

# The Fed and Its Shadow: A Historical View

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## Summary:

Central bank policies have always incorporated both a discretionary or active component and a passive component. Successful central banking has required a coordination of the two components. After a period of apparent dormancy, the passive component of monetary policy has emerged from the shadows and become relevant for Federal Reserve policy today.

## Key findings:

1. Central bank policies have always had both active and passive components.
2. Earlier generations of central banks strove for a balance between these two components.
3. After a period of dormancy, the passive component of monetary policy has become relevant for current policy decisions.

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Central bank policies have always incorporated both a discretionary or active component and a passive component. Successful central banking has required a coordination of the two components. After a period of apparent dormancy, the passive component of monetary policy has emerged from the shadows and become relevant for Federal Reserve policy today.

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## 1 Introduction

What is a “bank”? The usual answer is that a bank is a place where you can deposit your savings, have an account, use the account money to make payments, and then withdraw any remaining balance. The bank doesn’t choose your account balance; you control the timing and size of your holdings.

Generations of unfortunate money and banking students have been surprised to learn that this intuitive model does not apply to central banks. Central banks, the premier financial intermediaries in most economies, are puzzlingly un-bank-like. Can a person decide how much money to hold with the central bank? No. One can neither deposit money in a central bank, nor use balances at central bank, nor withdraw funds from a central bank. The central bank is a bank for banks, students quickly discover.

The confusion does not stop there, however. Can banks then decide how much to hold with the central bank? In the textbook model of central banks, in the aggregate, the answer is again a firm no; the central bank fixes the supply of its reserves—that is to say, it fixes the total amount of reserves that commercial banks can hold; withdrawals and deposits by commercial banks must adjust to offset one another: if one bank wants to increase its reserves, it must buy them from a bank (or other entity) wishing to reduce them on the interbank market.

Texts then describe how central bank money is created and destroyed by purposeful actions of the central bank. Only on occasion does the central bank adjust the amount of reserves available to the banks in the economy: through open market operations, buying or selling government securities in return for reserves (Federal Reserve), or through auctions of reserves (European Central Bank).<sup>1</sup> Adjusting these supplies constitutes the *active* monetary policy of the textbook central bank. This canonical view of monetary control finds resonance among theorists and market practitioners alike:

*The first necessity of a Central Bank, charged with responsibility for the management of the monetary system as a whole, is to make sure that it has an unchallengeable control over the total volume of bank-money ... .*

—John Maynard Keynes (1930)

*Money, unlike credit, at this time can only be created by central banks and can be created in whatever amounts the central banks choose to create.*

—Ray Dalio (2023)

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<sup>1</sup> Before the Fed starting paying interest on reserves in 2008, however, it engaged in relatively small-value open market interventions on an almost daily basis; see Garbade (2021).

But central banks developed historically from privileged public banks, and these earlier proto–central banks did not always focus on controlling the size of their balance sheet.<sup>2</sup> Their policies were instead oriented around setting terms under which a selected group of individuals or institutions could exchange safe assets for deposits or bank notes, through what might now be called a standing facility.

Hence the textbook model of central banks did not apply historically, and, we will argue, that model in its purest form does not apply now. Instead, central bank policy has tended to incorporate *both* an active and a passive component. In some cases, these components were sufficiently distinct, de facto or de jure, to constitute separate “sub-banks” within the central bank:

- **Passive bank:** a mechanistic institution that allowed for a swapping of safe assets for “cash” at the customers’ initiative, on predictable terms;<sup>3</sup>
- **Active bank:** an institution with discretionary powers used to promote macroeconomic and/ or financial stability through open market operations.

Successful central banks have managed to coordinate the two sub-banks. More generally, existence of a passive component of central bank policy has meant that the stock of central bank money is not entirely determined by discretionary open market operations, contrary to the canonical view.

The mechanics of this interaction are complicated. One reason that the dual nature of central banking has not been sufficiently understood is an accident of history. When the United States (and most other countries) went off the gold standard in the 1930s, the passive component of central bank policy was suppressed, and much of our thinking about the framework was effectively developed under this understanding. However, beginning in the 1950s, this passive component arose in a new form with financial innovation and deregulation. Its operation has become more obvious since 2008 with the application of unconventional monetary policy and changes in regulation. The underlying change between the historic examples and today—what is truly new—is a reconsideration of what constitutes the “safe asset”: a shift from metallic assets to government securities, above all US Treasury assets.

Before the 1930s, the passive component always existed for central banks: an ability to deposit and withdraw certain safe (precious metal) assets. What was less apparent in a pre-Keynesian world, however, was the importance of the active policies. In this paper we will

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<sup>2</sup> A standard reference on early public banks (proto–central banks) is Van Dillen (1934b). More recent surveys of these institutions can be found in Roberds and Velde (2016 a, b, c), Ugolini (2017), and Bindseil (2020). The term “central bank” was rarely used in the English language before the twentieth century.

<sup>3</sup> The exact form of the swap has varied over time and is explained in the examples below.

examine the active and passive policies in the context of three historical examples and use those examples to illuminate active and passive policies today. We note that post-2008 Fed policy has, perhaps by accident, resulted in a pattern of active-passive balance that mimics patterns observed in earlier times.

More specifically, our analysis focuses on the impact of repurchase agreements (repos) on Fed policy.<sup>4</sup> The pervasiveness of repos has led to differing interpretations of their role within the monetary system.<sup>5</sup> Below, we offer a straightforward interpretation: taking all cash positions in repo as “shadow reserves,” the sum of these constitutes a monetary aggregate that serves as a passive counterpart to the traditional, active component of the Fed. Drawing on historical precedent, we argue that in gauging the stance of monetary policy, one should take into account not only (active) changes in Fed reserves, but also movements in shadow reserves. We conclude by proposing that this active-passive balance merits explicit consideration in the articulation of Fed policy.

## 2 Safe versus liquid assets

When thinking about money, it is important to distinguish between two similar but distinct concepts: “safety” and “liquidity.” Safe assets are those assets that are “relatively immune to the costly production of private information about their value” (Gorton 2017, 548). Such assets have the “NQA” property, of being readily valued with no questions asked. In contrast, for our purposes, a “liquid” asset is one that can readily be used for trade and purchases of investments (real or financial).

For most of human history, the safest assets have been gold and silver coins. Popular types of coin, such as the silver Spanish *reales de a ocho* (called “Spanish dollars” or “pieces of eight” in the early United States) and the later English gold sovereigns functioned globally as liquid safe assets. In practice, however, coins still had several drawbacks as money. To trust a coin, one had to trust the coin producer. Coins could be debased at the mint or counterfeited; a definitive evaluation of a coin required its melting and assay, which made the coin into an illiquid lump of metal. Even trustworthy coins could have shifting market values, due to factors

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<sup>4</sup> A repurchase agreement or repo is a contract to sell and subsequently repurchase securities at a specified date and price. A reverse repo is the opposite side of a repo trade.

<sup>5</sup> Repos were included in broad aggregate (M3) money supply series that the Federal Reserve stopped compiling in 2006. Other parties (the Organisation for Economic Co-Operation and Development and the Center for Financial Stability) continue to compile money supply series that combine repos with commercial bank deposits, as well as certain short-term debt instruments, to obtain more general measurements of aggregate liquidity than traditional narrow (M1 and M2) series. Here, we focus on repo as giving rise to a form of liquid debt that closely mimics the passive provision of central bank liquidity discussed in the historical examples described below.

such as convenience premia and fluctuations in the gold-silver ratio.<sup>6</sup> Such factors made bank money (including central bank money) a means of payment that was *preferable* to coin (that is, *more* liquid) in many situations.

In the modern world, the safe-asset role of gold and silver coins has been taken over by government securities. US Treasury obligations, in particular, function as globally liquid safe assets, the Spanish dollars of the twenty-first century. Although Treasuries (especially T-bills) are widely trusted and are generally seen as “cash equivalents,” they are still not quite money, in the sense that one cannot extinguish a debt by transferring a Treasury security. This limitation creates a role for central bank money as an asset whose transfer discharges a debt. Commercial banks, for example, commonly settle mutual obligations through transfers of central bank money.<sup>7</sup>

### **3 Central banks and liquidity**

A bank’s task is to create liquidity. As noted above, even the safest of assets might not always be convenient for transactions. One way a bank creates liquidity is to take in safe assets, in return for providing claims which were more convenient for individuals to trade. However, the profits from this activity are limited. Commercial banks also turned to an alternative method: the creation of money through loans, sometimes with little-to-no backing. There was always a limit to the safety of such an arrangement, due to the need for prudent backing of claims on the bank.

