

October 2008

CHECK 21 ACT

Most Consumers Have Accepted and Banks Are Progressing Toward Full Adoption of Check Truncation





Highlights of [GAO-09-8](#), a report to Congressional Committees

Why GAO Did This Study

Although check volume has declined, checks still represent a significant volume of payments that need to be processed, cleared, and settled. The Check Clearing for the 21st Century Act of 2003 (Check 21) was intended to make check collection more efficient and less costly by facilitating wider use of electronic check processing. It authorized a new legal instrument—the substitute check—a paper copy of an image of the front and back of the original check. Check 21 facilitated electronic check processing by allowing banks to use electronic imaging technology for collection and create substitute checks from those images for delivery to banks that do not accept checks electronically. Check 21 mandated that GAO evaluate the implementation and administration of the act. The report objectives are to (1) determine the gains in economic efficiency from check truncation and evaluate the benefits and costs to the Federal Reserve System (Federal Reserve) and financial institutions; (2) assess consumer acceptance of the check truncation process resulting from Check 21; and (3) evaluate the benefits and costs to bank consumers from check truncation. GAO analyzed costs for the check operations of the Federal Reserve and a group of banks, interviewed consumers about their acceptance of and costs and benefits of electronic check processing, and analyzed survey data on bank fees.

The Federal Reserve agreed with the overall findings of the report.

To view the full product, including the scope and methodology, click on [GAO-09-8](#). To view the E-supplement, click on [GAO-09-09SP](#). For more information, contact Yvonne D. Jones at (202) 512-8678 or jonesy@gao.gov.

CHECK 21 ACT

Consumers Have Accepted and Banks Are Progressing Toward Full Adoption of Check Truncation

What GAO Found

Check truncation has not yet resulted in overall gains in economic efficiency for the Federal Reserve or for a sample of banks while Federal Reserve and bank officials expect efficiencies in the future. GAO's analysis of the Federal Reserve's cost accounting data suggests that its costs for check clearing may have increased since Check 21, which may reflect that the Federal Reserve must still process paper checks while it invests in equipment and software for electronic processing and incurs costs associated with closing a number of check offices. However, GAO found that the Federal Reserve's work hours and transportation costs associated with check services declined from the fourth quarter of 2001 through the fourth quarter of 2007. Several of the 10 largest U.S. banks reported to GAO that maintenance of both paper and image-based check processing systems prevented them from achieving overall lower costs, although they had reduced transportation and labor costs since Check 21 was enacted. Check imaging and the use of substitute checks appear to have had a neutral or minimal effect on bank fraud losses.

Most bank consumers seem to have accepted changes to their checking accounts from check truncation. In interviews with bank consumers, the majority of them accepted not receiving their canceled checks and being able to access information about their checking account activity online. Several reported that they did not need the "extra paper" from canceled checks and that image statements and online reviewing was more secure than receiving canceled checks. Eleven percent of the 108 consumers still preferred to receive canceled checks. Most consumers reported that they were not significantly concerned about their ability to demonstrate proof of payment using a substitute check or check image rather than a canceled check and few reported that they suffered errors from the check truncation process. Also, GAO found that the federal banking regulators reported few consumer complaints relating to Check 21.

To the extent that banks have employed check truncation, bank consumers have realized benefits and costs relating to faster processing and access to account information. GAO found that some banks have extended the hours for accepting deposits for credit on the same business day, which can result in faster availability of deposited funds for consumers. Based on consumer interviews, consumers have benefited from receiving simpler imaged account statements and immediate access to information about check payments. Check 21's expedited recredit (prompt investigation of claims that substitute checks were improperly charged to accounts and recrediting of the amount in question) also is considered a consumer benefit. However, based on our consumer and bank interviews, it appears that a small number of consumers have filed expedited recredit claims. Based on analysis of survey data on bank fees, GAO found some consumers may incur fees related to receiving canceled checks and images. Since 2004, fees for canceled checks appear to have increased, while fees for images appear to have remained relatively flat.

