresponding to a marked expansion in holdings of Treasury and mortgage-based securities¹¹. It is important to notice that the first significant round of purchases of housing-related securities, totalling \$1.25 trillion from the end of 2008 to mid 2010, was conducted under conditions of severe stress in the markets for these assets, which were then deemed part of the toxic derivatives associated with the near collapse of the banking system. Accordingly, this portion of what was retroactively called QE 1 in the financial press should more accurately be considered a dealer-of-last-resort operation.

Large scale security purchases were also part of the measures adopted by central banks to combat the Covid-19 crisis. On March 15, 2020 the Fed announced it would purchase up to \$500 billion in Treasury securities and \$200 billion in MBS and subsequently announced that it would purchase securities ‘in the amounts needed to support smooth market functioning and effective transmission of monetary policy to broader financial conditions.’ Importantly, we can see that the wording of this announcement¹² includes both DOLR (‘smooth market functioning’) and traditional quantitative easing (‘transmission of monetary policy’) elements.

¹¹ The pace of purchases announced in each round were as follows. November 25, 2008: up to \$100 billion in housing-related GSE (government-sponsored enterprises) debt and up to \$500 billion in MBS, extended on March 18, 2009 to \$100 more in GSE debt, \$750 billion more in MBS, and \$300 billion in long-term Treasury securities. November 3, 2010: further \$600 billion in long-term Treasury securities. September 13, 2012: additional \$85 billion per month in MBS and long-term Treasury securities.

¹² See <https://www.federalreserve.gov/newsevents/pressreleases/monetary20200323b.htm>

Indeed, because of Covid-19, functionality was at risk even for what used to be considered the deepest, most liquid of all markets, that of U.S. Treasury securities. As reported in Duffie (2020), in the first weeks of March 2020 these securities were exhibiting all the classic signs of stressed markets: wild price fluctuations, widening bid-ask spreads, high implied volatility, and misalignment between Treasury derivatives and underlying securities. The root cause of these disruptions was the phenomenon that triggered the resurgence of currency swap lines between central banks discussed in the previous section, namely an increase in global demand for U.S. dollars. Specifically, investors around the globe, ranging from hedge funds to central banks without access to swap lines with the Fed, began selling U.S. Treasury securities in unprecedented volumes in an effort to acquire U.S. dollars in the absence of other channels for obtaining funding liquidity. This large volume of sales overwhelmed the relatively small number of bank-affiliated dealers that, in normal times, are the makers for U.S. securities secondary market, a problem exacerbated by capital and liquidity requirements put in place after the 2008 crisis. The solution was that the Fed itself had to intervene and purchase Treasury securities at a daily pace comparable to monthly purchases in previous rounds of quantitative easing, totalling more than \$1 trillion in the three-week period from March 15 and approximately another trillion since then, as shown in Figure 8.

[Insert Figure 8 here]

2.6 – Other Measures

The combination of the policy measures described in the previous section resulted in the expansion of the balance sheet of the Federal Reserve System shown in Figure 9. As we can see, the immediate aftermath of the 2008 crisis led to a rapid doubling of total assets from a baseline of \$1 trillion, most of it in the form of newly purchased MBS as part of the effort to stabilize the financial sector. This was followed by a slower but still robust expansion over the course of the following five years, when subsequent rounds of quantitative easing raised total assets to a new stable level of over \$4 trillion, from which they rapidly increased again to approximately \$7 trillion in response to the Covid-19 crisis. With this crisis far from over, and many of the programs such as the

Corporate Credit and Main Street Lending facilities still well below their announced limits, the balance sheet of the Fed has the potential to expand even further.

[Insert Figure 9 here]

Extensive as these programs and facilities were as measured by their impact on the Fed's balance sheet, they still portray an incomplete picture of the full scope of the responses of the Federal Reserve to the Covid-19 crisis. A case in point are the provisions for purchase of municipal debt. Initially included as a form of eligible collateral for the Money Market Mutual Fund Liquidity Facility (MMLF), municipal debt later became the focus of the Municipal Liquidity Facility (MLF), a tradition-defying program allowing the Fed to purchase up to \$500 billion in debt directly from state and local governments.

As another example, on March 31, 2020 the Fed established the Foreign and International Monetary Authority Repo Facility (FIME), a facility allowing central banks and other international monetary authorities with accounts at the Federal Reserve Bank of New York to temporarily exchange their U.S. Treasury securities for U.S. dollars. This extraordinary facility, which was later extended to March 2021, provided U.S. dollar liquidity to a lower tier of central banks without access to the swap lines described in Section 2.3 and also complemented the securities purchase programs described in Section 2.5 by serving as an incentive for these central banks not to sell their Treasury holdings in the open market. As is the case with regular repo operations, which were also greatly extended as a response to the crisis¹³, these short-term transactions have a limited direct impact on the Fed's balance sheet, although they signal a much larger role for the Fed as a global lender of last resort.

3 – The Response of Other Central Banks

¹³ Repurchase agreements (repos) operations conducted in support of monetary policy increased from pre-crisis limits of about \$100 billion in overnight transactions to more \$500 billion – essentially providing unlimited liquidity to primary dealers in the Fed funds market. For current and historical limits and other details of repo agreements see <https://www.newyorkfed.org/markets/domestic-market-operations/monetary-policy-implementation/repo-reverse-repo-agreements/repurchase-agreement-operational-details>

As mentioned in the introduction, the policy response of other major central banks to the Covid-19 crisis was broadly similar to that of the U.S. Fed, and in many instances tightly coordinated with the American central bank.

At the Bank of England, for example, the most comprehensive announcement came on March 11, 2020, and consisted of an interest-rate cut, the creation of the Term Funding Scheme with additional incentives for Small and Medium-sized Enterprises (TFSME), and the relaxation of capital and liquidity regulations. By providing long-term (4 years) loans at low interest rates (at, or very close to, the Bank Rate) to banks and building societies, the TFSME had a similar purpose to the facilities created by the Fed in support of lending to small businesses, such as the TALF and the Main Street Lending Program, except without the use of an SPV as an accounting gimmick. At the time of the announcement, the Bank expected that the TFSME would provide in excess of GBP 100 billion in funding, although as of the end of August, loans made through this facility stood at just over one-quarter of this amount¹⁴.

This first announcement was followed by more targeted measures as the crisis evolved, including a more extensive use of swap lines with the Fed to provide U.S. dollar liquidity to U.K. financial institutions at extended maturity, reduced cost, and more frequent interventions. Following the Fed's lead in outright asset purchases, the Bank of England also announced on March 19 its own rapid increase in purchase of gilts (the U.K. equivalent of U.S. Treasuries) and corporate bonds to the tune of GBP 200 billion 'as soon as operationally possible'. In addition, in an effort to support the U.K. money markets, on March 24 the Bank activated its Contingent Term Repo Facility (CTRF) with a commitment to provide unlimited lending at close to Bank Rate against a wide range of collateral, similarly to the AMLF and MMLF facilities at the Fed. Finally, the Bank announced, in cooperation with Her Majesty's Treasury, the creation of the Covid Corporate Financing Facility (CCFF) with the purpose of supporting the country's largest, highest-rated firms, by purchasing marketable debt issue by them, similarly to the corporate credit facilities established by the Fed. As of the end of August, this facility accounted for approximately GDP 18 billion in assets.

¹⁴ See <https://www.bankofengland.co.uk/markets/bank-of-england-market-operations-guide/results-and-usage-data> for updated values.

The combined effect of these measures was an expansion of the balance sheet of the Bank of England by nearly one half in the five months from March to April, 2020, with total assets of the order of GBP 850 billion¹⁵, or close to 40% of the annual GDP for the U.K.. By comparison, in the 18 months from mid-2008 to the end of 2009, total assets for the Bank increased from about GBP 100 billion to approximately GBP 240 billion, or close to 25% of annual GDP. For an even longer historical perspective, the balance sheet of the Bank of England had remained below 18% of annual GDP for the previous two centuries, including the aftermath of the Napoleonic Wars, World Wars I and II, and the Great Depression¹⁶.

Similarly, the response to Covid-19 from the Bank of Canada consisted primarily of a combination of interest-rate cuts (namely three consecutive 50 basis points cuts on March 4, 16, and 27, bringing its policy rate down from 1.75% to 0.25%), large scale asset purchase programs and emergency lending. Interestingly, the Bank of Canada appears to have elevated its dealer-of-last resort role above its lender-of-last-resort one, in the sense that facilities designed to provide liquidity to traditional financial institutions are listed after the programs designed to provide market-making in times of turmoil¹⁷. The largest asset classes in these programs are U.S. Treasuries, Government of Canada bonds, and Canada Mortgage bonds, but the Bank of Canada also created special programs for purchase of provincial debt, corporate debt and commercial paper. Regarding emergency lending, the Bank of Canada focussed on enhancing the liquidity facilities underpinning Canada's main payment systems, the Large Value Transfer System (LVTS). This included lengthening the terms and broadening acceptable collateral for repo operations and the Standing Liquidity Facility (SLF), Canada's version of the discount window.

These policy responses resulted in the balance sheet of the Bank of Canada expanding by more than four times, with total assets going from about CAD 120 billion in February 2020 to over CAD

¹⁵ See <https://www.bankofengland.co.uk/weekly-report/2020/19-august-2020>.