The task of early central banks was similar to that of commercial banks, except that they provided an even more liquid asset than that offered by banks. Like commercial banks, early central banks could provide money in return for safe assets or create money by loans with less-than-full backing. However, central banks that wanted their money to be seen as safe had to guarantee that their money could be predictably exchanged for coin.

Thus, the passive part of the early central banks’ behavior, like that of regular banks, was to keep a portion of the arrangement safe and allow ready convertibility. Convertibility let depositors discipline banks with the threat of withdrawal (Calomiris and Kahn 1991). It also let the amount of funds rise and fall with demand. Use of these monies became “central” to the financial system because they were used by other financial institutions.

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<sup>6</sup> A case in point being dollar coins in the early United States (Knodell 2017, 146). Then, the most desirable coins were high-quality Spanish silver dollars, followed by US dollars, followed by degraded Spanish dollars. The first category of dollars was unobtainable unless one was willing to pay a variable premium, and degraded Spanish coins were the most common dollars in circulation.

<sup>7</sup> Large-value payment systems that effect immediate transfers of central bank funds are known as real-time gross settlement (RTGS) systems (Bech and Hobijn 2018). Fedwire is the RTGS settlement system operated by the Federal Reserve.

## 4 Central banks, then and now

A prerequisite for an economy's financial stability is a ready supply of liquidity. Ensuring that supply is the job of a modern central bank; and as long as that reliability is measurable by the constancy of the supply of a central bank's own money, the goal is clear. Keynes's 1930 dictum was, in effect, a statement that a central bank's absolute control over its money supply was indispensable for control over money more generally and hence, financial stability. More recently, however, the task of maintaining economic stability is complicated by the existence of alternative forms of liquidity separate from that provided by central bank funds, which nonetheless mimic these funds and which the central bank must consider when charting its policy.

Our argument proposes an updated version of Keynes's dictum: central banks in general, and the Federal Reserve in particular, should strive to control an aggregate of traditional (actively controlled) central bank money *and* the money of a shadow counterpart, which constitutes a major source of liquidity in the financial system today. This second component consists of, for example, the "cash" embodied in the repo market, and the values in FX swap arrangements, which serve as alternative, and in many cases, cheaper and more accessible alternatives to the use of liquidity embodied central bank money.<sup>8</sup>

Echoing the structure of earlier central banks, the secondary liquidity in this shadow institution is of a passive nature, created and destroyed at the initiative of market participants. These arrangements nonetheless provide safe liquidity in normal periods, through the creation of "sunny-day" NQA assets that function much as money (Mehrling 2011, 111). When these secondary arrangements come under pressure, however, questions will be asked and there will be a flight away from them and into primary forms of liquidity. A central bank must then decide whether to look the other way or prop up the economy by actively expanding its supply of reserves. By hypothesis, there is not enough of the safest (non-reserve) asset to back the provision; buying less-than-perfect assets increases liquidity, enabling central bank reserves to substitute (to some extent) for secondary arrangements. The decision to do so is an active aspect of central bank policy.

Clear historical examples of the interactions between primary and secondary liquidity are provided by the Bank of Amsterdam and the Bank of England, leading central banks of the eighteenth and nineteenth centuries, respectively. The structure of both institutions incorporated an active bank and a passive bank. For the Bank of England, these components arose through legislation that forced a legal separation. A similar division existed *de facto* for

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<sup>8</sup> An FX (foreign exchange) swap is a contract under which two parties exchange two currencies spot and commit to reverse the exchange at some future date and specified price. While the market for FX swaps is of first-order importance (Borio, McCauley, and McGuire 2022), due to data limitations this essay will focus on repo.

the Bank of Amsterdam. In an echo of these antecedents, the early Federal Reserve was conceived as a largely passive institution but soon discovered active policy as a desirable complement.

## 5 Historical examples

This section describes the passive-active structure as it existed for earlier generations of central banks. The relevance of this structure for today is discussed in Section 6.

### The eighteenth-century Bank of Amsterdam

The Bank of Amsterdam, chartered in 1609 as an agency of the City of Amsterdam, was at the center of European trade for much of the eighteenth century. Goods in European trade were paid for ultimately by transfer of value on the accounts of the bank; not only was this the preferred payment method for large value payments involving trade with Amsterdam, but routing payments through the bank was the lowest-cost alternative for transactors far away from Amsterdam.<sup>9</sup>

An account could be established at the bank by depositing “trade coins”—high-quality, large-denomination coins of standardized value, such as the Spanish dollar—in return for an account credit on the bank’s ledger.<sup>10</sup> While these coins were usually of well-determined value, they were not as convenient for local commercial trade. On the other hand, they were more useful than bank ledger money for some purposes: for example, for trade with Asian markets or paying the expenses of European military campaigns. Thus, large merchants found it valuable to park their coins with the bank for periods of time, during which the balances could circulate to support intra-European trade.

In addition to an account credit, the Bank of Amsterdam provided its depositor a receipt that conferred the option to repurchase the deposited coins within six months at a small, fixed premium (Smith 1981 [1776]; Van Dillen 1934; Quinn and Roberds 2019; Quinn, Roberds, and Kahn 2020). This liquidity arrangement, featuring call options on safe assets, was unique to the bank.

If all the bank were concerned with were maintaining its reputation for redemption, its business could have been handled mechanically. But inflows of coinage and consequent increase in the bank’s balances also had significant short-term effects: sudden inflows for long-term purposes (for example, foreigners’ use of the bank as a safe harbor for coins during

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<sup>9</sup> A popular way to effect such payments was an arrangement called *acceptance credit*. Under this arrangement, a payor in one city (say, Hamburg) would send payment to a payee in another city (say, Paris) by drawing a bill of exchange on a party (drawee) in Amsterdam. The bill would be paid through the bank. The bill might be payable at some future date, but once the bill was accepted (acknowledged by the Amsterdam party’s signature) it became a marketable instrument that could be exchanged for immediate liquidity.

<sup>10</sup> The Bank of Amsterdam’s money took the form of ledger money rather than banknotes.



unstable times) also meant an increase in the availability of balances usable for short-term purposes. The bump in supply of balances at the central bank reduced their short-run value relative to (less useful) alternatives for payments available from local financiers in Amsterdam. The Bank of Amsterdam took as one of its tasks to maintain the value of its balances in this short-term sense as well—stabilizing the supply of Bank of Amsterdam balances by sterilizing inflows or outflows of coinage, through discretionary sales or purchases of “secondary” coins in its possession—in effect carrying out open market operations.<sup>11</sup> Coins purchased by the bank in these “outright” transactions could not be withdrawn from the bank, only sold off by the bank at a time of its own choosing.

This way of operating effectively split the bank into two banks: the first, a passive bank with account balances that were fully backed by coins held under receipt, and the second, an active bank backed by coins acquired in open market operations, plus loans to favored counterparties (most often, the Dutch East India Company, but also the Province of Holland and the City of Amsterdam). Table 1 gives a sample balance sheet of the bank, for January 1737, shown both on a unified basis and also as broken down between the two component banks.

**Table 1: Two versions of the Bank of Amsterdam’s balance sheet, January 1737**

in millions of bank florins

As a consolidated bank				As two banks			
Assets		Liabilities and equity		Assets		Liabilities and equity	
Coins	17.5	Balances	22.4	Passive bank			
Credit	5.0	Equity	0.1	Coins	14.5	Balances	14.5
Total	22.5	Total	22.5	Total	14.5	Total	14.5
				Active bank			
				Coins	3.0	Balances	7.9
				Credit	5.0	Equity	0.1
				Total	8.0	Total	8.0

Memo: In this table, the metallic reserve ratio of the active bank, being coins owned outright (3.0) divided by active bank balances (7.9), is 38.1 percent.