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Abbreviations

ABA	American Bankers Association
ACH	automated clearing house
ATM	automated teller machine
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
Check 21	Check Clearing for the 21 st Century Act of 2003
EBT	electronic benefits transfer
ECCHO	Electronic Check Clearing House Organization
EFAA	Expedited Funds Availability Act of 1987
Federal Reserve	Federal Reserve System
Federal Reserve Board	Board of Governors of the Federal Reserve System
ICL	image cash letter
Informa	Informa Research Services

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Congressional Committees

In the last 10 years technological innovations and consumer and business preferences for electronic payments have transformed the U.S. retail payments system from a largely paper-based system to one that mostly uses electronic transactions. In 2007, the Federal Reserve System (Federal Reserve) reported that electronic payments, including credit and debit cards, exceeded two-thirds of all noncash payments while the number of checks written declined from more than 37 billion checks in 2003 to 33 billion checks in 2006.¹ Although check volume has declined, paper checks still represent a significant number of payments that need to be processed, cleared, and settled. The paper-based collection system for checks has been a labor-intensive process because at each step in the collection process, the paper check has had to be physically handled and transported before being settled.

The Check Clearing for the 21st Century Act (Check 21), enacted in 2003, was intended to make the check payment system more efficient and less costly by facilitating wider use of electronic check processing without demanding that any bank change its current check collection practices.² At the time that Check 21 was enacted, most banks could not leverage their investments in imaging technology to collect checks electronically because the legal framework for the check collection system constrained the efforts of many banks to use it.³ Prior to Check 21, a bank was required to present an original paper check to the bank where the check was payable—the paying bank—for payment unless the paying bank had agreed to accept presentment in some other form. This required the bank presenting the check—the collecting bank—to enter into agreements with

¹The Federal Reserve System, *2007 Federal Reserve Payments Study: Noncash Payment Trends in the United States 2003-2006* (Washington, D.C.: Dec. 10, 2007), 6. The study is part of an ongoing effort by the Federal Reserve System to measure trends in noncash payment in the United States.

²Pub. L. No. 108-100 (Oct. 28, 2003). For this report, we refer to commercial banks, thrifts, and credit unions collectively as banks.

³A check image is an electronic or digital image of an original check that is created by a depositor, a bank, or other participant in the check collection process.

all or nearly all of the banks to which it presented checks. Because of this impediment, banks were deterred from making the necessary investments to collect checks electronically.

Check 21 addressed this situation by authorizing a new paper negotiable instrument, called a substitute check, that when properly prepared is the legal equivalent of the original check. Any bank that transfers, presents, or returns a substitute check warrants that the substitute check contains an accurate image of the front and the back of the original check at the time the original check was truncated and a specific legend stating that the substitute check is a legal copy of the original check and can be used in the same way one would use the original check. Check 21 does not require the banks to adopt electronic check processing, but enables banks that want to truncate or remove the original paper checks from the check-collection system to do so. Check 21 facilitated electronic processing by allowing banks to use electronic imaging technology for collection and create substitute checks from those images for delivery to banks that do not accept checks electronically. Substitute checks are considered an intermediate step toward a matured electronic check processing system, in which the goal should be the electronic exchange of payment information and check images between banks.

Check 21 mandated that we evaluate the implementation and administration of Check 21. To respond to the Check 21 mandate, the objectives of this report are to (1) determine the gains in economic efficiency from check truncation and evaluate the benefits and costs to banks and the Federal Reserve from check truncation;⁴ (2) assess consumer acceptance of the check truncation process resulting from Check 21; and (3) evaluate the benefits and costs to consumers from check truncation under Check 21.

To determine the gains in economic efficiency from check truncation and evaluate the benefits and costs to financial institutions from check truncation, we separately analyzed costs for the check operations of the Federal Reserve and a group of banks. Using data from the Federal Reserve's cost accounting system, we applied an econometric cost model to estimate the effects of different variables, such as the volume of checks

⁴For this report, we define economic efficiency as an economically efficient production that is organized to minimize the ratio of inputs to outputs. Production is economically efficient when goods are produced at minimum cost in money and resources. This typically occurs where input prices are used to find the least-expensive process.

