



March 2019

U.S. CURRENCY

Financial Benefit of Switching to a \$1 Coin Is Unlikely, but Changing Coin Metal Content Could Result in Cost Savings

Accessible Version

GAO Highlights

Highlights of [GAO-19-300](#), a report to the Chairman, Committee on the Budget, U.S. Senate

Why GAO Did This Study

The U.S. spent about \$1.3 billion in 2017 to produce, process, and circulate coins and paper notes for use in the economy. Since 2006, both the penny and nickel have cost more to make than their face value. Other countries have replaced notes with coins of the same value to reduce costs. Since 1990, GAO had estimated replacing the \$1 note with a \$1 coin would provide a benefit to the federal government.

GAO was asked to examine the potential cost savings to the government from making changes to currency. This report (1) estimates the net benefit to the government, if any, of replacing the \$1 note with a \$1 coin and selected stakeholders' views on this change; and (2) examines what is known about potential cost savings from suspending penny production and changing the metal composition of the nickel, and selected stakeholders' views on these changes. GAO conducted economic simulations of continued use of \$1 notes and replacing notes with \$1 coins, examined cost data from the U.S. Mint, and interviewed officials from the Federal Reserve, U.S. Mint and Bureau of Engraving and Printing as well as 10 selected stakeholders representing industries that could potentially be affected by currency changes.

What GAO Recommends

Congress should consider taking steps to authorize the Secretary of the Treasury to adjust the metal content of circulating coins.

View [GAO-19-300](#). For more information, contact Andrew Von Ah at (202) 512-2834 or vonaha@gao.gov.

March 2019

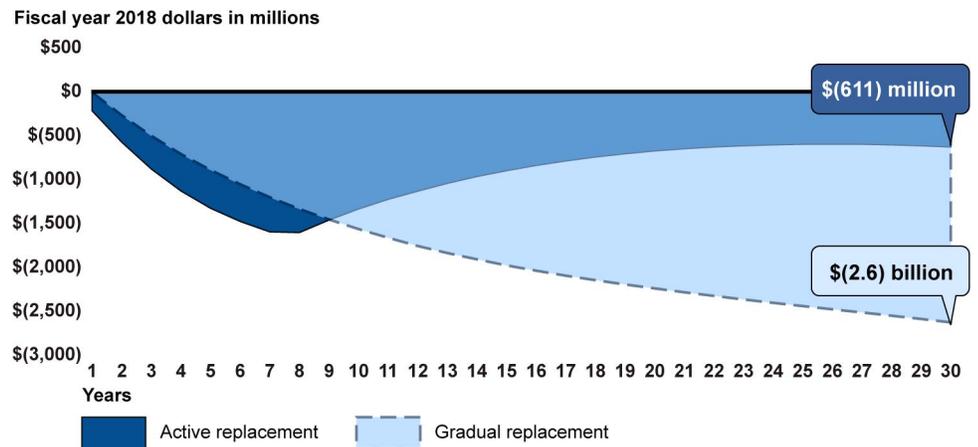
U.S. CURRENCY

Financial Benefit of Switching to a \$1 Coin Is Unlikely, but Changing Coin Metal Content Could Result in Cost Savings

What GAO Found

GAO's analysis found that replacing the \$1 note with a \$1 coin would likely result in a net loss to the government over 30 years. GAO found the government would incur a loss of about \$611 million if notes were actively replaced and about \$2.6 billion if \$1 notes were replaced gradually (see figure). These simulations represent the first time GAO has found that replacing the \$1 note with a \$1 coin would result in a net loss to the government rather than a net benefit. GAO's estimates are based on current data and economic projections, which have changed over time. For example, the lifespan of the \$1 note has more than doubled since a 2011 GAO analysis, from 3.3 years to 7.9 years, largely due to changes in note processing technology. Stakeholders generally identified few benefits from replacing \$1 notes with \$1 coins. Seven of 10 stakeholders GAO met with said that replacing the \$1 note with a \$1 coin would result in additional costs. For example, armored carriers told GAO that their transportation costs would increase because coins weigh more than notes.

Estimated Cumulative Present-Value Net Loss to the Government from Actively and Gradually Replacing \$1 Notes with \$1 Coins over 30 Years



Source: GAO analysis of agency and economic data. | GAO-19-300

The U.S. Mint estimates that it could save approximately \$250 million over 10 years by suspending penny production and between \$2 million and \$9 million per year by changing the metal composition of the nickel. It also estimates that it could save about \$74 million over 10 years by changing the metal composition of the dime and quarter. However, Federal Reserve officials and some stakeholders expressed concern about temporarily suspending the penny due to the potential for external effects, such as penny shortages. Stakeholders were unconcerned about changes to the nickel as long as the changes would not affect how the coin functioned, for example, in vending machines. Since Congress specifies in law which coins are made and their metal composition, the Mint has proposed legislation to enable the Secretary of the Treasury to change the metal content of coins as long as the weight or machine acceptance of the coins is unaffected. Without such authority, the Mint might not be producing coins as cost-effectively as possible.

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Abbreviations

BEP	Bureau of Engraving and Printing
CBO	Congressional Budget Office
Federal Reserve	Board of Governors of the Federal Reserve
GDP	gross domestic product
Mint	U.S. Mint
Treasury	Department of the Treasury

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March 21, 2019

The Honorable Michael B. Enzi
Chairman
Committee on the Budget
United States Senate

Dear Mr. Chairman:

The U.S. government invests financial resources to produce and issue currency—paper notes and metal coins—for use as a medium of exchange and store of value in the economy.¹ Making changes to U.S. currency, such as using less expensive metals in coins, could potentially save taxpayer funds. Other nations have taken steps to reduce the costs of issuing currency. For example, Canada replaced its \$1 note with a more durable \$1 coin in 1987, and, more recently, eliminated its one-cent coin in 2013 partly because it cost more to make than the coin was worth. The U.S. has taken some actions to reduce coin production costs in the past, such as changing the metal composition of the penny in 1982. Legislation seeking other changes has been proposed, such as legislation introduced in the 115th Congress to replace the \$1 note with a \$1 coin, suspend production of the penny for ten years, and change the metal composition of the nickel.² These actions could result in a benefit to government but may also entail broader societal costs to banks, retailers, and currency users, among others.

You asked us to examine the potential cost savings to the government from making changes to U.S. currency. This report

- determines the estimated net benefit to the government, if any, of replacing the \$1 note with a \$1 coin and selected stakeholders' views on this change, and
- examines what is known about potential cost savings to the government from suspending production of the penny and changing

¹For the purposes of this report, currency refers to both notes and coins.

²S. 759, "Currency Optimization, Innovation, and National Savings Act of 2017" and H.R. 2299, "Currency Optimization, Innovation, and National Savings Act of 2017." These bills have thus far not been reintroduced in the 116th Congress.

the metal composition of the nickel as well as selected stakeholders' views on these changes.

To estimate the net benefit or loss to the government of replacing the \$1 note with a \$1 coin, we conducted economic simulations under different scenarios and assumptions over a 30-year period. We simulated a “status quo” scenario and two “replacement” scenarios. In the status quo scenario, notes remain the dominant form of \$1 currency. In one replacement scenario, notes are replaced by \$1 coins gradually while in the other scenario, notes are replaced more quickly. We then compared each replacement scenario to the status quo scenario with respect to net benefits to the government. The various assumptions underlying our simulations include the extent to which the public holds more cash when coins are used instead of notes, the cost to produce \$1 notes and \$1 coins, and the lifespan of notes and coins, among others. Our analyses are projected over 30 years because that period roughly coincides with the life expectancy of the \$1 coin. (See app. I for more details on our simulations.) We interviewed knowledgeable officials from the Board of Governors of the Federal Reserve System (Federal Reserve); the Bureau of Engraving and Printing (BEP); and the U.S. Mint (Mint), and obtained data for our assumptions from each of these agencies and the Congressional Budget Office (CBO).

To determine stakeholder views on replacing the \$1 note with a \$1 coin, we identified and selected organizations representing industries that could potentially be affected by currency changes, including industry associations representing the banking industry, armored carriers, retailers, vending machine operators and manufacturers, and the gaming industry. We sought entities with the broadest representation so we eliminated individual companies, with the exception of those who are primary suppliers of raw material for the production of notes or coins. We selected and interviewed 10 of these entities representing potentially affected industries. We also selected and interviewed a private company involved in the production of materials used in coins and two organizations that advocate for a switch to a \$1 coin and for continued use of the penny, respectively. Since our selection comprises a non-representative sample, the results are not generalizable to all stakeholders. (See app. II for more details on our scope and methodology.)

To examine what is known about potential cost savings to the government from suspending production of the penny and from changing the metal composition of the nickel, we analyzed penny and nickel

production cost data from the Mint covering fiscal years 2003 through 2017 to include a range of the number of coins produced and cost changes from metal price fluctuations. We reviewed Mint studies on potential alternative metals and coin production cost savings that could result from changing the metal composition for these coins and conducted a literature search of relevant English language articles published between 2011 and 2018. We also interviewed Mint and Federal Reserve officials and the same set of selected stakeholders noted above to determine their views on these changes. We also reviewed documents from the Canadian government and interviewed an official from the Royal Canadian Mint to understand the rationale and effect of Canada's elimination of its penny. We took steps to assess the reliability of the data we used, such as interviewing knowledgeable agency officials about their processes for ensuring the overall reliability and quality of the data, and determined that the data were sufficiently reliable for the purposes of this report.

We conducted this performance audit from December 2017 to March 2019 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

The Constitution gives Congress the power to coin money, and under that authority, Congress has specified the coins that can be produced and the metal composition of circulating coins, including the penny, nickel, dime, quarter, and half-dollar.³ Congress has also passed legislation prohibiting the use of appropriated funds to redesign the \$1 note.⁴ Within the Department of the Treasury (Treasury), BEP produces notes and the Mint produces coins. To ensure that notes and coins are available in sufficient quantities to meet public demand, the Federal Reserve orders new notes

³31 U.S.C. § 5112.

