



How the Federal Reserve's Quantitative Easing Affects the Federal Budget



At a Glance

Quantitative easing (QE) refers to the Federal Reserve’s purchases of large quantities of Treasury securities and mortgage-backed securities issued by government-sponsored enterprises and federal agencies to achieve its monetary policy objectives. Historically, the Federal Reserve has used QE when it has already lowered interest rates to near zero and additional monetary stimulus is needed. QE provides that additional stimulus by reducing long-term interest rates and increasing liquidity in financial markets.

QE affects the federal budget through two channels:

- It changes net borrowing costs of the Treasury and the Federal Reserve.
- It stimulates economic activity, which affects other budgetary categories.

If economic output was far below potential output (the maximum sustainable output of the economy) and short-term interest rates were set close to zero, the effects of QE would at first reduce federal deficits, generally. As economic conditions improved and interest rates rose, however, the deficit-reducing effects of that policy would diminish and could even reverse and add to the federal deficit.

In the Congressional Budget Office’s assessment, the Federal Reserve’s QE programs conducted in response to the 2007–2009 recession and the 2020 recession induced by the coronavirus pandemic initially reduced federal budget deficits. The QE programs also have led to earlier increases in the federal funds rate—the interest rate that financial institutions charge each other for overnight loans of their monetary reserves—than would have occurred otherwise, in CBO’s assessment. After the 2007–2009 recession, QE programs were followed by quantitative tightening (QT) policies—that is, reductions in the Federal Reserve’s holdings of Treasury securities and mortgage-backed securities.

In CBO’s projections, the Federal Reserve again conducts quantitative tightening from 2022 to 2025. Its holdings of Treasury securities gradually rise again in the later years of the decade to meet growing demand for currency. The net budgetary effects over time of the combined QE and QT policies are uncertain.

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Notes

Unless this report indicates otherwise, all years referred to are calendar years.

This analysis is based on the Congressional Budget Office's May 2022 baseline economic and budget projections, which reflect economic developments as of March 2, 2022, and the assumption that current laws generally remain unchanged.

Numbers in the text and graphics may not add up to totals because of rounding.

How the Federal Reserve's Quantitative Easing Affects the Federal Budget

Summary

Quantitative easing (QE)—large asset purchasing programs conducted by the Federal Reserve—affects the U.S. economy and the federal budget both directly and indirectly. QE programs increase the size of and change the composition of the Federal Reserve's balance sheet, which is composed of assets and liabilities. Because of the balance sheet's economic and budgetary effects, the Congressional Budget Office projects its size and composition when developing its economic and budget projections. Those projections reflect current and anticipated policies of the Federal Reserve—whether QE (balance sheet expansions) or QT (quantitative tightening, or balance sheet contractions).

This report discusses the mechanisms by which QE affects the federal deficit. It also describes the two large expansions of the Federal Reserve's balance sheet that resulted from QE policies instituted in response to the 2007–2009 and 2020 recessions and discusses the risks involved when the Federal Reserve uses QE to achieve its monetary policy objectives of full employment and price stability.

How Does the Federal Reserve Conduct Quantitative Easing?

The Federal Reserve used quantitative easing in response to the two most recent recessions—the 2007–2009 recession and the 2020 recession caused by the coronavirus pandemic. In both instances, the Federal Reserve purchased large amounts of Treasury securities and mortgage-backed securities (MBSs) issued by government-sponsored enterprises and federal agencies.¹

1. MBSs are fixed-income securities backed by a pool of mortgages, which represent claims on the principal and interest payments of the underlying loans. Government-sponsored enterprises are financial institutions created by federal law—generally through a federal charter—to carry out activities such as increasing the availability of credit for borrowers or enhancing liquidity in particular sectors of the economy, notably agriculture and housing.

The central bank purchased those assets by creating bank reserves as liabilities.

Once monetary stimulus is no longer necessary, the Federal Reserve can contract its balance sheet in a process called quantitative tightening, in which the assets purchased during balance sheet expansions are allowed to either drop off the Federal Reserve's balance sheet as they mature (in a process known as balance sheet runoff) or are sold by the Federal Reserve. Between 2017 and 2019, the Federal Reserve used QT to shrink its balance sheet.

Why Does the Federal Reserve Conduct Quantitative Easing?

Historically, the Federal Reserve has used QE when its primary monetary policy tool, the federal funds rate (the rate that depository institutions charge each other for overnight loans of their reserves), is already at its lower bound and additional monetary stimulus is needed.² QE provides that additional stimulus by reducing long-term interest rates and increasing liquidity in financial markets.³ Those measures help achieve the Federal Reserve's monetary policy objectives of full employment and price stability. Although those objectives are generally consistent with a better outlook for the federal budget, the Federal Reserve sets monetary policy, including QE and QT, to achieve its dual mandate, which does not include explicit consideration of the federal budgetary effects of its policies. When the Federal Reserve engages in QE, the government's total liabilities, which include the Federal Reserve's liabilities, remain the same. One type of interest-bearing liability (a Treasury security, for example) is replaced with another (bank reserves).

2. The lower bound on the federal funds rate is an interest rate near zero, below which the effectiveness of further declines in the interest rate would provide little or no additional economic stimulus.

3. Liquidity is the ease with which an asset can be sold for cash. During times of financial market stress, there is typically an increased demand for highly liquid assets such as bank reserves. The Federal Reserve's purchases of long-term securities lead to an increase in bank reserves and thus an increase in liquidity.

What Is CBO's Projection of the Federal Reserve's Balance Sheet?

The Federal Reserve stopped expanding its balance sheet through QE in early 2022 as the economy continued to expand following the 2020 recession and began reducing the size of its balance sheet through QT in the middle of 2022. In CBO's projections, the Federal Reserve reinvests only a portion of the principal proceeds from Treasury securities and MBSs that mature, so that slightly less than \$100 billion of assets drop off of the Federal Reserve's balance sheet each month. QT is expected to continue until 2026, at which point the Federal Reserve is projected to purchase enough Treasury securities to keep reserves as a share of gross domestic product (GDP) at a constant value consistent with prepandemic levels.

How Do Changes to the Federal Reserve's Balance Sheet Affect Its Remittances to the Treasury?

When the Federal Reserve conducts QE, its balance sheet expands. Such expansions affect remittances, which are payments made by the Federal Reserve to the Treasury. Remittances are equal to the difference between the income generated by the Federal Reserve System and the sum of the following: the costs of generating that income, dividend payments to the Federal Reserve System's member banks, and changes in the amount of the surplus that the Federal Reserve holds on its books.

Most of the Federal Reserve's income comes from earnings on the assets it holds, and most of its expenses are for interest paid to banks that hold reserves and financial institutions participating in reverse repurchase agreements (RRPs).⁴ The effect of balance sheet expansions that occur under QE depends on the difference between the interest rates on the assets the central bank purchases and the rates on the bank reserves and other liabilities it issues to pay for them. The Federal Reserve uses changes to the rate of interest it pays on bank reserves to manage its primary monetary policy tool, the federal funds rate.

4. A reverse repurchase agreement occurs when a central bank sells Treasury securities to a dealer of government securities with the agreement that it will repurchase the Treasury securities at a higher price at some later date. Those transactions usually occur over short periods (typically overnight) and are used by central banks to manage the money supply. The counterparty in a reverse repurchase agreement is the party that holds the Treasury security before it gets repurchased by the Federal Reserve at that later date.

When the interest rate that the Federal Reserve pays on bank reserves is set *below* the interest rate on the assets it has purchased, the Federal Reserve generates more net profits and remittances from having expanded its balance sheet, all else being equal. Conversely, when the interest rate on reserves is set *above* the rate on the assets purchased, remittances are smaller because of the expanded balance sheet. Remittances would be suspended if the Federal Reserve's expenses exceeded its income.

As part of its response to the 2007–2009 recession and the 2020 recession, the Federal Reserve's QE policies substantially expanded its balance sheet. Because the interest rate on reserves has remained, on average, below that on assets purchased, those balance sheet expansions have resulted in increased remittances (as of May 2022). That effect, however, is likely to diminish and might reverse as the Federal Reserve continues to raise the interest rate on reserves to meet its target for the federal funds rate.

How Does Quantitative Easing Affect the Federal Budget?

QE affects the federal budget through two broad mechanisms. First, by changing the path of interest rates, QE affects the net borrowing costs of the Treasury and the Federal Reserve (and thus its remittances to the Treasury). Second, QE tends to stimulate the economy, which affects other budgetary categories. The net effect of QE on the federal budget through those channels is difficult to assess and depends on a number of factors.

If economic output was far below potential output (the maximum sustainable output of the economy) and short-term interest rates were set close to zero, the effects of QE would at first reduce federal deficits, generally. As economic conditions improved and interest rates rose, however, the deficit-reducing effects of that policy would diminish and could even reverse and add to the federal deficit.

The magnitude of those effects would depend on the rate at which the balance sheet expanded under QE and later contracted under QT as the economy grew. In CBO's assessment, the QE programs the Federal Reserve implemented in response to the 2007–2009 and 2020 recessions initially reduced the federal budget deficit, but their net budgetary effects over the long run are uncertain.

If the economy was at or above potential output when the Federal Reserve conducted QE, the stimulative effect of that policy would more likely result in higher inflation rather than higher real output—that is, output adjusted to remove the effects of inflation. (As of May 2022, QE had not been conducted when economic output was above potential output.) A large enough increase in inflation would prompt the Federal Reserve to raise short-term interest rates, and as short-term interest rates rose, the government's net borrowing costs would increase and remittances from the Federal Reserve would be reduced, all else being equal. The overall budgetary effect of QE under those conditions could be positive, neutral, or negative and would depend on how quickly and by how much inflation and short-term interest rates rose.

What Are the Risks of Quantitative Easing?

QE carries inherent risks. The economic outlook is uncertain, and there is a risk that the Federal Reserve will not provide the amount of QE (or QT) necessary to achieve its goals of maximum employment and price stability, especially if the economy deviates from expectations. In addition to general risks of monetary policy, QE also carries risks that are unique to using it as a tool of monetary policy. QE potentially makes the government's borrowing costs more sensitive to interest rate fluctuations, raises the risk of instability in financial markets, and increases the likelihood that the Federal Reserve will incur net losses.

The Federal Reserve's Balance Sheet

The Federal Reserve's balance sheet is the consolidated statement of the assets and liabilities of the Federal Reserve System. (See Box 1 for additional details.) The Federal Reserve buys and sells financial assets in its pursuit of its dual mandate of price stability and maximum employment, and it pays for those assets primarily by creating bank reserves and issuing Federal Reserve notes (or paper currency), which are Federal Reserve liabilities.⁵ Quantitative easing expands the Federal Reserve's balance sheet and quantitative tightening contracts the Federal Reserve's balance sheet.