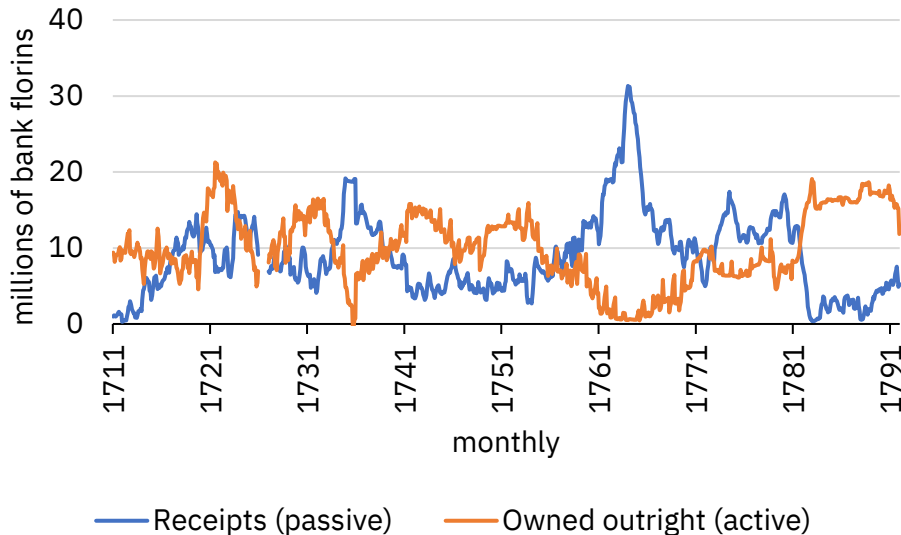
Source: Van Dillen (1925), Quinn and Roberds (2019).

Although these two banks were operationally distinct, the bank’s split personality was not observable to its customers, in part because the bank did not publish financial statements, and in part because the bank undertook policy actions to keep the stock of bank balances roughly constant. Figure 1 shows the evolution of the active and passive portions of the bank over the years 1711–91. In the figure, an increase in the blue line indicates a surge in trade

<sup>11</sup> Secondary coins used for open market operations were small-denomination Dutch coins or less often, trade coins whose receipts had expired without the repurchase option being exercised.

coins under receipt, usually corresponding to a fall in the orange line, which occurred when the bank sold off lesser coins (held outright) to drain liquidity.

**Figure 1: Active and Passive Parts of the Bank of Amsterdam, 1711–91**



Source: Quinn and Roberds (2024)

The figure shows a seesaw-like pattern of offsetting movements in the active and passive components of bank money, an exception being the period around 1763, when a major financial panic drove a surge of coins into the passive portion of the bank. It bears mention that while the bank had the technical ability to change its policy interest rate—the fee it charged for repurchasing trade coins—it rarely did so. Monetary policy in this era was synonymous with balance-sheet or quantitative policy.

### **The Bank of England during the Classical Gold Standard (1880–1913)**

The original design of the Bank of England (“Bank”), chartered in 1694, was closer to modern central banks than its counterpart in Amsterdam. It issued banknotes, funded government debt, and operated a discount window. Chartered as a private corporation, the early Bank followed Amsterdam’s habit of secretiveness and kept its financial condition rigorously shielded from public view. Parliament’s frustration with the Bank’s opacity eventually led to legislation in 1844, known as Peel’s Act, that forced more transparency and formally split the Bank into two divisions, known as “departments” (Horsefield 1953).

The first division of the Bank, known as the Issue Department, had the exclusive right to issue banknotes within the London market. Bank of England notes constituted the most liquid and safest general-use asset of the time with a value fixed by the “gold points”—the price at which the bank was constrained to buy any gold offered to it (bullion included), and the slightly higher price at which it was constrained to pay out its minted gold coins (known as sovereigns). The Act constrained the Issue Department to hold only a fixed amount of government debt,

beyond which notes had to be fully backed by gold. The need to maintain large stocks of gold for redemptions eventually caused the Bank to become the monopoly gold dealer, as well as monopoly banknote issuer, for the London market (Ugolini 2013).

The second part of the Bank, known as the Banking Department, was granted more discretion. Its liabilities were accounts, not notes, and it could hold variable amounts of government debt, as well as discount the paper of London banks and other financial intermediaries. Its reserves largely consisted of “own notes,” that is, notes issued by the Issue Department. The financial conditions of both departments were to be published weekly, in a high-level balance sheet known as the Return. Table 2 gives an example of this accounting.

**Table 2: Two versions of the Bank of England’s balance sheet, February 1851**

in millions of pounds sterling

As a consolidated bank				As two banks			
Assets		Liabilities and equity		Assets		Liabilities and equity	
Gold	15	Notes	28	Issue Department (passive)			
Credit	40	Balances	17	Gold	14	Notes	28
Own notes	9	Bills	1	Credit	14		
		Equity	18	Total	28	Total	28
Total	64	Total	64	Banking Department (active)			
				Gold	1	Balances	17
				Credit	26	Bills	1
				Own notes	9	Equity	18
				Total	36	Total	36

Memo: In this table, the Proportion, being Banking Department gold (1) plus own notes (9) divided by balances (17) plus bills (1), is 55.5 percent.

*Source:* Bank of England Balance Sheets (Huang and Thomas 2016).

The intent of Peel’s Act was that the passive component of the Bank (as embodied in the Issue Department) should dominate by virtue of its privilege of note issue and its straightforward structure, while the active portion (now assigned to the Banking Department) would be downgraded to that of a commercial-bank subsidiary.<sup>12</sup> The actual outcome was quite different from this intent, as the Bank developed increasingly sophisticated techniques to enable active control of its money stock. The Bank’s use of these techniques reached an apogee during the Classical Gold Standard (1880–1913), a period during which most countries were on a gold standard whose operation was tied to the London money market.

Some of the Bank’s techniques for discretionary control followed the quantitative tradition of the Bank of Amsterdam. One such device was to trade in secondary metallic assets, oftentimes American gold coins. Peel’s Act left the Bank’s trading in non-native gold assets relatively unconstrained, and the Bank used this leeway to add or subtract liquidity from the London markets and influence market gold prices (Ugolini 2013). Another device was for the Bank to sell assets into the market with an agreement to subsequently repurchase those same assets—effectively, to engage in reverse repurchase agreements, also known as reverse repos

<sup>12</sup> Peel’s Act also limited the ability of English banks other than the Bank of England to issue notes, thereby guaranteeing a strong demand for the Bank’s notes.

(Ugolini 2016).<sup>13</sup> Reverse repos had the advantage of not being easily detectable from the Bank’s published balance sheets.

The most revolutionary technique of the post-1844 Bank of England, however, was a device now seen as synonymous with monetary policy—the systematic variation of a policy interest rate (in the Bank’s case, the rate on discounts of paper in the London money market). Changes in Bank rate (the Bank’s discount rate) were infrequent before 1844 but became commonplace thereafter (Clapham 1945, 429–32; Anson et al. 2017, 37). The key operational goal of these changes was to stabilize a number known as “the Proportion”—the reserve ratio of the Banking Department (Sayers 1976, 30; see table 2 for an example of this calculation), which was thought to 1) preserve convertibility of Bank of England liabilities into gold, 2) offer an appropriate supply of Bank money to the London money markets, and 3) maintain the viability of the international gold standard.

The impact of the Bank’s active money management can be seen in figure 2, which plots the distribution of the Proportion over the Classical Gold Standard (1880–1913). This distribution is tightly centered around a mean value of 46 percent (with an interquartile range of 41 to 51 percent).<sup>14</sup> For contrast, figure 2 also plots out the distribution of the metallic reserve ratio of the active portion of the Bank of Amsterdam (see table 1) during the period of its maximum influence (1711 through 1780), which has both a much higher mean (70 percent) and a larger spread (interquartile range of 52 to 82 percent). By applying a full range of discretionary policy tools, the Banking Department was able to maintain its own liquidity while sustaining a large presence in the London money market.<sup>15</sup> Use of the policy-rate tool, in particular, lessened the Bank’s need to maintain a large war chest of metal for quantitative interventions.

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<sup>13</sup> Following standard central bank terminology, the term “reverse repo” is applied here because the Bank sold, rather than bought assets in the first transaction.

<sup>14</sup> The Proportion in table 2 (55.5 percent in February 1851) is higher than is typical for the Classical Gold Standard (CGS); by utilizing multiple policy tools, the CGS Bank was able to operate with lower reserve ratios.