¹⁶ See <https://www.bankofengland.co.uk/-/media/boe/files/speech/2009/the-bank-of-englands-balance-sheet>

¹⁷ See <https://www.bankofcanada.ca/markets/market-operations-liquidity-provision/covid-19-actions-support-economy-financial-system/>

520 billion in July. By comparison, during the last crisis¹⁸ the assets of the Bank of Canada expanded from just over CAD 50 billion to about CAD 80 billion from mid-2008 to early 2009.

The European Central Bank (ECB), on the other hand, already entered the Covid-19 crisis in an environment of historically low interest rates, with the Euro Overnight Index Average (EONIA) – the equivalent to the Fed Funds Rate – having been negative since 2015, leaving little space for further cuts in policy rate. Consequently, the main policy responses of the ECB in 2020 consisted of expanded asset purchases and increased emergency lending to banks. In its first announcement on March 12, 2020, the ECB committed to expand its existing Asset Purchase Programs (APP) by EUR 120 billion. Since its inception at the start of 2015, these programs had already accumulated total assets of the order of EUR 2,600 billion, primarily in the form of government bonds from different Euro zone countries, so the committed expansion was rightly perceived by the markets as inadequate. Accordingly, on March 18 the ECB announced a brand new Pandemic Emergency Purchase Programme (PEPP) with a total envelope of EUR 750 billion, later expanded in June to EUR 1,350 billion, with flexibility to purchase a wide range of public and private assets. As with other asset purchase programs in the U.S., U.K. and Canada, the PEPP served the dual purpose of complementing monetary policy (by reducing the yield on a variety of financial instruments, such as long term bonds) and backstopping potentially dysfunctional markets. In the Eurozone, this is particularly important for government bonds, as the national central banks of member states are not allowed to create Euro reserves to purchase the bonds of their own government, as can and has been done routinely by the Fed, the Bank of England, and the Bank of Canada. Absent purchases by the ECB, government bonds issued by countries facing budget shortfalls, such as Italy as it attempted to combat its epidemic, tend to drop in price, leading to increased yields and an amplifying debt spiral. This led to the divergence of yields during the height of the Euro crisis in 2010-12, culminating in the non-negligible possibility of default by some member states and likely collapse of the single currency. Concerns about such fragmentation risk¹⁹, as it is called by the ECB, were key motivations for the creation of the PEPP.

¹⁸ See <https://www.bankofcanada.ca/2010/07/annual-report-2009-2/>

¹⁹ See this blog post by the ECB President Christine Lagarde released the day after the announcement of the program: <https://www.ecb.europa.eu/press/blog/date/2020/html/ecb.blog200319~11f421e25e.en.html>.

Regarding emergency lending, the initial response of the ECB to the Covid-19 crisis consisted of revisions to its existing Targeted Longer-term Refinancing Operations (TLTRO III), which provide loans to banks and financial institutions in proportion to their lending to non-financial corporations and households. The revisions led to an estimated net increase in lending of the order of EUR 550 billion²⁰ and were further supplemented by the creation of the Pandemic Emergency Longer-term Refinancing Operations (PELTRO). The combined balance sheet effect of the asset purchase and refinancing operations introduced by the ECB in response to the Covid-19 crisis was an expansion of the total assets of the Eurosystem²¹ from about EUR 4,700 billion to over EUR 6,440 billion from March to August 2020.

As a final example, I consider the responses enacted by the Bank of Japan, a central bank with an even longer history of low interest rates, namely with the policy rate being slightly negative (at -0.1%) since 2016, set at zero from 2011 to 2016, and at or below 0.5% since the mid-1990s. Having pioneered the use of quantitative easing in the early 2000s, the Bank of Japan also accelerated the pace of its asset purchases, including JPY 33 trillion in Japan Government Bonds in the five-months period from March to August, 2020 (compared to JPY 4 trillion for the same period in 2019) and substantive increases in purchases of commercial paper, corporate bonds, exchange-traded funds and real estate investment funds²². In justifying the inclusion of these last two asset classes in the purchase programs, the Governor of the Bank of Japan stated²³ that ‘the aim is to prevent firms’ and households’ sentiment from deteriorating through volatility in financial markets’, echoing the prevailing view among central bankers that their response to crises should include widespread support to all sorts of financial markets.

²⁰ See the speech by the ECB Chief Economist Philip R. Lane:
<https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp200624~d102335222.en.html>.

²¹ The Eurosystem consists of the ECB plus the National Central Banks of member states. For the consolidated balance sheet, claims between participants of the system are netted out. Weekly consolidated financial statements are available at <https://www.ecb.europa.eu/press/pr/wfs/html/index.en.html>.

²² See <https://www.boj.or.jp/en/statistics/boj/other/acmai/index.htm/> for details.

²³ See <https://www.bis.org/review/r200803b.htm>

In addition to asset purchases, the Bank of Japan also extended its Securities Lending Facility (SLF) and activated emergency lending by creating the Special Funds Supplying Operations to Facilitate Corporate Financing Regarding the Novel Coronavirus, a facility offering up to JPY 100 trillion in loans to banks and other financial institutions lending primarily to small and medium enterprises. The overall balance sheet impact of these measures was an expansion of assets from approximately JPY 589 trillion in March, 2020 to over JPY 667 trillion in August, 2020. This corresponds to an annual pace of expansion of approximately JPY 188 trillion, which should be compared with the average JPY 55 trillion increase per year in the previous 8 years.

4 – The Illumination of Shadow Banking

The 2007-08 crisis is best characterized as a run on the shadow banking system (Gorton and Metrick 2012). Such characterization encompasses virtually all important aspects of this multi-faceted event, including the global savings glut and large ‘cash pools’ in search of alternatives to traditional bank deposits, the increase in short-term liabilities of global financial institutions and corresponding increase in the demand for safe assets, which in turn led to the growth in securitization, in particular the market for mortgages-backed securities (Tokunaga and Epstein 2018). Accordingly, it is also instructive to analyse the response of central banks to that crisis using a shadow banking lens²⁴.

Defined as ‘financial intermediaries that conduct maturity, credit, and liquidity transformation without explicit access to central bank liquidity or public sector credit guarantees’ (Pozsar et al 2012), the shadow banking system grew at a fast pace since the 1980s and includes investment banks, money market mutual funds, hedge funds, asset-backed commercial paper (ABCP) conduits, government-sponsored enterprises (GSE) and many other financial institutions that were at the core of the 2008 crisis. Using this definition, Pozsar et al (2012) report that the total liabilities

²⁴ The term ‘shadow banking’ was coined in 2007 by PIMCO economist Paul McCulley in a speech at the Fed’s annual symposium in Jackson Hole. McCulley had also coined the term ‘Minsky moment’ in 1998 to describe the Asian debt crisis of 1997, and has played an important role in bringing the work of Hyman Minsky to the attention of investors, mainstream economists, and policy makers since then. See https://www.iosco.org/library/annual_conferences/pdf/ac34-5.pdf

of the U.S. shadow banking system were nearly \$22 trillion in June 2007, compared with \$14 trillion in total liabilities for the traditional banking sector.

More generally, the Financial Stability Board (FSB), established in 2009 in part to monitor the growth and evolution of the global financial system, has been reporting on the size of shadow banking globally since 2011. In its 2018 report, the FSB replaced the term shadow banking by the more neutral expression Non-Banking Financial Intermediation (NBFIs) and further subdivided it into a broad measure called the Monitoring Universe of Non-Bank Financial Intermediation (MUNFI), consisting of all financial institutions that are not central banks, banks or public financial institutions; an intermediate measure called Other Financial Institution (OFI), the subset of MUNFI excluding insurance corporations, pension funds, or financial auxiliaries; and a narrow measure consisting of the subset of MUNFI that may pose bank-like financial stability risks. Data presented in its 2019 report²⁵ shows that from 2004 to 2018 the assets of MUNFI were, on average, 46.1% of total financial assets, whereas the corresponding average share for banks was 42.3%, with the remaining share corresponding to central banks and other public financial institutions.

As presented above, the definition of shadow banking based on institutions tends to emphasize the lack of access to central bank liquidity and corresponding lack of regulatory oversight. Accordingly, post-crisis proposals for reform of shadow banking under this definition focus on introducing explicit government support, such as access to lender-of-last-resort facilities at the central bank or guarantees for liabilities for a broader class of institutions, accompanied by extended regulatory controls, such as capital requirements and stricter rules on asset holdings. This is the essence, for example, of the proposals in Gorton and Metrick (2010), which apart from the provisions already included in the Dodd-Frank Act of 2010, such as hedge funds having to register with the Securities and Exchange Commission (SEC), advocate the chartering of Money Market Mutual Funds as a new form of Narrow Savings Banks, with liabilities insured by the government, and the chartering of Narrow Funding Banks, with assets under strict control and monitoring with respect to securitization.