Size and Composition of the Federal Reserve's Balance Sheet

The size and composition of the balance sheet is the result of many factors, including monetary policy

5. Federal Reserve notes, or paper currency, are liabilities of the Federal Reserve, but coins are not. This report uses the word "currency" to mean the stock of Federal Reserve notes.

decisions made by the Federal Reserve, demand for U.S. currency, and the borrowing and spending actions taken by the Treasury.

Size. The balance sheet increases in size when the Federal Reserve purchases securities and issues corresponding liabilities such as reserves or currency; that is, assets and liabilities held by the Federal Reserve expand in tandem. Since the Federal Reserve was established in 1913, the size of its balance sheet has increased for two main reasons: first, to meet growing demands for currency, and second, as a tool to encourage price stability and maximum employment when economic output was far below potential economic output. Historically, the Federal Reserve has used reductions in the federal funds rate as its primary way of providing monetary policy stimulus. It has only engaged in QE when additional stimulus has been needed after the federal funds rate hit its lower bound.

Until 2007, demand for currency primarily drove changes in the size of the balance sheet. Because demand for currency tends to grow gradually, the Federal Reserve's balance sheet (that is, its assets and liabilities) also grew slowly, as it issued currency and acquired assets. Because economic growth outstripped growth in the balance sheet, the Federal Reserve's balance sheet as a percentage of GDP declined from roughly 7 percent in 1975 to 6 percent in 2007.

Since 2008, the Federal Reserve has used QE to expand its balance sheet to help achieve its dual mandate when its primary monetary policy tool, the federal funds rate, had already been lowered to its lower bound. For example, in response to the 2007–2009 recession, the Federal Reserve reduced the federal funds rate to near zero.⁶ The central bank also established a number of emergency lending programs to serve as lender of last resort for some distressed financial sectors. Even so, the economy remained weak, and the Federal Reserve began purchasing assets in large quantities to put downward pressure on longer-term interest rates. As a result, the value of assets and liabilities held by the Federal Reserve increased

6. In 2008, the Federal Reserve began paying interest on reserves; since then, the market for federal funds has diminished in importance. Now, the rate of interest the Federal Reserve pays on reserves is a better indicator of the stance of monetary policy than the federal funds rate. Nonetheless, the two rates are closely related and because of the historical significance of the federal funds rate as an indicator of the stance of monetary policy, this report refers to it for that purpose.

Box 1.

What Makes Up the Federal Reserve's Balance Sheet?

The Federal Reserve's balance sheet shows its assets (the resources it owns) and its liabilities (what it owes to other entities).¹ As of the end of 2021, Treasury securities and mortgage-backed securities (MBSs) accounted for 94 percent of all Federal Reserve assets, and reserves and currency accounted for 71 percent of its liabilities. (See the table below for the largest categories of assets and liabilities held by the Federal Reserve as of December 2021.)

Assets

The Federal Reserve owns assets in the following categories:

- **U.S. Treasury securities.** The Federal Reserve purchases Treasury securities in open market operations.² Treasury securities include bills, notes, bonds, and Treasury inflation-protected securities (TIPS).
- **Mortgage-backed securities.** MBSs are fixed-income securities backed by a pool of mortgages that represent claims on the principal and interest payments of the underlying loans. The Federal Reserve purchases MBSs backed by Fannie Mae or Freddie Mac (government-sponsored enterprises) or Ginnie Mae (a government corporation) in open market operations.
- **Loans.** The Federal Reserve acts as a lender of last resort. That is, it can lend funds directly to depository institutions

1. When the Federal Reserve purchases an asset, its value is generally recorded on the balance sheet at face value, with the unamortized discount or premium at the time of purchases as a separate asset item. The amortization of premiums and accretion of discounts are then recognized as an expense or income over the life of the asset.

2. Open market operations are the Federal Reserve's purchases or sales of government securities to expand or contract reserves of the banking system and influence interest rates. For more information, see Board of Governors of the Federal Reserve System, Policy Tools, "Open Market Operations" (July 28, 2021), www.federalreserve.gov/monetarypolicy/openmarket.htm.

by using discount-window lending, a process by which banks borrow from the Federal Reserve at an above-market rate. Under section 13(3) of the Federal Reserve Act of 1913, the Federal Reserve also has the authority to make loans to other entities in "unusual and exigent circumstances."³

- **Central bank liquidity swaps.** To support the demand for U.S. dollars in international financial markets, the Federal Reserve can provide dollars to a trusted foreign central bank in exchange for an equivalent amount of the foreign central bank's currency, based on the market exchange rate at the time of the transaction. The Federal Reserve and the foreign central bank agree to reverse the transaction at a specified future date at the same exchange rate the "swap" was entered into, eliminating exchange rate risk.
- **Net portfolio holdings of special purpose vehicles (SPVs).** Under its emergency lending authority, the Federal Reserve can establish programs called facilities that make loans and purchase assets to support the flow of credit to consumers, businesses, and state and local governments. Those take the form of separate limited liability corporations (LLCs), which receive direct loans from the Federal Reserve and equity investments from the Treasury. The facilities then use those funds to purchase assets from and make loans to various borrowers.
- **Repurchase agreements.** To meet temporary increases in demand for reserves, the Federal Reserve can enter into repurchase (repo) agreements. In a repo agreement, the Federal Reserve purchases a security from a primary dealer

3. For more information about that law, see Board of Governors of the Federal Reserve System, Federal Reserve Act, "Section 13, Powers of Federal Reserve Banks" (February 13, 2017), www.federalreserve.gov/aboutthefed/section13.htm (accessed August 18, 2022).

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from \$891 billion (6 percent of GDP) in 2007 to \$4.5 trillion (25 percent of GDP) in 2015 (see Figure 1).

Between 2017 and 2019, as the economy continued to expand following the 2007–2009 recession and economic activity increased, the Federal Reserve conducted QT, which reduced the size of its balance sheet. Over those years, the value of assets held by the Federal Reserve declined from \$4.5 trillion (22 percent of GDP) to \$4.2 trillion (19 percent of GDP). Assets

purchased by the Federal Reserve during and after the 2007–2009 recession matured (when assets mature, they "run off" the Federal Reserve's balance sheet because their par value, or outstanding principal balance, is paid to the Federal Reserve, which reduces both assets and liabilities). At the same time, the Federal Reserve slowed its purchases of new assets, resulting in a net decline in its holdings of assets.

Box 1.

Continued

What Makes Up the Federal Reserve's Balance Sheet?

and agrees to sell the security back to the primary dealer at a specified price on a future date.⁴

- **Other.** Other assets on the Federal Reserve's balance sheet that make up a small share of its total balance sheet include gold and assets denominated in foreign currencies.

Liabilities

The Federal Reserve's liabilities consist of the following:

- **Reserves.** Depository institutions and some government agencies maintain accounts with the Federal Reserve to make and receive payments between themselves on behalf of clients. The balances they maintain at the Federal Reserve are known as reserves.
- **Currency in circulation.** When a depository institution requires more currency to meet customer demand, currency is sent from the Federal Reserve to the institution, with an equivalent decline in the institution's reserve

holdings at the Federal Reserve. That is, the depository institution trades reserves for currency.

- **Treasury General Account (TGA).** The TGA is the Treasury's primary checking account. Most receipts of the federal government are deposited in this account, and most outlays from the Treasury are paid from this account. When the Treasury collects a receipt, the payment is made from a depository institution to the Treasury, resulting in an increase in the TGA offset by a commensurate decline in reserves.
- **Reverse repurchase agreements.** To help manage short-term interest rates in money markets, the Federal Reserve can conduct reverse repurchase agreements through which the Federal Reserve sells securities to financial institutions who agree to sell the securities back to the Federal Reserve at a specified price on a future date.
- **Other.** Various other liabilities on the Federal Reserve's balance sheet include foreign official deposits, government-sponsored enterprise deposits, and Treasury contributions to SPVs; together they make up a small share of the balance sheet's total liabilities.

4. Primary dealers are trading counterparties of the Federal Reserve Bank of New York in its implementation of monetary policy.

Assets and Liabilities of the Federal Reserve, as of December 2021

Billions of Dollars

Assets		Liabilities and Capital	
Treasury Securities	5,652	Bank Reserves	4,040
Mortgage-Backed Securities	2,615	Currency in Circulation	2,237
Loans	35	Treasury General Account	284
Central Bank Liquidity Swaps	3	Reverse Repurchase Agreements	1,921
Assets purchased by Special Purpose Vehicles	40	Other	325
Repurchase Agreements	0		
Other	461		
Total	8,807	Total	8,807

Data source: Board of Governors of the Federal Reserve System. See www.cbo.gov/publication/57519#data.

Composition. From 1975 to 2007, Treasury securities dominated the asset side of the Federal Reserve's balance sheet. The central bank paid for those securities by issuing liabilities, of which the majority was currency. Reserves accounted for only a small fraction of total liabilities.

The composition of the Federal Reserve's assets shifted during the 2007–2009 recession and the recovery that followed. The central bank purchased MBSs in addition

to large quantities of Treasury securities to support economic recovery and reduce instability in financial markets. Emergency liquidity and credit programs, or facilities, established by the Federal Reserve also purchased more securities and extended more loans.