processed, wages, and other costs incurred by the Federal Reserve, on total check processing costs from 1994 through 2007. While the Federal Reserve has consistent cost accounting data, the banking industry does not. Accounting for costs associated with check processing varies across the banking industry, preventing a similar analysis for private-sector costs. Instead, we sent a data collection instrument to and interviewed officials from the 10 largest banks by deposit size as of March 2008 in the United States and a group of smaller banks. The 10 banks account for a significant volume of checks presented (in 2007, about one-third of all checks paid). We asked about costs related to paper check processing, the investment that banks incurred to exchange check images, the cost savings that banks achieved (including labor and transportation) with image technology, and the impact of check imaging and substitute checks on losses from fraudulent checks. We sent the data collection instrument to the 10 banks and received a response from 9. For the bank that did not respond, we interviewed an official representing the bank at an early stage of our engagement. We conducted follow-up interviews with a number of the institutions requesting clarification of their responses. In addition, we sent the data collection instrument to 12 smaller banks, which had assets ranging from less than \$500 million to \$5 billion. Our selection criteria included whether the banks were located in metropolitan or nonmetropolitan areas and were on the Electronic Check Clearing House Organization's (ECCHO) list of participating members. From this group of 12 banks, we received five completed forms. We conducted follow-up interviews with three of the smaller banks. To assess bank consumer acceptance of the check truncation process resulting from Check 21, we conducted in-person interviews with 108 consumers. The consumers represented an approximate distribution of the U.S. adult population across broad categories (age, education, and income). Consumers had to meet certain other conditions: having primary responsibility in the household for balancing the financial account that allows paper check writing and having received canceled original checks in paper form with the checking account statement at some point since 2000. However, the consumers recruited for the interviews did not form a random, statistically representative sample of the U.S. population; therefore, we could not generalize the results of the interviews to the relevant total population. The interview questions covered topics, such as how consumers reviewed their checking account activity, their acceptance of the check truncation process, and any problems or errors they might have had with their checking accounts since Check 21. This report does not contain all the results from the consumer interviews. We reproduced the text from our structured interview instrument and tabulated the results from the questions in Questions for Consumers about Check 21 Act ([GAO-09-09SP](#)).

To evaluate the benefits and costs to bank consumers from check truncation, we interviewed Federal Reserve Board staff, representatives from Consumers Union, the Consumer Federation of America, and the U.S. Public Interest Research Group, and bank officials to identify possible benefits and costs. We also analyzed a study by the Board of Governors of the Federal Reserve System (Federal Reserve Board) that assessed the banking industry's implementation of Check 21. To determine whether bank consumers incurred fees for receiving canceled checks and check images since Check 21, we reviewed survey data on bank fees for 2001 through 2006 collected by Informa Research Services Inc., a private-sector firm.

We conducted this performance audit from September 2007 to October 2008 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. See appendix I for a more detailed discussion of our scope and methodology.

Results in Brief

Check truncation has not yet resulted in overall gains in economic efficiency for the Federal Reserve or for selected banks, but Federal Reserve and bank officials expect efficiencies in the future. The expectation for electronic processing of checks was that it would lead to gains in economic efficiency—that is, removing paper from the payment stream would lead to lower costs. However, our analysis of Federal Reserve cost accounting data does not demonstrate that the Federal Reserve's costs for processing payments have decreased—which may reflect that the Federal Reserve must still maintain its ability to process paper checks, while it invests in equipment and software for electronic check processing and incurs costs associated with closing a number of check processing sites. But, we also found that the total work hours associated with the Federal Reserve's check processing operations decreased by approximately 48 percent from 2.1 million hours for the fourth quarter of 2001 to 1.3 million hours for the fourth quarter of 2007 and the transportation costs associated with check processing operations decreased by about 11 percent from the fourth quarter of 2001 to the fourth quarter of 2007. Estimates of whether costs were lower for banks as a result of Check 21 varied considerably, reflecting the diverse ways in which they handle checks and payments and differences among cost accounting systems. For example, several of the 10 largest banks noted

that maintaining a dual paper-electronic infrastructure to date had prevented them from achieving overall lower costs, although they also had seen reduced transportation and labor costs. As Federal Reserve officials noted, the willingness of private banks to invest in the equipment needed to process checks electronically demonstrated the bank's expectation of lower costs. The banks said that they expect that eventually costs would be lower. According to our interviews with three smaller banks, they generally have migrated all of their check volumes to electronic processing rather than operating two processing systems and have seen lower costs for transportation and labor. Since cost accounting systems vary among banks and many were unwilling to share proprietary data on their costs, it was not possible to estimate the industrywide cost effect of check truncation. Check imaging and the use of substitute checks appear to have had a neutral or minimal effect on bank fraud losses.