⁴See, for example, the Consolidated Appropriations Act, 2018, Pub. L. No 115-141, §117, 132 Stat 348.

from BEP and new coins from the Mint.⁵ The Federal Reserve pays BEP for the cost of producing the notes; the Mint pays for the cost of producing coins and the Federal Reserve pays the Mint for the face value of the coins. The Federal Reserve distributes the notes and coins to approximately 8,400 depository institutions—banks, savings and loans, and credit unions—in the United States through cash offices operated by its 12 regional Reserve Banks.⁶ The Reserve Banks also are responsible for ensuring the quality and integrity of notes in circulation by assessing the condition of each note and destroying any that are unfit.⁷ When a depository institution deposits currency with a Reserve Bank, each currency note is verified on high-speed processing equipment using electronic authentication and fitness sensors. During the “piece-verification” process, the deposited currency is counted, suspect counterfeit notes are identified and segregated, and unfit notes are destroyed. The fit currency is packaged and used to fill future orders for currency from depository institutions. The destroyed notes are replaced with new notes from BEP as there is public demand for cash.

The federal government spent about \$1.3 billion to produce, process, and circulate notes and coins in 2017.⁸ These costs are offset by the financial benefit the government realizes when it issues notes or coins because currency usually costs less to produce than its face value. This benefit, which is known as seigniorage, is the difference between the face value of currency and its cost of production; this difference provides a financial

⁵The Board of Governors of the Federal Reserve System is the issuing authority for notes, and the Mint is the issuing authority for coins.

⁶A portion of the Reserve Banks’ coin inventory is held at approximately 170 coin terminals operated by armored carriers that receive deposits from and fulfill orders of coins for depository institutions on behalf of the Reserve Banks. These terminals operate at no cost to the government. Armored carriers benefit from this arrangement because it eliminates the time needed and costs to haul coins to and from the Reserve Banks before distributing them to depository institutions.

⁷The Federal Reserve defines fit currency as a note that is suitable for continued circulation and is sufficiently clean to allow its genuineness and denomination to be readily ascertained; it defines unfit currency as a note that is not suitable for further circulation because of its physical condition, such as being torn, dirty, limp, worn, or defaced.

⁸According to agency data, in calendar year 2017, the BEP produced 6.6-billion notes at a cost of \$673.9 million and the Mint produced over 14-billion coins at a cost of \$480.3 million in fiscal year 2017. According to the Federal Reserve, its cost to process and circulate currency and coins was about \$155.5 million in calendar year 2017.

benefit to the government when the government issues currency.⁹ In calendar year 2017, the Federal Reserve reported transferring about \$81 billion to the Treasury,¹⁰ and the Mint reported transferring about \$269 million in fiscal year 2017.¹¹ The seigniorage the Federal Reserve and the Mint pay into the Treasury reduces the need for the government to borrow money, and as a result, the government pays less interest over time.

Other countries have taken steps to reduce currency costs by replacing notes with coins of the same value and eliminating the smallest value coin. For example, Canada introduced a \$1 coin in 1987 and a \$2 coin in 1996 that replaced corresponding-valued notes, and the United Kingdom replaced its £1 note with a £1 coin in 1983. These countries expected a cost reduction because, while coins are generally more expensive to produce than notes, the coins can last substantially longer in circulation. For example, in both countries, the \$1 and £1 notes, respectively, lasted 18 months or less while coins, according to experts, can be expected to last more than 30 years. As a result, these countries' governments expected to save money because over 30 years, the number of coins they would produce was far less than the number of notes they otherwise would have made.

These countries may have realized further financial benefits by replacing notes with coins because the public may hold more cash if a note is replaced with a coin and, as a result, the government would achieve a greater benefit from seigniorage.¹² As we reported in 2011,¹³ because of differences in how people use coins and notes, the public may hold more

⁹Traditionally, seigniorage is defined as the difference between the face value of coins and their cost of production. As long as there is public demand, the government creates this net value when it puts coins into circulation. Similarly, when the government issues notes, it creates an analogous net value, equal to the face value of the notes less their production costs. In this report, we use the term "seigniorage" to refer to the value created from the issuance of both coins and notes.

¹⁰The Federal Reserve generates revenue from sources other than interest earned on the securities purchased to collateralize the issuance of notes, such as from interest earned on other securities and fees it charges for services it provides to banks.

¹¹Of this transfer, about \$250 million was from seigniorage; the remaining \$19 million was net income from numismatic and bullion products.

¹²For example, Canadian officials reported that a switch from a \$1 note to a \$1 coin saved \$450 million (Canadian) over 5 years.

¹³GAO, *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).

than one coin for each note being replaced. Since people often store coins at home and store notes in their wallets, coins, as a result, circulate less frequently than notes and therefore more coins are needed to meet public demand. Thus, for a given denomination of currency, a larger number of coins would need to be maintained in circulation to meet the public's demand for cash than would be needed if that denomination were provided in notes. For example, we previously reported that when Canada replaced its \$1 note and the United Kingdom replaced its £1 note with a coin, both countries anticipated they would need to produce 8 coins to replace 5 notes, or a 1.6-to-1 replacement ratio.

In previous work, we reported a positive annual net benefit to the government of replacing the \$1 note with a \$1 coin.¹⁴ In 2011, we reported a 30-year net benefit of \$5.5 billion.¹⁵ Based on these results and the experiences of other countries, we have previously recommended that Congress consider and pass proposals to replace the \$1 note with a \$1 coin and, to ensure success of the coin, also provide for the elimination of the \$1 note. While the production of the \$1 coin has been authorized in law,¹⁶ elimination of the \$1 note has not, and the U.S. has continued producing it.

The U.S. has not eliminated any coins or altered any coin's metal composition since 1982. Some countries have also eliminated their low-denomination coins to reduce currency costs. In 2013 Canada eliminated its one-cent coin because the cost to make it was more than it was worth and the coin's usefulness had declined due to inflation.¹⁷ Over time, the costs of making these coins has increased due, in large part, to increases in the costs of metals used in coins—copper, zinc, and nickel. Since fiscal year 2006, both the penny and nickel have cost more to produce than

¹⁴See GAO, *National Coinage Proposals: Limited Public Demand for New Dollar Coin or Elimination of Pennies*, [GAO/GGD-90-88](#) (Washington, D.C.: May 23, 1990); GAO, *1-Dollar Coin: Reintroduction Could Save Millions if Properly Managed*, [GAO/GGD-93-56](#) (Washington, D.C.: Mar. 11, 1993); GAO, *A Dollar Coin Could Save Millions*, [GAO/T-GGD-95-203](#) (Washington, D.C.: July 13, 1995); GAO, *Financial Impact of Issuing the New \$1 Coin*, [GAO/GGD-00-111R](#) (Washington, D.C.: Apr. 7, 2000).

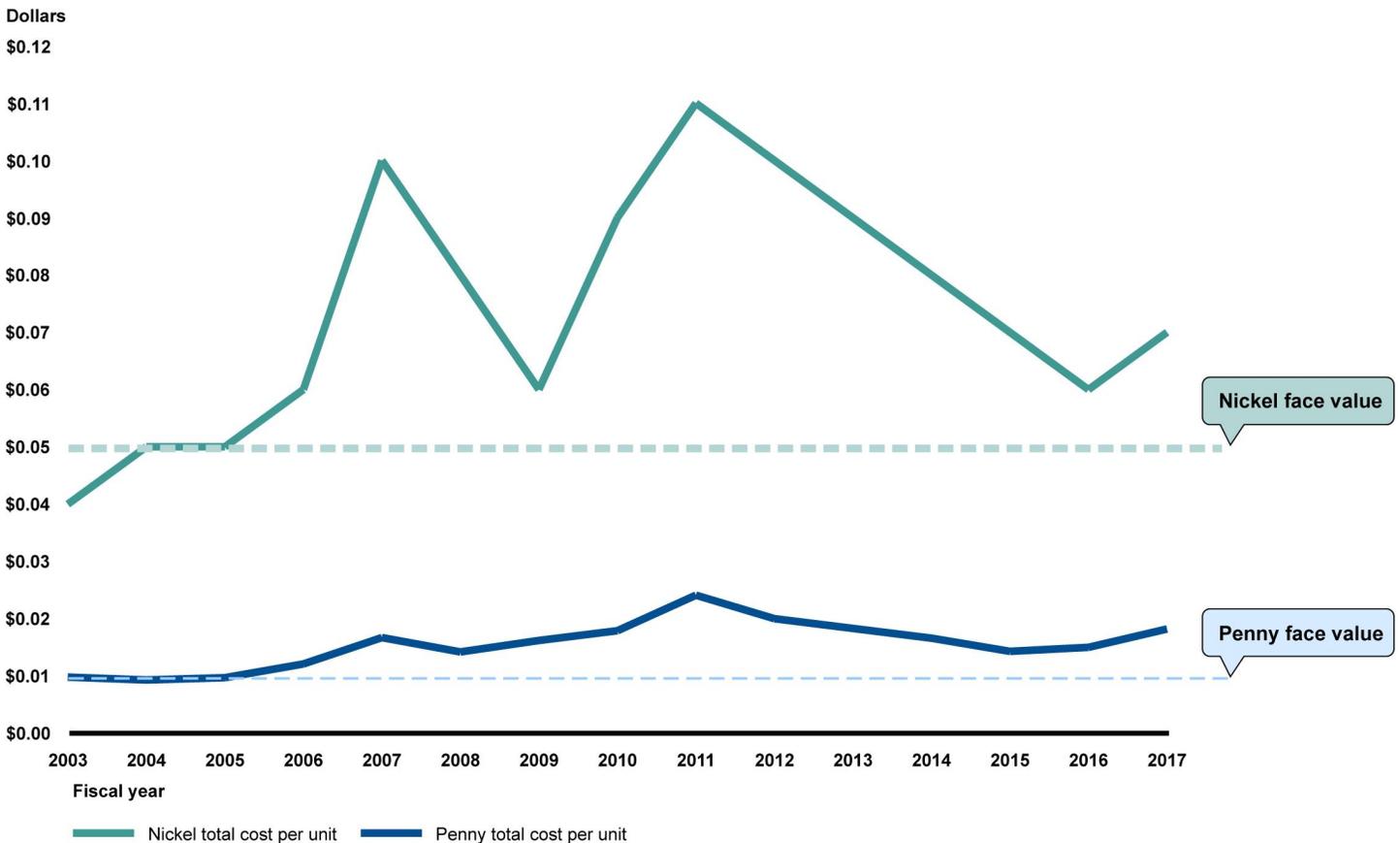
¹⁵[GAO-11-281](#).