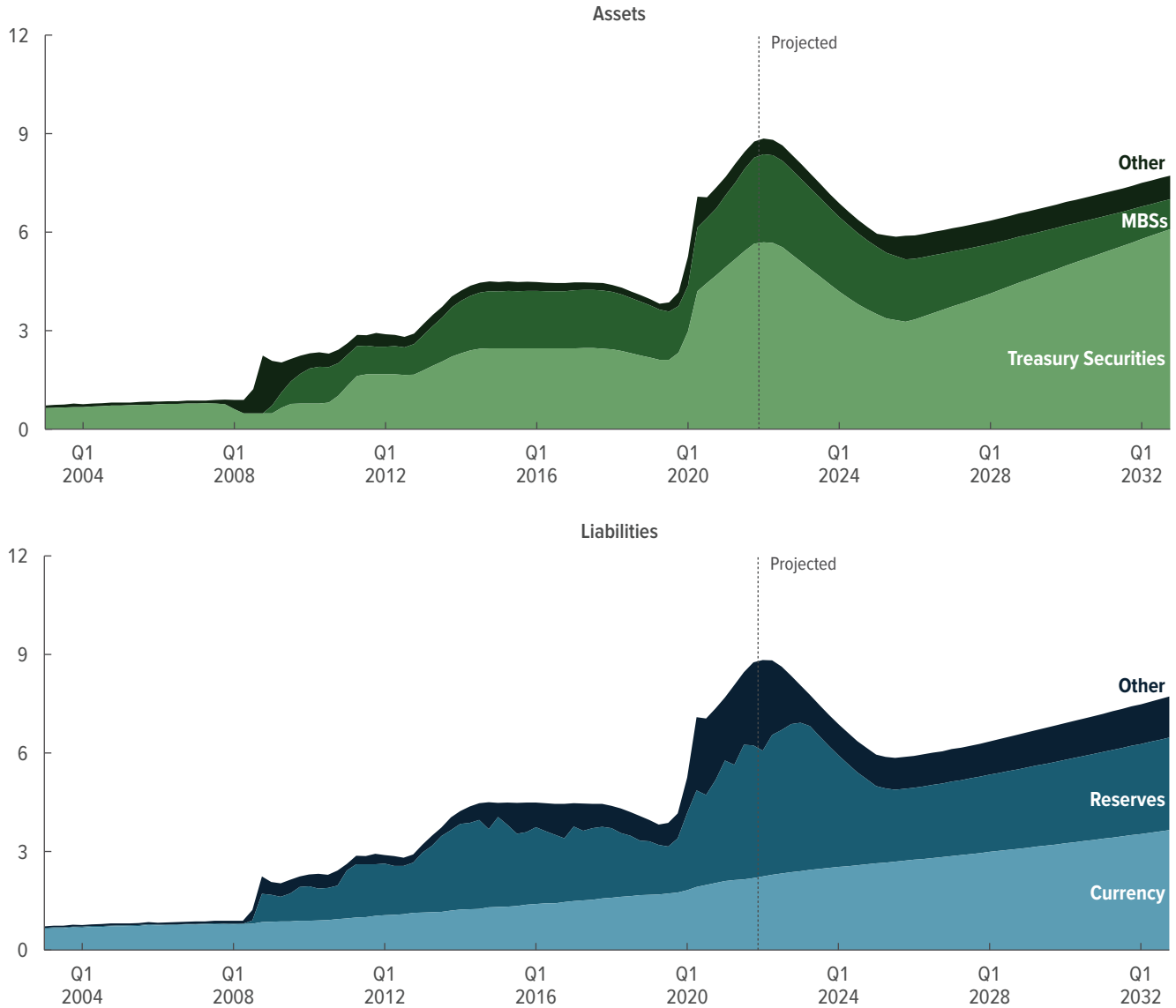
Although those purchases changed the composition of government liabilities held by private investors, the Federal Reserve's balance sheet expansions did not reduce



Figure 1.

Assets and Liabilities of the Federal Reserve

Trillions of Dollars



Data source: Congressional Budget Office, using data from the Federal Reserve Bank of New York and the Department of the Treasury. See www.cbo.gov/publication/57519#data.

MBS = mortgage-backed security.

the total amount of such liabilities (see Box 2). The Federal Reserve paid for most of those assets by crediting banks with added reserves (see Figure 1). As a result, bank reserves accounted for a far greater share of the Federal Reserve's liabilities than they did before the 2007–2009 recession. In addition, as part of the changes to monetary policy that began in 2015, the Federal Reserve established a program of regular overnight repurchase operations with a broad set of institutions; that program

increased the share of overnight repurchase agreements on the Federal Reserve's balance sheet.⁷

7. An overnight repurchase agreement (repo) is an overnight loan to dealers in government securities. An investor or central bank extends a loan to a dealer of government securities usually on an overnight basis, receiving Treasury securities in exchange. The dealer buys back the securities the following day. Any difference between the initial purchase price and the subsequent resale price determines the implicit overnight interest rate.

Between 2007 and 2019, the Federal Reserve's holdings of Treasury securities grew significantly, though the total share of Treasury securities held by the Federal Reserve declined (see Figure 2 on page 10 and see Figure 3 on page 11). That decline was largest for the shortest maturities (under 1 year) and the longest maturities (10 years or more). Although those numbers appear to indicate a smaller presence of the Federal Reserve in Treasury markets, all the relative declines can be attributed to growth in the denominator of the series, the quantity of Treasury securities outstanding for each maturity. For example, at the end of 2007, the par value of Treasury securities maturing in more than 10 years held by the Federal Reserve was \$72 billion; at the end of 2019, that amount had grown to \$583 billion. But the total value of such securities outstanding had risen from \$207 billion to \$2,080 billion, so the share held by the Federal Reserve declined from 34 percent to 28 percent.

The Federal Reserve also changes the composition of its balance sheet by conducting repurchase (repo) agreements and reverse repurchase agreements. In a repo agreement, the Federal Reserve purchases securities with the agreement that the seller will repurchase the securities at a later date. That transaction increases the supply of reserves in the banking system. Conversely, in an RRP, the Federal Reserve sells securities with the agreement that the buyer will sell the securities back to the Federal Reserve at a later date. That transaction decreases the supply of reserves in the banking system.⁸ Both types of agreements support monetary policy implementation and smooth market functioning, but they are not expected to have a significant net effect on the federal budget, all else being equal.⁹

Quantitative Easing in Response to the 2020 Recession. In response to the economic effects of the pandemic, the Federal Reserve conducted QE by purchasing large quantities of Treasury securities and MBSs to help stabilize financial markets and support the

economy.¹⁰ Those actions contributed to the doubling of the size of the balance sheet, increasing the par value of assets held by the Federal Reserve from \$4.2 trillion in the last quarter of 2019 (19 percent of GDP) to \$8.8 trillion in the fourth quarter of 2021 (36 percent of GDP), greater than the previous high of \$4.5 trillion in the fourth quarter of 2014 (25 percent of GDP).¹¹ As a result of the Federal Reserve's purchases of Treasury securities since March 2020, the share of outstanding Treasury securities held by the Federal Reserve increased significantly for all maturities (see Figure 2 on page 10). The Federal Reserve's purchases consisted of MBSs and Treasury securities with maturities between 1 year and 30 years; generally, those purchases probably raised the market prices of those assets and, correspondingly, reduced the interest rates on those same asset types. In turn, the declines in yields on MBSs and Treasury securities led to declines in interest rates on other debt instruments as well.

The Federal Reserve financed many of those purchases by creating reserves: Reserves rose from \$1.6 trillion at the end of 2019 to \$4.0 trillion in the fourth quarter of 2021. Demand for currency also increased; currency in circulation rose from \$1.8 trillion at the end of 2019 to \$2.2 trillion in the fourth quarter of 2021.

The amount of reverse repurchase agreements increased significantly starting in March 2021, rising from less than \$10 billion in February 2021 to \$1.9 trillion in the fourth quarter of 2021. That increase was caused by a decline in outstanding Treasury bills and a heightened demand by money market mutual funds for short-term safe assets. It affected the relative quantities of reserves and reverse repurchase agreements but did not change the size of the Federal Reserve's balance sheet. When financial institutions participate in RRP, reserves are effectively exchanged for RRP on the Federal Reserve's balance sheet, so any increase in RRP is associated with a corresponding decrease in reserves.

8. In July 2021, the Federal Reserve established a standing repo facility, which allows primary dealers and select depository institutions to convert Treasury securities and agency MBSs into reserves when necessary. The facility is unlikely to see significant uptake until the quantity of reserves held by depository institutions declines to near minimum levels.

9. Changes in the use of RRP and repos do not significantly affect the budget because they are substitutes for reserves and typically pay similar interest rates.

10. The expansion of the balance sheet using QE programs that occurred in response to the 2007–2009 recession ended at the beginning of 2015.

11. By comparison, foreign holdings of U.S. Treasury securities declined from 32.9 percent of GDP (\$7.1 trillion) in the first quarter of 2020 to 32.3 percent of GDP (\$7.7 trillion) in the fourth quarter of 2021, and total foreign holdings of U.S. assets rose from 183 percent of GDP (\$39.3 trillion) to 222 percent of GDP (\$53.2 trillion) over those same quarters. Foreign holdings of U.S. assets are claims on U.S. residents (households and businesses) that are owned by foreign investors.

Box 2.

Does the Federal Reserve Reduce the Government's Total Liabilities When It Conducts Quantitative Easing?

As part of quantitative easing (QE), the Federal Reserve purchases Treasury securities from private investors. Those purchases do not reduce the total amount of the liabilities of the government as a whole (the Treasury plus the Federal Reserve), but they do change the composition of those liabilities.

Total Amount of Governmental Liabilities

The total amount of governmental liabilities is a broader measure of government debt than Treasury debt held by the public, and it includes Treasury securities held by nonfederal entities, bank reserves (other than those held by the Treasury Department in the Treasury General Account), and U.S. currency. The interest payments on those liabilities include interest payments made by the Treasury and the Federal Reserve.

When the Federal Reserve purchases a Treasury security by creating new bank reserves, the reduction in Treasury securities held by investors is fully offset by an increase in the amount of reserves. Since both Treasury securities and bank reserves are included in the total stock of governmental liabilities, those purchases have no effect on the total stock.

Take, for example, a scenario in which the only assets held by the private sector are Treasury securities and reserves.¹ Suppose that the private sector owns \$100 in Treasury securities and \$100 in reserves. (The private sector holds many assets and the government has many liabilities, but this simple example isolates the effect of the Federal Reserve's purchases of Treasury securities.)

1. During periods of QE, the Federal Reserve purchases Treasury securities primarily from private investors on the secondary market, which is when investors trade securities with other investors, rather than with the initial issuer of the security. The Federal Reserve also reinvests some of the principal proceeds, or income earned on its investments, in newly issued Treasury securities.

Now suppose that the Federal Reserve purchases \$50 of Treasury securities from the private sector and pays for those assets with newly created bank reserves. The value of the private sector's total holdings of governmental liabilities (which are assets of the private sector) does not change, but the composition of those holdings does: The private sector now holds \$50 of Treasury securities and \$150 of reserves. The total value of liabilities of the government as a whole also remains the same after the Federal Reserve purchases Treasury securities. Both Treasury securities and reserves pay interest, so the total quantity of interest-bearing governmental liabilities is unchanged.

When the Federal Reserve purchases agency mortgage-backed securities (MBSs), the proper accounting treatment is less clear. The audited financial statement of the federal government does not classify Fannie Mae and Freddie Mac as part of the government. However, the Congressional Budget Office views them as part of the government: They are in federal conservatorship and they are controlled by the Federal Housing Finance Agency, their conservator, and the Treasury, which has ownership rights to a majority of their stock. Thus, Federal Reserve purchases of Fannie Mae and Freddie Mac securities exchange one form of governmental liability for another. Under that broader view of government, the stock of governmental liabilities does not change when the Federal Reserve purchases agency MBSs.