²⁵ See <https://www.fsb.org/2020/01/global-monitoring-report-on-non-bank-financial-intermediation-2019/>

An alternative, more encompassing, definition is provided by the Money View school (Mehrling et al 2014) according to which shadow banking is any *activity* that involves market-based borrow and lending. More explicitly, shadow banking consists of money-market funding of securities-market lending, that is to say, a form of financial intermediation whereby both borrowers and lenders engage in the purchase and sale of tradeable securities. This is to be contrasted with bank-based borrow and lending, where traditional bank assets in the form of (non-securitized, non-tradeable) loans are funded by traditional bank liabilities in the form of deposits (either demand or term-based). In addition to the activities of all the institutions covered by the previous definition, this transaction-based definition includes the activities of many traditional banks, which actively engage in market-based intermediation. For example, most banks in Europe and North America act as dealers in money markets, holding large quantities of repos as liabilities (borrowing) and reverse repos as assets (lending). Crucially, as we will see next, an activity rather than institution-based definition of shadow banking has profound implications for central bank responses and financial regulation.

Using repos as the quintessential examples of so-called ‘shadow money’, Gabor and Vestergaard (2016) demonstrate why central banks cannot rely on lender-of-last-resort policies alone to stabilize shadow banking. Because repo liabilities derived their ‘moneyness’ (i.e. convertibility) from the liquidity and safety of the underlying collateral, it is not enough for a central bank to backstop institutions. Instead, to stabilize shadow banking, central banks need to backstop *markets*, leading to the dealer-of-last resort role described in Mehrling (2011).

In terms of regulation, the activity-based definition of shadow banking implies that all financial institutions, including banks, should face stricter controls when engaging in market-based intermediation. These include²⁶ the liquidity and leverage ratios that were part of the Basel III rules introduced in 2010 as well as the financial transaction tax (FTT) originally proposed by the European Commission in 2011 and revised in 2013. Predictably, regulation of market-based

²⁶ See <https://www.bis.org/publ/bcbs188.pdf> for liquidity rules in Basel III and https://ec.europa.eu/taxation_customs/taxation-financial-sector_en for the FTT proposed by the European Commission.

finance was ferociously opposed by powerful lobbying from banks and asset managers alike²⁷. As a result, full implementation of the Basel III rules has been repeatedly postponed, most recently until January 2022, and the FTT proposal has been essentially abandoned by the European Commission.

Similarly, in a statement in 2015, then chairman of the Financial Stability Board Mark Carney welcome ‘the trend towards greater market-based intermediation through asset management entities’ and announced a renewed focus on resilience and stability of these markets²⁸. This normalization of shadow banking activities, including the push to adopt the neutral language of non-banking financial intermediation, paved the way for the policy responses by central banks to the Covid-19 crisis, which as we have seen in Sections 2 and 3 featured asset purchases and market stabilization of unprecedented scale and speed. Central bank interventions in the markets of assets used as collateral for repos issued by banks and other financial institutions is a direct consequence of the sophisticated, and necessarily fragile, collateral valuation framework the underlies shadow money, including haircuts, marking-to-market and margin calls (Gabor and Vestergaard 2016).

The tacit acceptance of market-based financial intermediation as the predominant form of banking, what I call the illumination of shadow banking, helps explain why backstopping core markets for both public and private debt morphed from being seen as exceptional measures in the aftermath of the 2008 crisis to core central bank responses to the Covid-19 crisis. This shows that the ‘quiet revolution in crisis central banking’ described in Gabor (2016), whereby a dealer-of-last-resort function was gradually embraced by central banks, is now completed. Backed by the softening of regulation described above, the illumination of shadow banking, with key liquidity instruments such as repos based on the availability of safe and stable collateral, ushers a new era of increased interdependence between public institutions and financial market

²⁷ For example, see https://web.archive.org/web/20100530081636/http://www.economist.com/business-finance/displaystory.cfm?story_id=16231434

²⁸ See <https://www.fsb.org/wp-content/uploads/IMFC-Statement-April-2015-FSB-Chairman-Mark-Carney.pdf>

5 – A Glimpse Towards the Future of Central Banking

Even before the Covid-19 crisis, a growing literature, especially in heterodox circles, was already considering alternative roles and mandates for central banks. For example, Rochon and Setterfield (2008), building on earlier work in Smithin (2004) and Lavoie and Seccareccia (1999), argue that the ultimate channel for monetary policy transmission is through its effect on income distribution, for example in the form of interest income of rentiers. The policies of large scale asset purchases pursued by central banks since 2008 added a new dimension to this channel, as the higher asset prices that they generate disproportionately benefit the wealthy individuals who hold these assets in their portfolios, meaning that monetary policy can favour the rich even in an ultra-low interest-rate environment²⁹. Similarly, Seccareccia and Khan (2019) propose that central banks should abandon a single mandate focussed on inflation targeting and pursue instead multiple goals including full employment and stability of income distribution. By analyzing the rate-setting behaviour of major central banks since 2008, they provide statistical evidence that they were not, in fact, solely guided by price stability, but were rather motivated by additional goals, in particular macro-financial stability. The policy responses described here corroborate this view in the broader context of unconventional monetary policy, in the sense that it is clear that the dealer-of-last-resort role clearly indicate targets much broader than inflation control. It remains to be seen, however, how the sustained balance-sheet interventions required to stabilize shadow banking and market-based finance will affect income distribution in the long run. As mentioned above, the resulting high asset prices indicate that such policies are as much biased against labor as the inflation targeting regimes described in Seccareccia and Khan (2019). More broadly, Palley (2019) challenges the dominant notion of central bank independence on the basis of its flawed economic and political justifications and reviews empirical evidence suggesting that the alleged negative relation between inflation and independence, which used to be strong for advanced economies in the 1980s, has disappeared in the 2000s (and never seemed to exist in emerging and developing economies). As explained below, this challenge has also been partially confirmed by the policy responses described here.

²⁹ A so-called 'wealth channel', whereby a lower interest rate leads to a higher valuation of discounted future cash-flows and consequently higher asset prices, has always been considered a possible transmission mechanism for interest-rate policy. Large scale asset purchases, by directly putting a floor on the prices of entire classes of assets, appears to be a much stronger channel.

This literature notwithstanding, the scope, volume, and nature of the policy interventions by central banks during the Covid-19 crisis sparked a lively public debate on the role of central banks in modern economies, most of which has yet to percolate through scholarly works.

Writing for *Foreign Policy*³⁰, economic historian Adam Tooze argues that the pandemic ended any illusion of central bank independence and uses the March 2020 ruling of the German Constitutional Court on the ECB asset purchase program to analyze how central banking evolved from a narrow inflation-fighting mandate to a much more expansive role. The Karlsruhe ruling that, in implementing the asset purchase program initiated by Mario Draghi in 2015, the ECB overstepped its monetary policy, is significant not only because it sets the Bundesbank in a collision course with the Eurosystem of which it is part, but also because it creates a precedent for similar legal challenges to the PEPP deployed by the ECB in response to the pandemic. Applying a shadow money lens, economist Daniela Gabor³¹ explains why such strict separation between monetary and fiscal policy is simply obsolete in the age of market-based finance: central banks primary motivation to purchase government bonds is not to ensure *public* debt sustainability, but rather to prevent volatility in assets used as collateral for repo markets and consequently maintain the flow of *private* credit.

In the U.S., the expansion of the universe of assets purchased by the Fed in response to the Covid-19 crisis, from corporate bonds to debt New York's Metropolitan Transportation Authority, inspired progressive writers such as Nathan Tankus³² to propose the issuance of 'complementary currencies' by public institutions such as universities, in effect mobilizing the resources of central bank-backed money creation away from banks and financial institutions.

³⁰ See <https://foreignpolicy.com/2020/05/13/european-central-bank-myth-monetary-policy-german-court-ruling/>

³¹ See <https://criticalfinance.org/2020/06/17/three-myths-about-eus-economic-response-to-the-covid19-pandemic/>

³² See <https://nathantankus.substack.com/p/responding-to-the-university-budget>

In a similar vein, the responses to the Covid-19 crisis invited a re-examination of the role of the banking sector in the real economy and the potential for more direct central bank support to firms and households. Applying an alternative measure of the size of the shadow banking at the onset of the 2008 crisis based on net financing to the nonfinancial sector, Gallin (2013) showed that it was less than one fifth of the estimate provided by Pozsar et al (2010) and mentioned in the previous section. In other words, about four fifths of the U.S. institution-based shadow banking sector in 2008 consisted of a network of ‘side-bets’ with no direct impact on the real economy. Using the activity-based definition of shadow banking, economist Elham Saeidinezhad³³ argues that traditional banks have a higher incentive to act as dealers in money markets and originators in securities markets than to provide funds to individuals and households, which explains the poor results associated with relying on the banking sector as a conduit for the Payroll Protection Program loans that were part of the CARES Act. As an alternative, she suggests the use of central bank digital currencies (CBDC) as a mechanism to provide liquidity directly to firms and households in periods of crisis, bypassing the banking sector altogether. Abstracting from implementation details, this is similar to the outright creation of broad money and purchasing power through direct lump-sum transfers of money to households proposed in Bützer (2017).