¹⁶31 U.S.C. § 5112(n) and (r).

¹⁷According to a Canadian parliamentary report, the Canadian penny had lost 95 percent of its purchasing power since it was first produced in 1908. See *The Costs and Benefits of Canada's One-Cent Coin to Canadian Taxpayers and the Overall Canadian Economy: Report of the Standing Senate Committee on National Finance* (December 2010).

their face value, according to our analysis of Mint data. (See fig. 1.) For example, in 2017, the Mint spent approximately 1.8 cents to produce each penny and approximately 6.6 cents to produce each nickel. Because the Mint sells coins to the Federal Reserve at face value, both coins cost more to produce than the Mint receives for them. As a result, in 2017, the Mint incurred net losses of about \$69 million to produce the penny and about \$21 million to produce the nickel. The dime and the quarter, however, cost less to produce than their face value. The combined cost to produce all widely circulating coins (the penny, the nickel, the dime, and the quarter) is less than their combined face value, so the government continues to realize positive seigniorage overall from producing circulating coins.

Figure 1: Unit Cost of Penny and Nickel Production, Fiscal Years 2003 through 2017



Source: GAO analysis of U.S. Mint data. | GAO-19-300

The Coin Modernization, Oversight, and Continuity Act of 2010¹⁸ authorized the Secretary of the Treasury to conduct research on alternative materials that could be used in coins. In response, the Mint conducted research on alternative metals, identified metal alloys that offered the potential for cost savings, and reported its results to Congress in 2012, 2014, and 2017.¹⁹

Replacing the \$1 Note with a Coin Would Likely Result in a Net Loss, and Selected Stakeholders Identified Little Benefit from Replacement

Replacing the \$1 Note with a \$1 Coin Would Likely Result in a Net Loss

According to our analysis, the government would likely incur a net loss over 30 years if it replaced the \$1 note with a \$1 coin. We conducted a number of simulations that used different sets of assumptions to estimate the net benefit to the government of replacing the \$1 note with a \$1 coin. In almost every simulation, the net benefit to the government from switching to a \$1 coin was negative, or an overall net loss (see app. I). For each set of assumptions, we simulated the status quo scenario in which notes are not replaced by coins, as well as two replacement scenarios. Under “gradual replacement,” the Federal Reserve would replace \$1 notes with \$1 coins as the notes became unfit for circulation.²⁰ Under “active replacement,” notes would be replaced by coins more quickly because the Federal Reserve would destroy unfit notes as well as some fit notes each year and replace them with \$1 coins. In both

¹⁸Pub. L. No. 111-302, 124 Stat. 3272.

¹⁹See U.S. Mint, *2012 Biennial Report to the Congress on the Current Status of Coin Production Costs and Analysis of Alternative Content*, (December 2012); U.S. Mint, *2014 Biennial Report to the Congress as required by The Coin Modernization, Oversight, and Continuity Act of 2010 (Public Law 111-302)*, (December 2014); and U.S. Mint, *2016 Biennial Report to the Congress as required by The Coin Modernization, Oversight, and Continuity Act of 2010 (Public Law 111-302)*, (June 2017).

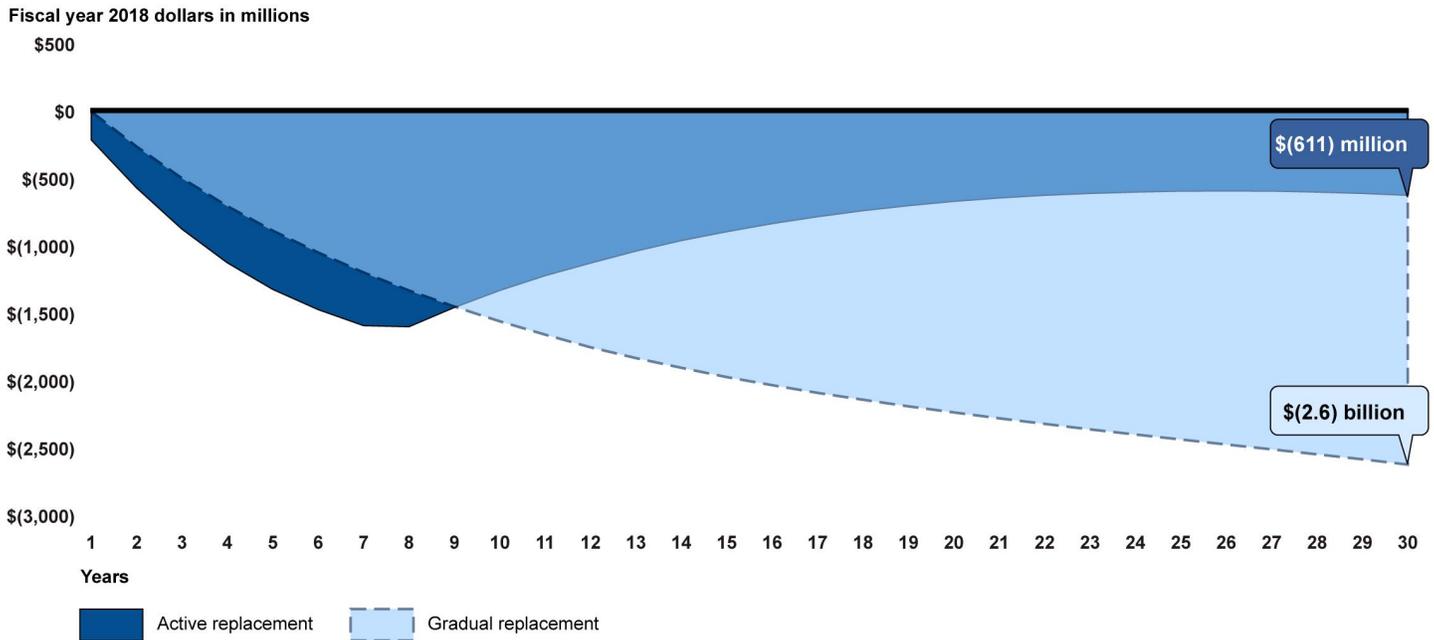
²⁰For example, in 2017, the Federal Reserve destroyed 1.5-billion \$1 notes out of 12.1-billion in circulation and thus the Federal Reserve would have replaced 1.5-billion notes with coins.

replacement scenarios, we assumed that the public would increase its holdings of cash when coins are used instead of notes and that the replacement ratio would be 1.5 coins for each note.²¹ We found that the present value of the net loss incurred by the government over 30 years would be about \$2.6 billion with gradual replacement and about \$611 million with active replacement (see fig. 2).²²

²¹We assumed that one and one-half (1.5) \$1 coins would be needed to replace each \$1 note. Thus, about 18-billion \$1 coins would be needed to replace the 12-billion \$1 notes in circulation in 2017.

²²Present value uses a rate, known as the discount rate, to convert the value of payments or receipts expected in future years to today's value, taking into account that the further into the future an amount that would be paid or received, the smaller its value is today. These amounts are expressed as fiscal year 2018 dollars. Applying a discount rate establishes a consistent basis for comparing alternative investments that will have differing patterns of costs and benefits over many years.

Figure 2: Estimated Cumulative Present-Value Net Loss to the Government from Actively and Gradually Replacing \$1 Notes with \$1 Coins over 30 Years



Source: GAO analysis of agency and economic data. | GAO-19-300

Notes: Under a gradual replacement scenario, the Federal Reserve would replace unfit \$1 notes—that is, damaged or soiled notes removed from circulation—with \$1 coins. Under an active replacement scenario, the Federal Reserve would replace notes with coins irrespective of the notes' condition.

Present value uses a rate, known as the discount rate, to convert the value of payments or receipts expected in future years to today's value, taking into account that the further into the future an amount is paid or received, the smaller its value is today.

Each simulation we conducted accounts for both costs and benefits to the government. The costs include production and processing costs for \$1 coins and \$1 notes, as appropriate. The coin replacement scenarios each include one-time startup costs that would be incurred upfront, in addition to recurring increased costs of producing higher-denomination notes when the \$1 note would no longer be made. In each simulation, we calculated benefits to the government as interest savings on debt that would be avoided because of seigniorage, or the difference between the face value of the currency that would be produced and the cost of producing it.

These simulations represent the first time we have found that replacing the \$1 note with the \$1 coin would result in a net loss to the government rather than a net benefit. The simulations are based on current data and

projections from CBO and the Federal Reserve, among others, that have changed over time. For example, the increased lifespan of the \$1 note relative to that of the \$1 coin and the decreased cost to the Federal Reserve for processing currency are key factors in these estimates and substantially reduced the relative costs of the status quo scenario. For our 2011 report, we assumed a median lifespan of 3.3 years for the \$1 note based on Federal Reserve data.²³ Since then, the \$1 note lifespan has increased, and our current simulations assume a median lifespan of 7.9 years based on the most recent data from the Federal Reserve. Due to this substantially longer note lifespan, fewer \$1 notes need to be produced over a 30-year period, which reduces the cost of producing them and diminishes the relative advantage of the long coin life. In our 2011 simulations, a \$1 coin was assumed to last about 10 times as long as a \$1 note (34 years to 3.3 years); in our current simulations, the lifespan of the coin remains the same but is now only about 4.3 times as long as that of the note (34 years to 7.9 years). Meanwhile, the relative cost of producing coins and notes has remained about the same.