Composition of Governmental Liabilities

Although QE generally does not change the stock of governmental liabilities, it does change the composition of those liabilities. In some ways, bank reserves, reverse repurchase agreements (through which the Federal Reserve sells securities to financial institutions that agree to sell the securities back at a specified price on a future date), and Treasury securities are

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CBO's Projections for the Federal Reserve's Balance Sheet

The Congressional Budget Office projects the size and composition of the Federal Reserve's balance sheet when it produces economic and budget projections. In early 2022, as the economy continued to expand following the 2020 recession, the Federal Reserve pivoted from a policy of expanding the balance sheet under QE to one of contracting the balance sheet under QT. In CBO's projections, the Federal Reserve's holdings of MBSs decline over

the 11 years from 2022 through 2032, and its holdings of Treasury securities decline through 2025, after which point the central bank purchases enough Treasury securities to keep reserves as a share of GDP constant over the remainder of the forecast horizon.

Also in CBO's projections, starting in the middle of 2022, the Federal Reserve reduces the share of principal proceeds reinvested in new purchases of Treasury securities and MBSs, thereby allowing the size of the

Box 2.

Continued

Does the Federal Reserve Reduce the Government's Total Liabilities When It Conducts Quantitative Easing?

similar. They are all interest-bearing governmental liabilities.² The interest rates paid on bank reserves and on overnight reverse repurchase agreements are set by the Federal Reserve and are closely tied to the federal funds rate (the rate that depository institutions charge each other for overnight loans of their reserves). When the Federal Reserve purchases Treasury securities, the effect of that action on the federal budget is roughly equivalent to a situation in which the Treasury Department buys back its own debt and replaces it with new Treasury securities that mature in one day.

There are, however, several important differences between Treasury securities and bank reserves. First, most Treasury securities (in particular, notes and bonds) pay the holder of the security a fixed amount of interest twice a year for the life of the security. By contrast, the interest rate on bank reserves, which is set administratively by the Federal Reserve, can be changed daily. Because bank reserves are effectively variable rate assets, the existing and future level of interest rates on overnight loans are critical factors in determining the effects of QE on the government's net borrowing costs over time. Additionally, bank reserves can only be held by banks, whereas Treasury securities can be purchased by individuals, nonfinancial institutions, and nondepository financial institutions as well as by banks.³ Finally, Treasury securities are frequently used as collateral for short-term lending in money markets whereas reserves are not.

When the Federal Reserve purchases agency MBSs by creating bank reserves, it does not change the amount of governmental liabilities, but the government's risks and potential returns

2. In 2006, lawmakers provided the Federal Reserve with authority to pay depository institutions interest on reserve balances held at Reserve Banks, which went into effect in 2011. In October 2008, the Congress agreed to extend that authority to the Federal Reserve immediately.

3. Select nondepository financial institutions and foreign government entities can also engage in reverse repurchase agreements with the Federal Reserve.

increase. When private investors hold agency MBSs, the government bears the risk of default on the mortgage payments underlying the MBSs and the investors who hold those MBSs bear the prepayment risk (that is, the uncertainty about the rate at which homeowners will refinance or sell their homes and prepay their mortgage balances). They also reap any additional compensation (in the form of higher interest rates) relative to assets like Treasury securities that do not carry prepayment risk. When the Federal Reserve purchases those MBSs from private investors, those additional risks and potential for higher compensation are transferred from the private sector to the government. In theory, the Treasury Department may be able to roughly replicate the effects of the Federal Reserve's purchases of Treasury securities as part of QE by swapping existing Treasury securities with new very short-term bills; however, the shifting of risk and profit potential from the private sector to the federal government resulting from the Federal Reserve's purchases of MBSs would be less possible to replicate through Treasury debt management decisions alone.

By changing the composition of governmental liabilities, QE can alter the timing of the effects of increased federal deficits on private investment. For instance, during an economic downturn, deficits tend to sharply increase. Those larger deficits place upward pressure on interest rates, which crowds out investment (that is, it reduces investment below what it otherwise would have been). A QE program would reduce that upward pressure on interest rates, thereby reducing the crowding out effect.

The overall net effect of QE on total crowding out over time is unclear, however. Because QE stimulates economic growth and puts upward pressure on prices, it allows the Federal Reserve to meet its monetary policy goals sooner than it would without conducting QE, and in turn, to remove monetary accommodation sooner. To do so, the Federal Reserve raises the federal funds rate and conducts quantitative tightening, which tends to push up longer-term interest rates and increase crowding out of investment.

balance sheet to decline. Specifically, the agency expects the Federal Reserve to reinvest enough of the principal proceeds from maturing Treasury securities and agency MBSs so that slightly less than \$100 billion of assets mature off the Federal Reserve's balance sheet each

month.¹² In CBO's projections, it is unlikely that more than \$30 billion of MBSs run off the balance sheet

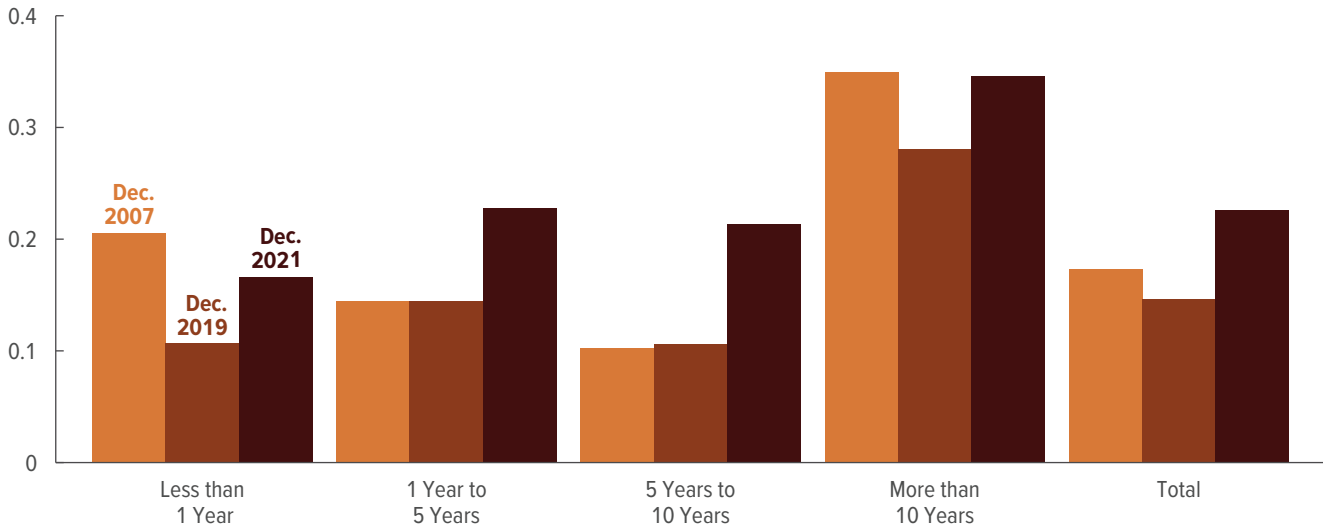
12. Consistent with the Federal Reserve's QT policy that saw the balance sheet begin to shrink in early 2018, CBO does not expect asset sales to be utilized. However, CBO's projection of the Federal Reserve's policy decisions is uncertain, and it is possible that the central bank will opt to sell MBSs so that holdings of those assets decline more quickly.



Figure 2.

Share of Outstanding Nominal Treasury Securities Held by the Federal Reserve, by Maturity Date

Percent



Data source: Congressional Budget Office, using data from the Federal Reserve Bank of New York and the Department of the Treasury. See www.cbo.gov/publication/57519#data.

Nominal Treasury securities include all Treasury securities except for those with rates of return that vary with inflation (Treasury inflation-protected securities) or prevailing interest rates (floating rate notes).

each month because of rising interest rates and limited prepayments on mortgages underlying the MBSs. In the agency's projections, the Federal Reserve lets Treasury securities run off the balance sheet until 2026, when reserves as a share of GDP return to prepandemic levels. After that point, the Federal Reserve would purchase enough Treasury securities to meet growing demand for currency and to keep reserves as a share of GDP unchanged over the remainder of the forecast horizon.

On the liability side of the balance sheet, the amount of RRP will probably decline over the next year as more Treasury bills are issued and households spend excess savings they accumulated since the start of the pandemic, CBO projects. Additionally, the amount of currency is expected to continue to grow at a gradual pace to meet increasing demand over the forecast window. Finally, bank reserves are projected to decline rapidly starting in 2023 until reaching prepandemic levels as a share of GDP in 2026.

Federal Reserve Remittances and the Federal Budget

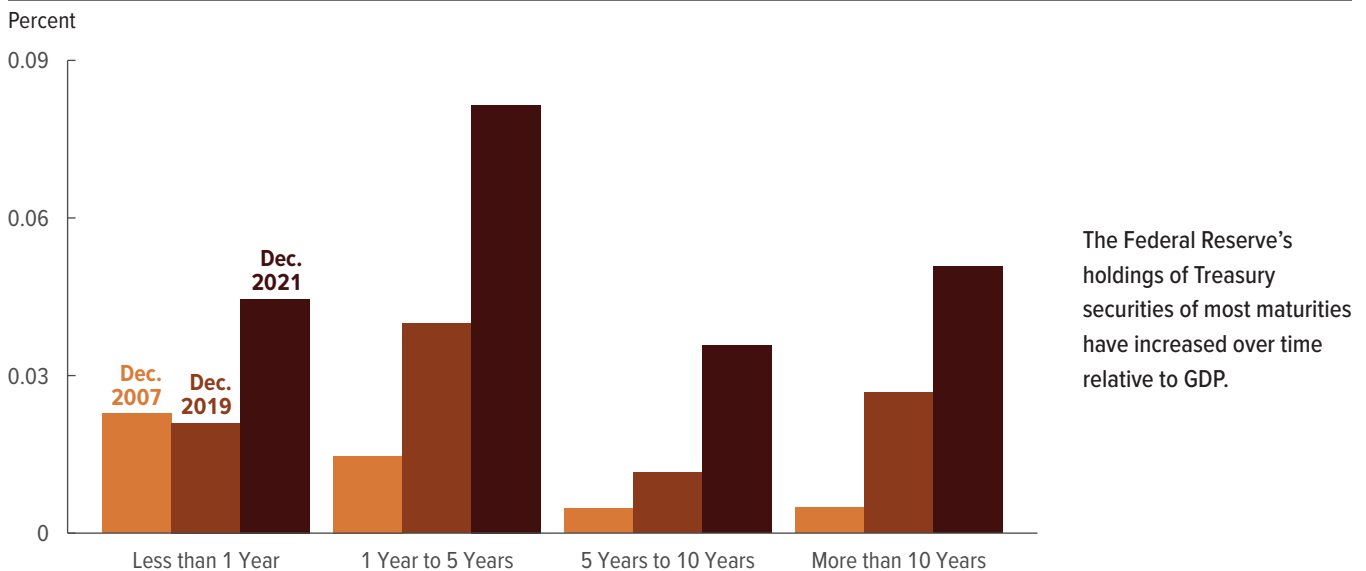
Federal Reserve banks earn income from interest-bearing assets, primarily Treasury securities and MBSs that were initially purchased through open market operations (that

is, transactions between the Federal Reserve and the private sector). Generating that interest income is not in and of itself a policy objective; rather, it is a by-product of the Federal Reserve's conduct of monetary policy in the interest of achieving its dual mandate and of taking measures to achieve its financial stability objectives. By law, that income, minus the cost of generating it (which consists of the interest paid on Federal Reserve liabilities, the cost of the system's operations, and dividends paid to member banks), is transmitted to the Treasury as remittances.