<sup>15</sup> For example, more than 23,000 bills of exchange (acceptances) were handled by the bank’s Discount Office in 1906 (Accominotti, Ugolini, and Lucena-Piquero 2021).

**Figure 2: Distributions of the Reserve Ratios for the Active Portion (Banking Department) of the Bank of England and the Active Portion of the Bank of Amsterdam**



Source: Quinn and Roberds (2024)

At times, however, the Bank’s approach to monetary control proved insufficient. During periods of financial stringency, the Bank rate was raised in order to protect the Proportion, yet too high a rate would have threatened the London money market and restricted the Bank’s ability to function as a lender of last resort. Under these circumstances, the Bank could receive a “Chancellor’s letter,” a letter from the government that granted the Banking Department access to the Issue Department’s gold reserves, effectively melding the two Departments (Anson et al. 2017, 50). Such letters, which carried the hint of fiscal support to the still privately owned Bank, allowed the Bank to lend more confidently in crisis situations. The letters were also a tacit admission of the de facto interdependence of the active and passive portions of the Bank, the intentions of Peel’s Act notwithstanding.

### The early Federal Reserve

The Federal Reserve System was created to displace a “shadow central bank”—a coalition of private banks that on occasion functioned much like a central bank. Before 1914, US banks pyramided reserves into the large correspondent banks of New York City, and those New York banks coordinated the nation’s large-value payment system through the New York Clearing House (Gorton and Tallman 2018). At that time, accounts in the big New York banks were the most liquid money in the United States, and the Clearing House sometimes took active measures to stabilize New York’s money supply during crises. After the Panic of 1907, however, many New York banks as well as others became convinced that the federal government should create a system of reserves that did not rely on New York (Broz 1999; Meltzer 2003, 69). Eventually, the political process produced the Federal Reserve Act of 1913,

and the twelve district banks that make up the system opened in November 1914 (Lowenstein 2015, 223-54).

In addition to accounts, the Fed was also to supply banknotes. The Fed notes were to eventually replace the banknotes then issued by commercial banks chartered under authority of the National Banking Acts of 1863–65, and the Fed’s process of banknote supply was passive. Through withdrawal from a Federal Reserve Bank, member banks chose when to circulate notes, and, once in circulation, anyone could redeem notes for gold on demand. Of course, the Fed might encourage the circulation of notes through lending, so the Act also restricted total note issuance to the amount lent to member banks<sup>16</sup> and put member banks in charge of when to borrow. The Act did this through a discount window, a type of standing facility.<sup>17</sup> District banks did have control over the discount rates at which these loans were offered, and, in practice, district banks could vary loan terms within tight constraints, so some active elements existed.<sup>18</sup> Despite this room for maneuver, the early Fed viewed notes and bill-based lending as fundamentally passive and interpreted total notes in circulation and the amount borrowed by member banks as expressions of the need for liquidity.

The Fed tracked its compliance with the requirement to back notes, and the top right of Table 3 converts this statement into a “Notes” balance sheet.<sup>19</sup> Like the Bank of England’s Issue Department in table 2, the requirement applied to all notes, whether in circulation or held

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<sup>16</sup> The Act also required notes to have at least 40 percent gold backing. In 1917, Congress reduced the requirement of loan backing from all notes to only the notes not backed by gold (Meltzer 2003, 89; Sastry 2018, 8).

<sup>17</sup> These loans were all short-term and were either “bills discounted,” meaning the Fed held a bank’s loans as collateral; “bills purchased,” meaning the Fed bought outright an existing bank loans; or “acceptances,” meaning the purchased bills were owed by a bank (Carlson and Duygan-Bump 2016). The Fed further divided discounts into rediscounts and advances. Rediscounts occurred when a member bank (1) had already created a short-term loan through the discount of a bill (2) then “re”-discounted the bill to the Fed to secure a loan from the Fed. The rediscount loan matured when the original discount loan matured. Member banks could also rediscount short-term Treasury paper. Advances were introduced in 1916 with the practical difference that the maturity of an advance (up to 15 days) was disconnected from the maturity of the underlying bill. Advances were a mechanism that allowed the Fed to make short-term loans to member banks secured by longer-term Treasury securities. The Fed had more potential control over acceptances but chose to accept all eligible acceptances in an effort to support a deepening of the market (Eichengreen and Flandreau 2012).

<sup>18</sup> For example, during a bank panic in Mississippi in 1930, the St. Louis Reserve Bank required supplemental collateral for rediscounts while the Atlanta Reserve Bank did not (Richardson and Troost 2009, 1039–40).

<sup>19</sup> See table No. 94 Federal Reserve Notes—Statement of Amounts Issued and Collateral (Federal Reserve 1943, 351). That table even identifies the amount of “excess collateral” that table 3 records as equity.

by district banks. To continue the comparison, table 3 also reports a balance sheet for the consolidated system.<sup>20</sup>

**Table 3: Two Versions of the Federal Reserve’s Balance Sheet, December 1925**

Figures represent billions of dollars.

As a consolidated bank				As two banks			
Assets		Liabilities and equity		Assets		Liabilities and equity	
Gold	2.6	Notes issued	2.2	Notes (passive)			
Bills	1.0	Balances	2.3	Gold	1.4	Notes issued	2.2
Treasuries	0.4	Other	0.7	Bills	0.9	Equity	0.1
Notes held	0.4			Total	2.3	Total	2.3
Other	1.1	Equity	0.3	Deposits (active)			
Total	5.5	Total	5.5	Gold	1.2	Deposits	2.3
				Bills	0.1	Other	0.7
				Notes held	0.4		
				Treasuries	0.4		
				Other	1.1	Equity	0.2
				Total	3.2	Total	3.2

Memo: In this table, the analog of the Proportion is gold not used as collateral for notes (1.2) plus notes held (0.4) divided by deposits (2.3) for a ratio of 69.6 percent.

Note: The figure for notes issued combines notes in circulation and notes held by the Fed (that is, uncirculated). The consolidated balance sheet has been adjusted to also use notes issued on the liability side and notes held on the asset side.

Source: Federal Reserve (1943; 331, 351)

As a result, the “Deposits” balance sheet in table 3 can be viewed as a second bank akin to the Bank of England’s Banking Department in table 2.<sup>21</sup> For the Fed, deposits had freedom of action because balances could be directly backed by Treasuries, and district banks could buy and sell those Treasuries at their discretion through open market operations. Treasuries could indirectly back notes by acting as collateral for loans to member banks, but that scenario fell under bills where member banks held the initiative. Congress allowed district banks to own Treasuries as a way to generate income, and in 1913 the US federal debt was small and mostly held by national banks (Sastry 2018, 6).

World War I, however, rapidly expanded federal borrowing, and large, difficult-to-manage quantities of Treasury securities began to show up at the Reserve Banks’ discount windows. Such borrowing was encouraged by the Fed’s “borrow and buy” program (Hall and

<sup>20</sup> The consolidated balance sheet in table 3 differs from the Fed’s published balance sheet (see Federal Reserve 1943, 331) by the addition of notes held to assets and the substitution of notes issued for notes in circulation on the liability sides. The “other” assets and liabilities are mostly payments in transit because the district banks also processed inter-regional check clearing for member banks.

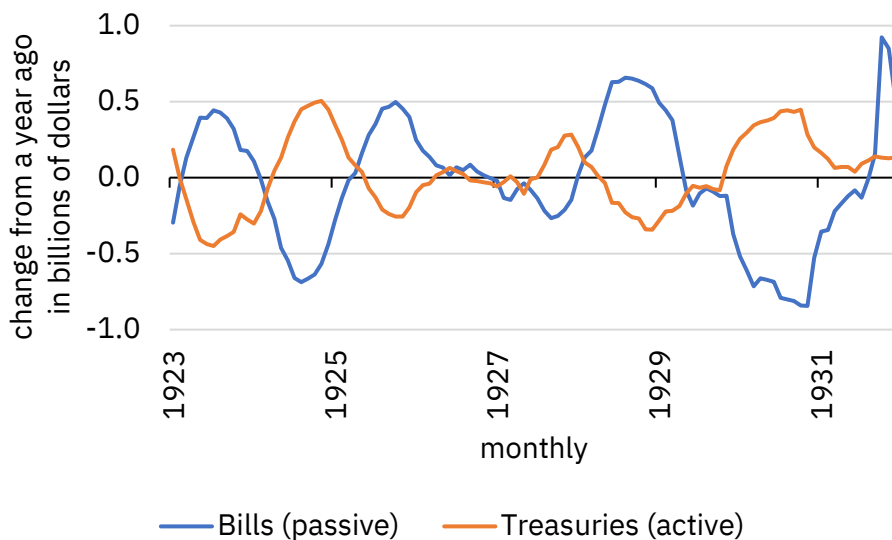
<sup>21</sup> The Federal Reserve Act required 35 percent gold backing of Fed deposits. Individual Federal Reserve Banks could borrow gold from other Feds to meet these requirements; see White and Roberds (2020).