Most bank consumers seem to have accepted changes to their checking accounts from the check truncation process. In one-on-one, in-person structured interviews with 108 bank consumers living in three cities, we learned that the majority of these consumers accepted not receiving their canceled checks and being able to access information about their checking account activity online. Eleven percent of these consumers still wanted to receive canceled checks with their account statement. In addition, most consumers reported that they were not concerned significantly about their ability to demonstrate proof of payment using a substitute check or check image rather than a canceled check. Few consumers reported that they experienced errors from the check truncation process. In addition, we found on the basis of our review of consumer complaints that the federal banking regulators reported few complaints about Check 21. Of the approximately 35,000 consumer complaints submitted to the four federal banking regulators in 2006 and 2007, 172 were related to Check 21 issues. The primary consumer complaint was that the account holder wanted to continue receiving canceled checks. These findings appear consistent with findings in the Federal Reserve Board's April 2007 report to Congress on Check 21. Specifically, the Federal Reserve Board reported that less than 1 percent of all complaints received by the federal banking regulators were related to Check 21.

To the extent that banks have implemented electronic check processing, bank consumers have realized both benefits and costs relating to faster processing and access to information about their checking accounts. We found that some banks reported that they have extended the cut-off time for accepting deposits for credit on the same business day, which can

result in faster availability of deposited funds for consumers. However, the funds availability requirements of the Federal Reserve Board's Regulation CC have not been amended as a result of Check 21. Regulation CC limits the time that banks can hold funds deposited into customer accounts before these funds must be made available for withdrawal. In its April 2007 report, the Federal Reserve Board concluded that much broader adoption of new technologies and processes by the banking industry must occur before check return times could decline appreciably and thereby permit a modification of the funds availability deadlines. However, Check 21 has contributed to acceleration of the pace of the Federal Reserve's consolidation of check processing offices, which has increased the proportion of checks that are classified as local. As a result, a large number of consumer checks are now subject to shorter maximum hold periods by banks under Regulation CC. Many bank consumers have realized other benefits including simpler statements (that is, consumers said it was easier to review images on a few sheets of paper than handle many canceled checks) and immediate access to information about payments. Bank and industry association officials also noted benefits of check truncation, such as better customer access to check images and accelerated customer deposit availability. Check 21's expedited recredit provision (requiring banks to complete their investigation of a consumer's claim that a substitute check had been improperly charged to their account within 10 business days and recredit the consumer's account for a specified amount pending completion of the investigation) is considered a consumer benefit. However, on the basis of our consumer and bank interviews, it appears that a small number of consumers have filed expedited recredit claims. Some consumers also may incur fees if they elect to receive canceled checks and check images. Based on a survey of large retail banks conducted by Informa Research Services from 2001 to 2006, fee amounts for receiving canceled checks generally have increased, while fees for image statements appear to have remained relatively flat. The Informa data also indicated that these banks charge different amounts depending on the type of checking account.

We provided a copy of a draft of this report to the Federal Reserve Board, which provided us with written comments that are reprinted in appendix III. It agreed with our overall conclusion that, over the past four years, the banking industry has made substantial progress toward establishing an end-to-end electronic check-processing environment. In commenting on this report, it noted that the Federal Reserve Banks expect that by year-end 2009, more than 90 percent of their check deposits and presentments will be electronic. They also commented that the ongoing transformation to electronic check-processing environment has not been without cost. As

noted in our report, the Federal Reserve Banks have reduced their transportation costs and work hours associated with their check services. And, according to the Federal Reserve Board, they earned a net income of \$326 million for providing check services from 2005 through 2007. The Federal Reserve Board concurred with a number of consumer benefits identified in the report: faster funds availability on check deposits due to later deposit deadlines, quicker access to account information, and improved customer service. In addition, we sent a draft of this report to the Federal Deposit Insurance Corporation, Office of the Comptroller of the Currency, and Office of Thrift Supervision. Only the Office of the Comptroller of the Currency provided us with technical comments, which we incorporated as appropriate. We provided sections of the draft of this report to bank officials for their technical review and several of them provided us technical comments, which we incorporated as appropriate.