Before the 2007–2009 recession, the Federal Reserve generally held Treasury securities as assets and issued Federal Reserve notes as liabilities. To issue those notes, the central bank purchases them from the Bureau of Engraving and Printing at a price based on their production costs, which include the costs of the raw materials and facilities for producing the notes. The Federal Reserve incurs additional costs related to issuing and maintaining the supply of notes, including transportation, disposal of notes taken out of circulation, and anticounterfeit efforts, for example. Overall, the costs associated with acquiring and maintaining the notes are small compared with their face value. The Federal Reserve then trades the notes at face value for Treasury

Figure 3.

The Federal Reserve's Holdings of Treasury Securities by Maturity, as a Share of GDP



The Federal Reserve's holdings of Treasury securities of most maturities have increased over time relative to GDP.

Data source: Congressional Budget Office, using data from the Federal Reserve Bank of New York and the Bureau of Economic Analysis. See www.cbo.gov/publication/57519#data.

Values exclude Treasury inflation-protected securities and floating rate notes.

GDP = gross domestic product.

securities. The difference between the costs of acquiring and maintaining the notes and their face value, along with earnings from the interest received on the Treasury securities, results in profits for the Federal Reserve. Consequently, the Federal Reserve has remitted funds to the Treasury in every year over the past 50 years.

As a result of QE, reserves have replaced Federal Reserve notes as the largest liability of the central bank. Federal Reserve notes are noninterest-bearing, but the Federal Reserve pays interest on the reserves that banks hold. Since 2008, that interest rate has been a key tool in how the Federal Reserve conducts monetary policy because that rate determines the costs of expanding its balance sheet under QE. When that rate is set below the interest rate on the assets it has purchased, the Federal Reserve generates more net profits and thus pays larger remittances from having expanded its balance sheet, all else being equal. When that rate is set above the interest rate on the assets purchased, remittances are reduced.¹³

Remittances account for a small share of federal revenues, but they have grown noticeably in recent years. Remittances averaged 1.5 percent of revenues, or 0.27 percent of GDP, from 1987 to 2007 (see Figure 4). In response to the 2007–2009 financial crisis, the Federal Reserve decreased interest rates and significantly expanded its balance sheet through quantitative easing. The weighted-average rate of interest earned on its portfolio of assets exceeded the rate paid on its corresponding liabilities. That positive interest rate differential, or spread, when applied to a larger balance sheet, boosted remittances to an average of \$90 billion (3.3 percent of revenues, or 0.53 percent of GDP) per fiscal year over the period from 2010 (the first full fiscal year since the balance sheet expansion began) to 2016 (the year in which the Federal Reserve first raised interest rates since the beginning of the crisis). Those revenues were about five times the amount of those from estate and gift taxes, three times the amount of those from customs duties, and about the same as the receipts from excise taxes over the same period. (Individual income

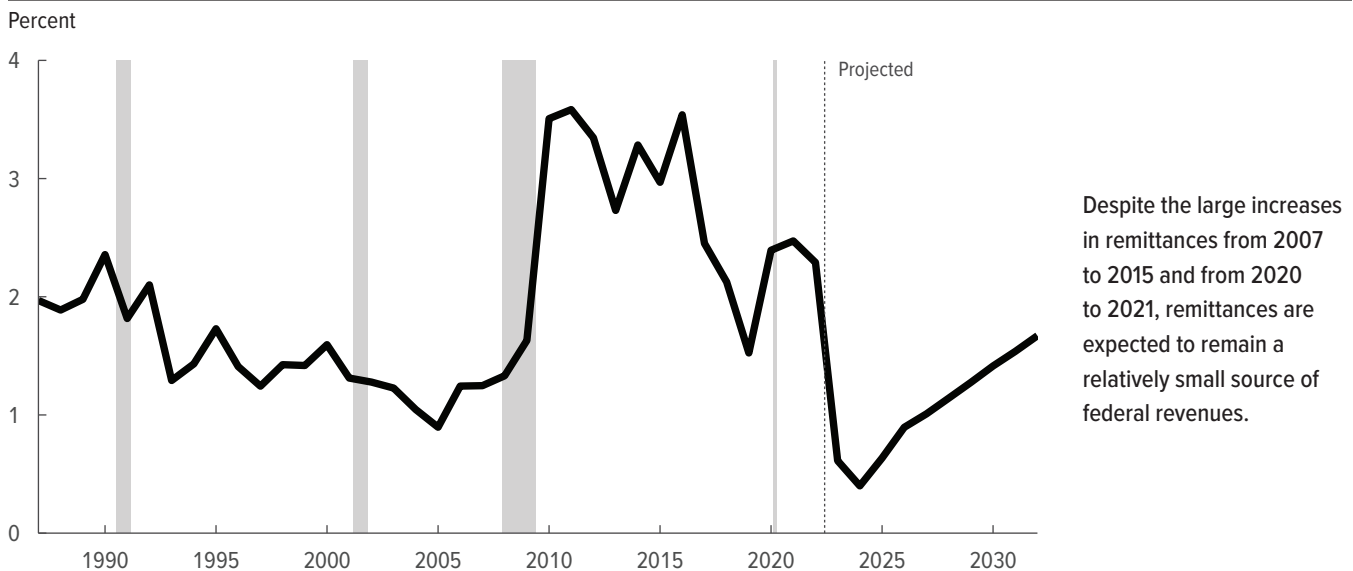
13. The expected effect of Federal Reserve purchases on remittances can be measured by the term premium. The term premium is the percentage-point wedge between long-term interest rates and the average of expected short-term rates over the period until a bond matures. That term premium reflects several factors including the following: compensation for the risk of holding long-term bonds, differences in liquidity between bonds of different

maturities, and investors' preferences for certain maturities over others. A positive term premium indicates that additional assets purchased by the Federal Reserve will earn a premium relative to market expectations for the interest expenses it will incur on the liabilities it issues to pay for those assets, thereby increasing remittances and reducing deficits, on net.



Figure 4.

Remittances as a Share of Federal Revenues, by Fiscal Year



Data source: Congressional Budget Office, using data from the Department of the Treasury. See www.cbo.gov/publication/57519#data.

The shaded vertical bars indicate periods of recession, which extend from the peak of a business cycle to its trough.

taxes, the largest source of federal revenues, accounted for 46.0 percent of the total for that period.)

As the economy recovered from the financial crisis and returned to a more sustained economic expansion, the central bank increased short-term interest rates and conducted QT to allow its asset holdings to decrease as a share of GDP. The Federal Open Market Committee (FOMC) raised the interest rate on reserves from its low of 25 basis points (or 0.25 percentage points) set during the crisis to 50 basis points (or 0.50 percentage points) in December 2015, the first of several times the FOMC raised the rate over the next several years. Each of those increases directly raised the Federal Reserve's interest expenses. Simultaneously, QT slowly reduced the Federal Reserve's balance sheet as a share of GDP.¹⁴ Largely because of those changes, remittances began to drop in fiscal year 2017, falling to \$81 billion (2.5 percent of revenues, or 0.42 percent of GDP) that year and to \$53 billion (1.5 percent of revenues, or 0.25 percent of GDP) by fiscal year 2019.

14. Although the nominal size of the balance sheet began shrinking in 2017 as a result of QT, the balance sheet began shrinking as a share of GDP in 2015.

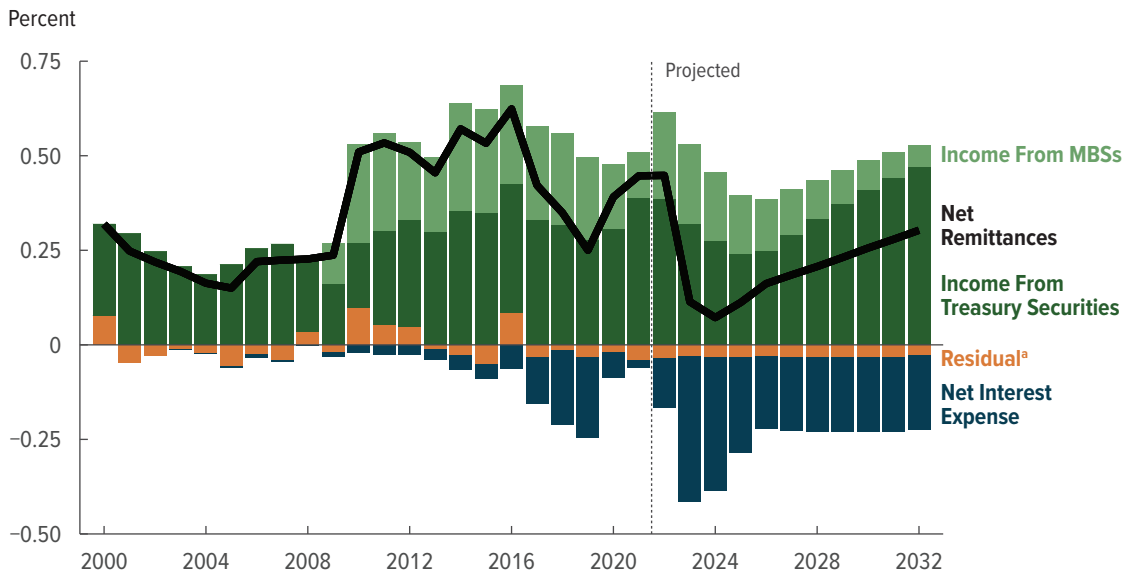
The Federal Reserve's response to the recession caused by the pandemic has led to another large increase in remittances to the Treasury because short-term interest rates have remained on average below the rates on the purchased assets and the Federal Reserve has not conducted significant asset sales (as of May 2022). In March 2020, the FOMC reduced the interest rate on reserves to 10 basis points and began to increase its holdings of Treasury securities and MBSs. In fiscal year 2021, remittances increased to \$101 billion (2.5 percent of revenues, or 0.45 percent of GDP). That increase was largely caused by the wider differential between the interest rates on the Federal Reserve's assets and the interest rates on its liabilities and the larger balance sheet to which that spread applied.¹⁵

In CBO's baseline projections, remittances peak this fiscal year at \$111 billion (2.4 percent of revenues, or 0.45 percent of GDP) and then drop in fiscal year 2023 because of higher interest rates paid by the Federal Reserve on bank reserves (see Figure 5). As more of the

15. The demand for RRP's in recent months has been greater than the demand after the 2007–2009 financial crisis. That difference is not expected to significantly affect remittances because the interest rate on RRP's is expected to continue closely following the interest rate on reserves.