Finally, like with all significant crises since the Great Depression, the Covid-19 crisis also reignited the calls for a more radical restructuring of the banking sector in the form of narrow banking³⁴. A complete description of the properties of narrow banking and a review of related literature is provided in Grasselli and Lipton (2019). For the purposes of this article, it suffices to recall that the main feature of narrow banking is to require that banks should hold marketable, liquid, low-risk, assets in excess of demand deposits held by their clients. In the more strict version known as full-reserve banking, the requirement is that these assets take the form of central bank reserves. This does not mean, however, that under narrow banking requirements banks would cease to be able to provide loans (or hold other types of less-liquid assets), but rather that the matching liabilities for these other assets should not be demand deposits. These liabilities can include time deposits and non-checkable savings accounts, as well as bonds and equity issued by

³³ See <http://elhamsaeidinezhad.com/in-a-world-where-banks-do-not-aspire-to-be-intermediaries-is-it-time-for-cutting-out-the-middlemen-part-i/>

³⁴ See, for example, <https://www.ft.com/content/f128ffd8-1d28-4f9b-b3aa-4b798ebdae3e>.

banks. In other words, narrow banking imposes a separation between two core functions of banks that have been historically joined under fractional-reserve banking: lending and the payment system. Using a fully specified stock-flow consistent model, Grasselli and Lipton (2019) show that debt-financed economic growth can still take place under full-reserve banking, whereas crashes associated with out-of-control lending are less likely to occur.

But exactly how radical is full-reserve banking, especially after the central bank responses to both the 2008 and Covid-19 crises? To answer this question, consider the examples of the banking systems in the U.S., the U.K., and Canada. Figure 10 shows the evolution of the total amount of demand deposits, reserves, and excess reserves for institutions that are required to maintain a balance with the Federal Reserve. As we can see, reserves went from being a negligible component of bank assets (averaging about 3% of demand deposits from the beginning of 2000 to August 2008) to rapidly surpassing demand deposits before the end of 2008 and remaining above the level of demand deposits until mid-2019 (with the average level of reserves for the 10 years period from 2009 to 2019 being 193% of demand deposits). After a brief period in 2019 during which reserves were below demand deposits, the policy responses to the Covid-19 crisis brought them up again to a peak of 150% of demand deposit in May 2020 (down to 120% in August). Similarly, data from the Bank of England³⁵, which as we have seen followed a similar pattern of balance sheet expansion as the U.S. Fed in both 2008 and 2020, show that the ratio of reserves to overnight deposits grew from approximately 3% in December 2007 to over 35% in July 2020.

[Insert Figure 10 here]

The situation is even starker in Canada, where reserves³⁶ held by chartered banks went from a negligible level of about CAD 1 billion before the start of 2020 to over CAD 240 billion in July 2020. By comparison, checkable deposits grew from approximately CAD 890 billion to CAD 1,065 billion in the same period. That is to say, in a system without reserve requirements (Lavoie

³⁵ See <https://www.bankofengland.co.uk/boeapps/database/>

³⁶ Technically called Bank of Canada deposits. See <https://www.bankofcanada.ca/rates/banking-and-financial-statistics/chartered-bank-selected-assets-monthly-average-formerly-c1/> for updated data.

2019), the ratio of reserves to demand deposits for Canadian banks went from about 0.1% to 22.5% as a result of responses to the Covid-19 crisis.

We therefore see that, on the one hand, the injection of liquidity by central banks brought the amount of central bank reserves held by banks to levels where full-reserve requirements are feasible and realistic. On the other hand, the growth and pervasiveness of market-based intermediation mean that lending is primarily funded by sources other than demand deposits. That is to say, at least from the point of view of balance sheet composition, the current banking system is already as close as it has ever been from separating lending from the payment system. Narrow banking regulation would simply make the separation explicit, allowing central banks to focus on the portions of the financial system that the citizens in their jurisdictions deem necessary to support.

6 – Conclusion

On the surface, the economic and financial fallout from the Covid-19 pandemic could not be more different from the global financial crisis of 2008. It originated from a sudden health emergency that affected all sectors of society and simultaneously impacted all major world economies. By contrast, the 2008 was the culmination of a long-brewing instability of the North Atlantic financial sector. Yet the responses from central banks in both crisis were essentially the same: lower interest rates (or keep them low if already against the effective zero-lower bound), offer emergency lending to financial institutions and, crucially, support the smooth functioning of financial markets.

This last aspect of the policy response, namely having central banks act as dealers of last resort in a variety of markets, was seen as a controversial, yet necessary, step during the 2008 crisis, especially for markets that were frozen because of the fear of toxic assets. In the response to the Covid-19 crisis, however, large scale asset purchases by central banks all over the world, even in the most liquid of markets, were justified as essential ways to maintain the flow of credit to the real economy. What changed in the intervening decade was that shadow banking, or market-based financial intermediation, evolved from being seen as an obscure, albeit large, segment of the financial industry to being accepted and welcome as the dominant form of borrowing and lending.

Consequently, because of the sophisticated apparatus underlying collateral valuation, central banks find it necessary to intervene in markets exhibiting slightly above normal volatility, not just frozen ones, in what could more accurately be described as a dealer-of-first-resort function.

This expanded and redefined role for central banks raises important questions about the legitimacy of the use of their immense firepower, in the form of seemingly limitless balance sheets, to support a financial industry increasingly disconnected from the real economy. Direct support to local governments and public institutions like universities through the purchase of their liabilities and direct lending to firms and households through the use of central bank digital currencies are two examples of expansions of monetary policy away from market-based finance. In the regulatory domain, the introduction of full-reserve requirements, which the policy responses to Covid-19 made more realistic than ever, would establish an even clearer separation between the functions of banking that should be protected by central bank interventions, such as the payment system, and those that should not, such as private market-making.

Acknowledgements: I would like to thank the participants of the conference The Future of Central Banking, Talloires (France), May 26-28, 2019, where preliminary ideas for this article were presented, as well as Ian Buckley, Jo Michell and an anonymous referee for comments and suggestions.

References

Bordo, M.D. 2014. 'Exiting from low interest rates to normality: An historical perspective'. *Hoover Institution Economic Working Papers*. 14110:1-24.

Bützer, S. 2017. 'Monetary Policy Options for the Euro Area: A Compendium to the Crisis.' In *Monetary Policy, Financial Crises, and the Macroeconomy*, edited by Frank Heinemann, Ulrich Klüh and Sebastian Watzka, 125–162. Cham: Springer International Publishing AG.

Duffie, D. 2020. 'Still the world's safe haven? Redesigning the US treasury market after the COVID-19 crisis'. *Hutchins Center Working Paper*. Number 62.

Gabor, D. 2016. 'The (impossible) repo trinity: The political economy of repo markets'. *Review of International Political Economy*, 23(6), 967-1000.

Gabor, D. and J. Vestergaard. 2016. 'Towards a Theory of Shadow Money', INET Working Paper, Institute for New Economic Thinking, New York, NY.

Gorton, G. and A. Metrick. 2010. 'Regulating the shadow banking system', *Brookings Papers on Economic Activity*, 261-297.

Gorton, G. and A. Metrick. 2012. 'Securitized banking and the run on repo'. *Journal of Financial Economics*, Volume 104, Issue 3.

Grasselli, M. and A. Lipton. 2019a, 'The Broad Consequences of Narrow Banking'. *International Journal of Theoretical and Applied Finance*. Vol. 22, No. 1, 1950007.

Grasselli, M. and A. Lipton. 2019b, 'On the Normality of Negative Interest Rates'. *Review of Keynesian Economics*, Vol. 7, No. 2, 201-219.

Jobst, A. and H. Lin. 2016. 'Negative interest rate policy (NIRP): implications for monetary transmission and bank profitability in the euro area', Working Paper 16/172, International Monetary Fund.

Lavoie, M. 2019. 'A System with Zero Reserves and with Clearing Outside of the Central Bank: The Canadian Case', *Review of Political Economy*, 31:2, 145-158.

Lee, K-S. and R. A. Werner. 2018. 'Reconsidering Monetary Policy: An Empirical Examination of the Relationship Between Interest Rates and Nominal GDP Growth in the U.S., U.K., Germany and Japan', *Ecological Economics*, Volume 146, Pages 26-34.

Mehrling, P. 2011. 'The New Lombard Street: How the Fed Became the Dealer of Last Resort', Princeton, NJ: Princeton University Press.

Mehrling, P. 2013. 'The Inherent Hierarchy of Money' Pages 394-404 in *Social Fairness and Economics: Economic Essays in the Spirit of Duncan Foley*, edited by Lance Taylor, Armon Rezai, and Thomas Michl. Routledge, 2013.

Mehrling, P., Pozsar, Z., Sweeney, J. and D. Neilson. 2014. 'Bagehot was a Shadow Banker: Shadow Banking, Central Banking, and the Future of Global Finance', in *Shadow Banking Within and Across Borders*, edited by Stijn Claessens, Douglas Evanoff, George Kaufman, and Luc Laeven. World Scientific Publishing.

Palley, T. 2019. 'Central Bank Independence: A Rigged Debate based on false Politics and Economics'. *Investigación económica*, 78(310), 67-102.

Pozsar, Z., Adrian, T., Ashcraft, A. and H. Boesky. 2010. 'Shadow Banking', *Federal Reserve Bank of New York Staff Report*, Number 458.

Rochon, L. 2007. 'The State of Post Keynesian Interest Rate Policy: Where Are We and Where Are We Going?', *Journal of Post Keynesian Economics*, 30(1), 3-11.

Rochon, L., and Setterfield, M. 2008. 'The Political Economy of Interest-Rate Setting, Inflation, and Income Distribution', *International Journal of Political Economy*, 37(2), 5-25.

