



October 2013

U.S. CURRENCY

Coin Inventory Management Needs Better Performance Information

GAO Highlights

Highlights of [GAO-14-110](#), a report to congressional requesters

Why GAO Did This Study

Efficiently managing the circulating coin inventory helps ensure that enough coins are available to meet public demand while avoiding unnecessary production and storage costs. The Federal Reserve fulfills the coin demand of the nation's depository institutions (e.g., commercial banks and credit unions) by managing Reserve Bank inventory and ordering new coins from the U.S. Mint. GAO was asked to review this approach. This report examines (1) how the Federal Reserve manages the circulating coin inventory and the related costs, (2) the extent to which the Federal Reserve follows key practices in managing the circulating coin inventory, (3) actions taken to respond to potential changes in demand for coins and notes, and (4) actions taken with regard to the circulation of the \$1 coin. GAO interviewed federal and foreign officials, experts, and industry representatives; reviewed documents and data on coin inventories; and compared the Federal Reserve's coin inventory management practices to key practices in supply chain management.

What GAO Recommends

Among other things, the Federal Reserve should (1) develop a process to assess factors influencing coin operations costs and identify practices that could lead to cost-savings and (2) establish additional performance goals and metrics relevant to coin inventory management. The Federal Reserve generally agreed with the report's recommendations.

View [GAO-14-110](#). For more information, contact Lorelei St. James at (202) 512-2834 or stjamesl@gao.gov.

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Coin Inventory Management Needs Better Performance Information

What GAO Found

In 2009, the Federal Reserve centralized coin management across the 12 Reserve Banks, established national inventory targets to track and measure the coin inventory, and in 2011 established a contract with armored carriers that store Reserve Bank coins in their facilities. However, according to Federal Reserve data, from 2008 to 2012, total annual Reserve Bank coin management costs increased by 69 percent and at individual Reserve Banks increased at rates ranging from 36 percent to 116 percent. The Federal Reserve's current strategic plan calls for using financial resources efficiently and effectively and monitoring costs to improve cost-effectiveness. However, the agency does not monitor coin management costs by each Reserve Bank—instead focusing on combined national coin and note costs—thus missing potential opportunities to improve the cost-effectiveness of coin-related operations across Reserve Banks.

In managing the circulating coin inventory, the Federal Reserve followed two of five key practices GAO identified and partially followed three. For example, the Federal Reserve follows the key practice of collaboration because it has established multiple mechanisms for sharing information related to coin inventory management with partner entities. The Federal Reserve has developed some performance metrics in the form of upper and lower national coin inventory targets. However, it has not developed other goals or metrics related to coin supply-chain management. One key practice is for agencies to identify goals, establish performance metrics, and measure progress toward those goals. Establishing goals and metrics, such as those related to coin management costs, could aid the Federal Reserve in using information and resources to identify additional efficiencies.

To collect information on potential changes in the demand for currency (coins and notes), the Federal Reserve has conducted studies and outreach, including developing a long-term strategic framework beginning in 2010 to consider changes in demand and implications for operations. While the magnitude of potential changes in the demand for currency is inherently uncertain, the Federal Reserve anticipates a gradual decline in currency use, and officials reported such changes could likely be accommodated by the current system. While Federal Reserve studies and data indicate electronic payments have increased over time, currency usage has remained strong. For example, from 2009 to 2012, the value of currency in circulation rose about 26 percent.

Starting in 2007, the Federal Reserve took actions to overcome barriers to circulation of the \$1 coin, such as holding regular meetings with depository institution representatives to gather feedback about demand for \$1 coins. The Federal Reserve manages the \$1 coin inventory as it does for all other coin denominations—overseeing distribution and ensuring sufficient supply is available to meet demand nationwide. Reserve Banks currently hold approximately \$1.4 billion in \$1 coins, an amount that, according to the Federal Reserve, is sufficient to meet demand for more than 40 years. Reserve Bank officials, depository institution representatives, and coin terminal operators stated that \$1 coins are readily available to the public throughout the country, but there is very low public demand for these coins.

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Abbreviations

BEP	Bureau of Engraving and Printing
COSO	Committee of Sponsoring Organizations of the Treadway Commission
CPO	Cash Product Office
GPRA	Government Performance and Results Act
GPRAMA	GPRA Modernization Act of 2010

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October 28, 2013

Congressional Requesters:

Efficiently managing the nation's inventory of circulating coins helps to ensure that the coin supply meets the public's demand while avoiding unnecessary production and storage costs. Efficient inventory management includes anticipating changes in future demand for coins and notes—collectively referred to as currency—in light of factors such as increased electronic payment options and changing economic conditions. The Federal Reserve System's 12 Federal Reserve Banks (Reserve Banks) fulfill the coin demand of the nation's depository institutions (e.g., commercial banks, federal savings associations, and credit unions) by managing coins held in inventory and ordering new coins from the United States Mint (U.S. Mint). In 2012, the U.S. Mint produced 9.1 billion coins. According to the Department of the Treasury (Treasury), coins worth approximately \$42 billion were in circulation at the end of 2012. Reserve Banks hold a portion of these coins in storage, including approximately 1.4 billion in \$1 coins.¹

In 2009 the Reserve Banks implemented a new, centralized approach to the management of the circulating coin inventory. You asked us to review the Federal Reserve's management of the circulating coin inventory and future demand for coins and notes.² This report addresses the following questions: (1) How does the Federal Reserve manage the circulating coin inventory and what are the coin management costs? (2) To what extent does the Federal Reserve follow key supply-chain management practices in managing the circulating coin inventory? (3) What actions has the Federal Reserve taken to respond to potential changes in demand for coins and notes? (4) What actions has the Federal Reserve taken with regard to the circulation of the \$1 coin, and what more, if anything, could it do?

¹The total amount of coins in circulation is comprised of coins held by the Reserve Banks and coins in general circulation (e.g., coins held by businesses or the public).

²For the purposes of this report, the term "Federal Reserve" refers to the Board of Governors of the Federal Reserve System as well as the Reserve Banks.

To address the first question, we reviewed documentation from and interviewed officials from the Federal Reserve and U.S. Mint. We also met with industry stakeholders (e.g., depository institution representatives and coin terminal operators) and academic experts to discuss their views on the management of the circulating coin inventory. To assess management operations related to the circulating coin inventory, we used the Federal Reserve's Strategic Framework 2012–2015 and the Committee of Sponsoring Organizations of the Treadway Commission's (COSO) Internal Control—Integrated Framework.³ In addition, from the Reserve Banks we obtained and analyzed coin inventory and production data from 2004 through 2012 and currency management cost data from 2008 through 2012. We took steps to assess the reliability of data used, such as interviewing knowledgeable agency officials, and determined that the data were sufficiently reliable for the purposes of this report.

To address the second question, we developed and validated criteria to assess the Reserve Banks' management of the circulating coin inventory with stakeholders' and experts' input. We worked with industry experts to identify a selection of key practices for supply chain management that are relevant to coin inventory management.⁴ The five key practices we identified were collaboration, risk management, performance metrics, forecasting demand, and system optimization.⁵ Establishing, documenting, and following these practices is considered important to effective inventory management. For each of these key practices, we selected the individual supporting characteristics most relevant to coin inventory management. To understand the Federal Reserve's coin inventory management practices, we interviewed Federal Reserve and

³Committee of Sponsoring Organizations of the Treadway Commission, *Internal Control—Integrated Framework* (1992). COSO is a joint initiative of five professional associations dedicated to providing thought leadership through the development of frameworks and guidance on enterprise risk management, internal control, and fraud deterrence.

⁴While there are many other leading supply-chain management practices and supporting characteristics, we selected and validated a sample of those most relevant to our review. In addition, academic and industry experts in operations and supply chain management validated that the selected key practices, definitions, and supporting characteristics were relevant to coin inventory management.

⁵We reviewed supply-chain-management and operations-management leading practices, our past defense inventory management and Government Performance and Results Act reports, and academic literature to identify those practices applicable to the circulating coin inventory. Selected experts and foreign government officials reviewed and validated that the five key practices identified were relevant to coin inventory management.

U.S. Mint officials and industry stakeholders. We then compared the Federal Reserve's coin-inventory management practices to the selected key supply-chain management practices. For each key practice, we assessed whether the Federal Reserve was following or substantially following the supporting characteristics (i.e., plans, policies, or processes have been developed and implemented properly for all or nearly all of the supporting characteristics), partially following (i.e., plans, policies, or processes have been developed and implemented properly for some of the supporting characteristics), or minimally or not following them (i.e., plans, policies, or processes are lacking for all or nearly all of the supporting characteristics). Thus, the individual assessments for each supporting characteristic served as the basis for the overall assessment for each key practice.

To address our third and fourth questions, we obtained perspectives on potential changes in coin and note demand, as well as the availability and use of \$1 coins from officials from the Federal Reserve and U.S. Mint, and Bureau of Engraving and Printing (BEP) as well as industry stakeholders and academic experts. In addition, we interviewed government officials in Australia, Austria, and Canada to obtain their perspectives on the leading practices in coin inventory management and potential changes in future coin and note demand. We selected these countries for illustrative purposes because they had replaced low denomination notes with coins and implemented coin-inventory management process improvements. These countries are not intended to be used for direct comparisons to the Federal Reserve's management of the circulating coin inventory. For more detailed information on our objectives, scope, and methodology, see appendix I.

We conducted this performance audit from March 2013 through October 2013 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

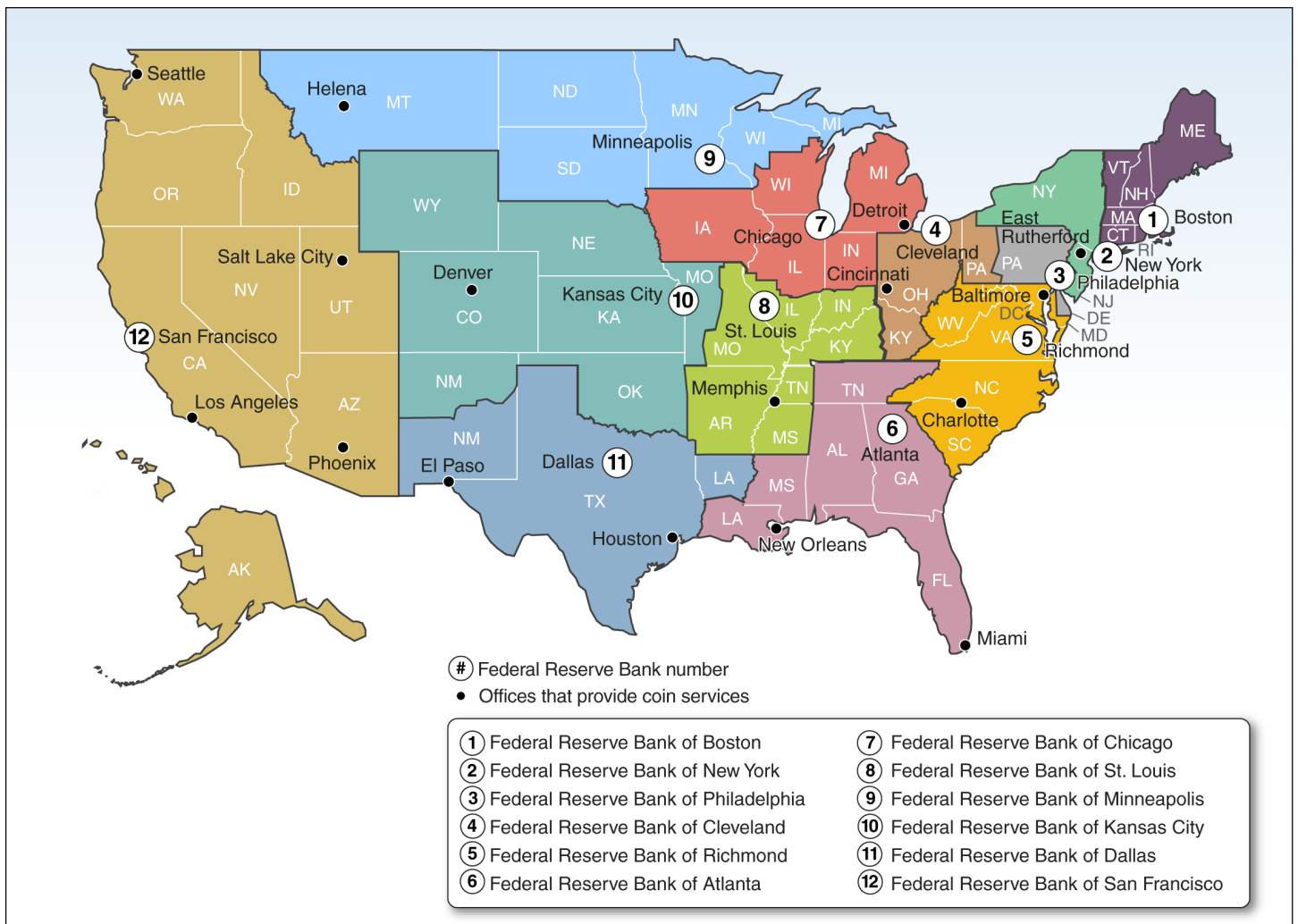
Roles and Responsibilities

The Federal Reserve System is composed of an independent government agency—the Board of Governors (Board)—and 12 regional Reserve Banks, each of which is located in a Federal Reserve district. (See fig. 1.) The Board is responsible for maintaining the stability of financial markets, supervising financial institutions such as bank holding companies and the U.S. operations of foreign banking organizations, and supervising the operations of the Reserve Banks. Unlike the Board, the Reserve Banks are not federal agencies. Each Reserve Bank is a federally-chartered corporation with a board of directors. Unlike federal agencies funded through congressional appropriations, the Board and Reserve Banks are self-funded entities that engage in a variety of activities that generate revenue, such as earnings from lending to financial institutions.⁶ The Federal Reserve deducts its costs from these revenues and transfers the remaining amount to the General Fund of the U.S. Treasury (General Fund).⁷ In 2012, the Federal Reserve transferred \$88.4 billion to the General Fund. Federal Reserve revenues contribute to total U.S. government revenues, and therefore, if its costs can be reduced—such as through more efficient coin-inventory management—more of its revenue could potentially be contributed to the General Fund.

⁶Funds derived from assessments imposed by the Board are not to be considered governmental funds or appropriated monies. 12 U.S.C. § 244.

⁷The General Fund refers to Treasury accounts that hold federal receipts not allocated by law for a specific purpose and includes money collected from taxes, customs duties, and revenues generated by government agencies.

Figure 1: Map of Federal Reserve Bank Districts and Offices That Provide Coin Services



Source: Federal Reserve and GAO.

The Reserve Banks carry out a variety of functions for the Federal Reserve, including ensuring that coins and notes are available in quantities sufficient to meet the public’s needs. The 12 Reserve Banks provide coins and notes to depository institutions, among other responsibilities. The Federal Reserve’s Cash Product Office (CPO) manages the Reserve Banks’ coin inventory from a national perspective, working closely with the Reserve Banks. For example, CPO places

monthly orders for new coins with the U.S. Mint on behalf of the Reserve Banks.