Figure 5.

Major Components of Federal Reserve Remittances as a Share of GDP, by Fiscal Year



Data source: Congressional Budget Office, using data from the Department of the Treasury, the Bureau of Economic Analysis of the Department of Commerce, and the Board of Governors of the Federal Reserve System. See www.cbo.gov/publication/57519#data.

GDP = gross domestic product; MBS = mortgage-backed security.

a. Includes all income and expenses not otherwise shown and small timing effects. (There is a short period between when remittances are determined by the Federal Reserve and when they are recorded by Treasury.) In the projection period, the residual is composed primarily of the operation costs of the Federal Reserve System.

Federal Reserve’s short-term assets mature and move off the balance sheet, interest expenses decrease and, starting in 2025, remittances begin to increase. The Federal Reserve is expected to begin increasing its asset holdings in 2026 to meet the demand for currency and reserves; remittances would continue to increase as a share of GDP, CBO projects.

Those projections are subject to uncertainty, particularly regarding interest rates. (See Figure 6 for CBO’s baseline interest rate projections.) On the one hand, if the economy or financial markets deteriorated or if additional crises occurred, the Federal Reserve could purchase additional assets or sustain lower interest rates, which could increase remittances. On the other hand, if it raised interest rates in the next several years by more than CBO forecast or if it sold assets rather than merely allowing them to mature, the interest expenses of Federal Reserve Banks could increase by more than their interest income or, in the event of asset sales, cause capital losses to be

realized.¹⁶ Those outcomes would reduce remittances and could even result in their temporary lapse.¹⁷

Quantitative Easing and the Federal Budget

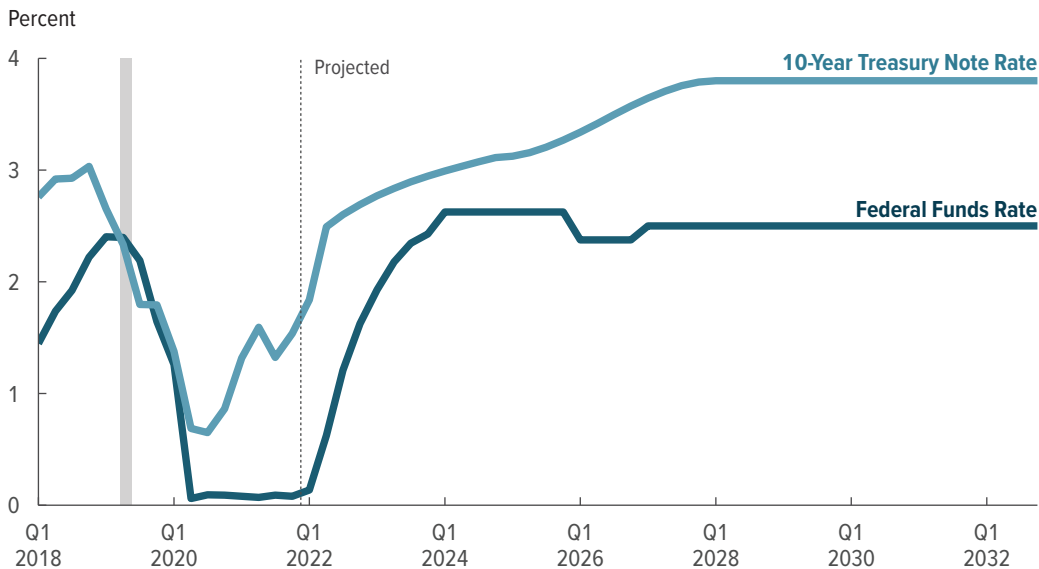
Quantitative easing affects the federal budget through two channels: by changing net borrowing costs of the U.S. government—defined here to include the Treasury and the Federal Reserve—and by stimulating aggregate

16. Capital losses occur when an asset that has decreased in value is sold for a lower price than the original purchase price or its adjusted basis (that is, the cost of an asset adjusted for various events that have occurred during its ownership and that affect its value).

17. When the Federal Reserve’s expenses have exceeded its income over short periods in the past, it has recorded a “deferred asset,” or debit balance against future profits, to enable it to meet current obligations; as the Federal Reserve returns to profitability, those deferred assets are marked down. In CBO’s view, such a scenario would have no direct implications for the central bank’s ability to achieve its monetary policy objectives. Paragraph 11-96 of the Federal Reserve’s accounting manual describes deferred assets. See Board of Governors of the Federal Reserve System, *Financial Accounting Manual for Federal Reserve Banks* (January 2022), p. 56, <https://go.usa.gov/xuk4s> (PDF, 1.5 MB).

Figure 6.

CBO's Forecast of the 10-Year Treasury Note Rate and the Federal Funds Rate



Data source: Congressional Budget Office, using data from the Board of Governors of the Federal Reserve System. See www.cbo.gov/publication/57519#data.

The shaded vertical bar indicates a period of recession. A recession extends from the peak of a business cycle to its trough.

The federal funds rate is the rate that depository institutions charge each other for overnight loans of their reserves.

economic activity, which affects the budget in a variety of ways. In general, it is difficult to gauge whether the overall effect of QE on the nation's finances is positive, negative, or neutral over the entire period that it affects the budget. In CBO's assessment, the QE measures taken in response to the 2007–2009 and 2020 recessions reduced deficits in the short run, but their net budgetary effects in the long run are uncertain.

To assess the effects of QE, it is necessary to identify the alternative: What would happen if the Federal Reserve did not use QE (and associated QT) as monetary policy tools? In such a scenario, it is likely that the central bank would keep short-term interest rates lower for longer to provide additional stimulus to the economy.¹⁸ In addition, it might take longer to achieve the Federal Reserve's objectives of maximum employment and price stability, leading to lower nominal incomes, less tax revenue, and increased federal expenditures through automatic stabilizers—changes in federal revenues and outlays that automatically occur in response to cyclical movements in the economy. However, keeping short-term interest

rates lower for longer would probably lead to lower net interest costs as well.

Net Borrowing Costs of the Treasury and the Federal Reserve

The net borrowing costs of the U.S. government consist of all interest payments the government makes minus all interest income it earns. Through its effect on interest rates, QE changes the net borrowing costs of the government mainly in two ways: the interest paid on some Treasury securities and the remittances from the Federal Reserve to the Treasury.

Interest Paid on Treasury Securities. The primary channel through which QE affects net borrowing costs is through changing market interest rates and, in turn, interest rates on Treasury securities.¹⁹ QE affects

18. Other factors may influence the economic and budgetary effects of QE and QT, such as the scale, timing, and speed with which QE and QT are conducted. However, CBO has not examined alternative counterfactuals that encompass changes to any of those factors.

19. Several characteristics of QE affect interest rates, including the size and composition of the balance sheet and people's expectations about future changes in the balance sheet. For a thorough description of how changes in the balance sheet affect interest rates, see Jane Ihrig and others, "Expectations About the Federal Reserve's Balance Sheet and the Term Structure of Interest Rates," *International Journal of Central Banking*, vol. 14, no. 2 (March 2018), www.ijcb.org/journal/ijcb18q1a8.htm; and Canlin Li and Min Wei, "Term Structure Modeling With Supply Factors and the Federal Reserve's Large-Scale Asset Purchase Programs," *International Journal of Central Banking*, vol. 9, no. 1 (March 2013), www.ijcb.org/journal/ijcb13q1a1.htm.

short-term and longer-term rates when the Federal Reserve purchases securities.²⁰ As the Treasury issues new securities, either as a result of increasing the total supply of Treasury securities or of replacing maturing securities, those changes in interest rates directly affect the interest expenses of the Treasury.

Remittances. QE also affects remittances paid by the Federal Reserve to the Treasury, which are recorded as revenues in the budget. When the Federal Reserve expands its balance sheet through QE, it earns more income in the form of interest received on the assets it purchases. At the same time, the Federal Reserve's interest expenses also increase because of the additional payments it makes on bank reserves and RRP. The net effect of QE on remittances is the difference between the increase in income and the increase in interest expenses.

Other Budgetary Effects

By reducing long-term interest rates, QE stimulates economic growth and thereby affects other budgetary categories.²¹ Reductions in long-term interest rates increase economic output in the following ways:

- They reduce the cost of capital and encourage additional business investment.
- They increase the demand by households for houses, cars, and other durable goods.²²

- They support higher domestic consumption of other goods and services by lowering the cost of credit for consumers.
- They boost the prices of longer-term assets, such as equities and houses, and the resulting increases in wealth also help support people's spending.
- They generally reduce international demand for U.S. financial assets and, in turn, the foreign exchange value of U.S. currency.²³ A weaker foreign exchange value of the dollar tends to boost U.S. exports by increasing the competitiveness of those exports in foreign markets.²⁴
- Because they stimulate economic growth, they lead to higher rates of inflation.

QE also provides liquidity to financial markets in times of financial stress, which mitigates negative economic effects from financial market disruptions.

Those changes in the economy caused by QE can in turn affect federal spending and revenues. Outlays for some programs considered automatic stabilizers, like federal unemployment insurance and the Supplemental Nutrition Assistance Program (SNAP, formerly called the Food Stamp program), tend to grow during economic downturns as unemployment rises and additional people qualify for benefits. Conversely, income and payroll tax revenues tend to fall with reductions in aggregate demand during downturns. To the extent that lower long-term interest rates caused by QE help to stimulate

20. It is possible that QE would reduce expected short-term rates in the very near term by providing a signal to financial markets about the policy stance of the Federal Reserve. For example, QE announcements could signal to markets that the Federal Reserve was attaching a higher weight to reducing unemployment, in which case the central bank would raise short-term rates by less as the unemployment rate fell. It is also possible that asset purchases could signal to markets that the Federal Reserve expected slower economic growth in the near future, in which case it would be unlikely to increase short-term interest rates in the near term.