According to the Federal Reserve, the increased lifespan of the \$1 note is largely attributable to a series of improvements in Federal Reserve currency processing procedures and equipment that has reduced the number of notes destroyed each year.²⁴ For example, prior to April 2011, depository institutions were required to deposit currency in stacks of like-notes with the portrait side of the note facing up. After discovering it was destroying many notes that were otherwise fit for circulation because they were “misfaced,”²⁵ the Federal Reserve undertook an effort to increase the percentage of notes that were properly faced by manually checking and correcting notes’ orientation.²⁶ Subsequently, during 2010 and 2011, the Reserve Banks installed new sensors on their high-speed processing equipment, which enabled the Reserve Banks to authenticate notes regardless of facing. In addition to increased note life, the costs that we anticipate the Federal Reserve would incur for processing notes has decreased since our 2011 analysis because it is processing fewer \$1

²³[GAO-11-281](#).

²⁴Federal Reserve officials divide the number of notes in circulation by the number of notes destroyed to estimate note life.

²⁵“Misfaced” notes are notes that are reverse side up rather than portrait side up.

²⁶At that time, the sensors on the Federal Reserve’s high-speed currency processing equipment could not verify misfaced notes and destroyed them instead.

notes. Although the cost per note for processing has remained the same—\$0.003 per note, based on Federal Reserve data—the number of notes processed in 2017 was about 1.6 billion less per year than at the time of our 2011 analysis. According to Federal Reserve officials, the public may be handling and using \$1 notes less and holding on to them longer. This could cause notes to circulate less frequently, reducing the number of notes processed.

Our simulations show that the losses to the government from replacing the \$1 note with a \$1 coin would not be incurred evenly over the 30-year period. Much of the cost of producing coins to replace notes would be borne by the government in the earlier years of our simulations, while the benefits to the government would accrue gradually and become relatively more important in later years. For example, in the gradual replacement scenario, more than half of the net loss to the government occurs in the first 10 years of the 30-year period. The large net losses in the early years largely reflect the upfront costs of replacing \$1 notes in circulation with \$1 coins and meeting increased demand for currency. In our simulations, the interest savings then accrue over a relatively long period of time due to the 34-year median lifespan of the coin.

Our simulations reflect uncertainty in the underlying projections and assumptions. In general, however, projections that are closer in time are more certain. For example, an estimate over a 10-year period would be more certain than an estimate over a 30-year period. Consequently, within our results, the estimated net loss in the first 10 years is more certain than the estimated net loss over the 30-year period.

Most Stakeholders We Interviewed Said Switching to a \$1 Coin Would Result in Added Costs without Providing a Benefit

Representatives from 7 of the 10 stakeholder industries we met with would be negatively affected by a switch to a \$1 coin because they stated they would incur additional costs as a result of such a change. For example, representatives from the armored carrier industry told us that they anticipate increased costs because of the additional weight of transporting \$1 coins compared to \$1 notes as well as the need to modify or procure additional coin-processing equipment. Representatives of the gaming industry, which includes casinos and companies who make electronic games found in casinos, said a switch to the \$1 coin would be costly because the industry has generally moved away from the use of

coins in favor of notes and casinos would incur additional costs for transporting and storing coins.

Of the 7 stakeholder industries that said they would incur additional costs, 3 provided us with estimates of these costs. All 3, which represent industries with machines that would require modification to accept \$1 coins, approximated these costs by multiplying an estimated number of units affected by an estimated per-unit cost of changing the machines. For example, a representative of the gaming industry estimated that about 98 percent of the approximately 1,000,000 electronic gaming machines in the U.S. and Canada were manufactured with no provision for accepting coins. According to this representative, the costs to convert machines to accept \$1 coins could range from \$130 to \$175 per unit because the level of modification needed would vary. Some machines would require, for example, a newly designed faceplate, a coin acceptance mechanism, and a box for collecting coins.

Most representatives from stakeholder industries said there would be no benefit to them from a switch to a \$1 coin, but 3 of the 10 representatives acknowledged some benefits of doing so. Two representatives said that coins are generally less likely to jam or be rejected by the payment mechanisms than notes. The other representative—from the bulk vending industry, which sells products such as gum balls and small toys through coin-operated equipment—said a \$1 coin would help the industry increase sales and offer higher-quality products than it offers now for 25 or 50 cents. According to this representative, virtually all these machines accept quarters but some require two or three quarters for a purchase. A \$1 coin would increase the likelihood that consumers would have the necessary change to use these machines thus increasing their sales, according to this representative.

Representatives from the remaining 3 stakeholder industries reported that switching to a \$1 coin would have little or no impact on their operations. For example, a representative of operators of toll roads and bridges said that all major toll operators have adopted some form of cashless, electronic collection system. The use of cash, including coins, for toll payment has declined to 18 percent of all toll revenue in 2015, down from 29 percent in 2010,²⁷ and most existing coin collection machinery

²⁷International Bridge, Tunnel and Turnpike Association, *Toll Technology Transforms Mobility for Customers, 2016 National Toll Technology Survey* (Washington, D.C.).

currently accepts \$1 coins. Similarly, a representative from the parking industry noted a trend toward increased use of cashless transactions along with a decrease in the number of coin-operated parking meters. A switch to a \$1 coin would have minimal effect on the industry because virtually all parking meters take quarters. The remaining representative said additional information, such as whether a new \$1 coin would be issued and whether it would have the same properties as currently circulating \$1 coins, would be needed to determine whether it would incur costs from a switch to a \$1 coin.

A representative of an organization that advocates replacing the \$1 note with a \$1 coin said that switching to the \$1 coin could make it easier for people with visual impairments to identify the denomination. We have previously reported that different denominations of US currency are identical in size, making it difficult for the blind or visually impaired to distinguish among them.²⁸ Moreover, according to the representative, eliminating the \$1 note would reduce the number of note denominations, and the \$1 coin may be easier to recognize by its physical difference from other coins.

Although anyone who uses currency could be affected by a switch to a \$1 coin, the extent of public support for making such a change is unclear, particularly when doing so would not provide a benefit to the government. Our most recent work on public perceptions of \$1 coins in 2002 found few survey respondents were using \$1 coins and 64 percent opposed replacing the \$1 bill with a \$1 coin.²⁹ A majority of survey respondents favored replacing the \$1 note with a \$1 coin when told that doing so could save about half a billion dollars per year—our then-current estimated net benefit to the government;³⁰ we did not seek to gauge public perceptions about the same action if it were to cause a loss. Similarly, the organization advocating in support of \$1 coins has reported increased public interest in a change from the \$1 note when substantial cost savings

²⁸GAO, *U.S. Currency: Reader Program Should Be Evaluated While Other Accessibility Features for Visually Impaired Persons Are Developed*, [GAO-14-823](#) (Washington, D.C.: Sep. 26, 2014).

²⁹GAO, *U.S. Coins: Public Views on Changing Coin Design*, [GAO-03-206](#) (Washington, D.C., Dec. 17, 2002).

³⁰Those who reported that they opposed replacement decreased from 64 percent to 37 percent, and those who reported that they favored such a proposal increased from 17 percent to 55 percent.

are factored in.³¹ However, according to Federal Reserve officials, the public continues to express its preference for the \$1 note because both the \$1 coin and \$1 note are available and the public overwhelmingly uses \$1 notes. Moreover, Reserve Banks currently hold more than 1-billion \$1 coins because there is little demand for them from the public, further demonstrating public preference for the \$1 note, according to these officials.

³¹For example, the Dollar Coin Alliance, an organization that advocates for a transition to a \$1 coin, cites a public opinion poll conducted in January 2017 that reported strong support for replacing the \$1 bill with a \$1 coin when survey respondents are told that such a change would save taxpayers \$4.4 billion over 30 years.

The Mint Estimates Suspending Penny Production and Changing the Nickel May Result in Savings, but Some Stakeholders Expressed Concerns about Suspending the Penny

The Mint Estimates That Suspending the Penny Would Save Over \$250 Million and That Changing Metal Content of the Nickel Would Save from \$21 Million to \$85 Million over 10 Years

The Mint estimates that it would save about \$27 million annually, or about \$252 million in present value over 10 years if Congress directed it to suspend the production of the penny (see table 1). However, the Mint's estimated savings are based on its penny production data from a single fiscal year—2017. Specifically, since the Mint lost \$27.3 million from making 8.4-billion pennies that year, this amount would also represent the savings to the Mint through cost avoidance if it had not produced any pennies. Because the number of pennies produced and the base metal costs vary from year to year, future changes to production volumes and costs could alter the estimated savings.³² The present value of the estimated savings could also be affected by the choice of discount rate.

³²Over the last 10 years, the number of pennies produced annually has ranged from 3.2 billion to 9.2 billion and penny production costs have ranged from \$52 million to \$133 million per year.

Table 1: U.S. Mint’s Savings Estimate from Suspending Production of the Penny for 10 years, in Millions of Dollars

Category	Category description	Fiscal year 2017 ^a (8.4 billion pennies)	10- year total (84 billion pennies)	Present value (fiscal year 2018 dollars)
Costs	Pre-fabricated coin blanks purchased from vendor ^b	\$97.1	\$970.7	\$897.0
Costs	U.S. Mint production ^c	\$9.5	\$95.2	\$88.0
Costs	Transportation to Federal Reserve Banks	\$1.9	\$18.8	\$17.4
Costs	Capital	\$3.1	\$30.7	\$28.4
Costs	Total costs	\$111.5	\$1115.4	\$1030.7
Revenue	Federal Reserve Banks’ purchases of pennies	(\$84.3)	(\$842.6)	(\$778.6)
U.S. Mint savings (costs - revenue)	n/a	\$27.3	\$272.8	\$252.1

Source: GAO analysis of U.S. Mint data | GAO-19-300

Note: Numbers may not sum to totals because of rounding.

^aThe Mint based its estimate on fiscal year 2017 penny production and costs. The Mint’s estimate assumes production of 8.4-billion pennies per year for the next 10 years, and a discount rate of 1.8 percent to convert future savings into today’s value, or net present value. Changes in the volume of pennies produced, the costs of production, or the choice of discount rate could change the estimated savings.

^bCoin blanks are metal disks that are ready for stamping to produce a coin. Excepting the penny, the Mint produces its own coin blanks from sheet metal for all the circulating coins it produces.

^cMint production costs include estimated direct labor and other direct production costs.