Other entities, including the U.S. Mint, coin terminal operators—armored carrier companies such as Brink’s and Dunbar, that hold both Reserve Bank and other customers’ coins in their facilities—and depository institutions play a role in issuing or managing the circulation and distribution of coins. (See fig. 2.) For coins, the Treasury’s U.S. Mint is the issuing authority. The U.S. Mint is financed through a revolving fund and generates revenue through various means including the sale of circulating coins at face value to the Reserve Banks.⁸ Revenue in excess of costs—including all costs allocable to the U.S. Mint’s circulating coin program—is transferred to the General Fund.⁹ U.S. Mint facilities in Philadelphia and Denver produce and ship new coins for circulation to Reserve Bank offices and coin terminals. Approximately 170 coin terminals are operated by 15 armored carrier companies. Coin terminal operators receive deposits from and fulfill orders of coins for depository institutions on behalf of the Reserve Banks and other customers. As we have previously reported, coin terminals operate at no cost to the government because while they maintain Reserve Bank coin inventories at no charge, they earn revenue from other customers—depository institutions—from the coin transportation and wrapping services they provide.¹⁰ Depository institutions order coins from the Reserve Banks—through an online ordering system called FedLine operated by the Reserve Banks—to meet retailers’ and the public’s demand; depository institutions’ coin orders are fulfilled with new and circulated coins held at Reserve Bank offices or coin terminals. Depository institutions can deposit coins with Reserve Banks when they have more coins than needed to fulfill demand. Depository

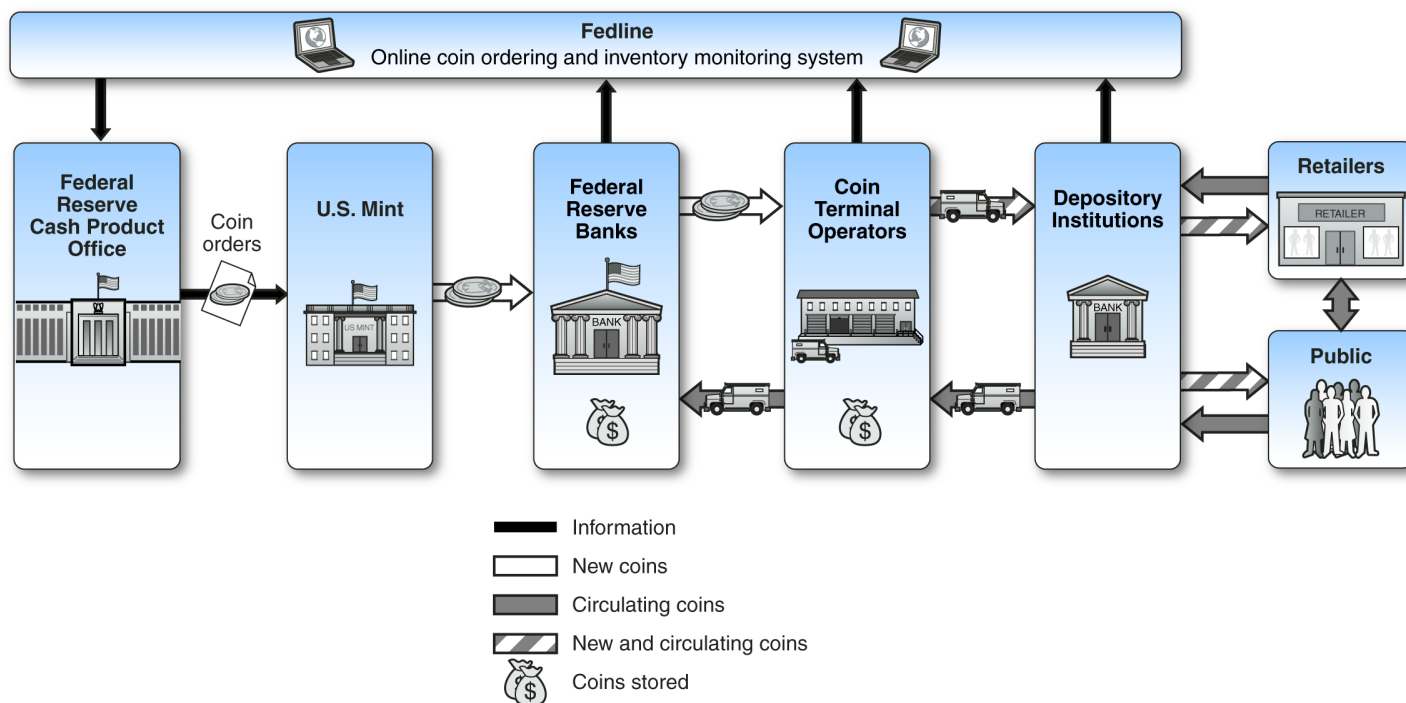
⁸The revolving fund of the U.S. Mint is financed through the U.S. Mint Public Enterprise Fund. The difference between the face value of minted circulating coins and the cost of their production, including the cost of metal used in the minting and the cost of transporting the coins to Reserve Banks for distribution to the public is referred to as “seigniorage.”

⁹In its 2012 Annual Report, the U.S. Mint reported an on-budget transfer of \$77 million to the General Fund for fiscal year 2012. However, the U.S. Mint did not make off-budget transfers to the General Fund in 2012 because it determined that amounts resulting from the sale of circulating coins were required to mitigate the risks of future economic uncertainty, impacts from continued penny and nickel losses, and loss of revenue from the suspension of \$1 coin production.

¹⁰GAO, *U.S. Coins: The Federal Reserve Banks Are Fulfilling Coin Demand, but Optimal Inventory Ranges Are Undefined*, [GAO-08-401](#) (Washington, D.C.: Mar. 21, 2008).

institutions contract with armored carriers to wrap and deliver the coins to them, ultimately providing these coins to retailers and the general public.

Figure 2: Production and Circulation of Coins



Source: GAO.

The circulating coin inventory consists of coins held by Reserve Banks—both in Reserve Bank offices and coin terminals—and those coins in general circulation for public use.¹¹ In 2012, Reserve Banks held about 5 percent (\$2.1 billion) of the circulating coin inventory, and 95 percent (\$42 billion) of the inventory was in general circulation. As of December 2012, the 28 Reserve Bank offices held about 50 percent of the Reserve Banks’ total coin inventory of pennies, nickels, dimes, and quarters and about 92 percent of the Reserve Banks’ total coin inventory of \$1 coins. The 170 coin terminals held the remainder of the Reserve Bank’s coin inventory.

¹¹Circulating coins are available to the public (e.g., for general use in commerce), and are distinguished from coins produced and sold as collectibles.

Based on the Board's statutory authorities, it is responsible for note issuance, distribution, and processing.¹² For example, the Board is the issuing authority for notes and is also responsible for distributing and authenticating notes. The Treasury's BEP produces notes to meet the Board's annual note order. According to the Treasury, at the end of 2012, approximately \$1.1 trillion in notes were in circulation and approximately \$228 billion in notes were held by the Reserve Banks. In 2012, BEP production accounted for about 32 percent of the circulating note inventory. This is due, in part, to the amount of new notes that need to be replaced each year because they are worn or no longer fit for circulation. The Reserve Banks manage the note inventory through 28 note-processing centers and 10 note distribution locations. CPO also has a role in providing note services, including processing. Similar to the distribution process for coins, depository institutions order notes from the Reserve Banks through FedLine, and then place these notes in circulation to meet the demand of retailers and the public. The Federal Reserve also contracts with armored carriers to transport notes for circulation or storage. When notes are returned by depository institutions as deposits to the Reserve Banks, each note is processed to determine its quality and authenticity; coins do not undergo similar processing. During processing, worn and counterfeit notes are removed from circulation, and the rest are wrapped for storage or re-circulation.

\$1 Coin

The Reserve Banks are responsible for ensuring the efficient distribution and circulation of coins, including the \$1 coin, which co-circulates with the \$1 note. Legislation has been introduced in Congress to eliminate the \$1 note and replace it with the \$1 coin.¹³ In 2012, we reported that the federal government would receive \$4.4 billion net benefits over 30 years if Congress decided to replace the \$1 note with the \$1 coin.¹⁴ This most recent savings estimate is lower than the results of our previous similar

¹²12 U.S.C. §§ 411 and 414.

¹³S. 1105, the Currency Optimization, Innovation, and National Savings Act.

¹⁴GAO, *U.S. Coins: Benefits and Considerations for Replacing the \$1 Note with a \$1 Coin*, [GAO-13-164T](#) (Washington, D.C.: Nov. 29, 2012). [GAO-13-164T](#) assumed a lower replacement ratio than past GAO reports assessing the impacts of replacing the \$1 note. In addition, the life of the note has increased with new processing equipment.

analyses, in part, because the life of the \$1 note has increased.¹⁵ The Presidential \$1 Coin Act of 2005 requires the Federal Reserve and the Secretary of the Treasury to assess and submit an annual report to the Congress on the obstacles to the efficient and timely circulation of \$1 coins, among other things.¹⁶ As we have previously found, while Congress sought to increase the circulation of the \$1 coin in recent years, circulation has remained limited, in part, because the \$1 note has remained in circulation.¹⁷

Inventory Management Has Been Centralized; Rising Costs Have Not Been Analyzed

Coin Inventory Management

Since 2009, the Federal Reserve has made changes to its coin inventory management that includes centralizing the coin management system and establishing a contract with coin terminal operators.¹⁸

Centralized Coin Management

Introduced in 2009, the National Coin Inventory Management program centralized the management of the circulating coin inventory under the CPO so that the coin inventory would be consistently managed across the 12 Reserve Bank districts. Previously, each Reserve Bank office set and managed its own inventory levels, resulting in varying levels of inventory

¹⁵In commenting on this report, Federal Reserve officials noted that previous GAO analyses and the associated potential savings were due to increased seigniorage income and not to production costs savings. Additionally, they noted that other societal costs and benefits—such as costs related to transitioning to \$1 coins—were not included in GAO’s analysis.

¹⁶Pub. L. No. 109-145, § 104, 119 Stat. 2664, 2670 (2005), codified at 31 U.S.C. § 5112(p).

¹⁷GAO, *U.S. Coins: Replacing the \$1 Note with a \$1 Coin Would Provide a Financial Benefit to the Government*, [GAO-11-281](#) (Washington, D.C.: Mar. 4, 2011).

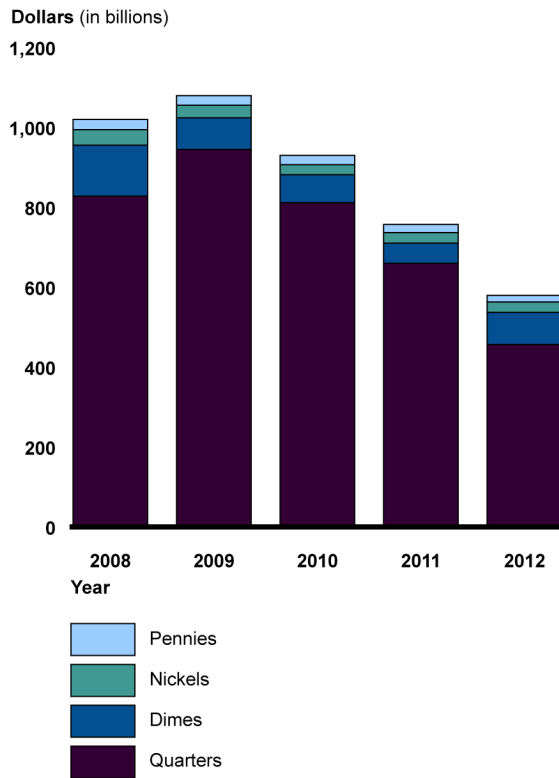
¹⁸For more information on earlier Reserve Bank coin management practices see [GAO-08-401](#).

held relative to demand. Under the centralized approach, CPO manages the distribution of coin inventory, orders new coins, and acts on behalf of the Reserve Banks in working with stakeholders.

The centralized approach to coin inventory management was set up to increase the efficiency of the coin distribution process. Since 2009, Reserve Bank inventories for pennies, nickels, dimes, and quarters have decreased due in part to the centralized program. In particular, from 2008 through 2012, the combined inventory for pennies, nickels, dimes, and quarters decreased 43 percent.¹⁹ (See fig. 3.) CPO officials have attributed these decreases in inventory and coin orders to the 2009 introduction of CPO management of the coin inventory but other factors may have also contributed to the decrease, such as the 2007–2009 financial crisis and recession, which may have affected the public’s demand for coins.

¹⁹From 2004 to 2008, Reserve Bank combined inventory for pennies, nickels, dimes, and quarters was on average about \$700 million per year. Information on the inventory of \$1 coins is presented later in this report.

Figure 3: Reserve Bank Coin Inventory, 2008–2012



Source: GAO analysis of Federal Reserve data.

As part of the centralized approach to inventory management, in 2009, CPO established national upper and lower inventory targets for pennies, nickels, dimes, and quarters to track and measure the coin inventory. CPO officials noted that these targets help meet their primary goal in managing the nation’s coin inventory: ensuring a sufficient supply of all coin denominations to meet the public’s demand. The upper national inventory target serves as a signal for CPO to reduce future coin orders from the U.S. Mint to avoid the risk of approaching coin-storage capacity limits and the lower national inventory target serves as a signal to CPO

that there is a need to increase future coin orders to avoid shortages.²⁰ According to CPO officials, they view falling below the lower targets as more problematic than exceeding the higher targets because the lower targets are designed to guard against the more serious risk of not having enough coin to meet demand. We analyzed national inventory targets from 2009 to 2012 and found that in most cases the national inventory targets were met. However, inventory exceeded the upper inventory targets in 2009 for nickels and quarters; in 2010 for nickels, dimes, and quarters; and in 2011 for quarters.²¹ In addition, the national inventory for pennies was 7 percent below the lower targets in 2012.²² See appendix II for additional information on coin inventories, orders, and circulation.

In addition to considering nationwide coin inventory, CPO reviews the daily inventories of the 200 Reserve Bank offices and coin terminals and has established upper and lower inventory levels to ensure there is a sufficient but not an excessive supply of coins at each location. Given that the coin supply at each location differs depending on that location's typical volume of coin payments and receipts, each Reserve Bank office and coin terminal is required to hold a minimum 2 weeks of "payable days" and a maximum 3 weeks of payable days in inventory.²³ Prior to 2009, there were no required inventory levels for distribution locations and coin shortages and excesses occurred in specific locations.²⁴ Since

²⁰The upper national inventory targets for 2013 are set based on the average peak Reserve Bank coin inventory from 2009 to 2010, and the lower national targets are set based on the 10 consecutive days from 2009 to 2012 when the most coin was paid to depository institutions. According to CPO officials, the lower target protects against the Federal Reserve's running out of coin during an extended period of time without deposits (10 days) and temporary dips below the lower target should not be construed as not having enough coins to meet demand during normal conditions.

²¹CPO officials attributed exceeding upper inventory targets for quarters to the end of the 50 State Quarter Program, which increased Reserve Bank inventory of quarters, and to lower demand for quarters during the financial crisis.

²²CPO told us that in 2012 Reserve Banks had a sufficient supply of pennies to meet demand and attributed not meeting the lower targets to fluctuations in the payments and receipts of pennies. The lower inventory target for pennies was decreased by approximately 10 percent from 2012 to 2013.

²³A "payable day" is the amount of coin inventory needed to meet one day of expected payments to depository institutions. Some Reserve Bank offices provide long-term storage of excess inventory of quarters, half dollars, and \$1 coins in addition to storing transactional levels of all denominations to support local demand.

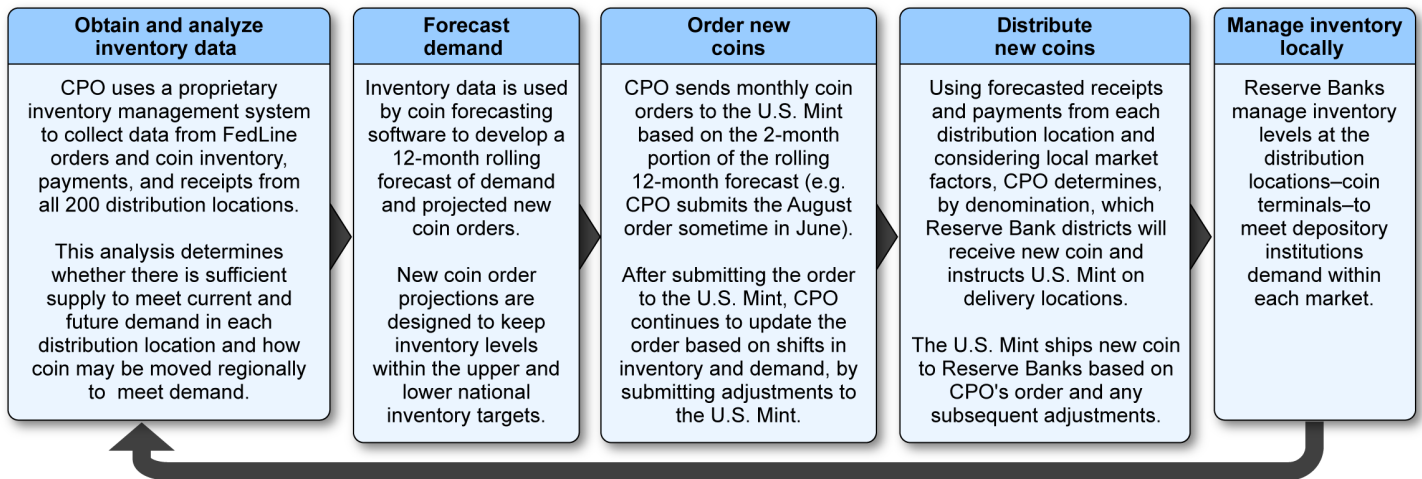
²⁴In 1999 and 2000 shortages for quarters and pennies in certain parts of the country were reported.

CPO has centralized the management Reserve Banks' coin inventory, coin terminal operators we spoke with said coin shortages are less common and that they are better able to manage their inventory and provide depository institutions with the denominations they need to fulfill public demand.

In managing the coin inventory, CPO determines if coins should be transferred from an area with more coins than needed to fulfill current and future demand or if additional coins should be ordered from the U.S. Mint. (See fig. 4.) To make this determination, CPO uses a proprietary inventory management system that collects data on inventory, receipts, and payments from the approximately 200 coin distribution locations and forecasts expected changes in coin demand for each location. Before transferring coins from one region to another, CPO considers whether a region's future demand is expected to change and considers typical seasonal shifts in coin demand and local market factors such as coin-recycling operations that could affect the flow of coins. These transfers, known as interbank transfers, according to CPO officials, are the only direct coin transportation cost to Reserve Banks because armored carriers provide local coin transportation and delivery of new coins is provided by the U.S. Mint.²⁵ Coins are also transferred between Reserve Bank offices and coin terminals within a region when distribution locations need additional coin supply or have excess coin inventory. For example, coins could be moved via interbank transfer from Reserve Bank offices in Seattle or Minneapolis to support distribution locations in Helena, Montana, and coins could be transferred among three distribution locations in Helena, a Reserve Bank of Minneapolis office, and two coin terminals. If there is an insufficient supply of coins to meet demand and transferring coins would not be cost effective, CPO orders new coins from the U.S. Mint.