Roser, M., Ritchie, H., Ortiz-Ospina, E. and J. Hasell. 2020. 'Coronavirus Pandemic (COVID-19)'. Published online at [OurWorldInData.org](https://ourworldindata.org).

Seccareccia, M. and Khan, N. 2019. 'The Illusion of Inflation Targeting: Have Central Banks Figured Out What They Are Actually Doing Since the Global Financial Crisis? An Alternative to the Mainstream Perspective', *International Journal of Political Economy*, 48:4, 364-380.

Thornton, D. 2008. 'Walter Bagehot, the Discount Window, and TAF'. *Economic Synopses*. Number 27, Federal Reserve Bank of St. Louis.

Tokunaga, J. and Epstein, G. 2018. 'The endogenous finance of global-dollar-based financial fragility in the 2000s: a Minskyan approach', *Review of Keynesian Economics*, 6(1), 62-82.

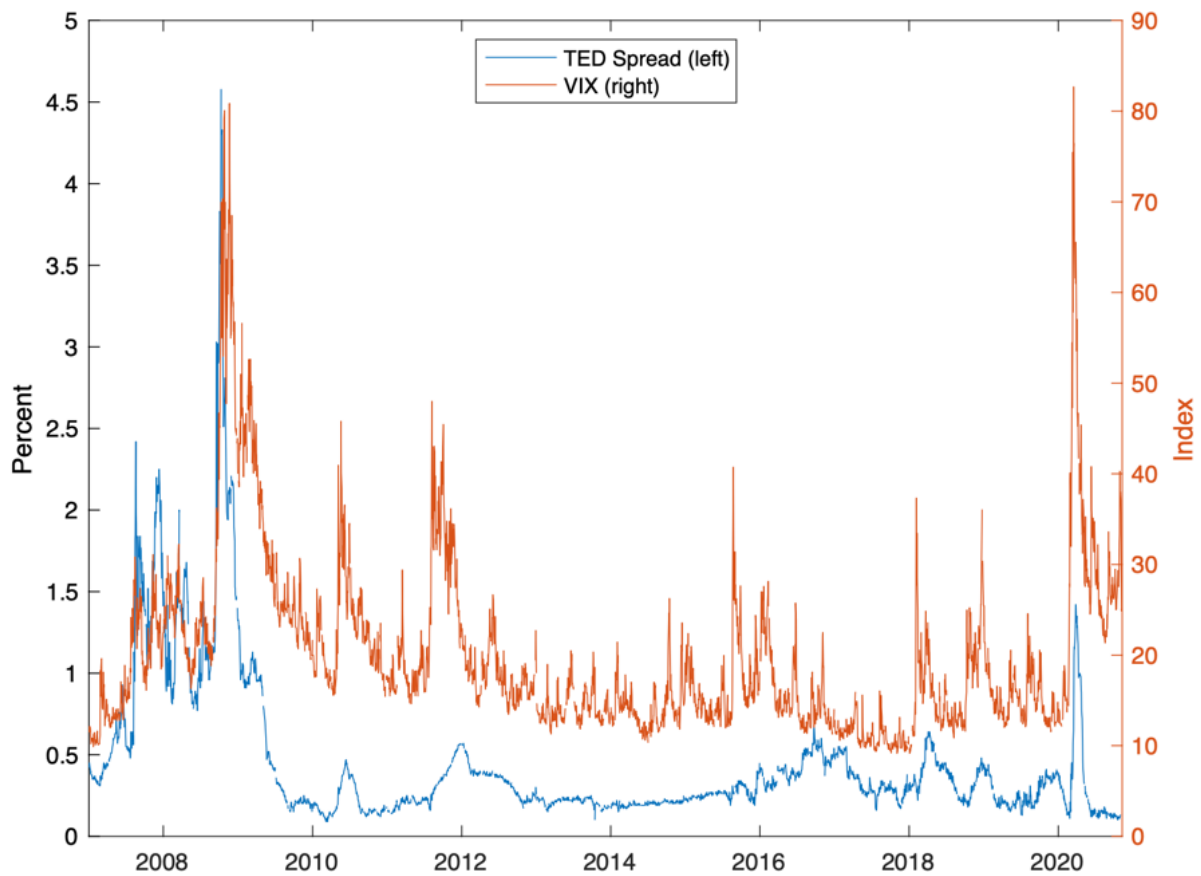


Figure 1: Indicators of financial distress during the 2008 and Covid-19 crises.
Sources: CBOE and St. Louis Fed, retrieved from FRED, Federal Reserve Bank of St. Louis.

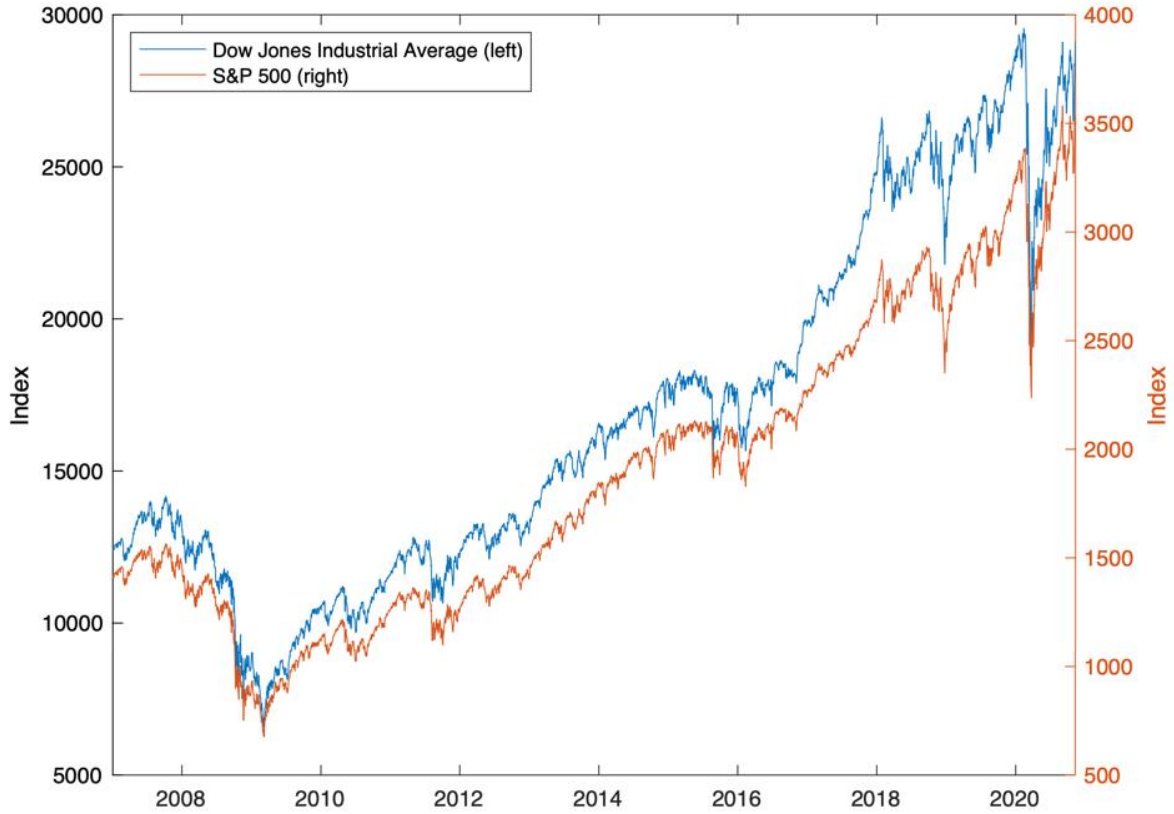


Figure 2: Stock market decline during the 2008 and Covid-19 crises.
Source: S&P Dow Jones Indices LLC, retrieved from Yahoo Finance.