Sargent 2021). To help finance military expenditures, individual investors were encouraged to buy certain Treasury securities with credit from their banks, pledging the securities as collateral. The banks, in turn, could repledge these securities to receive Fed discount window credit at a preferred rate. This policy moved Treasury securities in the direction of safe assets, readily exchangeable for credit with the central bank (however at variable discount rates).

Faced with a surge in passive liquidity, the Fed began to explore open market operations as an active counterweight. In 1923, district banks formed the Open Market Investment Committee to coordinate operations and created a collective record called the System Open Market Account to keep track of the totals (Meltzer 2003, 199). In the 1920s, the Fed also learned that creating money through operations could cause banks to borrow less at the discount window. Figure 3 shows the level of Treasuries held by the Fed and the level of borrowing by member banks from 1922 to 1931. Borrowing often offset operations.<sup>22</sup> The early Fed was yet another central bank learning the interactions between active and passive tools.

**Figure 3: Active and Passive Parts of the Early Federal Reserve, 1923–31**



Source: Federal Reserve Bank of St. Louis database (FRED)

The early Fed also understood that causation could go from passive to active. For example, to explain the first year of the Great Depression, the annual report of the Federal Reserve Board noted a sharp drop in overall credit in 1930. “Loans and investments of the banks, however, showed a considerable decline during the year, as the demand for credit by trade and industry diminished with the slackening of business activity” (Federal Reserve 1931, 9). That decline resulted in decreased member bank use of the discount window, and “[i]n these circumstances the Federal reserve system pursued a policy of monetary ease. This policy

<sup>22</sup> This relationship has been called the “Riefler-Burgess” doctrine after its discovery by two Fed employees, Winfield Riefler and W. Randolph Burgess, in the 1920s (Brunner and Meltzer 1968).

was expressed through the purchase at intervals of additional United States Government securities and in progressive reductions of reserve bank discount and acceptance rates” (Federal Reserve 1931, 1).

Although the purchases directly increased reserves, the lowered rates only ameliorated the large drop in discounts. “Notwithstanding these reductions in rates and the purchase of securities by the reserve banks, the total volume of reserve bank credit declined during the year” (Federal Reserve 1931, 4–5). For the Fed at that time, the diminished use of the standing facility communicated an overall decline in credit, and the Fed publicly used that awareness to motivate its easing of monetary policy.

The passive aspects of the Fed began to break down when the Glass-Steagall Act of 1932 permitted Federal Reserve notes to be directly backed by Treasuries (Sastry 2018, 18). The following year, the public, including member banks, lost the power to redeem Fed monies for gold, and then the Gold Reserve Act of 1934 had everyone in the United States surrender all monetary gold to the Treasury. Member bank borrowing was now the lone passive instrument, and that volume vanished for the rest of the 1930s. Borrowing from the Fed stopped being routine. Also, the Fed took little in the way of active policies either, as monetary control in the 1930s was taken over by the Treasury. An active Fed would begin to return with the Fed-Treasury Accord of 1951.

Finally, Fed balances never fully displaced New York City in the US system of reserves (Jaremski and Wheelock 2020, 81–2). Although member banks had to keep required reserves on deposit at the Fed, excess reserves could be and often were placed in correspondent banks in New York.<sup>23</sup> State banks that were not members of the Fed also kept substantial reserves in New York. Banks continued to find that money in New York’s “shadow central bank” had its advantages.

## **6 The Federal Reserve today**

The old ways of central banking were disrupted in the early 1930s, when most countries left the gold standard (Eichengreen and Flandreau 1997). Following World War II, US Treasury debt gradually came to play a safe-asset role in the US and world economies, not unlike the role of leading gold and silver coins during earlier times. This development was not due to happenstance but arose from the Bretton Woods system, which pegged most currencies to the

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<sup>23</sup> Under the original 1913 Federal Reserve Act, member banks could hold legally required reserves as 1) gold or gold certificates in their own vaults, or 2) funds on deposit with a Federal Reserve Bank. In 1917, the Act was amended to require reserves to be held solely as deposits at the Federal Reserve (Garbade 2021, 31–32).

US dollar. Global demand for sovereign US debt led to series of actions by the Federal Reserve and other parties, designed to enhance the liquidity of Treasuries.<sup>24</sup>

Treasuries' safe-asset status does not mean that just anyone can now deposit a security in a modern central bank, gain access to reserves, and subsequently withdraw the deposited securities.<sup>25</sup> But the existence of well-developed markets for repurchase agreements (or repos) means that participants in modern financial markets have access to an arrangement that shares many features with traditional deposit taking by central banks. A repo cash borrower in effect "deposits" a security that is "withdrawn" at the end of the repo. In the meanwhile, the borrower receives "cash," which can flow through various channels—including central banks—but need not. The micro details of Treasury repo trades, which can be complex, are described in Treasury Market Practices Group 2022 (a, b). The "cash" that changes hands in these trades may consist of reserve balances at the Fed (in bilateral repo), balances at the Bank of New York-Mellon (in triparty repo), or clearinghouse credit (under a cleared repo arrangement).

Table 4 illustrates the monetary character of repo in a stylized example. A securities dealer *A* owns a Treasury security that it would like to sell at a favorable price. A money market fund *C* has cash that it wants to invest, but only for a short term (overnight); it does not want to hold the Treasury security. A third party *B*, say a hedge fund, intermediates trade between *A* and *C*, by purchasing the security from *A* and financing the purchase via a repo of the security with Party *C*; cash flows from *C* through *B* to *A*.<sup>26</sup> In repo market jargon, *B* is the cash borrower and *C* the cash lender.

Post-trade, the repo cash borrower *B* has, in essence, deposited a security to gain liquidity from the cash lender *C*, while *C* gains a secure, money-like claim that did not exist before.<sup>27</sup> Note that both *B* and *C* retain some degree of control over valuable collateral (the security), which they may think of "theirs."

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<sup>24</sup> See Garbade (2021). These actions include the introduction of electronic settlement of trades in Treasuries, as well as the Fed's increased engagement with the money market via Treasury repo and reverse repo (also called "matched sale-purchase") operations. Contractual uncertainty surrounding repos was reduced via regulation and legislation during 1980s (Garbade 2006).

<sup>25</sup> More recently, however, passive policy has regained some prominence. On March 12, 2023, the Federal Reserve announced a funding facility, the Bank Term Funding Program, that allows banks to swap Treasuries, valued at par, for reserves (Board of Governors 2023a). This move is seen as a temporary measure needed to address funding problems encountered by certain banks in early 2023. Currently this facility is set to expire in March 2024.

<sup>26</sup> The term "hedge fund" in these examples is a stand-in for what Pozsar (2014) calls a "portfolio manager," meaning an entity such as hedge fund, but also entities such as pension funds, family offices, sovereign wealth funds, etc. A unifying property of these different types of market participants is that they all may use leverage available through repo as a way of achieving higher returns on their portfolios.

<sup>27</sup> Note that cash lenders such as Party *C* cannot literally "spend" their new money (in the traditional sense) but may nonetheless have access to liquidity through rehypothecation, as discussed below.