²⁵Between 2009 and 2012, the average cost of an interbank transfer was around \$2,200. Our analysis of CPO and U.S. Mint data indicated that there were more interbank transfers in 2009 and 2010 than in 2011 and 2012. See figure 19 in appendix II.

Figure 4: The CPO's Process for Developing Monthly Coin Orders



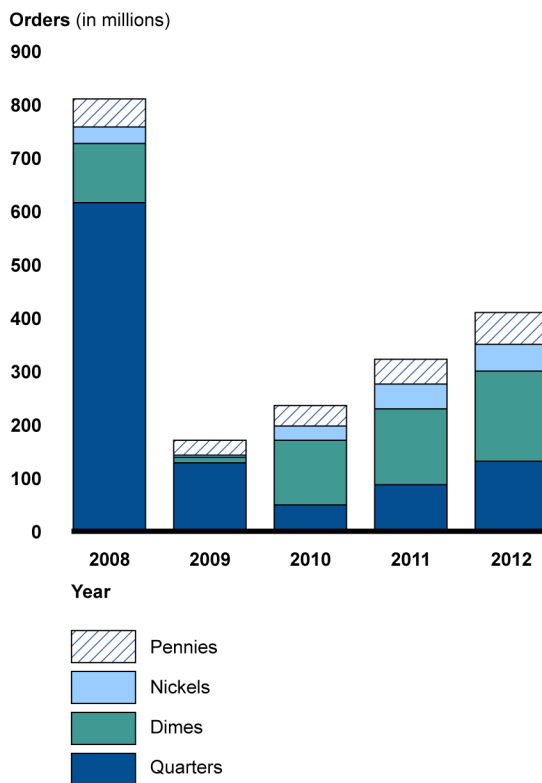
Source: GAO based on Federal Reserve information.

CPO orders new coins each month from the U.S. Mint based on its 2-month rolling forecast of expected demand, as shown above in figure 4. CPO provides a monthly order to the U.S. Mint about 2 months prior to expected delivery (e.g., CPO submits the August order in June), and to help the U.S. Mint prepare for potential future orders, CPO provides estimates of projected demand and new coin orders for up to the next 12 months. After submitting orders to the U.S. Mint, CPO may increase an order or defer shipments to later months based on updated information. In part to respond to these changes, each month the U.S. Mint produces a safety stock of coins. If this stock is not applied to the current order, it is used to fill future orders.²⁶ After the new coins are produced, based on expected demand, CPO determines which Reserve Bank will receive new coins, and then Reserve Banks determine which offices and coin terminals will receive them. From 2008 to 2009, new coin orders for pennies, nickels, dimes, and quarters decreased by 79 percent; however,

²⁶On a monthly basis, the U.S. Mint produces safety stock equivalent to the average deviation between past CPO initial orders and actual shipments. In addition to helping the U.S. Mint respond to changes in monthly coin orders, producing safety stock also helps the U.S. Mint respond to seasonal changes in coin demand.

since 2010 new coin orders have increased annually.²⁷ (See fig. 5.) According to CPO officials, the 2009 introduction of centralized coin management led to the reduction in coin inventories and the more recent increases in coin orders reflect a return to a more normal ordering pattern that is closely aligned with payments to circulation and receipts from circulation. However, other factors may have also contributed to decreased new coin orders in 2009, such as the 2007-2009 financial crisis and recession, which may have affected the public's demand for coins.

Figure 5: Value of New Coin Orders by Denomination, 2008–2012



Source: GAO analysis of Federal Reserve data.

²⁷ Between 2004 and 2007, more than \$900 million worth of new pennies, nickels, dimes, and quarters were ordered each year. Information on orders of \$1 coins is presented later in this report.

Contract with Coin Terminal Operators

In 2011, on behalf of Reserve Banks, CPO developed and negotiated a contract with coin terminal operators, which standardized procedures and internal controls for the storage and handling of coins across all Reserve Bank districts. Prior to this contract, each Reserve Bank negotiated its own contract with coin terminal operators that operated in its district. We spoke with 5 of the 15 coin terminal operators, and they reported satisfaction and efficiency gains with the standardized contract and CPO's centralized management. For example, one coin terminal operator told us that the Federal Reserve's centralized approach allows coin terminal operators to manage their business proactively rather than reactively. Among other things, the contract requires coin terminals to use FedLine to order new coins and track changes to Reserve Bank coin inventory held by the coin terminal. Coin terminal operators have told us that FedLine works more effectively than the earlier ad-hoc communications to order coin and track inventory that preceded it.

Coin Management Costs

In 2012, Reserve Bank costs related to coin management were about \$62 million or 14 percent of the estimated \$449 million that coins indirectly cost the U.S. government.²⁸ These costs included CPO's administration, coin handling, and interbank coin transfer costs.²⁹ The remaining 86 percent of U.S. government costs include about \$387 million for the U.S. Mint's production and distribution of new coins. In addition, the government earns a return on the issuance of coins to the extent that production and distribution costs are less than the face value of the coins put into circulation—this value to the government is known as seigniorage. The U.S. Mint reported that in 2012 the government received about \$106 million in seigniorage because the face value of coins produced was \$493 million, and the U.S. Mint's cost of producing and distributing them was \$387 million.³⁰

²⁸These costs are indirect costs to the government because the Federal Reserve and U.S. Mint incur the costs and the amounts they remit to the U.S. Treasury are less the costs related to coins.

²⁹In 2012 there were about 600 interbank transfers costing about \$1.3 million. For more information on interbank transfer expenses see figure 19 in appendix II.

³⁰Since 2006, the costs of producing pennies and nickels have been above the face value of these coins. For example, in fiscal year 2012, the penny cost the U.S. Mint 2 cents to produce. This represents negative seigniorage because the face value was less than the cost of production for these denominations.

The Federal Reserve's 2012–15 strategic plan includes an objective to use financial resources efficiently and effectively.³¹ In addition, according to COSO, as part of the internal control process management should ensure that operations, such as managing an inventory, are efficient and cost effective, and this process includes monitoring costs and using this information to make operational adjustments.³² To monitor costs related to coin and note operations, CPO officials said they review currency management costs—which include costs related to both coins and notes—at the national level because individual Reserve Banks may vary in their accounting for operational costs related to coins and notes.³³ When we reviewed currency management costs at the national level using data provided by CPO, we found that from 2008 through 2012 total annual Reserve Bank currency management costs increased by 23 percent.³⁴ (See fig. 6.) Cost information for coins and notes is available separately; however, CPO does not separately monitor coin costs.

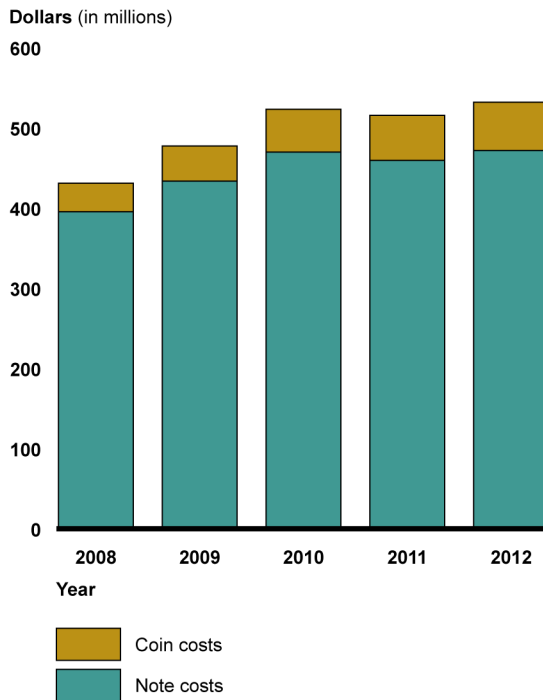
³¹Federal Reserve, *Strategic Framework 2012-15* (2013).

³²Committee of Sponsoring Organizations of the Treadway Commission, *Internal Control—Integrated Framework* (1992).

³³Each Reserve Bank independently manages and is responsible for establishing and maintaining internal controls over its financial reporting and recording. The Federal Reserve's cost accounting system allocates costs based on the percentage of time employees spend on an activity, and Reserve Banks may vary in their assignment of activity costs across locations within their districts. In addition, personnel allocate their time across activities such as note processing and destruction or coin paying, receiving, and verification, rather than directly charging specific time to a function such as coin management. According to CPO officials, the amount of time spent on an activity is determined through an annual employee survey that tracks the time employees spend on various activities.

³⁴In 2012, costs related to coins represented 11 percent of overall currency management costs, and currency management costs represented approximately 21 percent of Reserve Bank costs. From 2008 to 2012, Reserve Bank currency management direct costs increased by 10 percent and support costs increased 30 percent. In addition, from 2008 through 2012, according to the Federal Reserve's Annual Budget Reviews, overall Reserve Bank operation costs increased by 49 percent from \$1.7 billion to \$2.5 billion.

Figure 6: Reserve Bank Costs Related to Coin and Notes, 2008–2012



Source: GAO Analysis of Federal Reserve Data.

Our analysis of coin management costs, using CPO data, indicates that coin management costs increased by 69 percent from 2008 through 2012. CPO officials attributed the increase in coin management costs to support costs, which increased by 80 percent during that time period, from \$24.5 million in 2008 to \$44.1 million in 2012.³⁵ (See fig. 18 in app. II.) Support costs include utilities, facilities, and information technology as well as other local and national support services such as CPO’s services. According to CPO officials, support costs are influenced by a variety of factors, including the number and size of operating units at each location. Also, with the consolidation of some operating units, such as check processing, other operations, including coin management, have absorbed

³⁵Between 2008 and 2012, similar to currency management costs, direct costs represented about 30 percent of coin management costs and support costs represented the remaining 70 percent.

a higher percentage of support costs, according to these same officials. They further explained that direct costs—which include personnel and equipment—represent their primary measure of Reserve Bank coin operation costs. We found that direct costs for coin operations increased by 45 percent during this period; about \$5 million across the 28 Reserve Bank offices. According to CPO officials, the increase in direct costs can be largely attributed to an increase in personnel costs, which may be influenced by volume of coin bags handled onsite and the number of coin terminals serviced.³⁶ By not separately monitoring coin costs, the Federal Reserve may be missing opportunities to assess and improve the cost-effectiveness of its coin operations.

In addition, we also reviewed coin management costs at each Reserve Bank and found that the rates of increasing coin-management costs differ across Reserve Banks. Using data provided by CPO on individual Reserve Banks' costs, we found that from 2008 through 2012, coin management costs increased for all Reserve Banks with the increases ranging from a low of 36 percent to a high of 116 percent.³⁷ To account for variations in the volume of coins handled by individual Reserve Banks, we also reviewed the average cost per bag handled by Reserve Banks and found that in 2012 it ranged from about \$2 to \$57 per coin bag.³⁸ CPO officials attributed variations in Reserve Bank coin management costs to different operational practices such as outsourcing coin handling to coin terminals and differences in direct and support costs.³⁹ While outsourcing coin handling may decrease some costs as personnel are not required at the Reserve Bank location to perform these services, it may also increase other costs related to daily management and periodic auditing of these outsourced services. Without taking steps to identify and share cost-effective coin management practices across Reserve Banks,

³⁶From 2008 through 2012, across the 28 Reserve Bank locations personnel costs increased from about \$9 million to about \$13 million and the average number of personnel increased from about 110 to 135.

³⁷Costs related to centralized coin management—such as CPO operations—are distributed across the individual Reserve Banks.

³⁸Federal Reserve coins are transported and distributed in standard-sized bags. These standard bags of loose coins (new and circulated coins) contain \$50 in pennies, \$200 in nickels, \$1,000 in dimes, \$1,000 in quarters, \$1,000 in half dollars, and \$2,000 in \$1 coins.

³⁹According to CPO officials, two of the 28 Federal Reserve offices fully outsource coin services to coin terminals in their markets, and the other 26 Reserve Bank offices provide coin services on-site.

the Federal Reserve may be missing opportunities to support more efficient and effective use of Reserve Bank resources. Moreover, more efficient management of the coin inventory may contribute to cost savings and additional funds returned to the General Fund.

The Federal Reserve Follows Some Key Practices in Managing the Circulating Coin Inventory but Lacks Performance Information for Additional Metrics and Forecasting

In managing the circulating coin inventory, we found that the Federal Reserve follows key practices for collaboration and risk management and partially follows key practices for performance metrics, forecasting demand, and system optimization. To effectively manage inventory, private and governmental organizations involved in production and distribution operations use supply-chain and operations-management practices. We identified five key supply-chain practices—collaboration, risk management, performance metrics, forecasting demand, and system optimization—and selected supporting characteristics applicable to coin inventory management to assess the Federal Reserve’s management of the circulating coin inventory.⁴⁰ (See table 1.) These key supply-chain management practices are closely related, and improvements or shortfalls in one practice may contribute to improvements or shortfalls in another practice. In addition, establishing, documenting, and following these practices and their supporting characteristics contribute to a more effective inventory management system.

Table 1: Key Practices for Managing the Circulating Coin Inventory

Key practice	Definition and selected supporting characteristics	GAO assessment
Collaboration	<p>Maintain working relationships with partner entities across the supply chain by establishing policies, roles and responsibilities, and mechanisms for sharing information.</p> <ul style="list-style-type: none"> Develop and use policies or guidelines governing relationships with partner entities. Establish agreed upon roles and responsibilities with partner entities. Develop and use mechanisms for sharing information related to the circulating coin inventory with partner entities. 	●

⁴⁰For additional information on these key practices and supporting characteristics as well as our analysis for each supporting characteristic, see appendix III.

Key practice	Definition and selected supporting characteristics	GAO assessment
Risk management	<p>Plan and prepare for risks related to unanticipated events that could disrupt the normal flow of the system.</p> <ul style="list-style-type: none"> Identify sources of potential disruptions. Assess the potential impact of the risk. Develop and use plans to mitigate the risk. 	●
Performance metrics	<p>Establish, track, and reevaluate goals or metrics to measure change or improvement in a process or performance area.</p> <ul style="list-style-type: none"> Develop and use reasonable metrics that are clearly defined, measurable, actionable, relevant, and timely. Track progress against those metrics or targets. Establish and implement a process to reevaluate metrics or targets. 	◐
Forecasting demand	<p>Prepare for and estimate expected changes in future demand and plan and make decisions based on these estimates.</p> <ul style="list-style-type: none"> Have a process in place to forecast demand. Use forecast results to plan and manage the circulating coin inventory. Assess forecast accuracy. 	◐
System optimization	<p>Consider, as a whole, the strategic interactions and operations of the entire supply chain or inventory process in developing process change.</p> <ul style="list-style-type: none"> Obtain access to information and resources from across the circulating coin supply chain. Use information and resources to identify and implement efficiencies within the supply chain. 	◐

● Key practice followed or substantially followed—plans, policies, or processes have been developed and implemented properly for all or nearly all of the supporting characteristics

◐ Key practice partially followed—plans, policies, or processes have been developed and implemented properly for some of the supporting characteristics

○ Key practice minimally or not followed—plans, policies, or processes are lacking for all or nearly all of the supporting characteristics

Source: GAO analysis of literature and Federal Reserve practices.

Key Practices Followed

Collaboration

The Federal Reserve follows the key practice of collaboration through its relationships with supply chain stakeholders, including Reserve Banks, coin terminal operators, depository institutions, and the U.S. Mint. CPO has developed policies and guidelines governing relationships with each of its partner entities. For example, as previously discussed, in 2011 CPO introduced a contract with coin terminal operators, which includes a manual of operations that standardized procedures and internal controls for handling Reserve Bank coins. CPO has also agreed upon roles and responsibilities with partner entities. For example, U.S. Mint officials told us that as part of the coin supply chain, they deal almost exclusively with CPO to manage day-to-day operations and interbank coin transfers. The U.S. Mint arranges coin transportation across Reserve Banks, and CPO reimburses the U.S. Mint for the cost of this transportation. CPO has multiple mechanisms, such as stakeholder working groups, for sharing information related to the circulating coin inventory with partner entities. Reserve Banks, coin terminal operators, depository institutions, and the U.S. Mint reported to us that they are generally satisfied with their relationships with CPO.