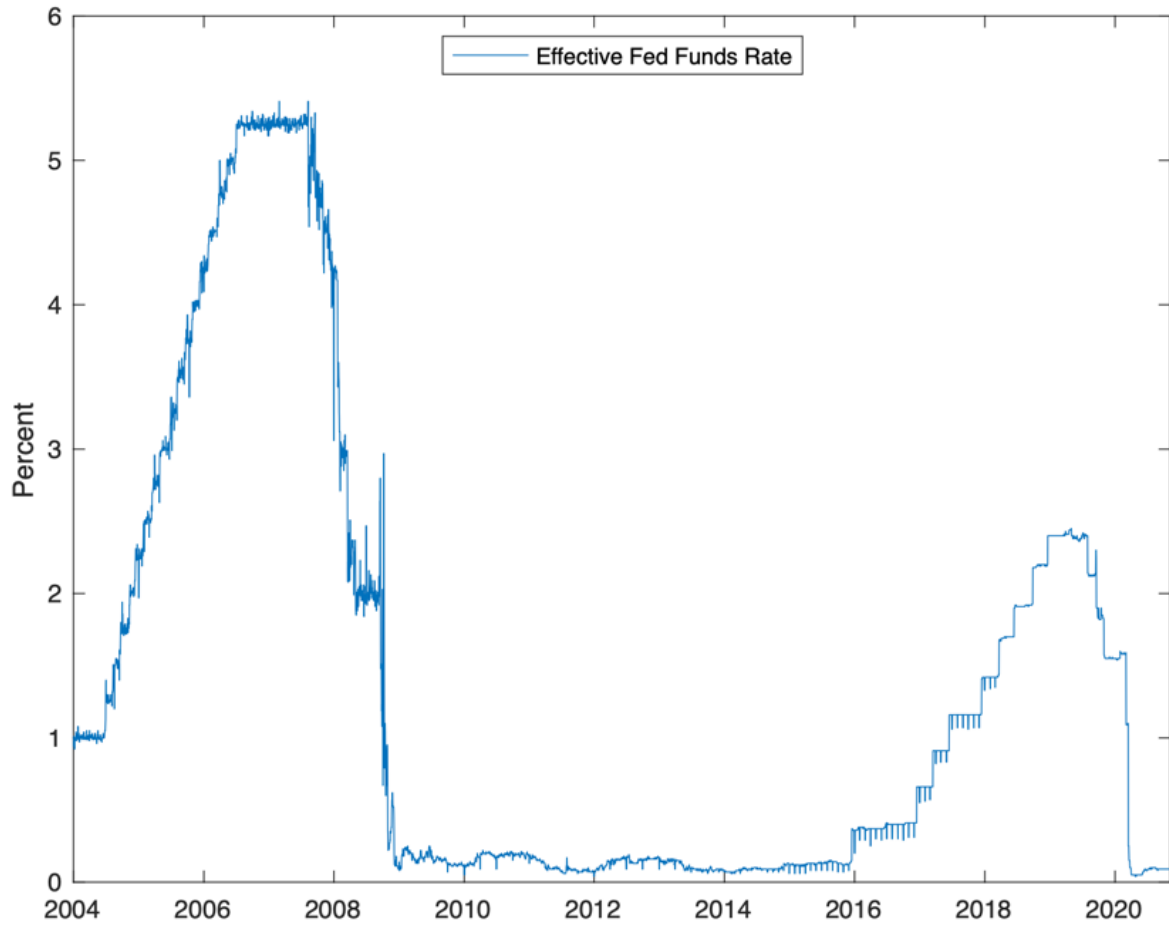


Figure 3: Interest rate policy in the US around the 2008 and Covid-19 crises.
Source: Board of Governors of the Federal Reserve System (US), retrieved from FRED, Federal Reserve Bank of St. Louis.

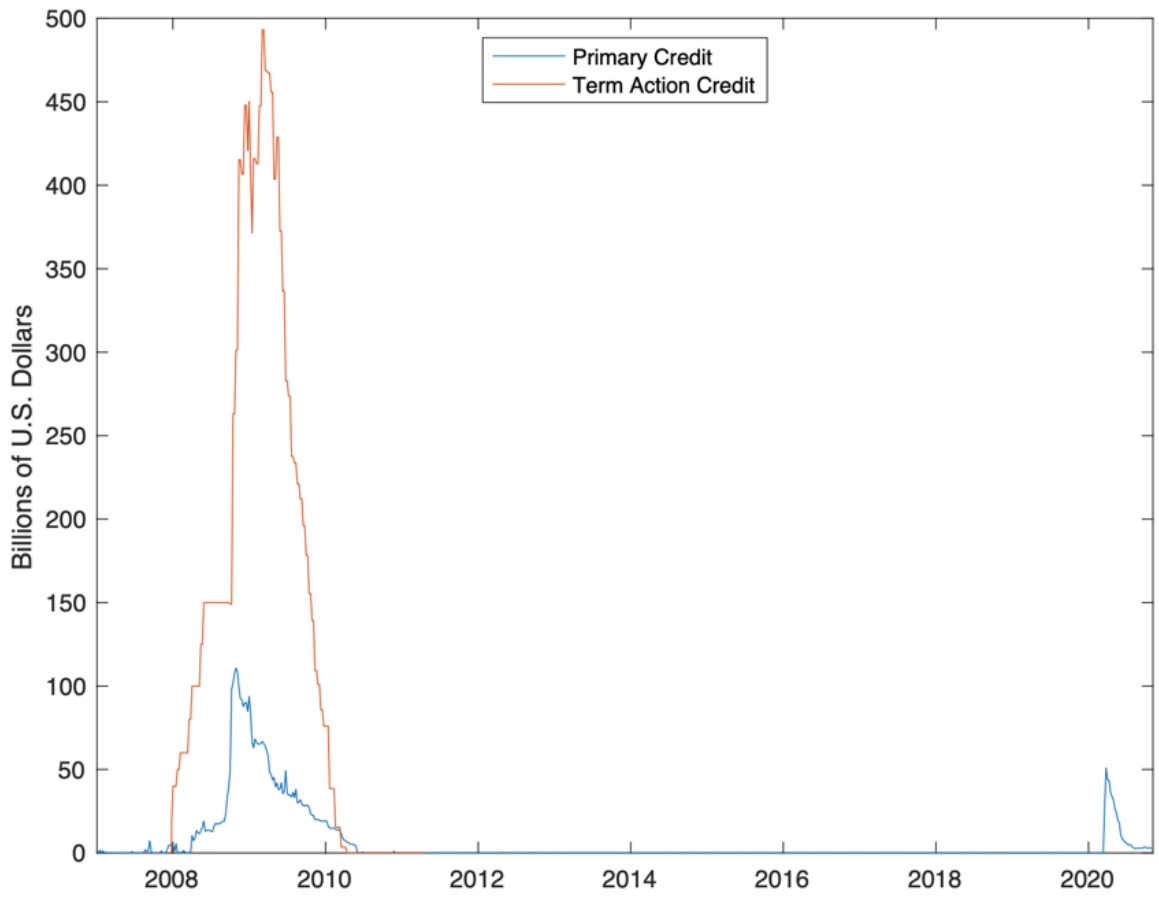


Figure 4: Lending facilities established by the Fed under standard discount window authority. Seasonal and Secondary Credit are not included in the figure, as their size never exceeded \$500 Million during the period.
 Source: Board of Governors of the Federal Reserve System (US), retrieved from FRED, Federal Reserve Bank of St. Louis.

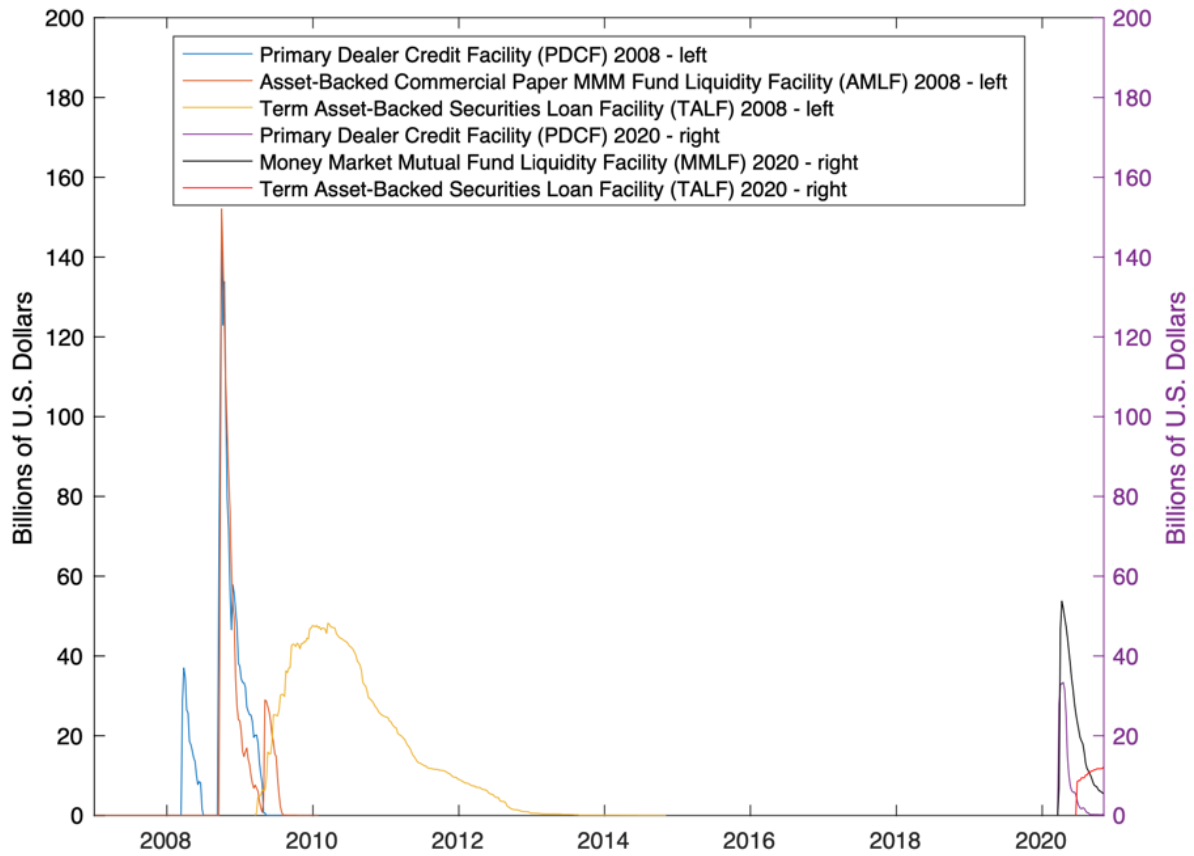


Figure 5: Lending facilities established by the Fed under Section 13(3) of the Federal Reserve Act.
 Source: Board of Governors of the Federal Reserve System (US), retrieved from FRED, Federal Reserve Bank of St. Louis.