The Mint has suspended production of some coins in the past due to a lack of demand for those coins. Specifically, the Mint suspended production of the half-dollar coins for circulation in fiscal year 2006 and the Presidential \$1 coins for circulation in 2011.³³ The Mint suspended production of these coins because demand for them was low. In contrast, demand for the penny remains strong, as the Mint produced about 8.4 billion pennies in fiscal year 2017 in response to orders from the Federal Reserve. Penny inventories at Federal Reserve Banks can meet demand for about 1 month, according to Federal Reserve officials. According to Mint officials, the Mint has not taken a position on proposed legislation introduced in the 115th Congress that would suspend production of the penny for 10 years, among other things.³⁴ However, the Mint has

³³Under current law, the denomination, specification, and design of circulating coins that the Secretary of the Treasury may mint is prescribed by statute and the Secretary has the authority to mint these coins in the amount necessary to meet the needs of the United States. 31 U.S.C. §§ 5111(a), 5112(a).

³⁴S. 759, Currency Optimization, Innovation, and National Savings Act of 2017.

developed a preliminary plan to implement a penny suspension if required to do so by law. According to this plan, suspending penny production would take place over a 2.5-year timeframe: the first year would be devoted to planning and preparing for penny suspension, and the next 1.5 years would be devoted to ending the Mint's contracts with its suppliers, addressing the disposition of affected Mint personnel,³⁵ and deciding what to do with excess production equipment and physical space. The Mint would also conduct outreach and communication to the public, Congress, and Mint employees during this time.

The Mint is also taking steps to reduce the financial loss from producing the penny. According to Mint officials, they and the Federal Reserve are working with industry stakeholders specifically to identify alternative practices that would reduce dependency on the manufacture of additional pennies. For example, the Federal Reserve and Mint met with stakeholders to discuss these practices in January 2019. According to Mint officials, the Mint would not need to produce as many pennies if the pennies currently in circulation were more actively circulated. Mint officials stated that billions of pennies are held by banks, armored carriers, or the public.³⁶ According to Mint officials, if pennies were to circulate more quickly, the demand for new pennies would be reduced, and production of new pennies could decrease and would reduce the financial losses from penny production.

The Mint also estimates it would save between \$2.2 million and \$9.1 million annually, or between \$21 million and \$85 million in net present value over 10 years, by changing the metal composition of the nickel (see table 2). The Mint's estimated savings are based on fiscal year 2017 production of 1.3-billion nickels at a cost of \$86 million. The nickel currently consists of about 75 percent copper and 25 percent nickel. Based on research, the Mint reported it would achieve cost savings by changing the metal composition to about 80 percent copper and 20 percent nickel (80/20) or by changing the metal composition to a copper,

³⁵Mint officials told us that suspending the penny would not affect its workforce as the approximately 50 staff dedicated to penny production would either be assigned to other positions or retire.

³⁶According to Mint officials, the Mint contracted for a study to estimate the lifespan of a penny and found that pennies are lasting much longer than previous research indicated. Based on the estimated lifespan, the study estimated that nearly 240 billion pennies are currently in circulation.

nickel, manganese, and zinc combination (C99750T-M).³⁷ Because the number of nickels produced and their cost varies from year to year, future changes to production volumes and costs could alter the estimated savings.³⁸ Both changes in the composition of the nickel are seamless changes because nickels made of these alloys would have the same weight and electromagnetic signature as the current nickel, according to the Mint.³⁹ As a result, these nickels would function the same for the public and in vending machines.⁴⁰ However, according to Mint data, even if the Mint changes to one of these alternative metal compositions, the unit cost of producing the nickel would likely remain greater than the face value of the coin. In fiscal year 2017, the Mint spent approximately 6.6 cents to produce each nickel, which would have been reduced to about 6.4 cents if the Mint had produced the 80/20 nickel and 5.9 cents for the C99750T-M nickel.

³⁷According to Mint officials, the 80/20 alloy has undergone extensive testing and can be used now, while the C99750T-M alloy has been preliminarily tested but requires additional testing to confirm its viability.

³⁸For example, in 2014 the Mint estimated annual savings from an 80/20 nickel to be \$5 million annually, based on fiscal year 2014 production levels and costs. Annual nickel production has ranged from 207 million to 1.6 billion and nickel production costs have ranged from \$12.2 million to \$99.7 million over fiscal years 2008 to 2017.

³⁹The electromagnetic signature is an electronic reading by a sensor, which is directly influenced by the materials and thickness of a coin.

⁴⁰The Mint tested other alternative metal compositions and alloys for use in the nickel that would potentially offer greater savings but they are not seamless and would, according to the Mint, require modifications to coin-accepting and handling equipment at a cost that exceeds the benefit of the savings.

Table 2: Estimated Savings to the U.S. Mint from Changing the Metal Composition of the Nickel for 10 years, in Millions of Dollars

Option	Fiscal year 2017 Savings ^a (1.3 billion nickels)	10- year total (13 billion nickels)	Present Value (fiscal year 2018 dollars)
80/20 nickel	\$2.2	\$22.2	\$20.5
C99750T-M nickel	\$9.1	\$91.4	\$84.5

Source: GAO analysis of U.S. Mint data | GAO-19-300

^aThe Mint based its estimate on fiscal year 2017 nickel production of 1.3 billion nickels. To be consistent with the Mint's penny estimates to calculate 10 year savings and net present value, we assumed production of 1.3 billion nickels per year for the next 10 years and a discount rate of 1.8 percent to convert future savings into today's value, or net present value. Because these factors—the number of nickels produced, their cost, and the discount rate—vary from year to year, future estimated savings could be different.

Based on authorities granted in the Coin Modernization, Oversight, and Continuity Act of 2010,⁴¹ the Mint has conducted research and identified potential alternative metal compositions for the dime and quarter. This research shows that the same alloys that could reduce the cost of producing the nickel could be used to reduce the costs of producing the dime and quarter. Specifically, this research indicated potential savings of \$74 million over 10 years by using the C99750T-M alloy in the dime and quarter, although additional testing of the alloy is required. Changing the metal composition of circulating coins could help the Mint achieve more effective and efficient operations by reducing production costs, resulting in savings to the government and the taxpayer.

The Secretary of the Treasury and Mint officials do not have the authority to alter the metal content of coins—except the penny—as metal content is determined in statute.⁴² The Mint has sought authority from Congress to change the metal composition of the nickel, dime, and quarter, if those changes meet certain requirements. Specifically, in its fiscal year 2019 budget proposal, the Mint proposed a legislative change to its authorities that would enable the Secretary of the Treasury to alter the metal composition of coins, if those changes did not affect the weight or

⁴¹Pub. L. No. 111-302, 124 Stat. 3272.

⁴²31 U.S.C. § 5112.

electromagnetic signature of the coins.⁴³ This proposed change is consistent with the Treasury's 2018–2022 strategic plan, which includes a goal to introduce efficiencies to lower the unit costs of coins produced by the Mint. Legislation supporting this proposal has not been introduced. Without the authority to change the metal composition of coins, the Mint cannot fully realize operational efficiencies, even though it has identified methods to reduce the cost of coins without altering their characteristics.

⁴³The Mint's fiscal year 2019 proposed legislative change is of more limited scope than proposed legislation introduced in prior years, such as the Coin Modernization and Taxpayer Savings Act of 2008, H.R. 5512, 110th Cong. (2008); Coin Modernization and Taxpayer Savings Act of 2007, H.R. 3956, 110th Cong. (2007); and Coinage Materials Modernization Act of 2007, H.R. 3330, 110th Cong. (2007)—which sought to give the Secretary of the Treasury the authority to change both the weight and the metal content of circulating coins.

Some Selected Stakeholders Expressed Concerns about Penny Suspension but None Expressed Concerns about Changes to the Nickel

Government officials we spoke with raised concerns about the potential effects of a penny suspension, such as regional penny shortages or other unintended consequences. Specifically, Federal Reserve officials noted that suspending production could create a shortage of pennies if demand is greater than the supply of pennies. These officials explained that even if there are enough pennies to meet overall demand, the distribution of pennies across the country may be uneven and not matched to the location of greater demand. In this case, the Federal Reserve could incur additional costs to transport pennies to balance supply and demand across the country. Federal Reserve officials also said a suspension could potentially be successful if there was a reduction in penny demand and steps taken to mitigate potential disruptions to the penny supply. Mint officials expressed concern about potential unintended consequences of a penny suspension and effects on Mint operations. Specifically, according to Mint officials, suspending penny production may cause an increase in the number of coins returned to circulation because the public may react to a suspension by using its pennies in addition to the other coins in its coin jars.⁴⁴ The resulting influx of coins into circulation may be sufficient to satisfy some or all of the demand for new coins for a period of time and cause the Mint to decrease or suspend production of coins. Mint officials said that costs the Mint would incur due to a disruption of coin production operations and loss of income from seigniorage could be as high as \$3 billion over 7 to 10 years. These officials also raised concerns about the ability to securely store larger-than-usual quantities of all coins because the existing infrastructure, particularly vault storage, may be insufficient.

Mint officials noted that, while other countries have stopped producing coins, suspending penny production may have a similar impact as not producing the penny. When Canada stopped producing its penny, it began to actively take the coins out of circulation, and the public knew the

⁴⁴As we previously reported, many coins are not in active circulation because people hold coins in storage containers in their homes, automobiles, or office desk drawers, among other places. Some people periodically cash-in stored coins primarily, according to the Mint, at coin counting kiosks. See [GAO-11-281](#) and GAO, *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).

penny would eventually no longer be used. While the proposal to suspend penny production does not remove the penny from circulation or use in commerce, Federal Reserve and Mint officials told us that the results of suspending penny production are uncertain, partly because a suspension has not been tried before.