Risk Management

The Federal Reserve follows the key practice of risk management because it has identified sources of potential disruptions, assessed the potential impact of risk, and developed plans to mitigate risk at multiple levels of operations, including Reserve Bank, FedLine, and coin inventory management operations. For example, the lower national-inventory targets are set based on the highest consecutive 10-day gross pay period from 2009 to 2012 because, according to CPO officials, the U.S. Mint can produce and deliver new coins within 10 days. Therefore, the lower inventory target guards against a coin shortage if a disruption prevented circulating coin payments from depository institutions. In addition, risk management for the circulating coin inventory is built into the Federal Reserve's overall risk management and contingency protocols. For example, each Reserve Bank has a designated "buddy bank" to perform its functions—including coin circulation activities—if it is unable to operate due to a disruption. According to CPO officials, as soon as disruption is anticipated, they begin planning with stakeholders operating in the affected area, including Reserve Bank officials, coin terminal operators, and depository institutions. Continuity plans are also in place for Federal Reserve services such as FedLine. The FedLine website includes information on the types of potential disruptions, such as system outages

or closures of Reserve Bank or coin terminal operations by inclement weather or other events, and what depository institutions and armored carriers should do in the event of a disruption.

Key Practices Partially Followed

Performance Metrics

The Federal Reserve partially follows the key practice of performance metrics because its use of performance metrics is limited to inventory targets and it has not developed other goals or metrics related to coin-supply chain management. CPO has established, tracks, and annually reevaluates performance metrics in the form of upper and lower inventory targets for pennies, nickels, dimes, and quarters. In addition, CPO closely monitors “net pay” to measure how well they are meeting general demand nationwide and at individual locations.⁴¹ However, CPO has not established additional management goals or metrics to measure other aspects of its management such as costs because, as discussed earlier, CPO’s primary goal is to ensure a sufficient supply of all coin denominations are available to meet the public’s demand. Federal agencies have been required to develop performance goals and measure and report on their progress in achieving these goals since the Government Performance and Results Act (GPRA) was enacted in 1993.⁴² Although the Federal Reserve is not covered by GPRA, the Board has chosen to voluntarily comply with the spirit of the act. In addition, our previous work on managing results has shown that agencies should identify goals and establish a suite of performance metrics to determine

⁴¹The difference between payments to and receipts from depository institutions is referred to as “net pay” and is used by CPO to help determine general coin demand nationwide and at individual locations.

⁴²GPRA sought to focus federal agencies on performance by requiring agencies to develop long-term and annual goals—contained in strategic and annual performance plans—and measure and report on progress towards those goals on an annual basis (Pub. L. No. 103-62, 107 Stat. 285 (Aug. 3, 1993)). The GPRA Modernization Act of 2010 (GPRAMA) enhances GPRA and provides important tools that can help inform congressional and executive branch decision making to address challenges the federal government faces (Pub. L. No. 111-352, 124 Stat. 3866 (Jan. 4, 2011)). Among other things, GPRAMA requires that agencies establish priority goals and metrics and report on them quarterly. These goals include performance and efficiency improvements to program activities, regulations, policies, and agency management.

Forecasting Demand

whether they are meeting those goals.⁴³ We have identified customer satisfaction, efficiency, and costs, among others, as performance metrics that can be used to measure an agency's progress towards its goals.⁴⁴ Moreover, costs are among the common performance measures used in supply chain management. The Australian, Austrian, and Canadian mint and central bank officials we interviewed have established multiple performance goals and metrics for their coin inventory management.⁴⁵ For example, the Royal Australian Mint and its commercial bank partners have established targets to reduce coin holdings that will result in reducing the cost of freight and other related coin expenses. Further, the Royal Australian Mint tracks and monitors coin management costs to ensure that they are progressing towards their targets.

We found that the Federal Reserve partially follows the key practice of forecasting demand because it forecasts future coin demand and uses this information to make decisions, but does not systematically track the accuracy of its monthly forecasts compared to the final coin orders. As discussed previously, CPO has a process in place to forecast demand by tracking current inventory, payments, and receipts and using this information to calculate expected future demand. These forecasts are then used to plan and manage the circulating coin inventory, including decisions on coin transfers and new orders. CPO officials told us they review their annual forecasts, and have found their forecasts for payments and receipts are within 10 percent of actual orders for pennies, nickels, dimes, and quarters. However, CPO has taken minimal steps to assess monthly forecast accuracy.⁴⁶ CPO officials told us that they

⁴³GAO, *Managing for Results: Executive Branch Should More Fully Implement the GPRM Modernization Act to Address Pressing Governance Challenges*, [GAO-13-518](#) (Washington, D.C.: June 26, 2013).

⁴⁴GAO, *Managing for Results: Enhancing Agency Use of Performance Information for Management Decision Making*, [GAO-05-927](#) (Washington, D.C.: Sep. 9, 2005) and GAO, *Managing for Results: A Guide for Using the GPRM Modernization Act to Help Inform Congressional Decision Making*, [GAO-12-621SP](#) (Washington, D.C.: June 15, 2012).

⁴⁵In addition to producing and issuing coins, the Australian, Austrian, and Canadian mints are responsible for distributing coin and managing their circulating coin inventories.

⁴⁶Various methods can be used to assess forecast accuracy. Examples of methods commonly used in operations management include mean absolute deviation, absolute percent of error, and tracking signal. Tracking signal can be used to assess bias in a forecast by measuring the variation between the forecast and demand for several consecutive periods.

compare their initial coin orders to net pay, but do not track the accuracy of their monthly forecasts because seasonal shifts in coin demand make reviewing annual trends more useful for their purposes.⁴⁷ Our analysis of initial monthly CPO coin orders and actual U.S. Mint coin shipments from 2009 through 2012 indicates that initial orders were consistently less than the final orders (i.e., U.S. Mint shipments of new coin). APICS—an operations management industry association that offers professional certifications—recommends that forecasting results must be continuously monitored and a mechanism should be in place to revise forecasting models as needed and that if the forecast consistently exhibits a bias, the forecast should be adjusted to match the actual demand.⁴⁸ According to the Logistics Management Institute, accurate forecasts result in effective and efficient inventories, whereas inaccurate forecasts often cause inventory excesses and shortfalls.⁴⁹ In addition, inventory management experts told us that accurate forecasts would make the Federal Reserve better able to respond to changing trends in coin demand, as discussed later in this report. Taking additional steps to assess forecast accuracy could help CPO identify the factors influencing forecast accuracy and then adjust forecasts to improve accuracy.

System Optimization

Although CPO has multiple systems that provide information from across the supply chain, we found that it partially follows the practice of system optimization because this information is not currently used to better understand some additional aspects of its coin management activities to optimize the efficiency of the circulating coin inventory. As discussed earlier, CPO has access to information and resources from across the circulating coin supply chain. This access includes information on actual and forecasted coin demand and Reserve Bank coin management costs, as well as information from stakeholders, such as new coin delivery information from the U.S. Mint. In addition, the Federal Reserve has taken some steps to identify areas where they could gain incremental efficiency

⁴⁷According to CPO officials, demand for coin fluctuates throughout the year based on seasonal changes in public demand and receipts from depository institutions and these fluctuations in coin demand can be volatile. For more information on seasonal fluctuations in coin demand see fig. 13 in appendix II.

⁴⁸APICS, *Principles of Operations Planning: Demand Management* (Chicago, IL: 2013).

⁴⁹Logistics Management Institute, *Lifecycle Forecasting Improvement: Causative Research and Item Introduction Phase*, Report DL920T1 (November 2010).

improvements such as the centralized management of the coin inventory and note-processing efficiencies, which we discuss later.

However, CPO could improve its use of information and resources to identify and implement efficiencies within the supply chain by using the range of information available to establish and track performance metrics to measure progress. For example, the U.S. Mint's monthly production of new coins could be more efficient with improvements to the accuracy of initial new coin orders. Currently, the U.S. Mint produces a safety stock, in part, to ensure it is able to produce enough coins to fulfill CPO's final, adjusted order.⁵⁰ More accurate monthly forecasts and coin orders could lessen the need for the U.S. Mint to produce safety stock, and thus help to optimize the efficiency of the supply chain. In addition, if CPO used its information on Reserve Bank coin management costs and its knowledge of coin management operations across the 12 Reserve Banks, it could help to identify factors that have contributed to varying coin-management costs at individual Reserve Banks and opportunities for cost savings that could limit rising costs. Better information related to forecast accuracy and costs could also aid CPO in using its information and resources to identify inefficiencies and support system optimization. Further, optimizing U.S. Mint and individual Reserve Bank operations could potentially contribute to reducing U.S. Mint or Federal Reserve costs related to circulating coins, a reduction that could potentially increase the amount of money returned to the General Fund.

⁵⁰Producing "safety stock" also helps the U.S. Mint respond to seasonal changes in coin demand. The U.S. Mint can smooth production throughout the year rather than ramp production up or down in response to seasonal increases or decreases in demand. Regarding the use of safety stock for meeting adjustments in monthly orders, according to U.S. Mint officials, the costs related to storing this stock are less than the alternative of hiring additional staff or paying overtime to produce more coins if additional production was required to meet the final order. Thus, the benefit of holding safety stock relates both to promoting level-loading production over the course of time as well as helping to ensure that adequate stock is on hand even if final coin orders exceed initial forecasted orders.

Demand for Currency Expected to Decline Gradually in the Near Term, but a Variety of Factors Make Predicting Longer-Term Change Difficult

Potential Changes in Demand for Currency

To collect data and information on potential changes in the demand for currency, the Federal Reserve has conducted studies and outreach with groups such as depository institutions and merchants, and found a general consensus that the use of currency may decline slightly in the near term. According to the Federal Reserve, this expectation is due, in part, to an increase in alternative payment options. Federal Reserve officials we met with described how interrelated factors make it difficult to predict long-term (i.e., 5 to 10 years) currency demand. The factors the Federal Reserve identified as influencing currency demand and the mechanisms used to supply that demand include the relative costs and benefits of currency versus other forms of payment, the level of economic activity and other economic conditions, technological change, and regulations and policies. Federal Reserve officials explained that how these factors will play out in the years ahead is unknown, and therefore the magnitude of the change in demand for currency is uncertain.

According to many agency officials, stakeholders, and foreign government officials we spoke to, while there may be changes in the use of various types of payments in the coming years, the effect on currency demand is likely a gradual decline. Thus far, Federal Reserve officials noted that their research indicates that the amount of currency in circulation continues to rise and currency usage is currently steady.⁵¹ Federal Reserve studies and data also indicate electronic payment options have increased over time. For example, in a 2010 study, the

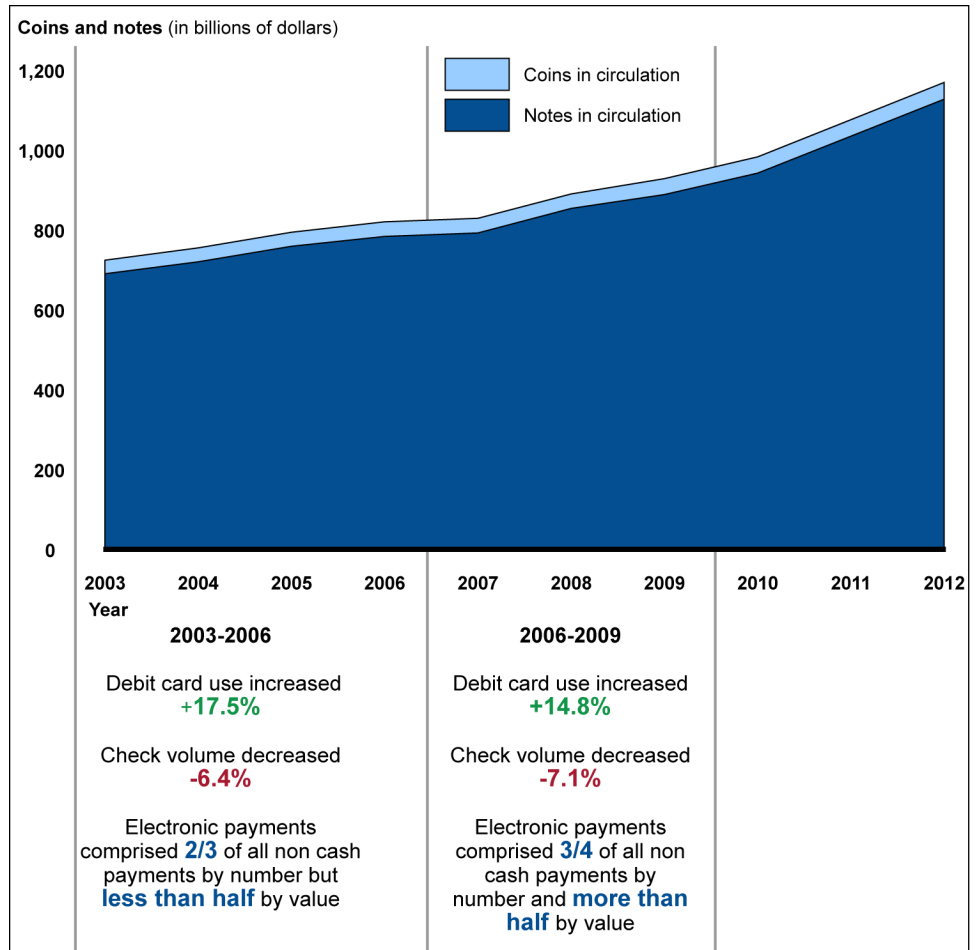
⁵¹Traditionally, as the economy and population grow, the demand for currency also grows. However, it is difficult to know whether this relationship might change in the future if, as expected, financial transactions become increasingly conducted electronically.

Federal Reserve reported that the number of non-currency payments—including credit card and debit card payments, among others—increased 4.6 percent per year from 2006 to 2009.⁵² Since 2006, the debit card has surpassed the check as the most used non-currency payment method, with the number of debit card transactions increasing 14.8 percent per year from 2006 to 2009. Over the same period, check volume decreased 7.1 percent per year. Many stakeholders noted that even with changes in non-currency payments, the effect on currency demand is likely to be gradual. For example, BEP officials stated that the increasing use of electronic payments has not had a major impact on demand for currency. Further, these officials said demand for currency may even increase and that growing use of electronic and mobile payments will likely affect checks more than currency. Royal Australian Mint officials also stated that while the use of electronic payment methods is expected to increase as new technologies emerge, how fast and when such a change will occur is unclear.

While data on credit card usage and electronic transactions are available, the volume of currency transactions is difficult to measure. Specifically, other data sources cannot be used to determine what portion of the currency in circulation is being used for transactions—for example, some currency in circulation are stored, as opposed to being deposited or used for commerce. As the use of non-currency payment methods has increased, the quantity of notes in the economy has also grown. According to Federal Reserve data, the number of transactional notes (i.e., \$1s, \$5s, \$10s, and \$20s) in circulation has increased steadily from approximately 19.6 billion pieces in 2009 to 21.8 billion pieces in 2012. During this period, the value of currency in circulation rose approximately 26 percent. (See fig. 7.) Coin terminal operators noted that there will be a continued need and demand for coins and notes, particularly because there will always be some portion of the population who will only use currency, such as individuals without bank accounts, or “the unbanked.”

⁵²Federal Reserve System, *The 2010 Federal Reserve Payments Study* (2011). This study includes the most recently available data on payment trends. The 2013 study will present similar data for 2009–2012 and is expected to be complete later this year.

Figure 7: Currency in Circulation and Examples of Changes in Non-Currency Payments



Source: GAO analysis of Treasury circulation estimates and 2007 and 2010 Federal Reserve Payments Study data.

Note: The Federal Reserve's 2013 Payments Study will include similar debit card, check volume, and electronic payment trends for the period from 2009-2012, but is not expected to be completed until late 2013.

Addressing Changes in Demand for Currency

Federal Reserve officials expect that their current procedures and approach to managing the coin and note inventory—including their forecasting and monitoring of the coin inventory targets discussed previously—will allow the agency to accommodate gradual shifts in demand. For example, to respond to increasing or decreasing demand for coins and notes, CPO can decrease or increase coin orders from the U.S. Mint and the Board can decrease or increase note orders from BEP.

Specifically, in 2012 the Federal Reserve assessed how notes received from circulation are processed and determined that current operations can handle a significant change in volume—either an increase or a decrease—without significant change to the operating model and staffing levels. Nonetheless, according to the officials, CPO is continually working to identify ways to streamline its processes to be more flexible and adaptable to changes. In addition, CPO and the Reserve Banks have established risk management plans and procedures to address the effects associated with a short-term, unexpected change in coin and note demand—such as from a natural disaster.

Other experts and foreign officials agree that well-managed currency systems are capable of handling major trend-based changes. According to inventory management experts we consulted, a key to effectively managing a supply chain is dependable forecasts. Effective forecasts would take both trends and cyclical demand changes into account. Therefore, combining forecasts with continual tracking of demand and inventory levels should allow the Federal Reserve to be able to adapt to any major trend-based changes in coin and note demand. As discussed earlier, this makes accurate forecasting by the Federal Reserve even more important. Royal Australian Mint officials also stated that by routinely monitoring activities such as coin trades and transfers between and among institutions, any changes in these or other measures would give officials insight on specific ways in which demand was changing, which would ultimately allow for adjustments in the volume of coins being circulated, responding to public demand.