Table 4: Balance Sheets in a Stylized Repo

Party A		Party B		Party C	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
-Treasury		+Treasury	+Reverse repo	+Repo	
+Cash				-Cash	

Source: See text

Pozsar (2014) discusses why repos tend to be preferable to the alternative of a collateralized bank loan. The cash lender in a repo transaction has the right to immediate liquidation of collateral outside the normal bankruptcy process, a feature known as “safe harbor” (Garbade 2006, Sissoko 2010). By contrast, large bank deposits are uninsured and only constitute a (senior) debt claim on the bank. Hence, repos may be seen as safer than placing a large deposit with a bank. Pozsar (2014) also provides three instructive examples of how repos can arise in practice:

1. A market participant (say a hedge fund) may fund a long position in a security by reposing the security with a securities dealer; the dealer provides the cash to effect the purchase of the security.
2. The hypothetical hedge fund may also use repo to take a short position in a security, sending cash to a dealer in return for the security it wants to short; in such cases the dealer becomes the virtual depositor.
3. Or the hedge fund can use repo to obtain cash necessary to make a margin call.

The mechanisms for the clearing and settlement of these transactions are various, and the “money” created is of a short and determinate life—the maturity of the repo, often overnight. Repos can be rolled over, however, subject to favorable market conditions, to enable a trading position to “live another day”—that is, to allow extended funding of a given position.<sup>28</sup> These arrangements were traditionally seen as part of the shadow banking system, but they came out of the shadows during events such as the 2007 “run on the repo,” the 2008 Global Financial Crisis, the 2019 “repo riot,” and the 2020 Covid shock (Gorton 2010; Gorton and Metrick 2012; Barth and Kahn 2021; Copeland, Duffie, and Yang 2021). Following the historical

<sup>28</sup> A noteworthy difference between current arrangements and the 18th and 19th century examples is that repo rollover requires a stable value of the underlying collateral. By contrast, a sale of Spanish dollars (to the Bank of Amsterdam) or gold bullion (to the CGS Bank of England) could be treated as an outright sale, at the discretion of the bank customer.

examples, our perspective on this activity is to aggregate all repo cash into a single “shadow reserves” aggregate, which serves as a passive counterpart to Fed reserves.

Table 5: Stylized Balance Sheet of the Federal Reserve and Its Shadow

Federal Reserve (“active bank”)		Shadow reserves (“passive bank”)	
Assets	Liabilities & equity	Assets	Liabilities & equity
Treasuries	Currency	Repos	“Cash”
Other securities	Reserves		
Loans	Equity		

Source: See text

In employing the “shadow reserve” terminology, several caveats are in order. Modern repo does not literally mimic historical central-bank antecedents, among other reasons because repo transactions are traditionally between private parties, and private repos do not give rise to new central bank credit.<sup>29</sup> Second, many repo cash borrowers do not have access to reserve accounts, and the cash they access through repo may reside outside the Federal Reserve. Third, not all repos are in safe assets; nonetheless, Treasuries and agency mortgage-backed-securities predominate.<sup>30</sup>

Another complication is that the cash lender in a repo transaction (unlike historical central banks) may repledge collateral in order to obtain cash from other parties, an action that may be repeated several times over.<sup>31</sup> Singh (2011) refers to this phenomenon as repo “velocity,” an allusion to repo’s monetary functionality. As noted, however, cash obtained via repo is subject to rollover risk and may become prohibitively expensive or unavailable in a turbulent market.

While acknowledging these caveats, we would emphasize the key commonality between then and now: the passive character of liquidity created via the swapping of safe assets for cash. A repo transaction might or might not involve central bank money, but this distinction is unlikely to matter to a portfolio manager seeking to take a long or short position in a given security, or to make a margin call. More important is that repo enables access to a

<sup>29</sup> However, repos involving the Fed are discussed later in this section.

<sup>30</sup> Kolchin, Podziemska, and Mustafa (2022) report that about 70 percent of repo is in Treasuries, with most of the remainder in agency MBS.

<sup>31</sup> Such repledging of collateral is termed “rehypothecation” or “reuse” depending on the circumstances of the transaction. Different jurisdictions have differing rules regarding this practice.

viable form of liquidity that they may “deposit” or “withdraw,” at their own initiative, without displacing central bank reserves.

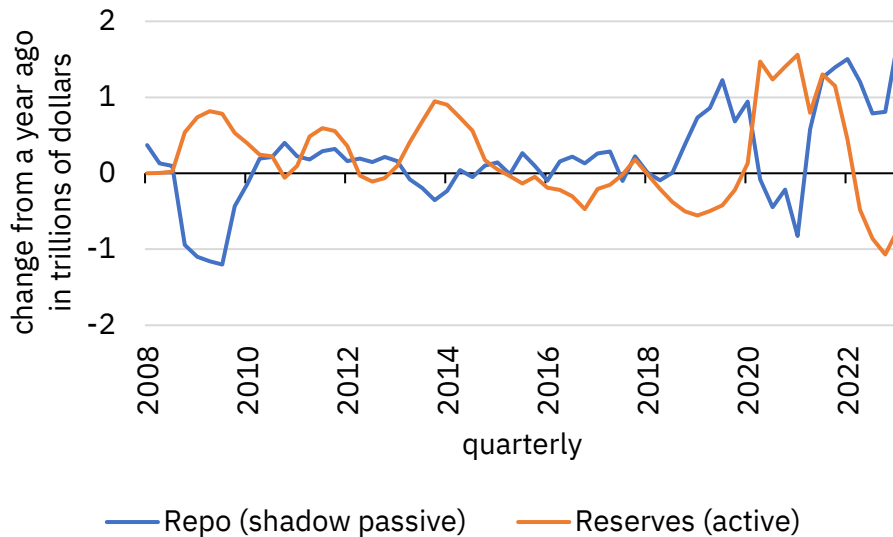
Another commonality with the historical examples is in the offsetting pattern of fluctuations in active and passive liquidity. Since the onset of the Global Financial Crisis in 2008, the Federal Reserve has engaged in a number of concerted efforts to expand and contract its balance sheet, which have in turn resulted in sharp expansions and contractions of reserves.<sup>32</sup> Figure 4 shows that these rounds of active policy have tended to coincide with roughly offsetting movements in passive liquidity, repeating the seesaw pattern of historical eras. Active liquidity has substituted for passive and vice versa; the decisions of individual market participants, in aggregate, have tempered active Fed policy.<sup>33</sup>

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<sup>32</sup> Episodes of quantitative policy actions are QE1 (November 2008–March 2010), QE2 (November 2010–June 2011), QE3 (September 2012–October 2014), QT1 (October 2017–July 2019), “reserve management” (November 2019–March 2020), QE4 (March 2020–March 2022), and QT2 (June 2022–present).

<sup>33</sup> Figure 4 does not assert reserves and shadow reserves are perfect substitutes, only that there is some substitutability that gives rise to the pattern observed in the data. Copeland, Duffie, and Yang (2021, 2) note that in the absence of financial frictions, arbitrage would equate market repo rates to the interest rate the Fed pays on reserves (IOR); this hypothetical scenario would make reserves and shadow reserves into closer substitutes. However, the same authors also note that under current market structure, some threshold stock of reserves is necessary to ensure smooth functioning of repo markets. For levels of reserves at or near this threshold, reserves and shadow reserves tend to function more as complements than substitutes.

Figure 4: Fed Reserves and Repos, 2008Q1 to 2022Q4



Note: Figure depicts four-quarter changes in trillions of dollars.

Source: Board of Governors of the Federal Reserve System, Federal Financial Institutions Examination Council