Representatives from 9 of the 10 stakeholder industries said they do not anticipate incurring costs if the penny were suspended; most said they were not concerned about this action because the coins are either not used or minimally used in their industry. Three selected stakeholders said they would be affected by a penny suspension—associations representing armored carriers, banks, and retailers—as well as the company that manufactures the penny blanks for the Mint. They expressed uncertainty about how the suspension would be carried out and effects it might cause, such as penny shortages, and provided the following views and information:

- *Armored Carriers* – A penny suspension may not have a significant effect on operations since a suspension would not necessarily reduce the number of coins processed or transported, according to armored carrier representatives we spoke to. However, if penny shortages occurred, the carriers may have to move pennies from one geographic region to another to satisfy variations in demand from their customers, incurring additional transportation costs. Alternatively, suspension of the penny may cause the public to turn in pennies, along with coins of other denominations, which could exceed the secure storage capacity of carriers and coin terminals.
- *Bankers* – According to an association representing banks, bankers are unclear if the government would issue any guidance about rounding cash transactions to avoid inconsistent approaches. Because banks have received questions from customers about changes to currency in the past, the association emphasized the need for public education before suspending the penny.
- *Retailers* – Retailers have not determined the impact of suspending the penny on their industry, according to a retailer association. However, many retailers sell items priced below \$1 as an important part of their business and merchandising strategy, according to these representatives, so it is important for retail businesses to be able to continue to make change down to the penny at the end of cash transactions.
- *Vendor* – a representative of the company that supplies the Mint with penny coin blanks told us that a penny suspension would force a

decision whether to sell or deactivate the penny blank production equipment during the 10-year suspension. If sold, the vendor may then not have the equipment if the government decided to produce the penny again.

None of the representatives from stakeholder industries raised concerns about changes to the nickel as long as the changes to the nickel are seamless.

Conclusions

Producing money for use in commerce is an important function of the U.S. government. The Federal Reserve, along with the Treasury's BEP and the Mint, work together to ensure that there is an adequate supply of U.S. coins and notes for use around the world. In addition to ensuring an adequate supply of these coins and notes, it is also important to ensure that the government is producing these items efficiently. Because our current estimate shows the federal government would likely incur a net loss from replacing the \$1 note with a \$1 coin, we are no longer recommending that Congress consider replacing the \$1 note with the \$1 coin.

The Treasury cannot alter the metal content of coins unless Congress provides that authority to the Treasury. If Congress were to grant the Treasury the authority to change the metal composition of coins, as the Mint has proposed, then it could use the results of its research to lower the costs of coin production while producing coins that look, feel, and function the same as current coins. Further, the Mint could decrease its production costs without affecting the characteristics of the coins. Without this authority, the Mint cannot provide the best value to the taxpayer and produce coins in the most efficient and cost-effective manner possible.

Matter for Congressional Consideration

Congress should consider amending the law to provide the Secretary of the Treasury with the authority to alter the metal composition of circulating coins if the new metal compositions reduce the cost of coin production and do not affect the size, weight, appearance, or electromagnetic signature of the coins. (Matter for Consideration 1)

Agency Comments

We provided a draft of this report to Treasury, including the Mint and BEP, and the Federal Reserve for their review and comment. In comments, reprinted in appendix III, the Mint agreed with our matter for congressional consideration and clarified its position on the potential cost impact of a penny suspension. The Mint's comments stated that if the penny were suspended, consumers may return large amounts of all coins, not just pennies, which would decrease the need for future coin production. Without demand for coin production, the Mint estimated costs from idle production capacity and loss of seigniorage from coins to be up to \$3 billion over 7 to 10 years. The Mint also commented that the effect of suspending penny production could be the same as the effect of stopping penny production. We revised our report to reflect the Mint's perspective. The Department of the Treasury concurred with comments provided by the Mint. BEP did not have any comments. The Federal Reserve provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to the appropriate congressional committees, the Secretary of the Treasury, the Director of the U.S. Mint, the Director of the Bureau of Engraving and Printing, the Chair of the Board of Governors of the Federal Reserve System, and other interested parties. In addition, the report will be available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or vonaha@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 key contributions to this report are listed in appendix IV.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Andrew Von Ah". The signature is fluid and cursive, with a large initial "A" and "V".

Andrew Von Ah, Director
Physical Infrastructure Issues

Appendix I: GAO's Economic Simulations and Alternative Analyses

This appendix describes the economic simulations discussed in this report, including the assumptions we used and their sources, as well as the alternative simulations we conducted.

Economic Simulations

To estimate the net effect on the government of replacing the \$1 note with a \$1 coin, we simulated the benefits and costs to the government of issuing currency—including both notes and coins—under different scenarios and assumptions over a 30-year period.¹ For each set of assumptions we considered, we simulated three scenarios—the status quo scenario, in which the \$1 note would continue to be produced, and two replacement scenarios, in which the \$1 coin would replace the \$1 note. In the gradual replacement scenario, \$1 notes are replaced as they become unfit for circulation, while under the active replacement scenario, \$1 notes are replaced more quickly. We then compared the net benefit to the government in each replacement scenario to the net benefit under the status quo. As part of our analysis, we also ran alternative simulations with different sets of assumptions, to examine how the assumptions underlying our analysis would affect the estimated net benefit to the government.

The various assumptions include the extent to which the public would increase its holdings of cash when coins are used instead of notes, the expected rate of growth in the demand for currency over 30 years, the costs of producing and processing both coins and notes, and the life span of both forms of currency (see table 3). In our replacement scenarios, we assumed that the replacement would be implemented starting in 2018, and during that year the U.S. Mint (Mint) would invest in new equipment

¹Replacing the \$1 note with a \$1 coin would also have benefits and costs for private businesses and for the general public and consumers, but our simulations do not estimate these effects.

to establish its production capability for \$1 coins. We also assumed that production of the paper note would stop as soon as \$1 coins were introduced.²

A key assumption in our analysis is the extent to which the public may hold more cash when notes are replaced by coins. Because of differences in how people use notes and coins, the public may need more than one coin for each note than would otherwise have been demanded. For example, people may take coins out of their pockets and store them at the end of each day, rather than retain them in their wallets as they do notes. These factors cause coins to circulate more slowly than notes, and more \$1 coins would need to be maintained in circulation to meet the public's demand for \$1 notes.

Consistent with simulations in our previous reports, we assumed in our economic simulations that the public would hold more \$1 coins, requiring that more than one coin would be needed to replace each note. Therefore our replacement scenarios use a replacement ratio of 1.5 – that is 1.5 \$1 coins for each \$1 note to be replaced. For our alternate simulations we allow the replacement ratio to vary, to include a case in which no additional currency is demanded when coins are used (i.e., the replacement ratio is 1.0). As part of this sensitivity analysis, we found that a key driver of the estimated net benefit is the extent to which the public would hold more cash when \$1 coins are used instead of notes.³

Table 3: Assumptions, Values, Sources, and Rationales Used in the Simulations

Assumption	Value	Source(s)/rationale
Government borrowing rate	Varies by year	We used the projected nominal rate on all federal debt held by the public from the Congressional Budget Office's (CBO) 2018 report <i>The 2018 Long-Term Budget Outlook</i> .
Nominal discount rate	Varies by year	We used the projected government borrowing rate to discount nominal values.

²We assumed that after production of \$1 notes stops, the number in circulation would decline over time. Under our gradual replacement scenario, only unfit notes are removed from circulation, and some notes continue to circulate throughout the 30-year simulation period. In contrast, under our active replacement scenario, notes would be removed from circulation more quickly, subject to our assumption about the Mint's annual production capacity for \$1 coins, and all notes would be removed from circulation after 8 years.

³We did not model the extent to which the public would change the number of higher-denomination notes it holds following the replacement of the \$1 note with a \$1 coin.

**Appendix I: GAO's Economic Simulations and
Alternative Analyses**

Assumption	Value	Source(s)/rationale
Inflation	Varies by year	We used CBO's projected values of the gross domestic product (GDP) price index to estimate annual rates of inflation.
Growth rate of demand for \$1 notes	Varies by year	We assumed that the demand for \$1 notes would grow at a rate between the real and nominal gross domestic product growth rates. We used regression techniques on historical data to estimate the relationship between growth in demand for \$1 notes and annual growth in nominal and real GDP. We used the estimated coefficients from this regression, along with CBO's projected rates of growth in nominal and real GDP, to project the rate of growth in demand for \$1 notes through fiscal year 2047.
Replacement ratio	1.5 coins to 1 note	We assumed that because coins circulate more slowly than notes, the public would hold more cash when the \$1 note is replaced by a \$1 coin. As a result, more than one coin would be needed to satisfy the demand for one note, on average.
Lifespan of notes	Median of 7.9 years (8 percent annual attrition rate)	Our analysis of data from the Board of Governors of the Federal Reserve System (Federal Reserve) indicates the current median lifespan for \$1 notes is 7.9 years.
Lifespan of coins	Median of approximately 34 years (2 percent annual attrition rate)	We assumed a median lifespan for \$1 coins based on testimony from the Mint and international experts that put the average life of coins in general at about 30 years.
Variable cost of notes	3.0 cents per note in fiscal year 2018	We based this assumption on our analysis of 13 years of cost and production data from the Bureau of Engraving and Printing (BEP) and the Federal Reserve as well as information on the long-run variability of certain cost categories provided by BEP. We assumed that the nominal production cost would grow with inflation and that the real cost would remain constant over time.
Variable cost of coins	14.6 cents per coin in fiscal year 2018	We based this assumption on our analysis of 13 years of cost and production data provided by the Mint. Specifically, we regressed the total production costs on a constant and the number of coins produced. We used the coefficient on the number produced as the estimate of variable cost.
Time frame	2018 through 2047	We estimated the net benefit to the government over 30 years. We assumed the policy would go into effect at the beginning of 2018 and discounted all values to this base year.
Note-processing cost	Approximately 0.3 cents per note	We used 9 years of data (2009–2017) from the Federal Reserve, which included total direct-processing costs and the number of notes processed.
Coin-processing cost	Approximately 0.01 cents per coin	We used 9 years of data (2009–2017) from the Federal Reserve, which included total direct-processing costs and the number of coins processed.
Note-processing frequency	0.9 times per year per note	We used data provided by the Federal Reserve for calendar year 2017.
Coin-processing frequency	0.1 times per year per coin	Federal Reserve officials told us they are unable to provide an estimate of coin-processing frequency because the Federal Reserve Banks do not have processing equipment to process coins, as they do for notes. We used the frequency estimate provided by the Federal Reserve for our 2011 report. ^a
Initial number of \$1 notes in circulation	Approximately 12.1 billion at the end of fiscal year 2017	We based this assumption on Federal Reserve data.