21. Quantitative estimates vary, but most studies find that the Federal Reserve's balance sheet expansion through QE programs and maturity extension programs probably had a weak but positive effect on the economy from 2008 to 2014. Studies also suggest that the balance sheet's expansion in that period reduced the unemployment rate and raised GDP relative to what they would have been in the absence of those programs. See Kenneth N. Kuttner, "Outside the Box: Unconventional Monetary Policy in the Great Recession and Beyond," *Journal of Economic Perspectives*, vol. 4, no. 32 (Fall 2018), pp. 121–146, <https://doi.org/10.1257/jep.32.4.121>.

22. According to the Bureau of Economic Analysis, residential investment consists of new construction of single and multifamily units, improvements to existing housing units, and various other expenditures on housing units.

23. A number of papers have produced evidence that QE weakens the exchange value of the domestic currency. See Luca Dedola and others, "Does a Big Bazooka Matter? Quantitative Easing Policies and Exchange Rates," *Journal of Monetary Economics*, vol. 117 (January 2021), pp. 489–506, <https://doi.org/10.1016/j.jmoneco.2020.03.002>; Saroj Bhattarai, Arpita Chatterjee, and Woong Yong Park, "Effects of U.S. Quantitative Easing on Emerging Market Economies," ADBI Working Paper Series, no. 803 (Asian Development Bank Institute, January 2018), <https://tinyurl.com/2p2m6ewy> (PDF, 652 KB); and Pablo Anaya, Michael Hachula, and Christian J. Offermanns, "Spillovers of U.S. Unconventional Monetary Policy to Emerging Markets: The Role of Capital Flows," *Journal of International Money and Finance*, vol. 73 (May 2017), pp. 275–295, <https://doi.org/10.1016/j.jimonfin.2017.02.008>.

24. The foreign exchange value of the dollar refers to the value of the dollar relative to a basket of foreign currencies. By reducing the value of the dollar in foreign exchange markets, QE increases the relative value of the Federal Reserve's holdings of foreign exchange assets, which boosts remittances because changes in the value of those holdings are treated as income by the central bank. However, those effects are small relative to the other effects that QE has on remittances.

the economy and thereby mitigate economic downturns, QE can lead to lower outlays for programs that function as automatic stabilizers as well as higher tax revenues, holding all else constant.

In addition, to the extent QE led to higher rates of inflation, it would tend to further increase taxable income and therefore federal revenues. But it would also boost outlays for programs that are affected by price changes (including unemployment insurance and SNAP). The net effect of higher prices on the federal budget would depend on a number of factors, including whether and how they affect interest rates and economic growth.

Overall Effect of Quantitative Easing on the Federal Budget

In CBO's view, the effect of QE on the budget in the short run depends on the gap between economic output and potential output. The net effect of balance sheet expansions on the nation's finances over the long run is difficult to assess and may be positive, negative, or neutral.

When Economic Output Is Below Potential Output.

In CBO's view, if economic output is below potential output, QE leads to an initial decline in federal deficits but to uncertain long-run effects. The Federal Reserve's previous uses of QE took place when economic output was below potential output and after the federal funds rate had been dropped to its effective lower bound.

Short-Run Effects. In the short run, QE that takes place when economic output is below potential output reduces federal deficits through its effect on interest rates. By lowering interest rates, QE under those conditions lowers interest payments from the Treasury to holders of federal debt, increases the Federal Reserve's remittances to the Treasury, and reduces federal deficits through its other macroeconomic effects.

QE initially lowers the Treasury's interest payments by reducing the interest paid on any newly issued fixed-rate securities.²⁵ When market interest rates decline, the

Treasury can issue long-term fixed-rate debt at lower interest rates. The more fixed-rate debt securities the Treasury replaces with new debt securities at lower rates, the larger the decline in its net interest costs.²⁶

QE also initially increases remittances from the Federal Reserve to the Treasury. When short-term interest rates are at the effective lower bound, the longer-term assets purchased by the Federal Reserve typically have rates of return that are higher than the interest rate it pays on bank reserves. As a result, additional purchases by the Federal Reserve initially increase its interest income more than its interest expenses.

Finally, the positive macroeconomic effects of QE reduce federal deficits in the short run through other budgetary channels. By stimulating the economy during economic downturns, QE strengthens the labor market and reduces outlays for programs like unemployment insurance that function as automatic stabilizers. By stimulating economic output, QE also increases federal income and payroll tax revenues.

Long-Run Effects. In CBO's view, when economic output is below potential output, the net effect of QE on the federal deficit over the long run is uncertain. The short-run effects of QE reduce the gap between economic output and potential output, and as economic output recovers, the deficit-reducing effects of balance sheet expansions decline or even reverse. Conducting QE can help the Federal Reserve achieve its mandated goals (full employment and price stability) sooner and, as a result, allow the central bank to raise the target range for the federal funds rate sooner than it would have if it had not expanded its balance sheet.

Raising the target range for the federal funds rate sooner eventually leads to less net income for the government. First, it increases the Federal Reserve's interest expenses much more than it increases its interest income. Because the Federal Reserve buys mostly longer-term, fixed-rate securities as part of QE, those securities as well as the reserves and RRP's used to pay for them persist on the balance sheet if they are not sold. They are, therefore, likely to still be held during periods when economic conditions warrant increases in the target for the federal funds rate.

25. Lower interest rates reduce the flow of interest payments to and from the federal government. CBO estimates that, on net, federal outlays and deficits would be smaller in a scenario with lower interest rates. For example, if interest rates for Treasury securities of all maturities were 100 basis points less than CBO projects, starting in fiscal year 2022, net interest outlays of the Treasury would be \$2.7 trillion (or 33 percent) less over the 2022–2032 period. See Congressional Budget Office, "Workbook for How Changes in Economic Conditions Might Affect the Federal Budget: 2022 to 2032" (interactive, June 2022), www.cbo.gov/publication/57980.

26. In addition, 2.7 percent of all marketable Treasury securities outstanding (that is, those already issued) pay a variable rate of interest linked to prevailing market rates for 13-week Treasury bills. To the extent that QE lowers not only long-term interest rates, but also short-term interest rates, the interest costs for new and outstanding variable-rate securities would also fall.

Hence, the income earned by the Federal Reserve on the assets it holds tends to be relatively insensitive to changes in short-term interest rates, but banks' reserves and RRP are floating rate liabilities; that is, they pay interest rates that change as soon as the Federal Reserve adjusts the target range for the federal funds rate. Those changes reduce the net income of the Federal Reserve and thus its remittances to the Treasury. The magnitude of that downward pressure on remittances depends on the amount of reserves and RRP that remain on the balance sheet when the target range for the federal funds rate rises. If the Federal Reserve sells the assets rather than holds them to maturity, it would instead be likely to realize capital losses as market interest rates rise, which would have a similar downward effect on remittances.

Second, QE leads to higher net borrowing costs in the long run. As the economy recovers and economic output returns to potential output and markets expect a quicker rise in the federal funds rate, other short-term interest rates will rise in anticipation of Federal Reserve rate hikes. That increase in short-term interest rates raises net interest costs for the Treasury relative to what they would have been had the balance sheet not expanded.

By stimulating economic growth, QE is also likely to eventually result in upward pressure on prices and inflation. The net effect of higher prices on federal deficits can depend on a number of factors, including whether and how they affect interest rates and economic growth.²⁷

Following QE with QT could reduce inflationary pressure and the need for interest rate hikes, thereby altering the pattern of the budgetary effects stemming from changes in the balance sheet. If the Federal Reserve allowed assets to mature without replacing them, as economic output approached potential output, the contraction in the balance sheet resulting from QT would partially moderate some of the rise in net borrowing costs resulting from higher short-term rates. If the Federal Reserve sold assets, it would reduce its interest expenses but might realize capital losses; the net budgetary effect would depend on the target for the federal funds rate, prevailing market interest rates, and which assets were

sold. (For more details about the effects of QT on the economy and the budget, see Box 3.)

Whether QT resulted from runoff or from sales, it would raise long-term interest rates and slow economic growth. Higher long-term interest rates resulting from QT would reduce domestic investment and consumer spending on housing and durable goods, thereby diminishing the support provided to economic activity. In addition, QT would put upward pressure on the foreign exchange value of the dollar, which would depress growth of U.S. exports. By slowing economic growth, QT would lower inflationary pressure and reduce the need for the Federal Reserve to use rate hikes to reduce inflationary pressure. Consequently, QT could limit the rise in net borrowing costs that would arise when short-term rates rose.

The effect of each dollar of QT on the federal deficit and economy might not perfectly offset the effect of each dollar of QE. The magnitude of the effect of each dollar of assets purchased under QE depends on the characteristics of the asset purchased and, in turn, how those purchases affect the supply of assets held by private investors. Some of those characteristics include whether the asset is a Treasury security or an MBS, and the amount of time until the asset matures.²⁸ Similarly, the magnitude of the effects of QT depends on those same characteristics of the assets that come off the balance sheet. When QT is conducted through runoff, the assets that come off the balance sheet fastest are those with the shortest time to maturity. As a result, an asymmetry can arise between the types of assets that tend to be purchased under QE and those that tend to come off the balance sheet when QT is conducted through runoff. The extent to which the effects of QE and QT on the economy and budget ultimately offset each other could depend on other factors as well, including prevailing short-term interest rates, inflation rates, and whether there are supply or demand shocks.²⁹

The Effects of Previous Expansions. The expansions of the Federal Reserve's balance sheet resulting from QE that

27. CBO estimates in one stylized scenario with higher inflation that the resulting increases in revenues and outlays are similar. See Congressional Budget Office, "Workbook for How Changes in Economic Conditions Might Affect the Federal Budget: 2022 to 2032" (interactive, June 2022), www.cbo.gov/publication/57980.

28. A number of differences between Treasury securities and MBSs, in particular those related to the relationship between prepayments and changes in interest rates, have implications for QE and QT that are outside the scope of this report.

29. Another important factor in determining the effect of each dollar of QE and QT is how the Treasury responds to each program in terms of the mix of different maturity lengths and other characteristics of the Treasury securities it chooses to issue.

Box 3.