While Federal Reserve officials we met with indicated their current processes should enable them to adapt to gradual changes in coin and note demand, a significant and unexpected change could affect the management of the coin and note inventories. According to Federal Reserve officials and some coin terminal operators we met with, the elimination of the \$1 note for the \$1 coin would be the type of event that could significantly affect demand for a specific coin denomination, and it would have implications for the overall management of both the coin and note inventory. For example, Federal Reserve officials stated that replacing the \$1 note with the \$1 coin would likely require increases in coin vault space and manpower as well as improvements in coin authentication technologies. CPO officials also said that if a large decline in coin usage occurs, they would adapt their management of the inventory in response. For example, if demand for coins were to decrease suddenly, leaving too many coins in circulation, the Federal Reserve would first stop ordering new coins from the U.S. Mint, and would then

focus on storing the excess coin inventory. Coin attrition would reduce this inventory over time, and CPO officials anticipate that they would have sufficient storage capacity available to accommodate the excess coins. CPO officials told us that inventory levels would need to be well in excess of the existing targets before they would have an effect on storage capacity and related costs. Further, if public demand for coins decreased substantially, additional storage could be needed to accommodate and store the coins returned by depository institutions to the Reserve Banks. Coin terminal operators also did not expect a decrease in coin demand significant enough to exceed their storage capacity.

In 2010, CPO began to develop a long-term strategic framework to consider potential changes to currency demand over the next 5 to 10 years and how this change could affect CPO's operations. According to Federal Reserve officials, while the future is inherently uncertain, this framework is an internally focused effort to help them share information, refine internal operations, and monitor trends. The Federal Reserve has not established deadlines for completing this effort, but CPO officials said they continue to share what they are learning from data and other research, and they continue to assess current coin distribution and note-processing operations. The following activities are components of these efforts:

- *Engaging system stakeholders.* As an initial step, CPO officials interviewed stakeholders such as depository institutions, armored carriers, equipment vendors, merchants, and alternative payment providers to collect information and perspectives on potential changes in currency demand. Groups such as the Customer Advisory Council and the Cash Advisory Group also continue to serve as a mechanism for the CPO to coordinate and collect data and information on currency activity nationwide.
- *Examining internal operations for coin distribution and note processing.* CPO officials have sought to increase the efficiency of coin-distribution and note-processing operations to better position the agency to adapt to future changes in demand. For example, the Federal Reserve enhanced its note sensor technology in 2010, improving the efficiency of note processing operations by nearly 10 percent, according to CPO officials. CPO officials told us that they continue to look for other areas to incrementally improve and add additional flexibility in their operations. Incremental improvements such as those related to note processing activities could contribute to supply-chain system optimization, as discussed earlier.

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- *Conducting research.* The Federal Reserve continues to conduct research and analysis related to Reserve Bank operations. For example, one Reserve Bank is conducting the most recent in a series of triennial payment studies, which it expects to complete later this year, to determine the current volume and composition of electronic and check payments, reporting trends in these payments since 2009. As part of a broader effort to look at trends in various payment types, another Reserve Bank is examining the detailed spending habits of a selection of consumers, who were asked to document their transactions and payment decisions over a period of time in a shopping “diary.” Because, as previously noted, determining how much of the currency in circulation is being used for transactions is difficult—this type of study can help officials better understand currency use in the United States. The diary study is expected to be completed and published later this year, and CPO officials told us they plan to assess and incorporate relevant findings into their currency management operations.

Australian, Austrian, and Canadian officials we interviewed are also exploring the potential impact of alternative payment technologies and continue to analyze past trends and to collect new data to inform these research efforts. For example, Austrian and Canadian officials have also conducted diary studies to better understand individuals’ use of various payment options. Collecting detailed consumer payment information through these types of studies can help officials in these countries better understand consumers’ payment and currency management habits.

The Federal Reserve Is Managing the Existing \$1 Coin Inventory, Took Steps to Meet Demand for Circulation, and Plans No Future Action

Management of the \$1 Coin Inventory

The Federal Reserve manages the \$1 coin inventory as it does all other coin denominations, overseeing the distribution of coins produced by the U.S. Mint and those already in circulation.⁵³ The Federal Reserve's goal, based on its statutory responsibilities, is to ensure that sufficient supplies of coins are available to meet demand nationwide.⁵⁴ According to Federal Reserve officials, from an operational perspective, the Federal Reserve fills all orders it receives and treats all denominations of coins and notes the same.

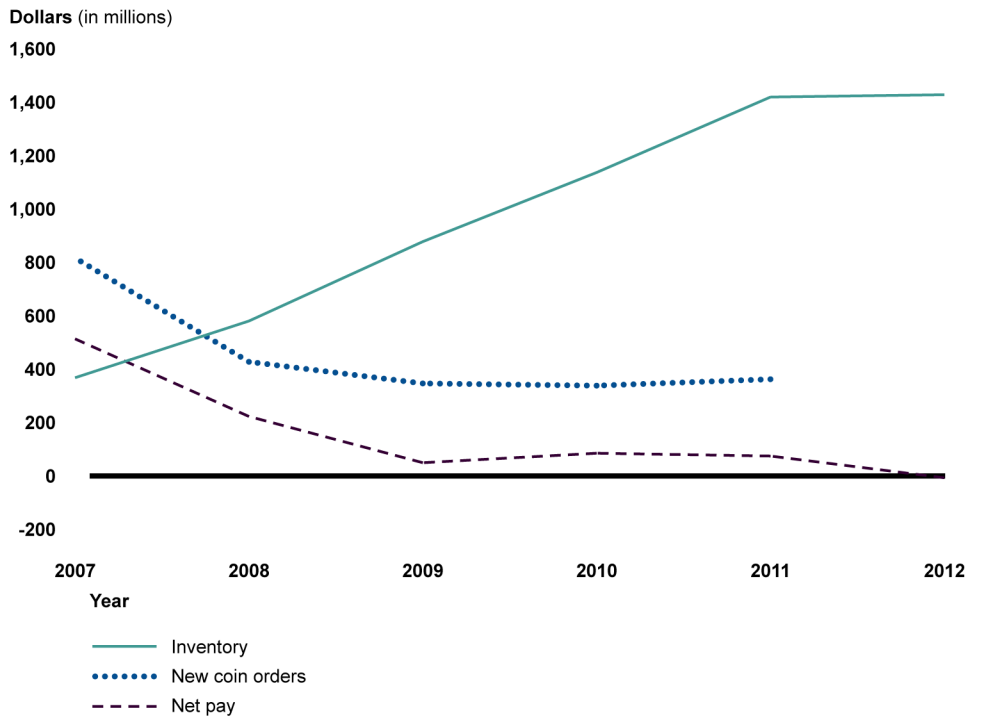
Reserve Banks held approximately \$1.4 billion in \$1 coin inventory as of March 2013. According to the Federal Reserve's *2013 Annual Report to Congress*, this inventory level is sufficient to meet the demand for \$1 coins for more than 40 years assuming a continuation of the current level of demand. Federal Reserve officials told us the annual net demand for \$1 coins was approximately \$51 million per year from 2010 through 2012. Inventory increased steadily with the issuance of the Presidential Coin series beginning in 2007, but has leveled off since the 2011 Treasury decision to cease production of new \$1 coins for circulation (see fig. 8).⁵⁵ In addition, \$1 coin payments to depository institutions have declined from \$804 million in 2007 to \$245 million in 2012, while receipts from depository institutions generally increased until 2012. In 2012, because there was less public demand for \$1 coins than were in circulation, Reserve Banks received more \$1 coins back than they paid out, as indicated by net pay in figure 8.

⁵³Due to the December 2011 Treasury decision to cease production of new \$1 coins for circulation, the Federal Reserve's current management of the \$1 coin inventory is focused on managing those \$1 coins already in storage or circulation.

⁵⁴12 U.S.C. § 418.

⁵⁵Although production of circulating Presidential \$1 Coins was suspended in 2011, collectible versions continue to be available through the U.S. Mint's website. The public and collectors are able to directly order Presidential \$1 coin rolls, bags, and boxes.

Figure 8: \$1 Coin Inventory, Net Pay, and New Coin Orders, 2007–2012



Source: GAO analysis of Federal Reserve data.

Note: Net pay is the difference between coin payments to depository institutions and coin receipts from depository institutions over a given period of time.

According to Reserve Bank officials, depository institution representatives, coin terminal operators, and vending machine industry representatives we met with, \$1 coins are readily available to the public throughout the country. Most of the officials and representatives told us that they do not have problems obtaining \$1 coins or supplying them to their customers, but emphasized that there is low public demand for these coins. For example, Reserve Bank officials in the Cash Advisory Group said that \$1 coins are available at their locations nationwide and that they are able to fill customers' orders as needed. Depository institution representatives on the Customer Advisory Council told us their depository institutions routinely fill \$1 coin orders for organizations with standing orders—such as transit agencies or vending machine companies—but that requests from the general public are rare. A Federal Reserve coin terminal we visited also had an inventory of \$1 coins, and officials there told us that while they generally receive \$1 coin deposits, withdrawals are rare. In contrast, representatives from the Dollar Coin Alliance said that

there is limited commercial and public access to the \$1 coin and that some alliance members have had difficulty obtaining the coins from depository institutions. According to these representatives, the Federal Reserve's treatment of \$1 coins—in particular, a limited ordering period for new \$1 coins featuring a specific president—has hampered successful circulation.⁵⁶ However, other depository institution and industry representatives we met with did not identify similar access or availability issues.

Federal Reserve Actions to Overcome Barriers to Circulation

Beginning in 2007, in response to a requirement in the Presidential \$1 Coin Act of 2005, the Federal Reserve took steps to identify and overcome barriers to circulation of the \$1 coin early in the Presidential \$1 Coin program. The Presidential \$1 Coin Act requires Treasury and the Federal Reserve to identify, analyze, and overcome barriers to the “robust circulation” of \$1 coins, including improved methods of distribution and circulation, and improved public education and awareness campaigns.⁵⁷ Beginning in 2007, the Federal Reserve met regularly with depository institution representatives to gather feedback about demand for \$1 coins and identify potential barriers to circulation. In its *2007 Annual Report to Congress on the Presidential \$1 Coin Program*—a statutorily required annual report—the Federal Reserve outlined actions it had taken to eliminate identified barriers, including developing \$1 coin distribution plans, establishing a special ordering period for new coins along with special packaging and order sizes, and communications with industry and other federal agencies.⁵⁸ In addition, the Federal Reserve and U.S. Mint conducted national and local outreach with coin user groups to gather input and help plan for the introduction of the new coins. According to Federal Reserve officials, most efforts began in 2007 and continued until the 2011 Treasury decision to cease production of the \$1 coin for circulation.

⁵⁶The U.S. Mint has issued \$1 coins featuring Presidents in sequential order and every Reserve Bank office has had unmixed supplies of the coins available for a 6-week special ordering period to allow members of the public to order coins featuring a specific President.

⁵⁷31 U.S.C. §5112(p).

⁵⁸31 USC 5112(p)(3)(B).

While the Federal Reserve took steps to overcome barriers to the circulation of the \$1 coin to meet existing demand, according to Federal Reserve officials, it can do little else given the \$1 coin is no longer produced for circulation and the agency's statutory responsibilities focus on ensuring \$1 coins are available to meet demand, not on taking steps to change demand. The Federal Reserve's *2007 Annual Report to Congress* reported that the U.S. Mint and stakeholder feedback identified the co-circulation of the \$1 coin with the \$1 note as the most significant barrier to improved circulation of the \$1 coin. In addition, many depository institutions, coin terminal operators, experts, and foreign officials we met with identified the \$1 note as a barrier to the increased circulation of the \$1 coin and mentioned that eliminating the \$1 note would increase demand for the \$1 coin. However, neither the *2007 Annual Report* nor subsequent annual reports identified the \$1 note as a barrier to the \$1 coin. According to Federal Reserve Legal Division's attorneys, they do not consider the \$1 note to be a barrier because they do not view co-circulation as limiting the circulation of the \$1 coin. Rather, Federal Reserve officials noted the \$1 note is an alternative to the \$1 coin that the public freely chooses—that is, their view is that the \$1 coin is fully available to the public and its circulation is thus at the level that the public demands. According to Federal Reserve officials, the Federal Reserve's authority does not extend to promotion, and therefore the agency is not likely to take unilateral action to promote wider circulation of the \$1 coin. If this is the case, congressional actions would likely be the only feasible action that could replace the \$1 note with the \$1 coin.

Consistent with the actions of other countries, we have previously recommended that the Congress replace the \$1 note with a \$1 coin due to the financial benefit the government would receive from the replacement. As we found in our prior work, other countries that have replaced a low-denomination note with a coin, such as Canada and the United Kingdom, stopped producing the note.⁵⁹ Officials in these countries noted this step was essential to the success of their transition to the coin and that, with no alternative to the note, public resistance dissipated within a few years. Australian and Canadian Mint officials also explained that they took steps in advance of the issuance of their \$1 coins to facilitate public adoption. For example, Royal Canadian Mint officials said that public outreach, stakeholder collaboration, and removing the \$1

⁵⁹[GAO-11-281](#).

note from circulation were key elements of a successful transition to the \$1 coin in Canada.

In its *2011 Annual Report to Congress*, the Federal Reserve stated that stakeholders and depository institution representatives reported through their routine meetings that the \$1 coins continue to be easy to order and that its communications about the program have been effective, but that transactional demand for \$1 coins has not increased since the start of the program and overall demand continues to come primarily from collectors. Federal Reserve officials told us they continue to discuss the \$1 coin as necessary with groups such as the Customer Advisory Council, but that they do not intend to take any additional actions. The Board believes the suspension of the minting of the Presidential \$1 coin for circulation makes the annual report no longer necessary and, in its *2012 Annual Report to Congress*, proposed the elimination of the annual reporting requirement.

Conclusions

Since 2009, on behalf of the Reserve Banks, the Federal Reserve has taken steps to standardize its management of the circulating coin inventory from a national perspective. Generally, these efforts have contributed to improvements, such as reductions in national coin inventories and orders, and stakeholder satisfaction with the Federal Reserve's new approach. The Federal Reserve's current strategic plan calls for the efficient and effective use of financial resources that could lead to more efficient operations and potentially cost savings. However, some issues remain.

- Reserve Bank coin management costs have risen since 2008 and CPO has not taken steps to systematically assess factors influencing direct and support costs related to coin management and assess whether opportunities exist to isolate elements of their coin inventory management that could lead to cost savings across the Reserve Banks.
- Interrelated key practices related to the Federal Reserve's management of the circulating coin inventory indicate opportunities to advance the use of performance information to establish and monitor additional performance goals and metrics and to improve processes for forecasting demand. For example, establishing goals and metrics and tracking progress toward those two will allow the Federal Reserve to better ensure that multiple aspects of its coin management activities are being monitored and will help agency officials identify

and document other program impacts or to determine where additional efficiencies could be gained.

- Taking steps to assess monthly forecasts to improve accuracy can also lead to overall improvements in the coin supply chain. Developing and tracking performance information and assessing forecasts—key practices used by private and governmental organizations to effectively manage their inventories—could ultimately help identify cost savings for Reserve Banks or improve the efficiency of U.S. Mint coin production, which may in turn result in more money returned to the General Fund, contributing to U.S. taxpayer savings.

Recommendations for Executive Action

To ensure efficient management of the circulating coin inventory, we recommend that the Board of Governors direct CPO to take the following three actions:

- develop a process to assess the factors that have influenced increasing coin operations costs and differences in costs across Reserve Banks and a process to use this information to identify practices that could lead to cost-savings;
- establish, document, and annually report to the Board performance goals and metrics for managing the circulating coin inventory, (e.g., Reserve Bank coin management costs) and measure performance towards those goals and metrics; and
- establish and implement a process to assess the accuracy of forecasts for new coin orders and revise the forecasts as needed.

Agency Comments

We provided a draft of this report to the Chairman of the Board of Governors of the Federal Reserve System and the Secretary of the Treasury for review and comment. In written comments, reproduced in appendix IV, the Federal Reserve generally agreed with the report's recommendations. Treasury had no comments.

We are sending copies of this report to the appropriate congressional committees and the Federal Reserve, U.S. Mint, and BEP. In addition, the report is available at no charge on GAO's Web site at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or stjamesl@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix V.



Lorelei St. James
Director, Physical Infrastructure

List of Requesters

The Honorable John B. T. Campbell, III
Chairman, Subcommittee on Monetary Policy and Trade
Committee on Financial Services
House of Representatives

The Honorable Spencer Bachus
Committee on Financial Services
House of Representatives

The Honorable Steve Stivers
Committee on Financial Services
House of Representatives

The Honorable David Schweikert
House of Representatives

Appendix I: Objectives, Scope, and Methodology

This report addresses the following questions: (1) How does the Federal Reserve manage the circulating coin inventory and what are the coin management costs? (2) To what extent does the Federal Reserve follow key supply-chain management practices in managing the circulating coin inventory? (3) What actions has the Federal Reserve taken to respond to potential changes in demand for coins and notes? (4) What actions has the Federal Reserve taken with regard to the circulation of the \$1 coin, and what more, if anything, could it do?