Assumption	Value	Source(s)/rationale
Initial number of \$1 coins in circulation	3 billion held by the public; 1 billion stored with the Federal Reserve	We based this assumption on data from the Mint and the Federal Reserve. We assumed that there are 3 billion coins held by the public. Some have been lost and some are not actively in circulation. We assume that 1 billion of these coins enter active circulation in the replacement scenario.
Increase in BEP variable costs	Proprietary information	We based this assumption on data provided by BEP and its suppliers.
Cost to Mint to convert production lines	Approximately \$8 million	We based this assumption on data from the Mint.
Public awareness campaign	Approximately \$7.8 million	We assumed a public awareness campaign would be conducted to inform the public during the first year of the transition period. We used an estimated cost provided by the Mint for a previous GAO report, updated for inflation. ^a

Sources: GAO and sources indicated | GAO-19-300

^aGAO, *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)

Alternate Simulations

We altered some assumptions to simulate how the change would affect our estimate of the net benefit or loss to the government. See table 4. We present our analysis to show the effect of changes under both gradual and active replacement, and we show the results both with and without gains from seigniorage.

To assess the effect of the public's holding more or less cash as a result of needing fewer or greater numbers of coins to replace each note in circulation, we conducted separate simulations in which we:

- decreased the replacement ratio from our current estimate of 1.5 coins per note to 1 coin per note, and
- increased the replacement ratio from our current estimate of 1.5 coins per note to 2 coins per note.

To assess the effect of the Board of Governors of the Federal Reserve System (Federal Reserve) not releasing into circulation the \$1 coins it currently holds, we:

- assumed that the approximately 1.2-billion \$1 coins held by the Federal Reserve would not enter circulation and would continue to be held by the Federal Reserve.

To assess the effect of changing production costs for notes and coins, we conducted separate simulations in which we:

- increased the costs of producing notes from our current estimate of 3 cents to 4.9 cents without changing the costs of producing coins;
- increased the costs of producing coins from our current estimate of 14.6 cents to 17.5 cents without changing the costs of producing notes; and
- increased the costs of producing both notes and coins from our current estimates of 3 cents to 4.9 cents for notes and 14.6 cents to 17.5 cents for coins.

To assess the effect of decreased demand for currency if people switched to electronic means of payment, we conducted separate simulations in which we assumed:

- demand for currency grows at a slower rate—75 percent of the growth in demand in the replacement scenarios—after fiscal year 2028, and
- demand for currency grows at a slower rate—50 percent of the growth in demand in the replacement scenarios—after fiscal year 2028.

Appendix I: GAO's Economic Simulations and Alternative Analyses

Table 4: Estimated Present-Value Net Benefit or Loss to the Federal Government from Replacing \$1 Notes with \$1 Coins over 30 Years under Alternative Assumptions, in Millions of Fiscal Year 2018 Dollars

Alternative assumption	Active replacement	Gradual replacement	Active replacement, without seigniorage	Gradual replacement, without seigniorage
Replacement scenarios	-611.3	-2,627.5	-5,012.1	-4,566.2
1 replacement ratio ^a	-2,294.0	-3,957.7	-2,790.6	-2,552.2
2 replacement ratio ^a	497.2	-1,189.8	-7,124.4	-6,590.0
Federal Reserve does not release \$1 coins ^b	-960.5	-2,833.3	-5,164.0	-4,732.4
Increased note costs ^c	-242.8	-2,259.0	-4,843.6	-4,397.7
Increased coin costs ^c	-2,432.4	-4,235.5	-6,309.2	-5,731.3
Increased coin and note costs ^c	-2,063.9	-3,867.0	-6,140.7	-5,562.8
Slower growth in currency demand - 75 percent ^d	-162.6	-2,178.8	-4,454.7	-4,008.8
Slower growth in currency demand - 50 percent ^d	227.5	-1,788.7	-3,963.8	-3,517.9

Source: GAO analysis of agency and economic data | GAO-19-300

^aTo assess the effect of the public's holding more or less cash as a result of needing fewer or greater numbers of coins to replace each note in circulation, we decreased the replacement ratio from our current estimate of 1.5 coins per note to 1 coin per note, and increased the replacement ratio from our current estimate of 1.5 coins per note to 2 coins per note.

^bTo assess the effect of the Board of Governors of the Federal Reserve System's (Federal Reserve) not releasing \$1 coins it currently holds into circulation we assumed that the approximately 1.2-billion \$1 coins held by the Federal Reserve would not enter circulation and would continue to be held by the Federal Reserve.

^cTo assess the effect of changing production costs for notes and coins, we increased the costs of producing notes from our current estimate of 3 cents to 4.9 cents without changing the costs of producing coins; increased the costs of producing coins from our current estimate of 14.6 cents to 17.5 cents without changing the costs of producing notes; and increased the costs of producing both notes and coins from our current estimates of 3 cents to 4.9 cents for notes and 14.6 cents to 17.5 cents for coins.

^dTo assess the effect of decreased demand for currency if people switched to electronic means of payment, we assumed the demand for currency grows at a slower rate—75 percent of the growth in demand in the replacement scenarios—after fiscal year 2028, and demand for currency grows at a slower rate—50 percent of the growth in demand in the replacement scenarios—after fiscal year 2028.

Appendix II: Objectives, Scope, and Methodology

This report: (1) determines the estimated net benefit to the government, if any, of replacing the \$1 note with a \$1 coin and selected stakeholders' views on this change, and (2) examines what is known about potential cost savings to the government from suspending production of the penny and changing the metal composition of the nickel coin as well as selected stakeholders' views on these changes.

To estimate the net benefit or loss to the government of replacing the \$1 note with a \$1 coin, we conducted economic simulations under different scenarios and assumptions over a 30-year period. We simulated a "status quo" scenario and two "replacement" scenarios. In the status quo scenario, notes remain the dominant form of \$1 currency. In each replacement scenario, notes are replaced by \$1 coins under various assumptions. We then compared each replacement scenario to the status quo scenario with respect to net benefits to the government. As part of our analysis, we also ran alternative simulations with different sets of assumptions, to examine how the assumptions underlying our analysis affect the estimated net benefit to the government. The various assumptions underlying our simulations include the extent to which the public holds more cash when coins are used instead of notes, the cost to produce \$1 notes and \$1 coins, and the lifespan of notes and coins, among others. Our analyses are projected over 30 years because that period roughly coincides with the life expectancy of the \$1 coin. We interviewed relevant officials from the Board of Governors of the Federal Reserve System (Federal Reserve), the Bureau of Engraving and Printing (BEP), and the U.S. Mint (Mint). We also obtained data for our assumptions from these agencies and economic projection data from the Congressional Budget Office. More detailed information on the structure, assumptions, and inputs of our economic simulations are found in appendix I.

To determine how the Federal Reserve estimates the life-span of the \$1 note (a key input to our economic simulations), we reviewed work papers and analyses from prior work. We interviewed knowledgeable Federal Reserve officials about the methodology for calculating a note's life-span and reviewed data on a note's estimated life from calendar years 2005

through 2017.¹ We also observed note-processing operations and equipment at the Federal Reserve's Cash Technology Office (located in the Federal Reserve Bank of Richmond), reviewed Federal Reserve's and Treasury Department's cash-processing policy and procedure manuals, and interviewed knowledgeable officials about technological innovations in Federal Reserve note processing since 1998. 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 determine selected stakeholder views on changes to currency, we identified 91 entities that could potentially be affected by reviewing prior GAO, Mint, and Federal Reserve reports and the results of a literature search. We eliminated some of these entities from further consideration because we could not identify a way to contact them or they did not respond to our efforts to contact them. We sought entities with the broadest representation so we generally eliminated individual companies, with the exception of those that are primary suppliers of raw material for the production of notes or coins.² Of the remaining 36 entities, we selected and interviewed 10 organizations representing potentially affected industries, primarily based on the entities' role with respect to currency and the currency change likely to affect it most. We also selected and interviewed a private company involved in the production of materials used in coins and two organizations that advocate for a switch to a \$1 coin and for continued use of the penny, respectively.

We categorized each entity's role with respect to currency as a maker (involved in, or represents those involved in, supply of materials for production of coins or notes); a mover (involved in, or represents those involved in, transporting, processing, or facilitating use of coins or notes); or a user (involved in, or represents those involved in, transactions where coins or notes are exchanged). We also categorized each entity as being most affected by, or most interested in, changes to the \$1, nickel, or penny. We used information we collected or had used in prior work about these stakeholders and also used professional judgement and logic to determine in which role category they belonged. In some cases, we

¹We selected this time period to include data prior to our 2011 review to the most recently available data.

²We included these companies because we can identify the entire, small universe of them; they are sole-source suppliers in some cases; and they may not be represented by industry associations.

assigned an entity to more than one category. In addition to categorizing stakeholders, when making our selection, we also considered the extent an entity's area of representation overlapped with another to avoid duplication. If a selected entity did not respond to our request for an interview, we sought to replace that entity with a similar one, if available. Since our selection is comprised of a non-representative sample, the results are not generalizable to all stakeholders.