The Effects of Quantitative Tightening on the Economy and the Budget

Quantitative tightening (QT) is the process by which the assets purchased during a balance sheet expansion either drop off the Federal Reserve's balance sheet as they mature or are sold by the Federal Reserve. In the Congressional Budget Office's projections, the Federal Reserve lets Treasury securities and mortgage-backed securities (MBSs) run off the balance sheet at a maximum pace of slightly less than \$100 billion per month and allows Treasury securities to run off the balance sheet until the quantity of reserves returns to prepandemic levels relative to gross domestic product.

What Is the Effect of Quantitative Tightening on the Economy?

Quantitative tightening removes monetary policy accommodation that resulted from earlier quantitative easing. QT leads to long-term interest rates that are higher than would otherwise be the case, which reduces domestic investment and consumer spending on housing and durable goods, thereby diminishing the support provided to economic activity. In addition, shrinking the balance sheet puts upward pressure on the exchange value of the dollar, which depresses growth of U.S. exports. By reducing the support provided to economic activity and slowing economic growth, QT lowers inflationary pressure and reduces the need for the Federal Reserve to raise short-term interest rates.

What Is the Effect of Quantitative Tightening on the Budget?

The effect of quantitative tightening on Federal Reserve remittances depends on several factors: the interest rate on

the assets that either matured or were sold, the interest rate on reserves, the interest rate on assets that the Federal Reserve would have purchased if it replaced the maturing assets with new ones, and whether assets were sold or merely allowed to mature without replacement. Higher interest rates on newly issued long-term Treasury securities (relative to a scenario in which the Federal Reserve did not let assets mature off the balance sheet) would lead to higher interest costs paid by the Treasury. Additionally, slowing economic growth as a result of quantitative tightening would probably lead to smaller tax collections than would have occurred had the Federal Reserve not let assets mature off the balance sheet.

How Uncertain Are the Effects of Quantitative Tightening?

The effects of quantitative easing and quantitative tightening on the economy and the budget are highly uncertain. For example, if quantitative easing occurred when output was above potential, it would probably lead to increased inflation, which would require the Federal Reserve to raise short-term interest rates and start quantitative tightening earlier than it would have needed to otherwise. That could significantly increase federal borrowing costs, resulting in larger deficits than would have prevailed had the Federal Reserve not conducted quantitative easing followed by quantitative tightening.

occurred in response to the 2007–2009 and 2020 recessions were conducted when economic output was below potential output and the federal funds rate was at its effective lower bound. In CBO's view, those expansions initially reduced federal deficits. However, the long-run effects of those purchases on the federal budget are uncertain. CBO has not estimated the budgetary effects of previous QE programs. Assessing those effects would require estimates, which CBO did not produce, of the Federal Reserve's balance sheet, the economy that would have existed, and the resulting paths for federal spending and revenues had the Federal Reserve not conducted QE. Additionally, CBO has not produced estimates that isolate the effects of QE from other factors that influence

the federal budget, including the economic shocks that led the Federal Reserve to conduct QE.³⁰

When Economic Output Is Above Potential Output.

Because QE has not been conducted when economic output is above potential output, the effect on the budget of QE conducted under such circumstances is highly uncertain (as of May 2022). In CBO's view, QE that took place under those conditions or when interest rates were above their lower bound would be less likely to reduce federal deficits in the short run than when output

30. For the Federal Reserve's analysis of the effect of QE on the federal budget, see Federal Open Market Committee, memorandum, "Fiscal Implications of Additional Large-Scale Asset Purchases for the Federal Government and the Federal Reserve" (March 11, 2013), <https://tinyurl.com/45d5ch3t> (PDF, 1 MB).

was below potential. It would probably increase inflation rates above the Federal Reserve's long-run target, which would prompt it to raise short-term interest rates. As short-term interest rates rose, net borrowing costs would increase, all else held constant. The net effect on the federal deficit of conducting QE under those conditions could be positive, neutral, or negative depending on how quickly and by how much inflation and short-term interest rates rose.

Risks of Using the Balance Sheet as a Tool of Monetary Policy

Using QE to achieve monetary policy objectives carries risks. When the Federal Reserve employs any tool of monetary policy—such as short-term policy rate adjustments or QE—it does so on the basis of its expectations about the economy. If the economy evolves differently than expected, the Federal Reserve can adjust its monetary policy strategy.

However, the future course of the economy is highly uncertain and there is always the risk of providing too much or too little economic stimulus, either of which could result in temporary deviations from the Federal Reserve's desired objectives of full employment and price stability. For example, if the economy experienced an adverse shock, the Federal Reserve might not respond quickly enough and short-term interest rates might be set too high or the size of its balance sheet might be too small. In that case, the unintended consequences of that policy would probably be inflation below the Federal Reserve's 2 percent objective or employment that is less than the maximum sustainable level. In contrast, if the economy experienced a positive shock, short-term interest rates might be too low or its balance sheet might be too large, with the possible consequences being inflation above the Federal Reserve's 2 percent objective, asset price bubbles, and a weakening of the value of the dollar on international currency exchanges.

In addition to the general risks associated with using any tool of monetary policy, using QE as a policy tool carries its own unique set of risks. It makes the government's interest costs more sensitive to interest rate fluctuations, potentially leads to net losses for the Federal Reserve, and raises the risk of financial market instability. In addition, QT (which often follows periods of QE) also exposes the government to risks.

The Federal Government's Borrowing Costs

When the Federal Reserve conducts QE, it makes total government borrowing costs more sensitive to changes in interest rates. Most of the assets purchased by the Federal Reserve pay interest at fixed rates, but the bank reserves issued by the Federal Reserve to pay for those assets have variable interest costs. When the Federal Reserve expands its balance sheet through QE by creating bank reserves with which to purchase securities, it makes a larger share of total governmental liabilities, including those of the Federal Reserve and the Treasury, subject to a variable interest rate. That larger share exposes the U.S. government to greater interest rate risk.

QE also heightens the risk that the Federal Reserve will have periods of net losses—that is, expenses that exceed its income. In such cases, the Federal Reserve would record a deferred asset and suspend remittances to the Treasury. In CBO's view, any such losses would be smaller than the combined positive profits resulting from QE itself (which initially boosts profits) and from the long-run growth in demand for Federal Reserve notes. In addition, CBO estimates that temporary net losses would not directly affect the Federal Reserve's ability to achieve its dual mandate. Nonetheless, periods of net losses could affect perceptions of the Federal Reserve's independence or its ability to achieve its objectives. In turn, that could influence expectations about inflation or growth.

Stability of the Financial Sector

QE may affect financial-sector stability in different ways. On the one hand, QE may impose a regulatory burden on the financial sector, which could reduce the supply of credit and increase the riskiness of the banking sector. When the Federal Reserve purchases assets from nonbank entities, bank assets rise because the Federal Reserve credits banks with reserves (unless they are offset by sales of Treasury securities or other safe and liquid assets).³¹ Regulations limit the degree to which banks can increase their asset holdings (without an increase in bank

31. For example, consider a case in which the Federal Reserve purchases Treasury securities from a hedge fund (or any nonbank entity). The hedge fund sells the Treasury securities to the Federal Reserve and is credited with deposits at the hedge fund's depository institution, whereas the depository institution is credited with the corresponding amount of reserves held at the Federal Reserve. Thus, the depository institution's assets and liabilities increase, although it is not party to the transaction between the Federal Reserve and the hedge fund.

capital) by increasing their liabilities.³² If a bank exceeded the limit established by regulators, it would probably respond by reducing holdings of safer low-return assets and discouraging additional deposits through lower interest rates. Those actions could impede the functioning of some markets in which banks play a central role and could increase the riskiness of banks' balance sheets.

On the other hand, it is possible that maintaining a large Federal Reserve balance sheet would discourage excessive creation of risky assets in the private sector. When the Federal Reserve purchases an asset, it typically pays for that asset with newly created reserves, which from the private sector's perspective are safe short-term assets. Expanding the supply of safe short-term assets might discourage financial institutions in the private sector from issuing their own short-term liabilities, which could be subject to a sharp reduction in demand in times of market stress.³³ Thus, by keeping a large balance sheet, the Federal Reserve could make the financial sector more resilient to disorderly financial market events.

Risks Associated With Quantitative Tightening

When the Federal Reserve conducts QT, it reduces the supply of bank reserves, which are an important liquid asset for banks. Federal Reserve balance sheet policy (that is, whether the Federal Reserve is expanding or reducing

its balance sheet through QE or QT) sets the supply of reserves, whereas financial markets determine the demand for them. However, that demand can be difficult to observe and predict. In the fall of 2019, for example, interest rates in private repo markets rapidly increased, a sign of stress that suggested a sudden unmet need for liquidity in financial markets. That spike occurred at a time when the Federal Reserve was using QT to remove some of the accommodation its earlier expansion in response to the 2007–2009 recession had provided. The central bank announced the precise and very gradual reduction in the level of reserves well in advance, but a shortage of liquid assets emerged suddenly and led to uncertainty in broader financial markets. Another QT program would pose similar risks of instability in financial markets.

Those risks are mitigated somewhat by the Federal Reserve's introduction of a standing repo facility, which allows primary dealers and select depository institutions to convert Treasury securities and agency MBSs into reserves when necessary. As the supply of reserves is gradually reduced toward the minimum quantity of reserves necessary for stability in money markets, demand for repurchase agreements should increase gradually, signaling that the minimum quantity of reserves was being approached. That change in demand for the repurchase facility could allow the Federal Reserve to slow the pace of QT or cease it altogether before stress in money markets emerged.

Another type of risk arising from QT is that the resulting upward pressure on long-term interest rates could reduce economic output. That reduction in economic growth could also result in a decline in the inflation rate below the Federal Reserve's long-term goal or reduce employment below the central bank's assessment of maximum employment.

32. When a bank increases its asset holdings by increasing its liabilities, it is said to be leveraged. The regulatory limit referred to here is called the leverage ratio.

33. See Robin Greenwood, Samuel Gregory Hanson, and Jeremy C. Stein, "The Federal Reserve's Balance Sheet as a Financial-Stability Tool," *Jackson Hole Economic Symposium Conference Proceedings* (Federal Bank of Kansas City, 2016), pp. 335–397, www.hbs.edu/faculty/Pages/item.aspx?num=52330.

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About This Document

This report, which is part of the Congressional Budget Office's continuing efforts to make its work transparent, supplies information about the agency's projections of the Federal Reserve's balance sheet and remittances to the Treasury. In keeping with CBO's mandate to provide objective, impartial analysis, the report makes no recommendations.

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CBO seeks feedback to make its work as useful as possible. Please send comments to communications@cbo.gov.



Phillip L. Swagel
Director
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