Background

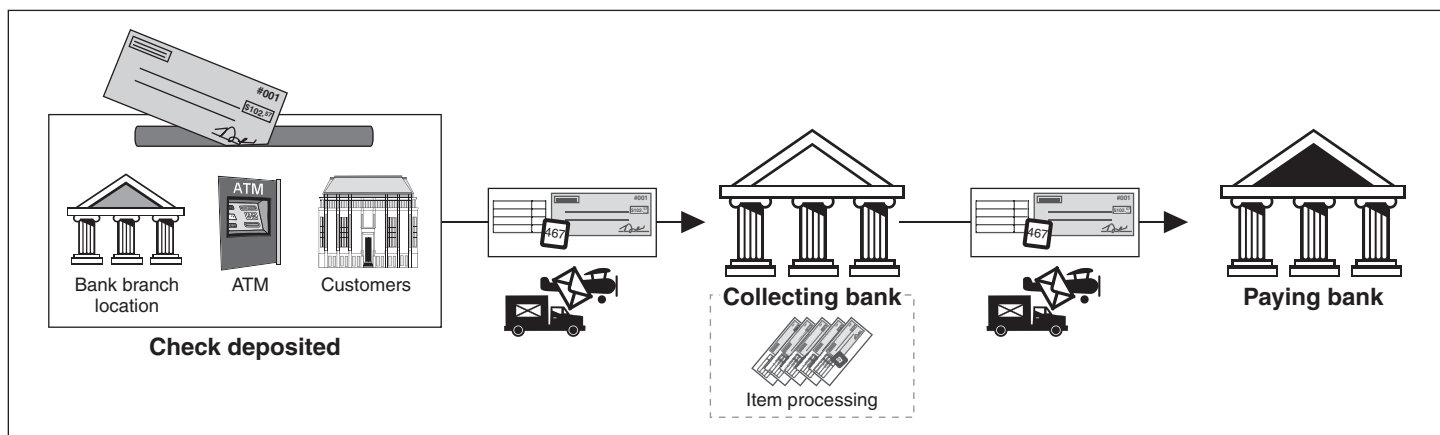
This section of the report describes the paper- and electronic-based check collection processes, presents statistics on the use of electronic and nonelectronic payments and types of check processing, and describes the Federal Reserve's role in check collection.

Check Collection Process

Interbank checks are cleared and settled through an elaborate check-collection process that includes presentment and final settlement.⁵ Check presentment occurs when the checks are delivered or images transmitted to the paying banks for payment and the paying banks must decide whether to honor or return the checks (see fig. 1). Settlement of checks occurs when the collecting banks are credited and the paying banks are debited, usually through accounts held at either the Federal Reserve or correspondent banks.

⁵Interbank checks are those in which the bank of first deposit and the paying bank are different. On-us checks are deposited or cashed at the same bank on which they are drawn.

Figure 1: Paper-Based Check Collection and Processing



Source: GAO (analysis); Art Explosion (images).

In the paper-based check collection process, banks of first deposit generally sort deposited checks by destination and dispatch them for collection. Banks of first deposit physically can collect a paper check through several methods:

- Direct presentment of the paper check to the paying bank;
- Exchange of the paper check at a clearing house in which the bank of first deposit and the paying bank are members;
- Collection of the paper check through an intermediary, such as a correspondent bank or a Federal Reserve Bank; or
- Some combination of the above methods.

When a paying bank decides not to pay a check, the bank typically returns the dishonored check to the bank of first deposit. Under the Uniform Commercial Code, the paying bank generally has until midnight of the day following presentment (“midnight deadline”) to return dishonored checks or send notices of dishonor.⁶ The paying bank may return a dishonored check, commonly referred to as a return item, directly to the bank of first deposit through a clearing house association, if applicable, or through a

⁶See U.C.C. §§ 4-301, 302. The Uniform Commercial Code is a set of model laws adopted and enacted by the states that govern commercial and financial activities.

returning bank (a bank handling a returned check), including the Federal Reserve.