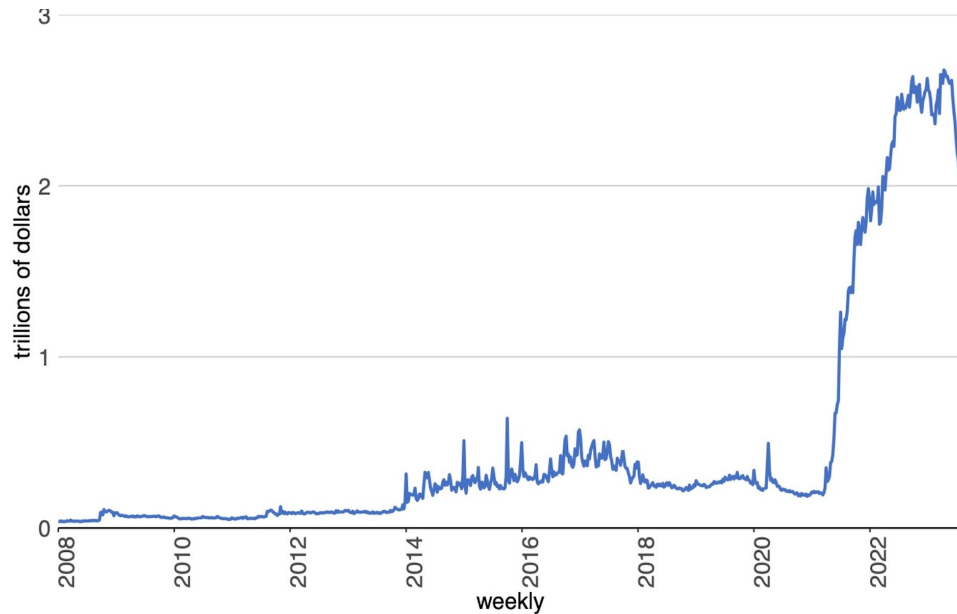
The fluctuations charted in figure 4 did not occur in a regulatory vacuum. Legislation passed in 2006 and 2008 allowed the Fed to start paying interest on reserves, thereby giving banks an incentive to hold large reserve balances (Frost et al. 2015, 5). Subsequent regulation penalized these large balances with a capital charge, but money center banks have nonetheless been encouraged by regulators to hold adequate reserves for intraday liquidity needs (Copeland, Duffie, and Yang 2021, 1–2). Capital charges for reserves were suspended during the Covid crisis but later reinstated (Afonso, Cipriani, and La Spada 2022, 3). The net result has been that banks continue to hold historically large reserve balances, but that their appetite is not unlimited; money center banks can dispose of unwanted reserves by pushing these into the broader money markets (including repo markets).<sup>34</sup>

Dramatic developments have occurred with the Federal Reserve’s use of reverse repos (RRP). Beginning in 2013, the Federal Reserve increased its use of RRP while expanding its set of potential counterparties (Frost et al. 2015, 8). Large RRP operations were employed by the New York Fed’s trading desk to maintain control over the fed funds market, as the FOMC hiked fed funds target rates (beginning in January 2015) and subsequently implemented quantitative

<sup>34</sup> See Correa, Wu, and Liao (2020, 24) on how reserves are “fracked” into certain markets. Fracking involves, for example, moving reserve balances from a bank to its associated securities dealer, who may then lend these via tri-party repo.

tightening (2017–19). Fed RRP expanded further during the 2020 Covid crisis and during the restart of quantitative easing, reaching a peak of \$2.6 trillion in December 2022 (figure 5).

**Figure 5: Fed Reverse Repos**



Source: Federal Reserve Bank of St. Louis database (FRED)

From the perspective of our framework, the expansion of Fed RRP means that the Fed itself has become the largest creator of shadow reserves (Afonso et al. 2023; cf. party *B* in Table 4). The cash borrower in Fed RRP transactions (the Federal Reserve) provides the cash seller (typically, a money market fund) with an attractive asset in terms of its safety (the Fed being an ultra-reliable counterparty) and yield (relative to other money market yields). Although the recent scale of Fed RRP is something new, the basic technique is not: the use of reverse repos was a mainstay of Bank of England policy during the Classical Gold Standard. Reverse repos were briefly employed by the Fed during the 1920s and commonly employed from 1966 forward (Garbade 2021, 362).<sup>35</sup>

A reasonable question to ask is to what extent the expansion of RRP has been the driver of the movements charted in figure 4. To address this question, figure 6 plots changes in

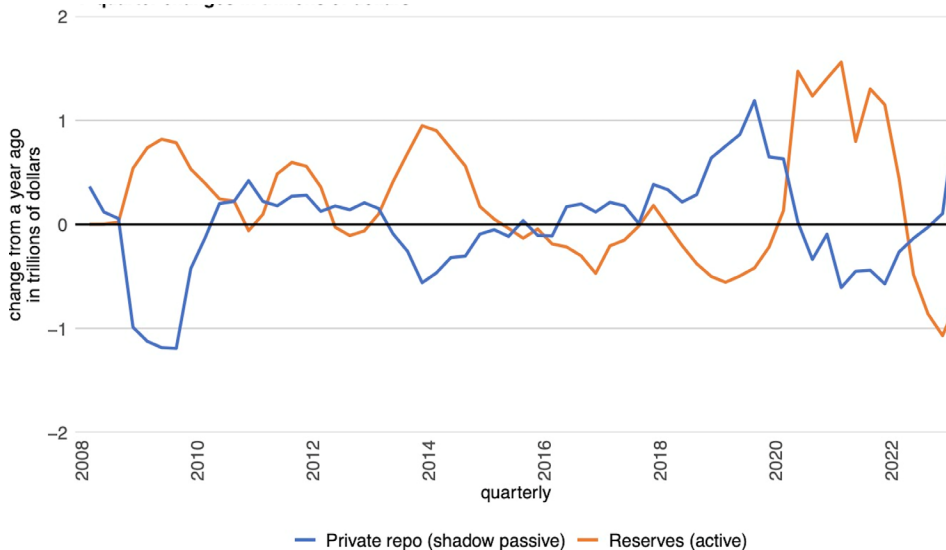
<sup>35</sup> The Fed touches on repo through two other channels. One channel is a pair of standing repo facilities, established in July 2021 (Board of Governors of the Federal Reserve System 2021); one facility is intended for use by the Fed’s private-sector counterparties (primary securities dealers and banks) and the other for use by foreign official institutions. The first significant use of these facilities occurred earlier this year, when \$59 billion was made available through the foreign official facility (Board of Governors 2023b). The second channel is securities lending operations; such loans are a smaller order of magnitude than reverse repo (as of this writing, \$55 billion securities lent versus \$2.5 trillion in reverse repos.)



reserves and private repo, filtering out changes in Fed repo (RRP).<sup>36</sup> For the private repo, the pattern of negatively correlated movements with reserves remains.

**Figure 6: Fed Reserves and Private Repos 2008Q1 to 2022Q4**

Data depict four-quarter changes in trillions of dollars.



Source: Board of Governors of the Federal Reserve System, Federal Financial Institutions Examination Council

## 7 Implications

The years since 2008 have seen a reemergence of the seesaw pattern of active versus passive liquidity that characterized earlier eras of central banking. The rules of the playground have changed, however. In pre-1930s central banking, active policy was often seen as secondary to the main business of the central bank: to offer passive liquidity on predictable terms. Modern doctrines of central banking take an opposite tack, with the active component dominating. This emphasis is reflected, for example, in FOMC statements that articulate policy in terms of the fed funds rate, the rate for overnight loans of reserves between banks; only the Fed can create these reserves. Repo rates are not mentioned in the statements, but they show up in an implementation note that sets the rates at which the Fed is willing to conduct repo and reverse repo transactions. These rates are seen as devices to ensure that fed funds rates stay within a target range.

A time-traveling central banker from the eighteenth, nineteenth, or early twentieth century might have a hard time understanding this role reversal. Repo markets are much larger than the fed funds market, are accessible to a broader cross section of counterparties, and allow for mobilization of safe-asset collateral as well as “cash.” The repo market disruptions of

<sup>36</sup> Details of the data charted in figures 4 and 6, as well as alternative graphical representations, are given in the data appendix.

2007–08, 2019, and 2020 have shown that the Fed must respond to dysfunction in these markets, and the recent expansion of Fed RRP has made the Federal Reserve the largest repo counterparty. Although the Fed’s repo footprint may shrink as the current round of quantitative tightening proceeds, experience with the previous round of quantitative tightening (2017–19) suggests that conventional, active monetary policy and the passive provision of liquidity will not disconnect.

Going forward, what role should the Fed play in providing passive liquidity? How should passive liquidity be integrated with traditional monetary policy? In the eighteenth- and nineteenth-century examples, the passive portion of the central bank occupied a privileged role. The Bank of Amsterdam was the only party in eighteenth-century Amsterdam to offer (quasi) repos against trade coins; the Bank of England served as London’s monopolist gold dealer during the Classical Gold Standard. For the Federal Reserve, taking greater ownership of repo would entail an expansion of Fed counterparties to include many entities over whom it currently has little or no regulatory authority. But as has been pointed out in recent policy discussions, such an expansion could place the Fed in the awkward position of supplying leverage to nonbank financial market participants (Group of Thirty 2021, 9; Task Force for Financial Stability 2021, 47). A permanently larger Fed presence in repo might also be seen as conflicting with the Fed’s macroeconomic policy goals.