To address these questions we met with federal agency officials, foreign officials, industry and academic experts, and currency industry representatives. (See table 2.) We selected industry and academic experts with supply-chain or coin-inventory management expertise. We selected Australia, Austria, and Canada as countries with experiences relevant to our review—such as replacing low denomination notes with coins, or recent implementation of coin-inventory management process improvements. These countries were selected for illustrative purposes and are not intended to be used as benchmarks for direct comparisons to the Federal Reserve’s management of the circulating coin inventory. We obtained documents from and conducted interviews with Federal Reserve officials to obtain information about the agency’s processes for managing the distribution of the circulating coin inventory. We also visited a Federal Reserve coin terminal in White Marsh, Maryland. In addition, we reviewed literature and our prior reports related to coin inventory management.

Table 2: Organizations and Individuals Interviewed

Federal agencies
Bureau of Engraving and Printing
Federal Reserve Banks' Cash Advisory Group
Federal Reserve Board
Federal Reserve Cash Product Office
Federal Reserve Retail Payments Office
United States Mint
Foreign officials
Department of Finance Canada
Oesterreichische Nationalbank
Royal Australian Mint
Royal Canadian Mint
Industry and academic experts
APICS
Dr. Dean Croushore, University of Richmond
Dr. Neil Geismar and Dr. Chelliah Sriskandarajah, Texas A&M University
Industry representatives
American Bankers Association
Coinstar
Customer Advisory Council
Dollar Coin Alliance
Independent Armored Car Operators Association
Independent Community Bankers of America
National Armored Car Association (Brink's, Dunbar Armored, Loomis)
National Automated Merchandising Association

Source: GAO.

To review the Federal Reserve's management of the circulating coin inventory and identify costs associated with managing this inventory, we interviewed Federal Reserve, United States Mint (U.S. Mint) officials, and industry representatives—such as National Armored Car Association members and depository institution representatives on the Cash Product Office's (CPO) Customer Advisory Council (a group established to provide input on coin and note operations). To assess management operations related to the circulating coin inventory, we used the Federal

Reserve's Strategic Framework 2012-2015 and the Committee of Sponsoring Organizations of the Treadway Commission's (COSO) Internal Control—Integrated Framework.¹ We also obtained and analyzed coin inventory and production data for 2004 through 2012 from the Federal Reserve, U.S. Mint production data from 2010 through March 2013, and Reserve Bank coin and note management cost data from 2008 through 2012. For example, we reviewed Federal Reserve data for monthly coin forecasts, annual coin inventory levels, analyzed data on monthly coin orders and shipments for bias, and compared the overall and individual Reserve Bank costs related to coin and note operations.

To assess the extent to which the Federal Reserve follows key supply-chain and inventory-management practices, we developed and validated criteria with stakeholder and expert input. To develop and define practices common to efficient supply chain and inventory management and applicable to the circulating coin inventory in the United States, we reviewed supply chain management and operations management literature on leading practices, our past defense inventory management and Government Performance and Results Act reports, and academic literature.² We also worked with industry experts to identify a selection of supply-chain management practices relevant to coin inventory management. We identified five key practices: collaboration, risk management, performance metrics, forecasting demand, and system optimization. For additional information on these key practices, see appendix III. The supporting characteristics associated with the key practices were selected based on knowledge of circulating coin management. Selected academic and industry experts in operations and supply chain management and the circulating coin inventory as well as foreign mint or central bank officials from Australia, Austria, and Canada validated that the selected key practices, definitions, and supporting characteristics were relevant to coin inventory management.

¹Committee of Sponsoring Organizations of the Treadway Commission, *Internal Control—Integrated Framework* (1992).

²For example, GAO, *Defense Inventory: Actions Underway to Implement Improvement Plan but Steps Needed to Enhance Efforts*, [GAO-12-493](#) (Washington, D.C.: May 3, 2012) and *Managing for Results: Executive Branch Should More Fully Implement the GPRA Modernization Act to Address Pressing Governance Challenges*, [GAO-13-518](#) (Washington, D.C.: June 26, 2013).

We compared the Federal Reserve's inventory management practices to the five key practices by assessing the extent to which the Federal Reserve met individual supporting characteristics for each practice. The individual assessments for the supporting characteristics served as the basis for the overall assessment for each key practice. Specifically, after we assessed the selected supporting characteristics, we made an overall assessment for each of the five practices using the following scale:

- Followed or substantially followed—plans, policies, or processes have been developed and implemented properly for all or nearly all of the supporting characteristics.
- Partially followed—plans, policies, or processes have been developed and implemented properly for some of the supporting characteristics.
- Minimally or not followed—plans, policies, or processes are lacking for all or nearly all of the supporting characteristics.

To determine the extent to which the Federal Reserve followed these key practices and supporting characteristics, we reviewed agency documents and interviewed officials from the Federal Reserve and U.S. Mint. We also met with industry stakeholders (e.g., depository institution representatives and coin terminal operators) and academic and industry experts to discuss their views on the Federal Reserve's management of the circulating coin inventory and working relationships with other entities in the circulating coin supply chain.

To identify actions the Federal Reserve has taken to respond to potential changes in demand for coins and notes, we interviewed officials from the Federal Reserve, U.S. Mint, and Bureau of Engraving and Printing (BEP). We also interviewed depository institution representatives on the Customer Advisory Council, academic experts and industry representatives including coin terminal operators and Coinstar. We also interviewed government officials in Australia, Austria, and Canada to obtain their perspectives on potential changes in future cash demand. In addition, we reviewed Federal Reserve research and analysis pertaining to electronic and other payment methods including reports and documentation related to the CPO's long-term strategic framework and the Retail Payment's Office triennial payments studies from 2007 and 2010. We also interviewed Federal Reserve officials who have worked on these studies and obtained information about additional research efforts underway related to examining and preparing for changes in future demand for coins, notes, and other payment methods.

To identify actions taken by the Federal Reserve regarding the circulation of the \$1 coin, we obtained perspectives on the availability and use of \$1 coins from Federal Reserve and Reserve Bank officials. We also met with industry stakeholders and coin user groups—including depository institution representatives, the National Automated Merchandising Association, the Dollar Coin Alliance, Coinstar, and selected industry experts. We reviewed Federal Reserve and U.S. Mint responsibilities related to the circulation of the \$1 coin, including those outlined in the Presidential \$1 Coin Act of 2005 and Native American \$1 Coin Act. To identify actions taken to identify, analyze, and overcome barriers to the circulation of the \$1 coin, we reviewed the Federal Reserve’s Annual Reports to Congress on the Presidential \$1 Coin Program for 2007 through 2013 and interviewed Federal Reserve officials. In addition, we interviewed selected foreign government officials from Australia, Austria, and Canada to identify examples of actions taken to promote low denomination coins and to enhance the circulation of these coins in other countries. We also analyzed Federal Reserve data on \$1 coin inventories, U.S. Mint orders, payments, and receipts from 2007 through 2012.

We assessed the reliability of data used in this report by (1) performing electronic testing of required data elements, (2) reviewing existing information about the data and the system that produced them, and (3) interviewing agency officials knowledgeable about the data. We determined that the data were sufficiently reliable for the purpose of this report.

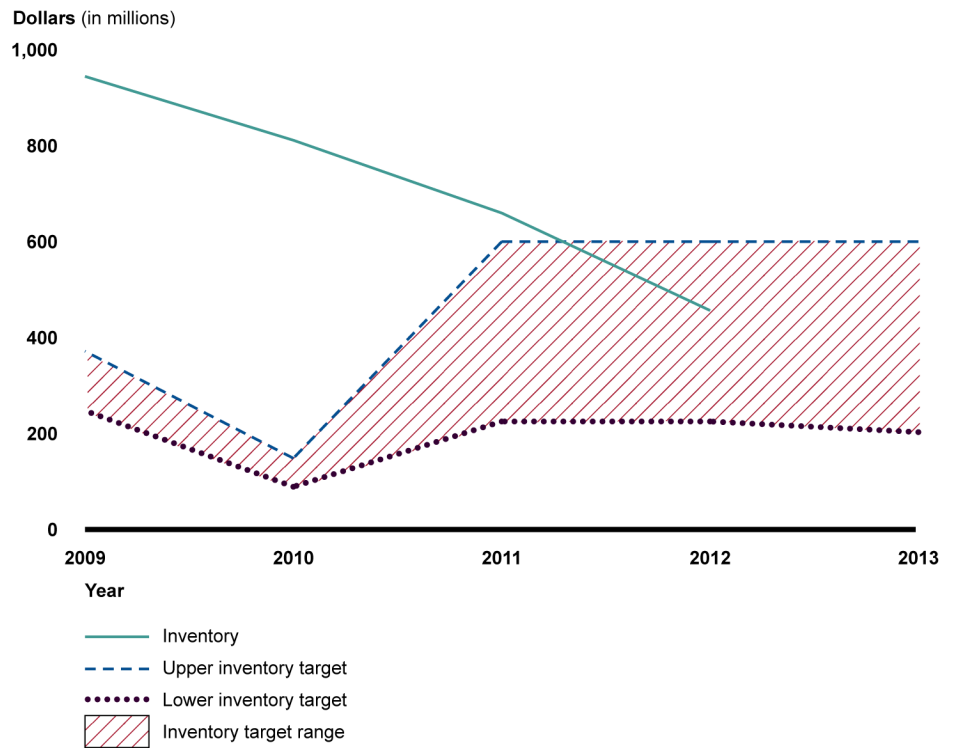
We conducted this performance audit from March 2013 through October 2013 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Data and Figures on Coin and Note Inventory, Orders, and Circulation

Reserve Bank Coin Inventory and Inventory Targets

In 2009, the Federal Reserve’s Cash Product Office (CPO) established national upper and lower inventory targets for pennies, nickels, dimes, and quarters to track and measure the coin inventory. National upper and lower inventory targets are reviewed and updated annually. In 2013, the upper national inventory targets were set based on the average peak Reserve Bank coin inventory from 2009 to 2012, and the lower national targets were set based on the 10 consecutive days from 2009 to 2012 with the most coin payments to depository institutions. Figures 9 through 12 present the Reserve Bank inventories of quarters, dimes, nickels and pennies from 2009 through 2012 and upper and lower national inventory targets from 2009 through 2013.¹

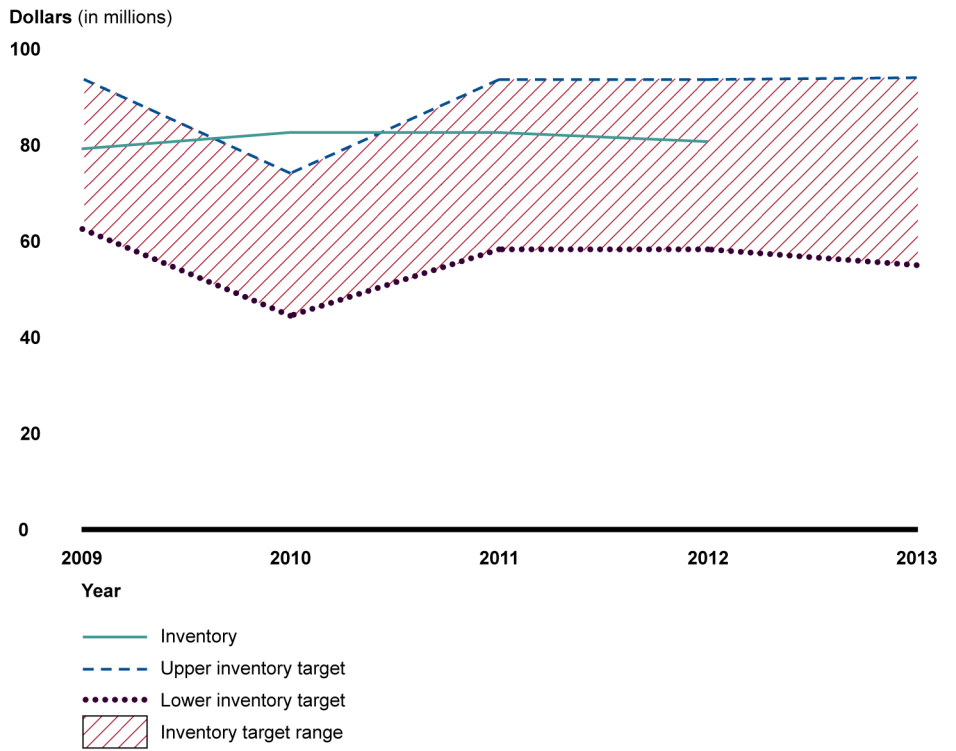
Figure 9: Reserve Bank Inventories of Quarters, 2009–2012, and National Inventory Targets, 2009–2013



Source: GAO analysis of Federal Reserve data.

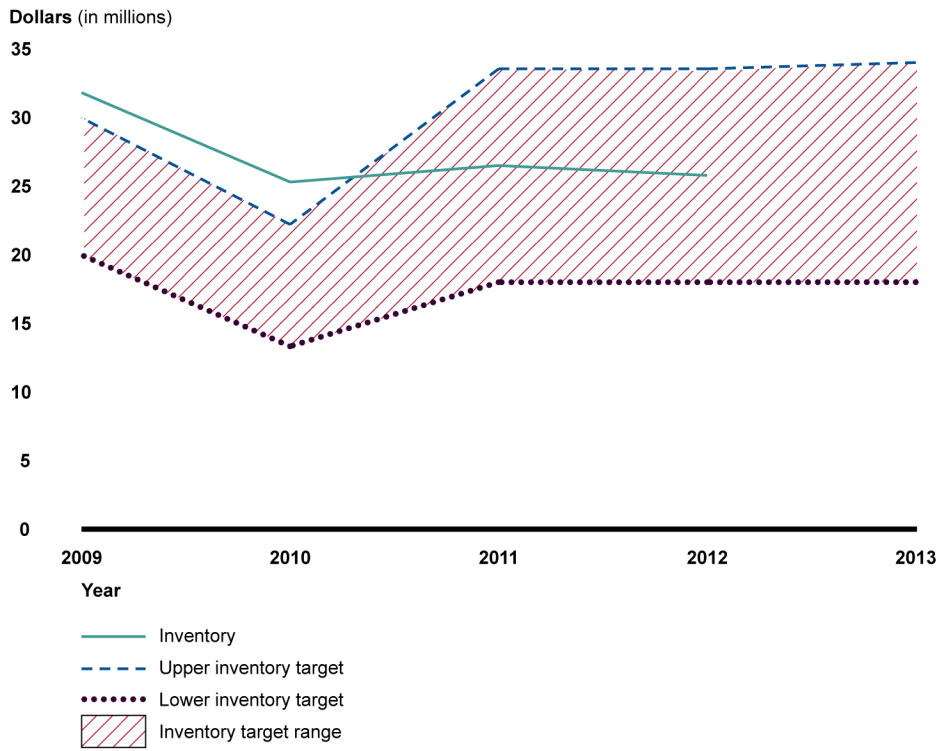
¹2012 annual Reserve Bank inventory data on quarters, dimes, nickels and pennies and 2013 national upper and lower inventory targets was the most recent available.

Figure 10: Reserve Bank Inventory of Dimes, 2009–2012, and National Inventory Targets, 2009–2013



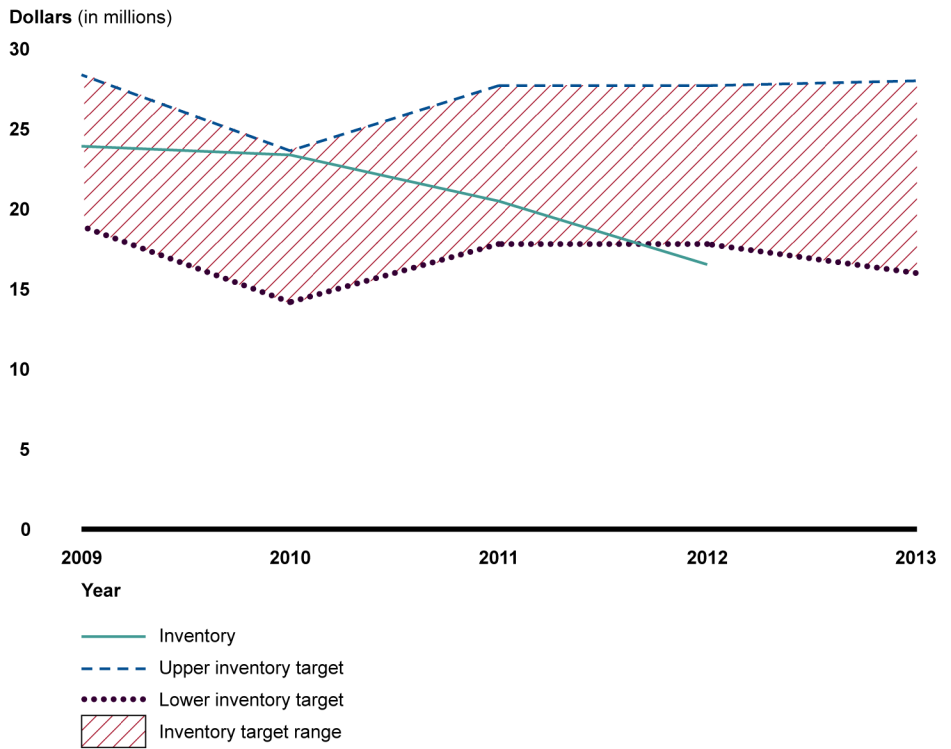
Source: GAO analysis of Federal Reserve data.