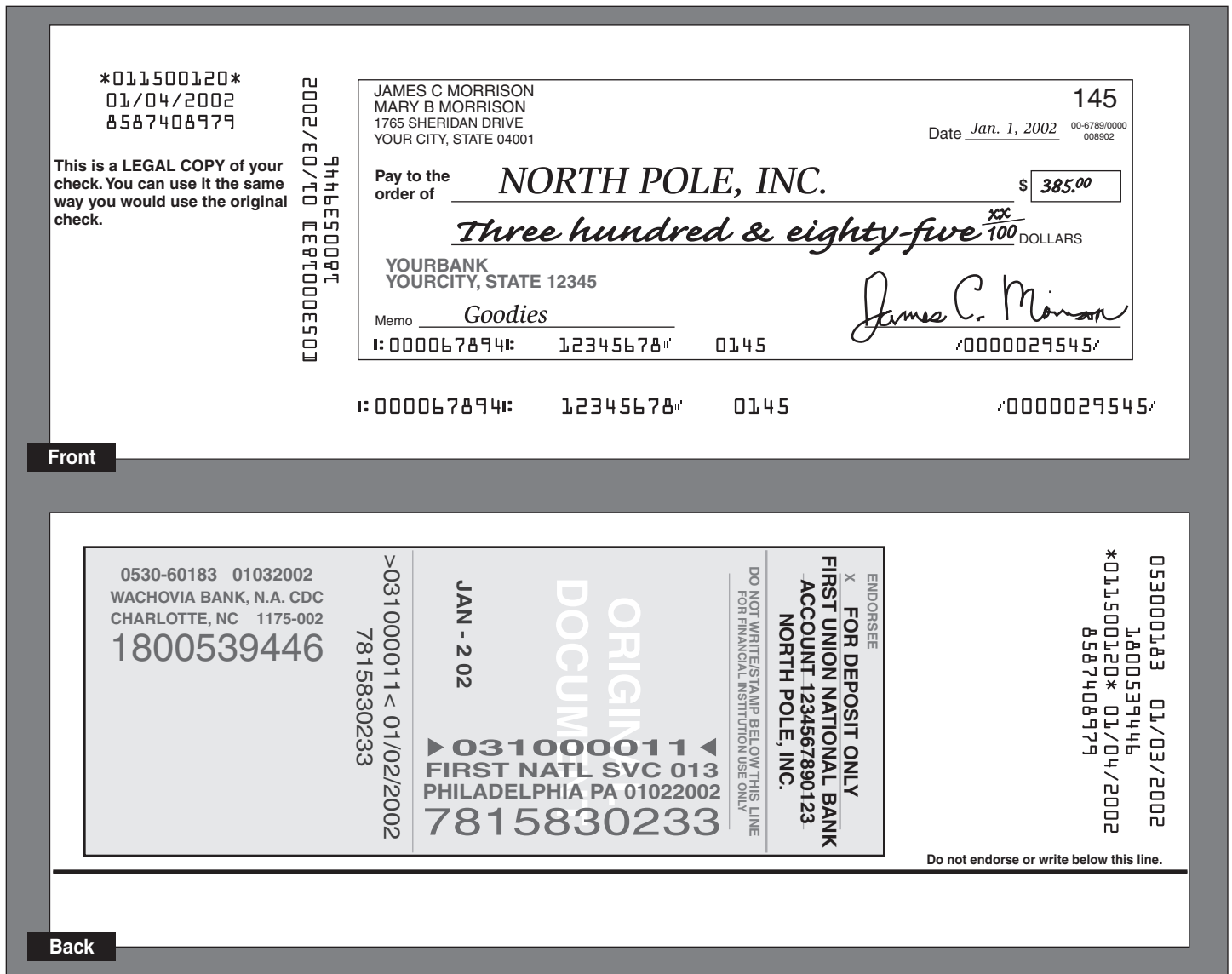
Regulation CC was promulgated by the Federal Reserve Board in 1988 to implement the Expedited Funds Availability Act of 1987 (EFAA), which establishes the maximum periods of time that banks can hold funds deposited into accounts before those funds must be made available for withdrawal. Among other things, the EFAA and its implementing Regulation CC generally require banks to make funds from local checks available by the second business day after the day of deposit; funds from nonlocal checks must be available by the fifth business day after the day of deposit.⁷

At each step, the check must be processed physically and then shipped to its destination by air or ground transportation. Some have suggested that truncating paper checks, or stopping them before they reach the paying bank, could result in lower costs to process checks and benefits to both the banking industry and the public. Under Regulation CC, the term “truncate” means to remove an original check from the collection or return process. Instead, the recipient receives a substitute check; or by agreement, information relating to the original check (including data taken from the magnetic ink character recognition line of the original check or an electronic image of the original check), whether with or without the subsequent delivery of the original check (see fig. 2).⁸

⁷See 12 C.F.R. § 229.12. Local checks are checks in which the bank of first deposit and the paying bank are located in the same Federal Reserve check-processing region. Nonlocal checks are checks in which the bank of first deposit and the paying bank are located in different Federal Reserve check-processing regions.

⁸12 C.F.R. § 229.2(ddd).