Whatever the Fed’s future role in repo may be, it should be based on explicit recognition of the interactions between traditional (active) central bank liquidity and its shadow (passive) counterpart. The best guide for the future may be found in the past.

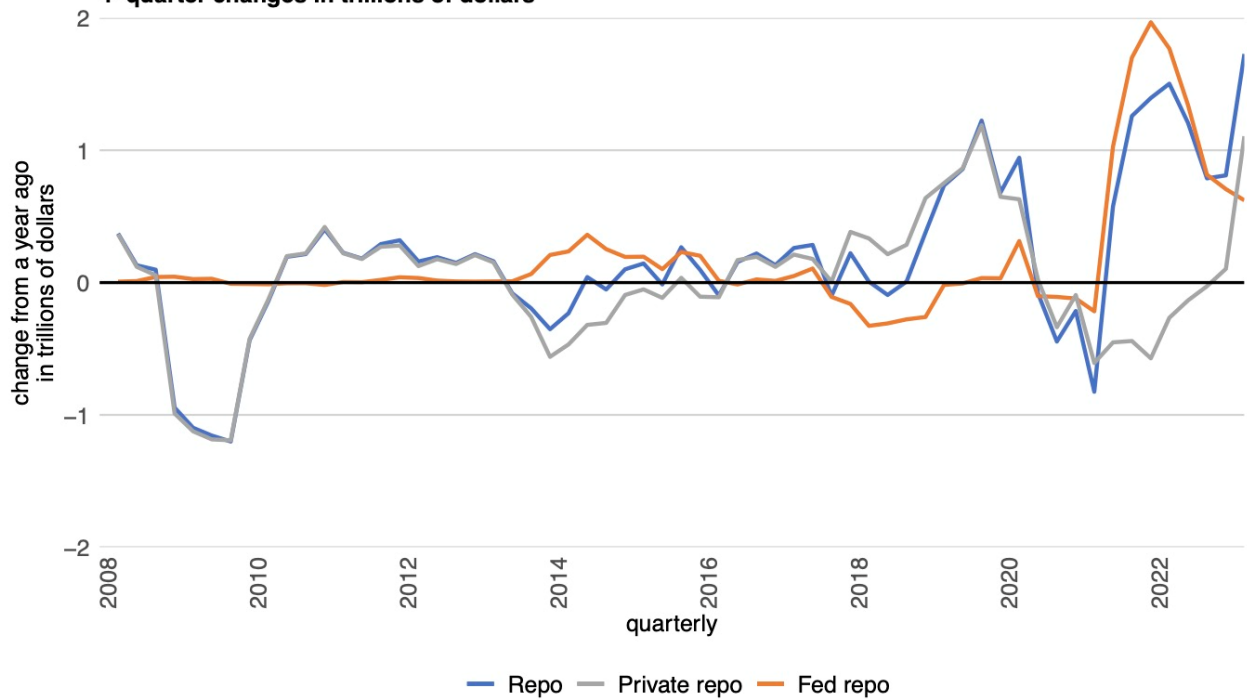
## Data appendix

The primary sources of data for figure 4 are the [Federal Funds and Security Repurchase Agreements](#) table located in the [Financial Accounts of the United States \(formerly Flow of Funds\) report](#) and [Statistical Release H.6, “Money Stock Measures,”](#) both published by the Board of Governors of the Federal Reserve System and accessed through the Federal Reserve Bank of St. Louis’s FRED. Federal Funds and Security Repurchase Agreements contains the combined amounts of repurchase agreements and federal funds as either liabilities or assets of various sectors, along with the amounts of federal funds liabilities and assets among the entities required to hold reserve balances at the Federal Reserve, specifically domestic banks, the US branches of foreign banks, credit unions, and the Federal Home Loan Banks. Statistical Release H.6 contains the total amount of reserves held by depository institutions in their accounts at the Federal Reserve.

As assets, repos consist of securities purchased under agreement to resell, while federal funds consist of the unsecured lending of reserves held at the Federal Reserve (also known as federal funds sold). To get the total amount of repo assets, we take the combined amount of assets reported for all sectors (“Total Assets”) and subtract the amounts of federal funds assets for domestic banks, US branches of foreign banks, credit unions, and Federal Home Loan Banks. Because the reporting of federal funds assets and liabilities for domestic banks only goes back to the first quarter of 2012, we supplement the financial accounts with the amounts of federal funds sold reported in Schedule RC of the [Federal Financial Institutions Examination Council’s \(FFIEC\) Call Report](#) to extend our data from the first quarter of 2007 to the fourth quarter of 2011.

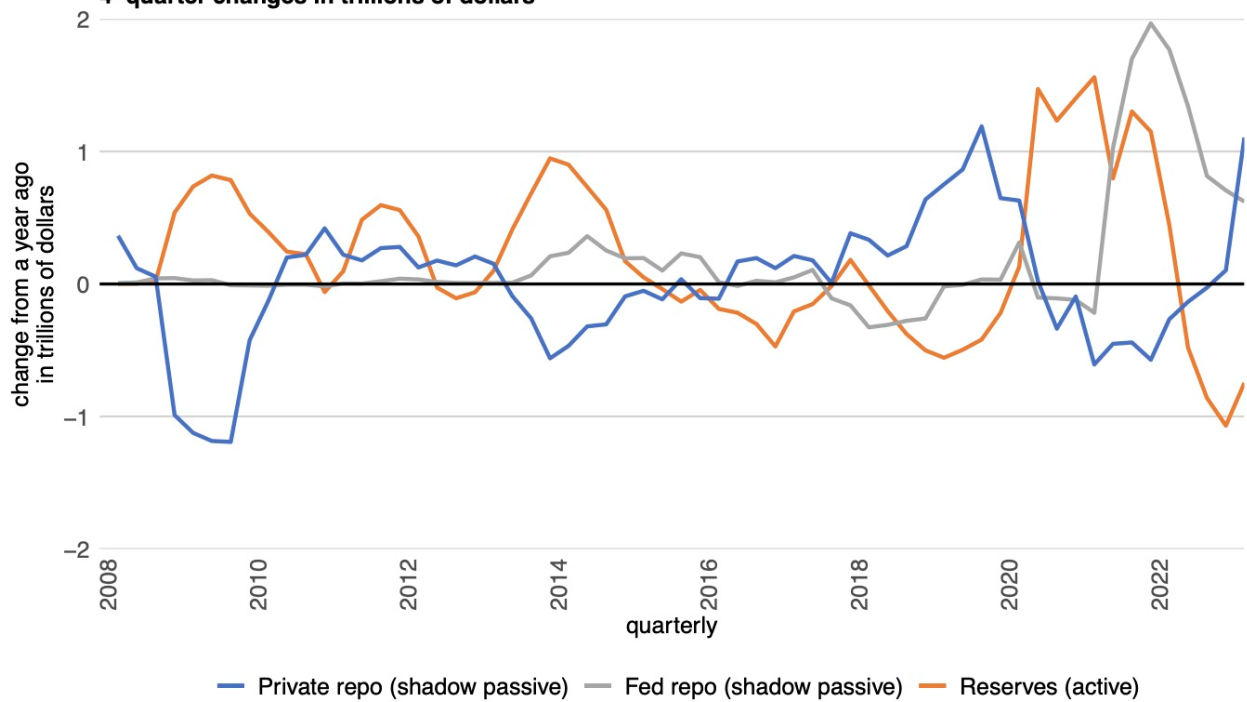
We further decompose repo assets into “private” and “Fed” components to account for the effects of the Federal Reserve’s reverse repurchase activity on repo assets. To do this, we take our repo asset total and subtract the amount of liabilities reported for the monetary authority located in federal funds and security repurchase agreements. Figure A.1 shows the year-over-year change in repo assets and its private repo and Fed repo components. Figure A.2 shows figure 4 with private repo and Fed repo.

**Figure A.1: The private and Fed components of repo 2008Q1 to 2023Q1**  
**4-quarter changes in trillions of dollars**



Sources: Board of Governors of the Federal Reserve System,  
 Federal Financial Institutions Examination Council

**Figure A.2: Fed reserves, Fed repos, and private repos 2008Q1 to 2023Q1**  
**4-quarter changes in trillions of dollars**



Sources: Board of Governors of the Federal Reserve System,  
 Federal Financial Institutions Examination Council

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