The stakeholders we selected are:

- American Bankers Association, aba.com
- Americans for Common Cents, pennies.org
- Association of Gaming Equipment Manufacturers, agem.org
- Coin Laundry Association, coinlaundry.org
- Coinstar, coinstar.com
- Dollar Coin Alliance, dollarcoinalliance.org
- International Bridge, Tunnel and Turnpike Association, ibtta.org
- International Parking & Mobility Institute, formerly the International Parking Institute, parking-mobility.org
- Jarden Zinc Products, jardenzinc.com
- National Armored Car Association, nationalarmoredcar.org
- National Automatic Merchandising Association, namanow.org
- National Bulk Vendors Association, nbva.org
- Retail Industry Leaders Association, rila.org

We also reviewed information on public perceptions and opinions about the use of a \$1 coin from prior GAO work and publicly available information from an organization that advocates for a transition to a \$1 coin.³

To examine what is known about potential cost savings to the government from suspending production of the penny coin and from changing the metal composition of the nickel coin, we analyzed penny and nickel production cost data from the Mint for fiscal years 2003

³GAO, *U.S. Coins: Public Views on Changing Coin Design*, [GAO-03-206](https://www.gao.gov/products/GAO-03-206) (Washington, D.C., Dec. 17, 2002).

through 2017 to include a range of the number of coins produced and cost changes from metal price fluctuations and reviewed Mint studies on potential alternative metals and on coin production cost savings that could result from changing coin metal composition for these coins. We reviewed and analyzed the Mint's preliminary plan if Congress were to authorize suspending production of the penny. We took steps to assess the reliability of the Mint data we used, such as reviewing relevant documentation, and determined that the data were sufficiently reliable for the purposes of this report. We also interviewed Mint and Federal Reserve officials, and the same set of selected stakeholders noted above. To understand the rationale and steps Canada implemented for eliminating the Canadian penny, we reviewed documents from the Canadian Senate, Department of Finance, and the Royal Canadian Mint. To understand the results of the elimination of the Canadian penny, we interviewed an official from the Royal Canadian Mint. We also conducted a literature search of relevant English language articles published from 2011 to May 2018 to provide information on the rationale and potential benefit to governments of making changes to coins and notes, along with information about the experiences of other English-speaking countries that have made such changes.

We conducted this performance audit from December 2017 to March 2019 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 III: U.S. Mint Comments



DEPARTMENT OF THE TREASURY
UNITED STATES MINT
WASHINGTON, D.C. 20220

February 28, 2019

DIRECTOR
OF THE
MINT

MEMORANDUM FOR ANDREW VON AH
DIRECTOR, PHYSICAL INFRASTRUCTURE ISSUES
GOVERNMENT ACCOUNTABILITY OFFICE (GAO)

FROM: David J. Ryden 
Director
United States Mint

SUBJECT: United States Mint Response to Draft GAO Report #GAO-19-300

Thank you for providing the United States Mint the opportunity to review GAO's Draft Report GAO-19-300, entitled "Financial Benefits of Switching to a \$1 Coin is Unlikely, but Changes to Coin Metal Content Could Result in Cost Savings."

Attached you will find our consolidated responses to the draft report (See Attachment A).

If you have any questions or comments, please do not hesitate to reach out to Patrick Cuddy, Senior Advisor, at 202 354-7660, or Thomas Noziglia, United States Mint Audit Liaison, at 202 354-7722.

Attachments:

- Attachment A: United States Mint Formal Responses to Draft GAO Report #GAO-19-300
- Attachment B: PDF Copy of Draft GAO Report #GAO-19-300

cc: John Shumann
Lindsay Bach
Travis Thompson
Mark Teskey
Patrick Hernandez
Patrick Cuddy
David Croft
Richard Robidoux
Kristie McNally
Kenyatta Fletcher
Timothy Grimsby
Thomas Noziglia

Response to GAO Report “Financial Benefit of Switching to a \$1 Coin is Unlikely, but Changes to Coin Metal Content Could Result in Cost Savings”

Page 18:

GAO Report: “Some Selected Stakeholders Expressed Concerns about Penny Suspension but None Expressed Concerns about Changes to the Nickel.”

Mint Input: The United States Mint (Mint) agrees with a portion of the financial analysis relating to plant and personnel savings should the manufacturing of the penny be suspended. However, there is no consideration for the cost of unintended consequences as experienced in Canada and currently in the United Kingdom under similar circumstances. A trigger event such as suspension would have a high probability of significantly increasing consumer behavior involving coin recycling frequency, impacting manufacturing volatility in unpredictable ways for many years.

The removal from circulation of the penny in 2013 by the Royal Canadian Mint (RCM) resulted in the return of approximately 20% of all coins minted since 1908. A corresponding flow-back of 20% of all denominations minted since 1960 in the U.S. would be logistically unmanageable according to armored car and aggregator stakeholders. The RCM is the only Mint in the world to manage the domestic distribution system, providing visibility and the ability to recognize efficiencies not found in the U.S. distribution system, thus placing the RCM in a more favorable position to address flow-back issues. Additionally, the risks in the U.S. are greater as our production levels on a unit-per-person basis have far exceeded the RCM for many decades which would result in higher flowback levels.

The Mint hosted an industry stakeholder event, Circulating Coin Roundtable, in January 2019. The objective of the meeting was to define the risks of various approaches to addressing penny circulation and solicit comments on alternative solutions that would reduce dependency on newly manufactured pennies through the more efficient use of already circulating coins. Included were large retailers, financial institutions, armored car companies, coin aggregators and processors, and associations that support each of the stakeholder groups. As expressed by the many industry stakeholder representatives during the roundtable, the likelihood of a penny suspension significantly increasing consumer recycling rates for all circulating coin is very high, which would result in production demand volatility. The cost and consequences to the Mint would result in years of idle capacity and loss of seigniorage, an amount estimated to be as high as \$3 billion over seven to 10 years.

The Mint, after consulting with industry stakeholders, does not support nor agree with the distinction noted in the report between a “suspension” versus a “removal” in contrasting the Canadian versus U.S. situations. The only uncertainty regarding suspension is the severity of the impact.

Page 20:

GAO Report: “Matter for Congressional Consideration: Congress should consider amending the law to provide the Secretary of the Treasury with the authority to alter the metal composition of circulating coins, if the new metal compositions reduce the cost of coin production and do not affect the size, weight, appearance, or electromagnetic signature of the coins. (Matter for consideration 1).”

Mint Input: The United States Mint fully concurs with this recommendation.

Appendix IV: GAO Contacts and Staff Acknowledgments

GAO Contact

Andrew Von Ah, (202) 512-2834 or vonaha@gao.gov

Staff Acknowledgments

In addition to the contact named above, John W. Shumann (Assistant Director); Travis Thomson (Analyst-in-Charge); Amy Abramowitz; Lindsay Bach; Dave Hooper; Delwyn Jones; Malika Rice; Oliver Richard; Ardith Spence; and Elizabeth Wood made key contributions to this report.

Appendix V: Accessible Data

Data Tables

Accessible Data for Estimated Cumulative Present-Value Net Loss to the Government from Actively and Gradually Replacing \$1 Notes with \$1 Coins over 30 Years

Years	Active replacement (dollars in millions)	Gradual replacement (dollars in millions)
1	-199	-9
2	-556	-269
3	-862	-504
4	-1112	-711
5	-1309	-893
6	-1459	-1055
7	-1578	-1203
8	-1586	-1337
9	-1443	-1456
10	-1317	-1565
11	-1207	-1664
12	-1114	-1758
13	-1025	-1838
14	-947	-1910
15	-881	-1979
16	-821	-2039
17	-770	-2096
18	-725	-2147
19	-688	-2196
20	-656	-2241
21	-631	-2285
22	-611	-2326
23	-597	-2367
24	-587	-2405
25	-580	-2442
26	-579	-2479
27	-580	-2515

Years	Active replacement (dollars in millions)	Gradual replacement (dollars in millions)
28	-587	-2552
29	-597	-2589
30	-611	-2628

Accessible Data for Figure 1: Unit Cost of Penny and Nickel Production, Fiscal Years 2003 through 2017

FY	Nickel (\$0.05)	Penny (\$0.01)
2003	\$0.04	\$0.0098
2004	\$0.05	\$0.0093
2005	\$0.05	\$0.0097
2006	\$0.06	\$0.0121
2007	\$0.1	\$0.0167
2008	\$0.08	\$0.0142
2009	\$0.06	\$0.0162
2010	\$0.09	\$0.0179
2011	\$0.11	\$0.0241
2012	\$0.1	\$0.02
2013	\$0.09	\$0.0183
2014	\$0.08	\$0.0166
2015	\$0.07	\$0.0143
2016	\$0.06	\$0.015
2017	\$0.07	\$0.0182

Accessible Data for Figure 2: Estimated Cumulative Present-Value Net Loss to the Government from Actively and Gradually Replacing \$1 Notes with \$1 Coins over 30 Years

Years	Active replacement (dollars in millions)	Gradual replacement (dollars in millions)
1	-199	-9
2	-556	-269
3	-862	-504
4	-1112	-711
5	-1309	-893
6	-1459	-1055

Years	Active replacement (dollars in millions)	Gradual replacement (dollars in millions)
7	-1578	-1203
8	-1586	-1337
9	-1443	-1456
10	-1317	-1565
11	-1207	-1664
12	-1114	-1758
13	-1025	-1838
14	-947	-1910
15	-881	-1979
16	-821	-2039
17	-770	-2096
18	-725	-2147
19	-688	-2196
20	-656	-2241
21	-631	-2285
22	-611	-2326
23	-597	-2367
24	-587	-2405
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26	-579	-2479
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28	-587	-2552
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Agency Comment Letter

Accessible Text for Appendix III U.S. Mint Comments

Page 1

MEMORANDUM FOR ANDREW VON AH

DIRECTOR, PHYSICAL INFRASTRUCTURE ISSUES GOVERNMENT
ACCOUNTABILITY OFFICE (GAO)

FROM: David J. Ryder

Director

United States Mint

SUBJECT: United States Mint Response to Draft GAO Report #GAO-19-300

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If you have any questions or comments, please do not hesitate to reach out to Patrick Cuddy, Senior Advisor, at 202 354-7660, or Thomas Noziglia, United States Mint Audit Liaison, at 202 354-7722.

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cc: John Shumann

Lindsay Bach

Travis Thompson

Mark Teskey

Patrick Hernandez

Patrick Cuddy

David Croft

Richard Robidoux

Kristie McNally

Kenyatta Fletcher

Timothy Grimsby

Thomas Noziglia

Page 2

Response to GAO Report "Financial Benefit of Switching to a \$1 Coin is Unlikely, but Changes to Coin Metal Content Could Result in Cost Savings"

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Mint Input: The United States Mint fully concurs with this recommendation.

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