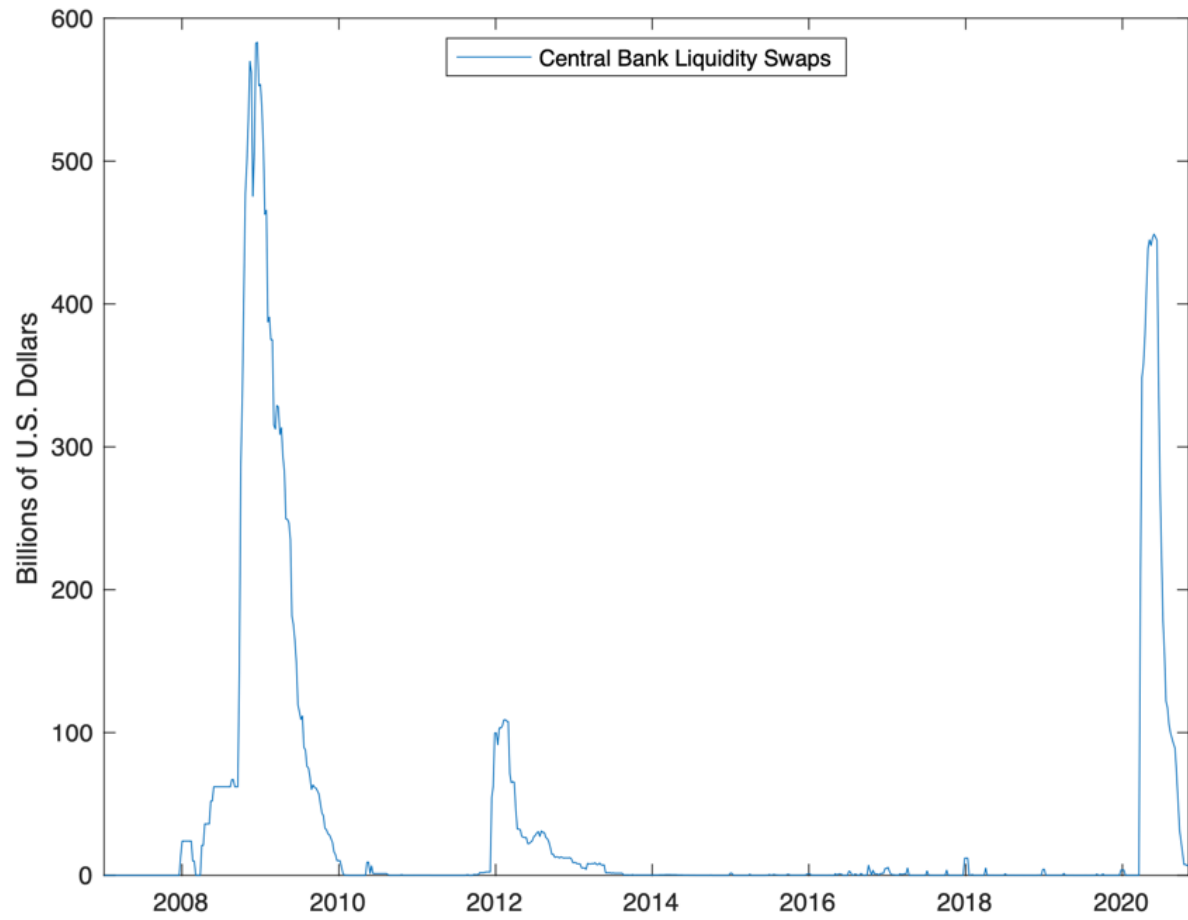


Figure 6: Currency swap lines between the Fed and other central banks.

Source: Board of Governors of the Federal Reserve System (US), retrieved from FRED, Federal Reserve Bank of St. Louis.

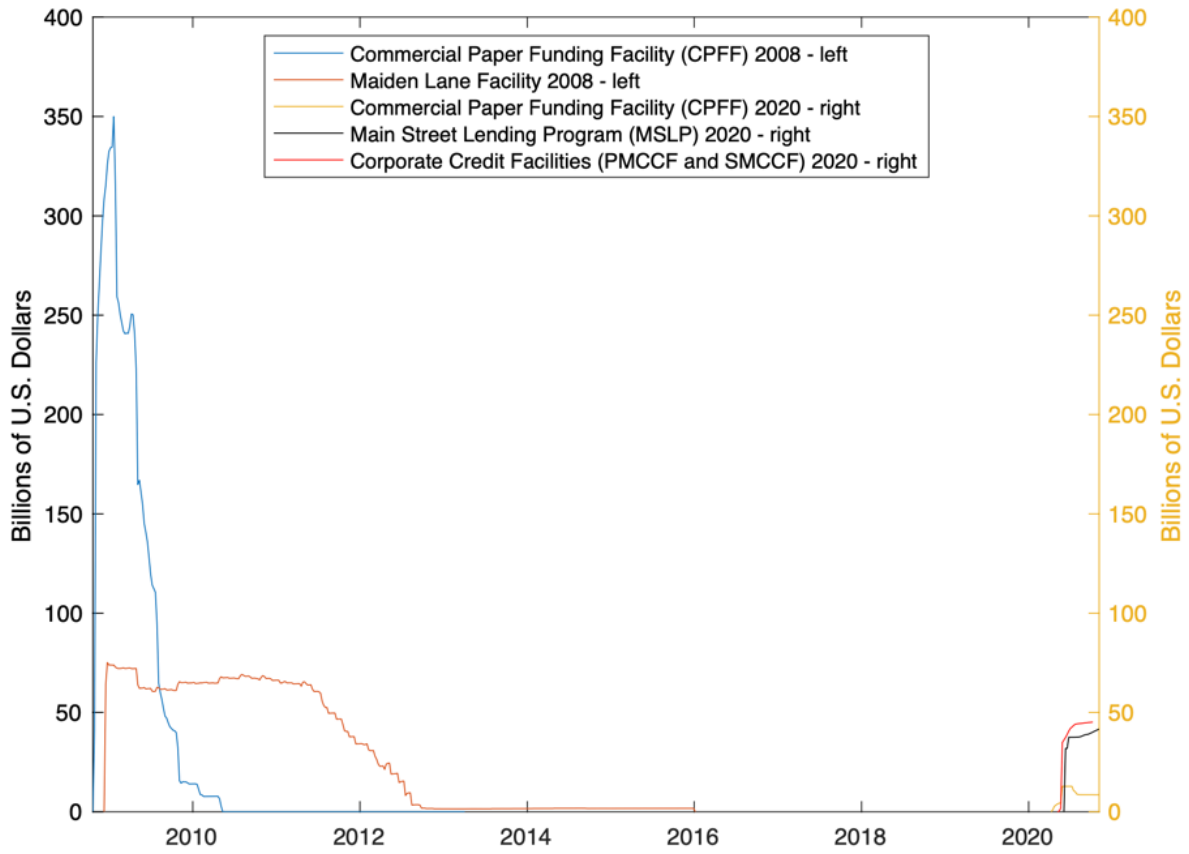


Figure 7: Dealer-of-last-resort facilities established by the Fed under Section 13(3) of the Federal Reserve Act.
 Source: Board of Governors of the Federal Reserve System (US), retrieved from FRED, Federal Reserve Bank of St. Louis.