Figure 11: Reserve Bank Inventory of Nickels, 2009–2012, and National Inventory Targets, 2009–2013



Source: GAO analysis of Federal Reserve data.

Figure 12: Reserve Bank Inventory of Pennies, 2009– 2012, and National Inventory Targets, 2009– 2013

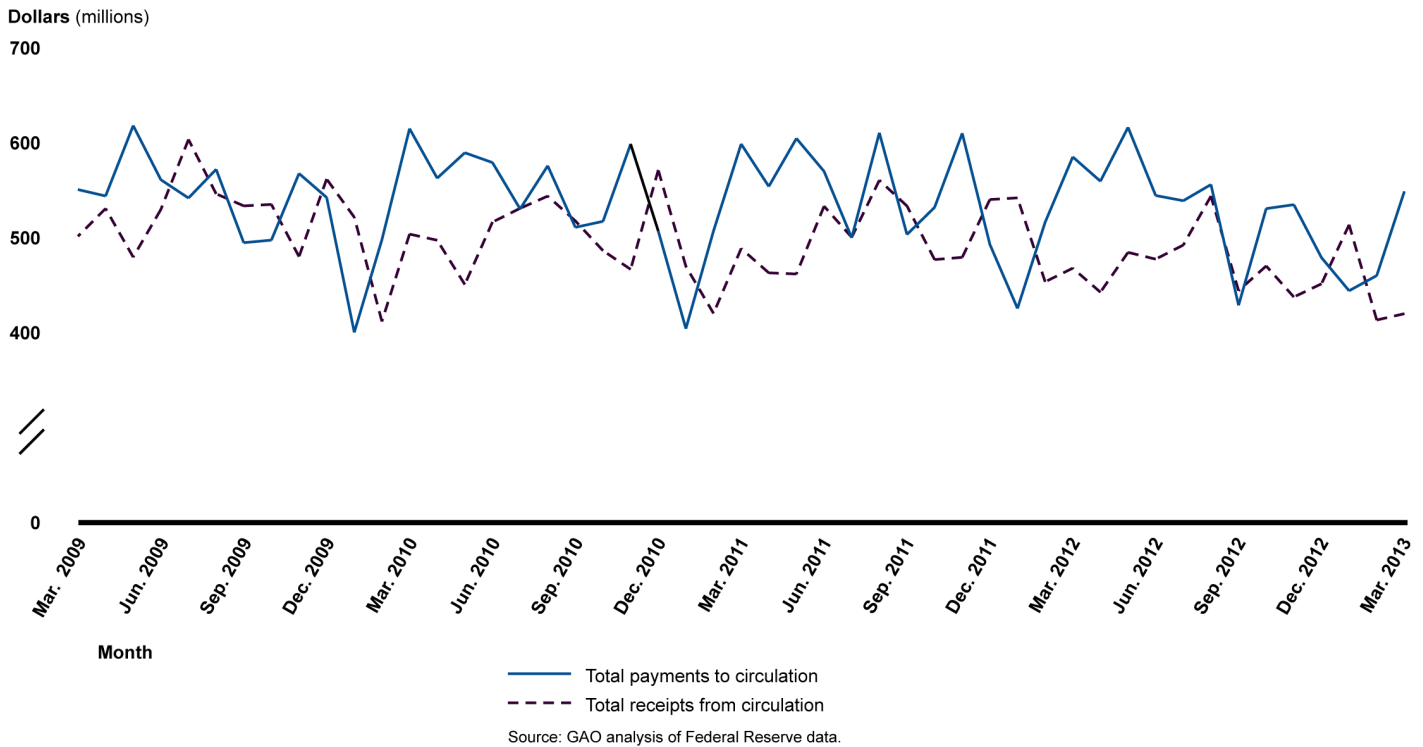


Source: GAO analysis of Federal Reserve data.

Monthly Payments and Receipts for All Denominations

Coin receipts from depository institutions and Reserve Bank payments to depository institutions fluctuate throughout the year—reflecting changes in the public’s spending patterns. (See fig. 13.) For example, in December 2012, the Federal Reserve paid about \$479 million in coins to depository institutions (payments) and received about \$452 million in coins from the depository institutions (receipts); this difference between payments and receipts is also referred to as net pay.

Figure 13: Monthly Reserve Bank Payments to and Receipts from Depository Institutions for All Denominations, March 2009–March 2013

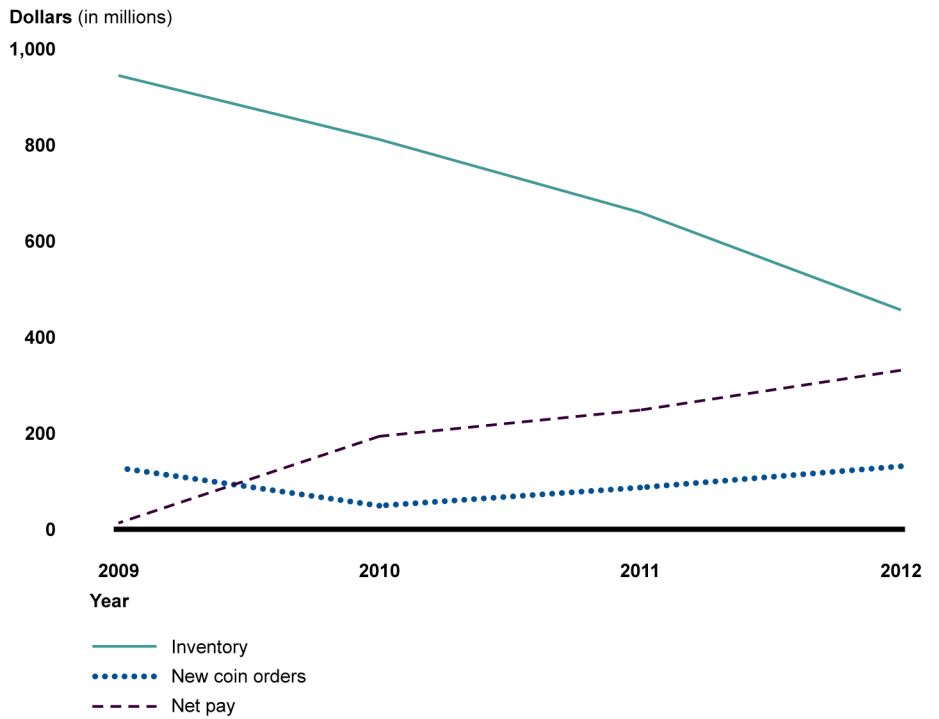


Annual Net Pay, New Coin Orders, and Inventories for Quarters, Dimes, Nickels, and Pennies

Net pay is the difference between coins paid to depository institutions and coins received from depository institutions over a given period of time. Net pay greater than zero (positive) indicates that the Federal Reserve paid more coins to depository institutions than it received from depository institutions during that period (e.g., month or year). In addition, positive net pay indicates that additional coins—coins transferred from areas with negative net pay or new coins—are needed to meet demand. CPO uses national data on net pay, inventory, and expected changes to demand to make inventory management decisions such as where to transfer coin within and between Reserve Bank districts. When coin payments to depository institutions are greater than coin receipts from depository institutions, CPO orders new coins or uses circulated inventory to meet demand. Figures 14 through 17 present annual data for net pay,

inventory, and new coin orders for quarters, dimes, nickels, and pennies from 2009 through 2012.²

Figure 14: Reserve Bank Quarter Inventories, Net Pay, and New Coin Orders, 2009–2012

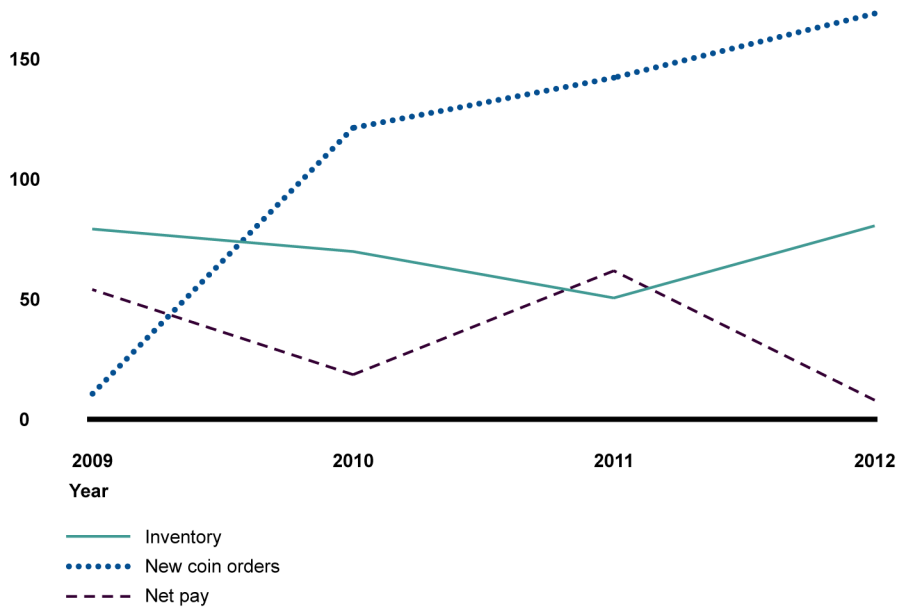


Source: GAO analysis of Federal Reserve data.

²These figures do not include coin payments made directly to circulation by the U.S. Mint. Information on net pay, coin orders, and inventory of \$1 coins is presented in the body of this report.

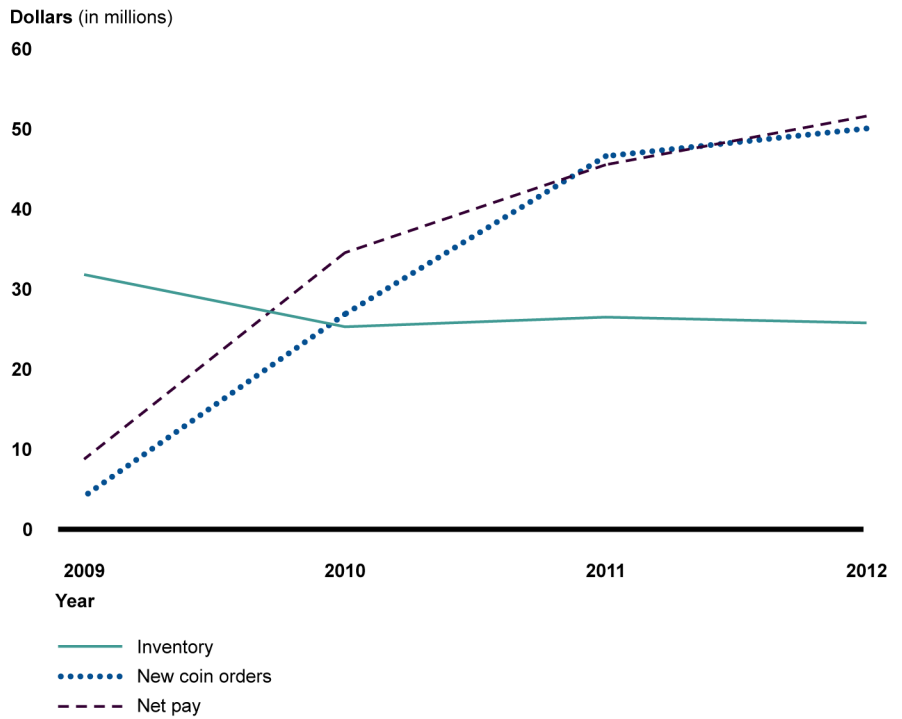
Figure 15: Reserve Bank Dime Inventories, Net Pay, and New Coin Orders, 2009–2012

Dollars (in millions)
200



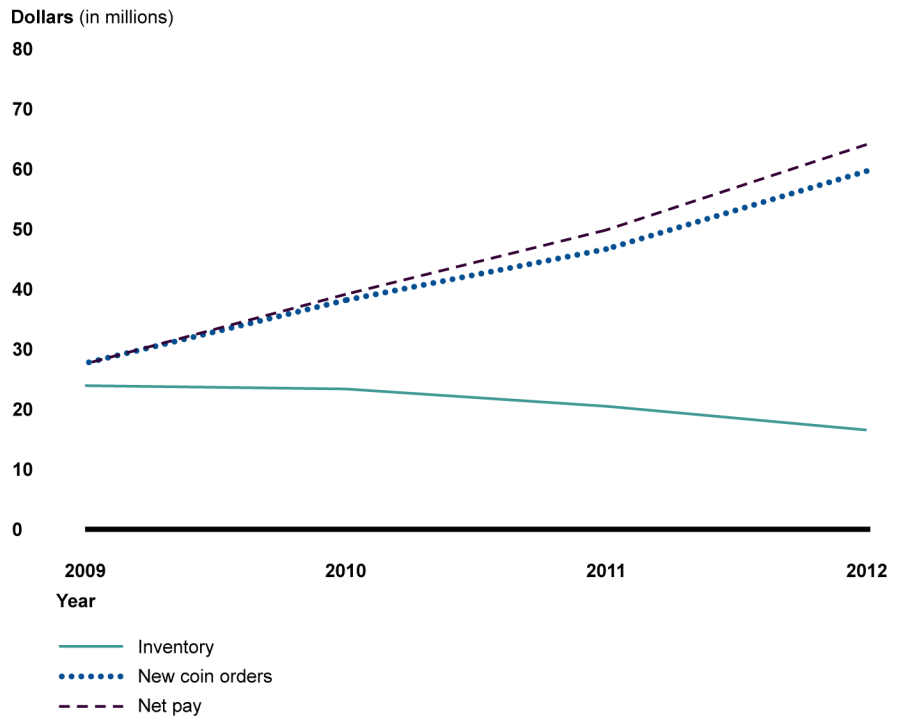
Source: GAO analysis of Federal Reserve data.

Figure 16: Reserve Bank Nickel Inventories, Net Pay, and New Coin Orders, 2009–2012



Source: GAO analysis of Federal Reserve data.

Figure 17: Reserve Bank Penny Inventories, Net Pay, and New Coin Orders, 2009–2012

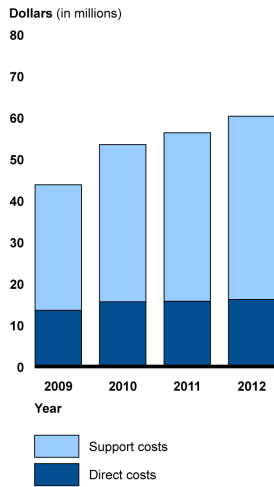


Source: GAO analysis of Federal Reserve data.

Reserve Bank Costs Related to Coin

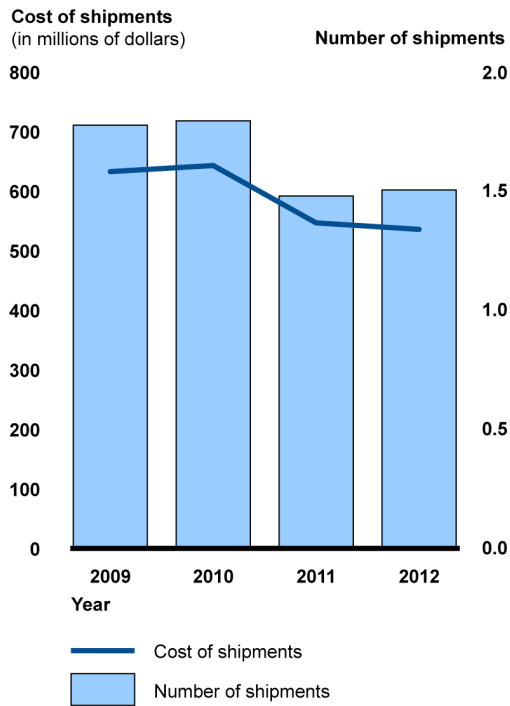
To manage the circulating coin inventory, Reserve Banks incur coin management costs and interbank transfer costs. The Reserve Banks' coin management costs include direct costs and support costs. (See fig. 18.) Direct costs are generally personnel costs such as salaries and benefits and support costs include utilities, protection, facilities, information technology, and other local and national support functions. From 2009 through 2012, direct costs represented about 30 percent and support costs represented about 70 percent of total coin management costs. Interbank transfers are shipments of coins from one Reserve Bank office region to another to ensure demand is met. (See fig. 19.)