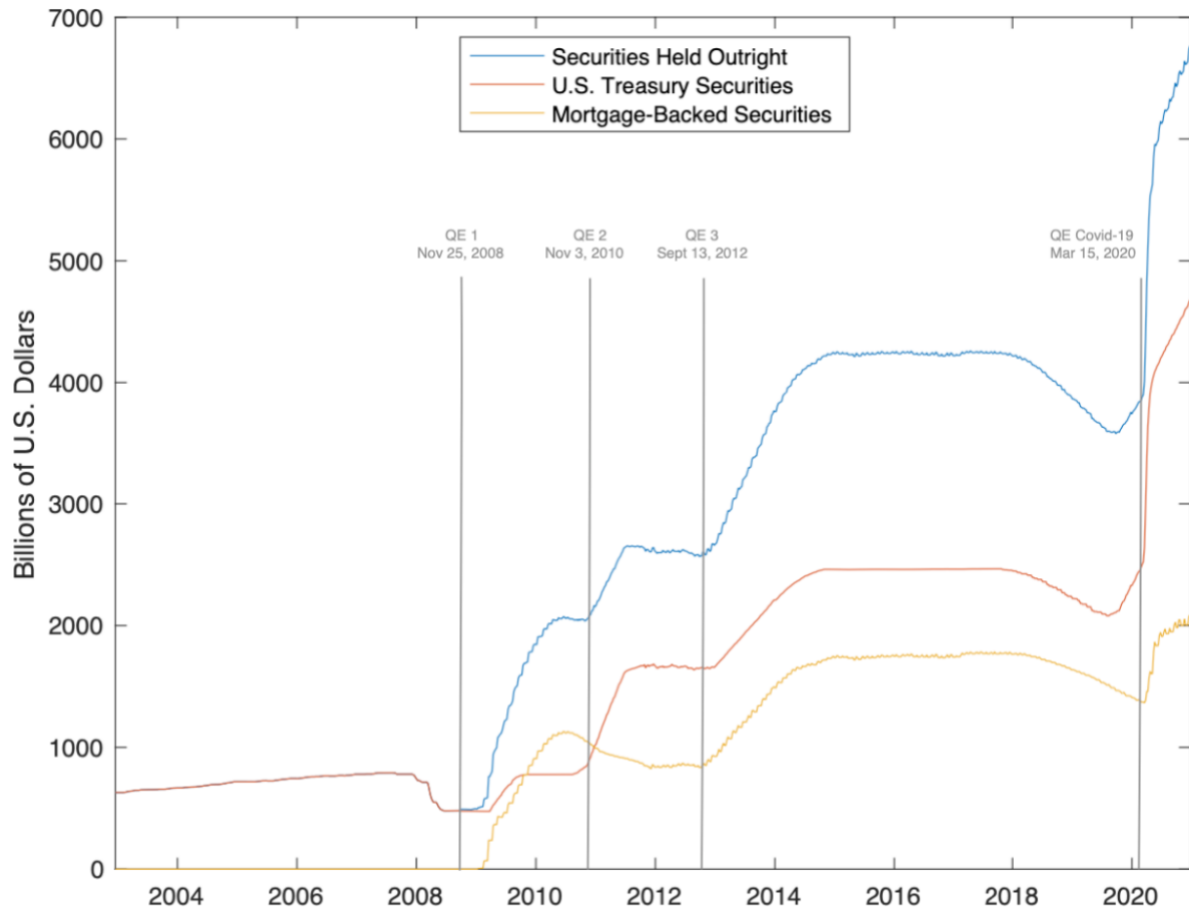


Figure 8: Asset-purchase programs at the Fed.

Source: Board of Governors of the Federal Reserve System (US), retrieved from FRED, Federal Reserve Bank of St. Louis.

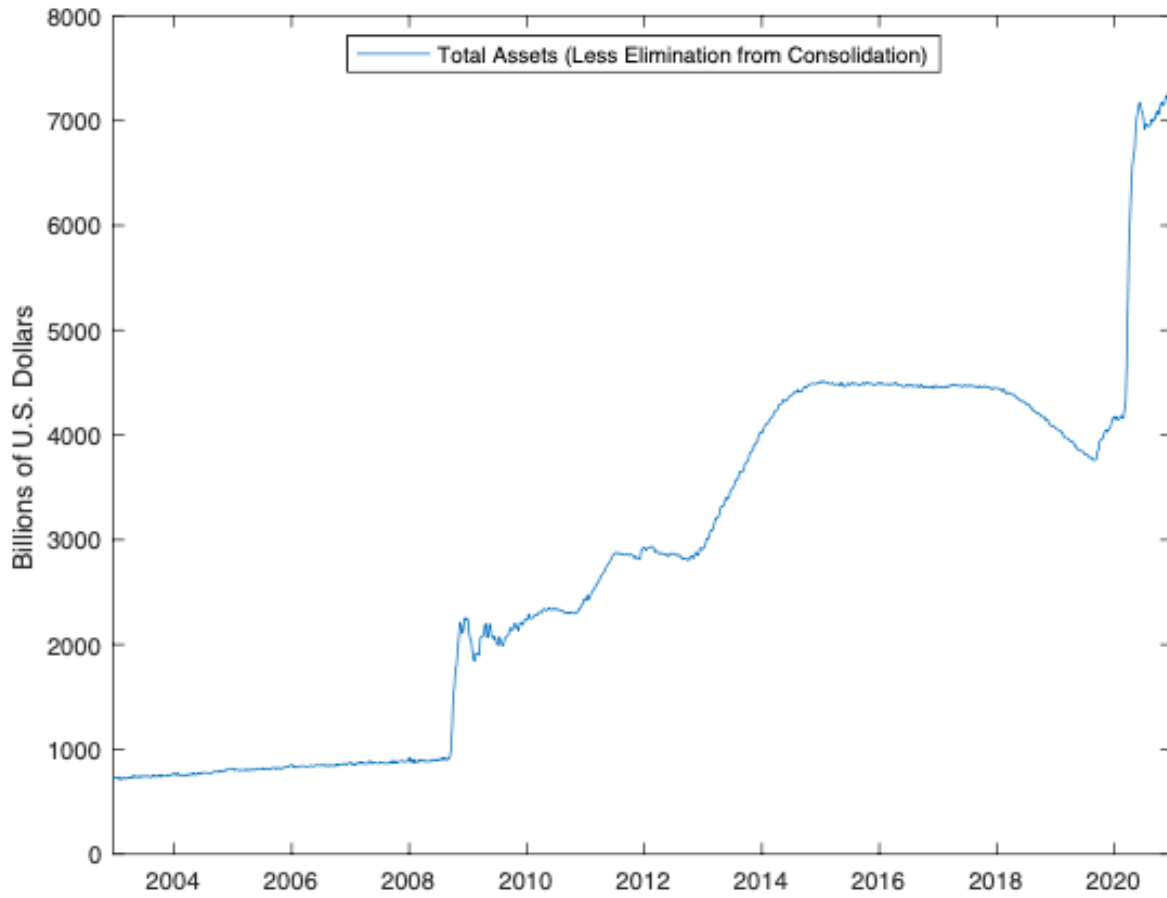


Figure 9: Total assets in the balance sheet of the Federal Reserve System.

Source: Board of Governors of the Federal Reserve System (US), retrieved from FRED, Federal Reserve Bank of St. Louis.

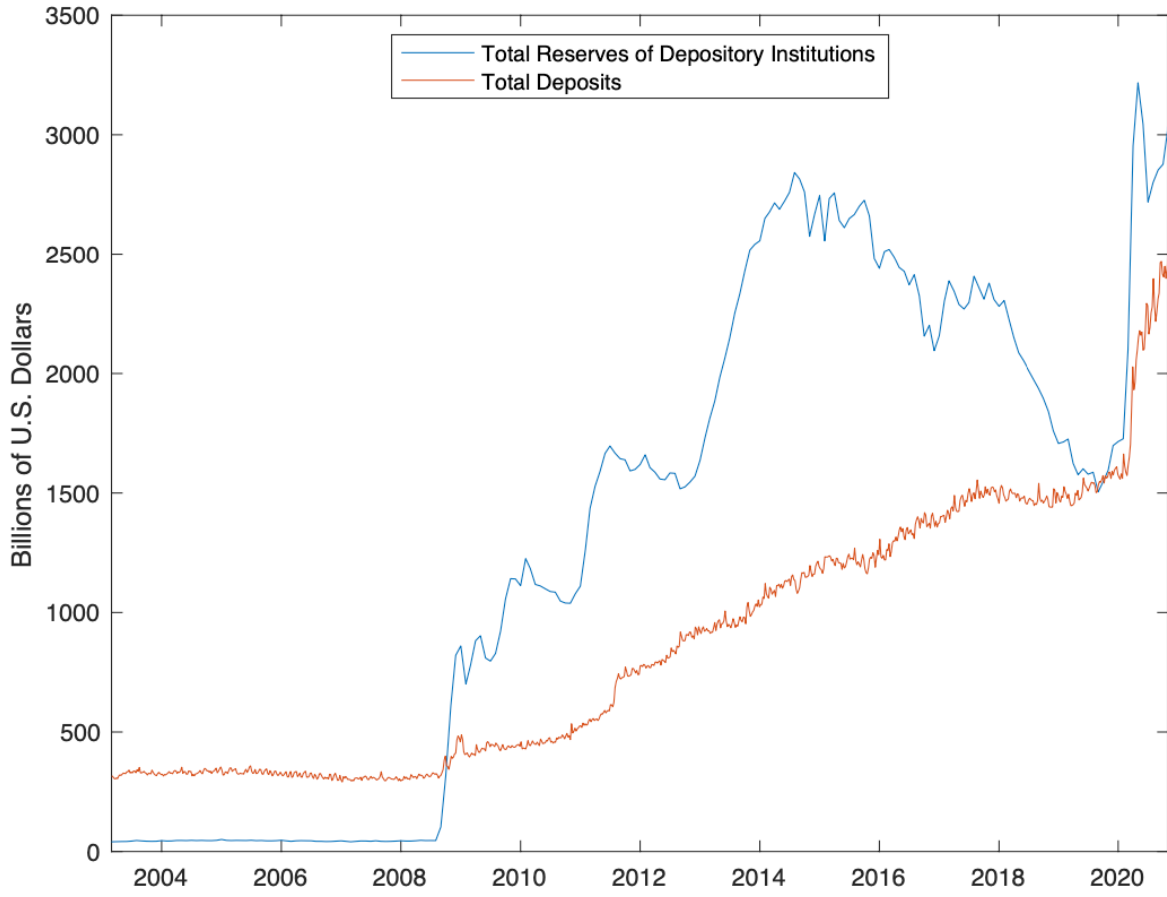


Figure 10: Total reserves and deposits for U.S. banks.

Source: Board of Governors of the Federal Reserve System (US), retrieved from FRED, Federal Reserve Bank of St. Louis.