Figure 18: Total Reserve Bank Coin Management Costs, 2009–2012



Source: GAO analysis of Federal Reserve data.

Figure 19: Number and Cost of Interbank Coin Shipments, 2009–2012

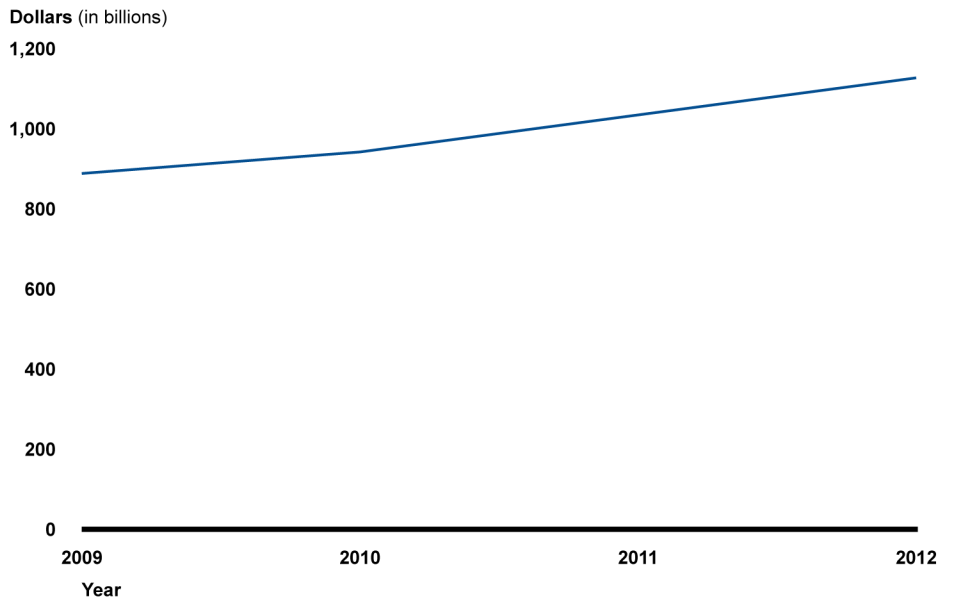


Source: GAO analysis of Federal Reserve data.

Notes in Circulation

From 2009 through 2012, the value of notes in circulation has increased by 27 percent from about \$888 billion in 2009 to over \$1,127 billion in 2012. (See fig. 20.)

Figure 20: Value of Notes in Circulation, 2009–2012



Source: GAO analysis of Treasury data.

Note: This represents the total face value of notes used as a medium of exchange that are in circulation. It includes some old and current notes that no longer circulate.

Appendix III: Discussion of Key Practices for Managing the Coin Inventory

To effectively manage their inventory, private and governmental organizations involved in production and distribution operations use supply-chain and inventory-management practices. To assess the Federal Reserve's management of the circulating coin inventory we identified five key supply-chain management practices: collaboration, risk management, performance metrics, forecasting demand, and system optimization. Establishing, documenting, and following these practices and their supporting characteristics contributes to a more effective inventory management system. In addition, these supply-chain management practices are interrelated—as activities in one area may have implications in another—and can be used to achieve efficiency improvements and cost savings. For example, collaborative working relationships can improve risk management practices because information related to disruptions and actions to minimize or mitigate disruptions are more easily shared across the system.

To assess elements of the five key supply-chain management practices, we selected 14 supporting characteristics based on their relevance to coin inventory management. Based on our review, we determined whether the Federal Reserve's management of the circulating coin inventory followed or substantially followed, partially followed, or minimally or not followed each supporting characteristic. Our assessment of the characteristics served as the basis for our overall assessment as to whether each key practice was followed or substantially followed, partially followed, or minimally or not followed. For example, if we found supporting evidence that two of the three characteristics of a practice were substantially followed but no evidence to support that the third characteristic was followed we would determine that the key practice was partially followed.

Table 3: Collaboration and Supporting Characteristics

Key practice: Collaboration	Overall assessment
<p>Collaboration is based on maintaining working relationships with partner entities across the supply chain by establishing policies, roles and responsibilities, and mechanisms for sharing information. Collaboration can be broadly defined as any joint activity that is intended to produce more public value than could be produced when the organizations act alone. GAO best practices for collaborative working relationships include, among other characteristics, agreeing on agency roles and responsibilities; establishing compatible policies, procedures, and other means to operate across agency boundaries; and developing mechanisms to monitor, evaluate and report results of collaborative efforts. In addition, according to APICS, building strategic partnerships is an effective way to reduce costs and improve service in the supply chain.</p>	●
Characteristics and coin inventory management examples	Assessment of characteristics
<p><u>Characteristic:</u> Develop and use policies or guidelines governing relationships with partner entities.</p>	
<p><u>Example:</u> The Federal Reserve’s Cash Product Office (CPO), on behalf of Reserve Banks, negotiated a contract with coin terminal operators. The contract includes a coin terminal manual of operations, which standardized procedures and internal controls for the coin terminals’ storage and handling of Reserve Bank coin across the 12 Reserve Bank districts.</p>	●
<p><u>Characteristic:</u> Agree upon roles and responsibilities with partner entities.</p> <p><u>Example:</u> For interbank coin transfers, the U.S. Mint arranges transportation of coins across Reserve Banks; CPO reimburses the U.S. Mint for the costs of this transportation.</p>	●
<p><u>Characteristic:</u> Develop and use mechanisms for sharing information related to the circulating coin inventory with partner entities.</p> <p><u>Example:</u> FedLine, an online tool created for Reserve Bank customers (depository institutions) to access payment services, also provides a communication link between CPO, Reserve Bank offices, coin terminals, and depository institutions.</p>	●
<ul style="list-style-type: none"> ● Key practice followed or substantially followed—plans, policies, or processes have been developed and implemented properly for all or nearly all characteristics. ◐ Key practice partially followed—plans, policies, or processes have been developed and implemented properly for some characteristics. ○ Key practice minimally or not followed—plans, policies, or processes are lacking for all or nearly all characteristics. 	

Source: GAO analysis of Federal Reserve information.

Table 4: Risk Management and Supporting Characteristics

Key practice: Risk management	Overall assessment
<p>Risk management is the planning and preparation for risks related to unanticipated events to help organizations respond to and maintain essential operations during events that could disrupt the normal flow of goods and materials within the supply chain. The Standard for Internal Control in the Federal Government and the Committee of Sponsoring Organizations of the Treadway Commission's (COSO) Internal Control—Integrated Framework require agencies to assess external and internal risks because conditions continually change, and to provide mechanisms to identify and deal with any special risks prompted by such changes. In addition, APICS recommends that supply chain management includes the management of risks surrounding unanticipated events that disrupt the normal flow of goods and materials within the supply chain.</p>	●
Characteristics and coin inventory management examples	Assessment of characteristics
<p><u>Characteristic:</u> Identify sources of potential disruptions.</p>	
<p><u>Example:</u> Federal Reserve officials identified disruptions that could affect regional coin supply chains (e.g., terrorist events, national weather disasters, or temporary events that limit transportation in metropolitan areas).</p>	●
<p><u>Characteristic:</u> Assess the potential impact of the risk.</p>	
<p><u>Example:</u> According to CPO officials, as soon as disruption is anticipated, they begin planning with stakeholders operating in the affected area, including Reserve Bank officials, coin terminal operators, and depository institutions. In addition, online resources are available for stakeholders to refer to.</p>	●
<p><u>Characteristic:</u> Develop and use plans to mitigate the risk.</p>	
<p><u>Example:</u> The 12 Reserve Banks have their own continuity of operations plans and each has a designated “buddy bank” to perform its functions, including coin circulation activities, in the event of a disruption. CPO will coordinate risk management efforts during a disruption for all Federal Reserve cash offices across the country.</p>	●
<ul style="list-style-type: none"> ● Key practice followed or substantially followed—plans, policies, or processes have been developed and implemented properly for all or nearly all characteristics. ◐ Key practice partially followed—plans, policies, or processes have been developed and implemented properly for some characteristics. ○ Key practice minimally or not followed—plans, policies, or processes are lacking for all or nearly all characteristics. 	

Source: GAO analysis of Federal Reserve information.

Table 5: Performance Metrics and Supporting Characteristics

Key practice: Performance metrics	Overall assessment
<p>Performance metrics involve the process of establishing, tracking, and reevaluating goals or metrics to measure change or improvement in a process or performance area. Performance goals and metrics should be clearly defined, measurable, actionable, relevant and timely, should be tracked to ensure that they are being met, and reevaluated periodically to ensure that they remain reasonable and useful. In addition, while it does not apply directly to the Federal Reserve, the GPRA Modernization Act of 2010 (GPRAMA) aims to ensure that federal agencies use performance information in decision making and holds them accountable for achieving results and improving government performance. We have previously reported that agencies should identify goals and establish a suite of performance metrics to determine whether they are meeting those goals.</p>	●
Characteristics and coin inventory management examples	Assessment of characteristics
<p><u>Characteristic:</u> Develop and use reasonable metrics that are clearly defined, measurable, actionable, relevant and timely.</p>	
<p><u>Example:</u> In 2009, the Federal Reserve established upper and lower inventory targets for pennies, nickels, dimes, and quarters to track and measure the national coin inventory and inventory at each Reserve Bank office and coin terminal. However, CPO does not have additional goals and metrics to measure other aspects of its management of the coin inventory.</p>	●
<p><u>Characteristic:</u> Track progress against metrics or targets.</p>	
<p><u>Example:</u> CPO tracks national and local inventory levels to ensure that the national coin supply and local inventories are within inventory targets.</p>	●
<p><u>Characteristic:</u> Establish a process to reevaluate metrics or targets.</p>	
<p><u>Example:</u> CPO reevaluates the national inventory targets annually; however, it has not established a process for reevaluating its methodology for setting local inventory levels.</p>	●
<ul style="list-style-type: none"> ● Key practice followed or substantially followed—plans, policies, or processes have been developed and implemented properly for all or nearly all characteristics. ◐ Key practice partially followed—plans, policies, or processes have been developed and implemented properly for some characteristics. ○ Key practice minimally or not followed—plans, policies, or processes are lacking for all or nearly all characteristics. 	

Source: GAO analysis of Federal Reserve information.

Table 6: Forecasting Demand and Supporting Characteristics

Key practice: Forecasting demand	Overall assessment ●
<p>Planning and forecasting for demand involves preparing for and estimating expected changes in future demand and planning and making decisions based on these estimates. Forecasts are developed in order to better estimate future demand and planning decisions are based on these forecasts to meet the expected changes in demand. According to APICS, forecasting is attempting to predict or project future statistics—typically, demand or sales. It requires that all factors surrounding the decision-making process are recorded. Factors that affect forecasting include sales demand patterns, economic conditions, competitor actions, market research, product mixes, and pricing and promotional activities. Forecasts can be made at strategic, tactical, and operational levels. The forecasting process predicts demand and the use of products and services so that the right quantities are ordered in advance. In forecasting, either historical demand data are transformed into future projections or a subjective prediction of the future is made—or some combination of the two.</p>	
Characteristics and coin inventory management examples	Assessment of characteristics
<p><u>Characteristic:</u> Have a process in place to forecast demand.</p>	
<p><u>Example:</u> Since 2009, the Federal Reserve has used a proprietary inventory management system to track circulating coin inventory and forecast future needs.</p>	●
<p><u>Characteristic:</u> Use forecast results to plan and manage the circulating coin inventory.</p>	
<p><u>Example:</u> Information from the proprietary system is used to develop forecasts of expected coin payments, receipts, and inventory for each distribution location and this information is used to determine if new coins should be ordered from the U.S. Mint or shipped from one location to another.</p>	●
<p><u>Characteristic:</u> Assess forecast accuracy.</p>	
<p><u>Example:</u> CPO lacks a method to assess or track forecast accuracy related to monthly coin orders. According to CPO officials, they compare the U.S. Mint’s actual coin shipment to their initial coin order by reviewing annual data, but they have not established or tracked any performance measures related to the accuracy of their monthly forecast.</p>	○
<ul style="list-style-type: none"> ● Key practice followed or substantially followed—plans, policies, or processes have been developed and implemented properly for all or nearly all characteristics. ◐ Key practice partially followed—plans, policies, or processes have been developed and implemented properly for some characteristics. ○ Key practice minimally or not followed—plans, policies, or processes are lacking for all or nearly all characteristics. 	

Source: GAO analysis of Federal Reserve information.

Table 7: System Optimization and Supporting Characteristics

Key practice: System optimization	Overall assessment
<p>System optimization involves considering, as a whole, the strategic interactions and operations of the entire supply chain or inventory process in developing process change. According to APICS, optimizing the logistics network is the process of achieving the most efficient network to move materials and products from the supplier through the manufacturing process to the end user. For example, to improve its inventory management, the Department of Defense has taken steps to collect information from all tiers of its supply chain and use that information to make decisions on movements of inventory and has developed models to inform them of the optimal use of its inventories.</p>	●
Characteristics and coin inventory management examples	Assessment of characteristics
<p><u>Characteristic:</u> Obtain access to information and resources from across the circulating coin supply chain (e.g., knowledge of coin production lead-time, inventory, demand and transportation).</p>	
<p><u>Example:</u> CPO has multiple systems that provide information from across the supply chain and help make decisions based on current and expected changes to demand and inventory. This information includes coin management costs and actual and forecasted coin demand. Regular communications with key supply-chain stakeholder representatives from Reserve Banks, depository institutions, coin terminals, and the U.S. Mint provide CPO with information such as market changes that could influence changes in demand and challenges that could limit the efficient distribution of coins.</p>	●
<p><u>Characteristic:</u> Use information and resources to identify and implement efficiencies within the supply chain.</p>	
<p><u>Example:</u> CPO's use of information and resources is limited thereby making it difficult to track progress for continued improvement or understand the extent to which these strategic interactions optimize the overall efficiency of its management of the circulating coin inventory. For example, the U.S. Mint's production of new coin could be more efficient with improvements to the accuracy of new coin orders. Currently, the U.S. Mint produces a safety stock, in part, to ensure it is able to produce enough coins to fulfill CPO's final, adjusted order. Therefore, more accurate forecasts and coin orders could lessen the need for the U.S. Mint to produce safety stock. Key supply chain stakeholders can also act as a resource for the CPO to identify efficiencies within the supply chain.</p>	○
<ul style="list-style-type: none"> ● Key practice followed or substantially followed—plans, policies, or processes have been developed and implemented properly for all or nearly all characteristics. ◐ Key practice partially followed—plans, policies, or processes have been developed and implemented properly for some characteristics. ○ Key practice minimally or not followed—plans, policies, or processes are lacking for all or nearly all characteristics. 	

Source: GAO analysis of Federal Reserve information.

Appendix IV: Comments from the Federal Reserve



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LOUISE L. ROSEMAN
DIRECTOR
DIVISION OF
RESERVE BANK OPERATIONS
AND PAYMENT SYSTEMS

September 26, 2013

Ms. Lorelei St. James
Director, Physical Infrastructure
U.S. Government Accountability Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Ms. St. James:

Thank you for the opportunity to comment on the GAO's draft report entitled "*U.S. Currency: Coin Inventory Management Needs Better Performance Information.*" As noted in the report, in recent years the Federal Reserve has improved its coin inventory management and its collaboration with supply chain stakeholders. That said, we recognize there are opportunities for continuous improvement. We appreciate the GAO's most recent review, generally agree with the report's recommendations, and have already begun working with the Reserve Banks' Cash Product Office to implement them. In particular, we will evaluate the drivers of Reserve Bank costs related to coin and assess practices that could lead to further cost savings. In a related effort, we will work with the Cash Product Office to identify performance metrics and targets for Reserve Bank coin operations. We will also evaluate opportunities to further improve the accuracy of our forecasts for new coin orders.

We would be pleased to update your staff periodically regarding the status of these efforts.

Sincerely,

A handwritten signature in black ink, appearing to read "Louise L. Roseman".

Email: Louise.Roseman@frb.gov
Phone: (202) 452-2789 • Fax: (202) 452-2746

Appendix V: GAO Contact and Staff Acknowledgments

GAO Contact

Lorelei St. James, (202) 512-2834 or stjamesl@gao.gov.

Staff Acknowledgments

In addition to the individual named above, Teresa Spisak, Assistant Director; Amy Abramowitz; Douglas Anderson; Patrick Dudley; Lawrance Evans, Jr.; David Hooper; Delwen Jones; Sara Ann Moessbauer; Colleen Moffatt Kimer; Constance Ify Onyiah; Josh Ormond; Jennifer Schwartz; and Maria Wallace made key contributions to this report.

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