Figure 2: Example of a Substitute Check



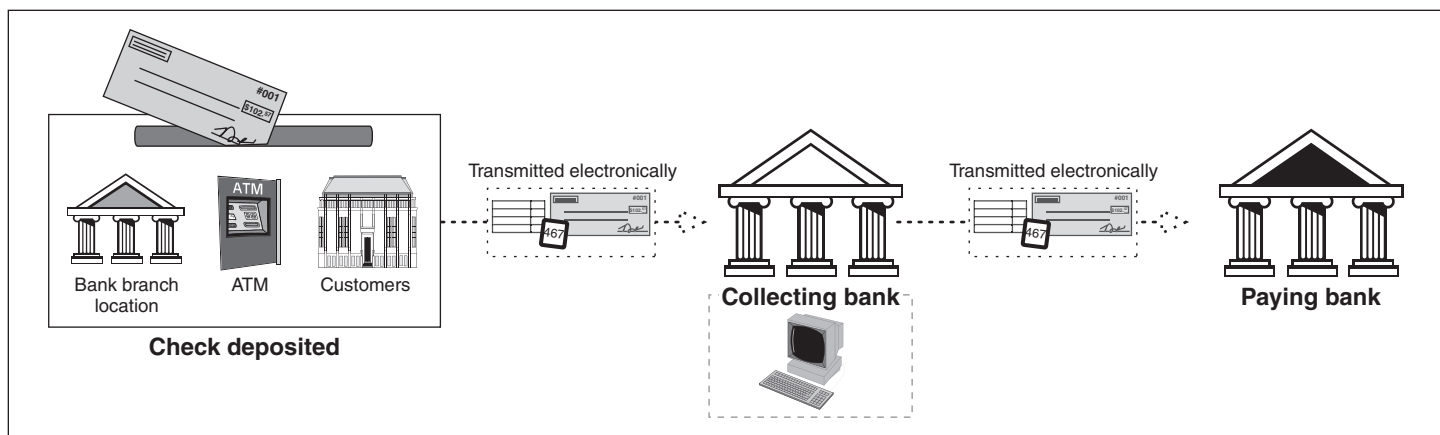
Source: ECCHO.

Electronic Check Processing and Imaging Technology

Essentially, check imaging is a process through which a paper check is scanned and a digital image is taken of the front and back of the paper check. The paper check may then at some point be destroyed and the images may then be stored in an archive maintained by the bank for

retrieval if needed. When a paper check is imaged depends on the structure of a bank's back office operations. Some banks have the capability to image a paper check at their branches, while others transport the paper to centralized locations where the paper is imaged. Once the images are taken, an image cash letter (ICL) is assembled and sent to the paying bank directly or to an intermediary (such as the Federal Reserve, a correspondent bank, or an image exchange processor) for ultimate presentment to the paying bank (see fig. 3). Since Check 21 was enacted, imaging technology has been further refined so that it is possible for a bank to image a paper check at its branches or automated teller machines (ATM)—commonly referred to as branch or ATM capture. In addition, some banks are beginning to offer a service to their customers called remote deposit capture where merchants can scan the paper checks they receive and electronically deposit those images at the bank.

Figure 3: Check Image Processing



Source: GAO (analysis); Art Explosion (images).

As discussed in the introduction to this report, electronic check processing was hampered by certain legal impediments that Check 21 addressed. Moreover, as we reported in 1998, perceptions about consumer preferences for receiving canceled checks also deterred electronic check processing.⁹ Because, under Check 21, checks drawn on any particular bank can be truncated by any bank across the country, banks cannot

⁹GAO, *Retail Payments Issues: Experience with Electronic Check Presentment*, GAO/GGD-98-145 (Washington, D.C.: July 14, 1998).

return the original canceled paper checks to their customers once they are imaged. At the time of our 1998 report, Federal Reserve officials and bank officials with whom we spoke expressed a belief that many consumers wanted their canceled checks returned.¹⁰

Recent Trends in Check Use, Overall Electronic Payments, and Electronic Processing of Checks

The popularity of the paper check as a retail payment instrument in the United States is waning. The Federal Reserve has estimated that the number of checks used in the United States peaked during the mid-1990s at around 50 billion checks per year.¹¹ In its 2007 study the Federal Reserve highlighted the decline in check usage as a retail payment instrument. It reported that both the number of checks written and checks paid declined from 2003 through 2006. In 2006, 33.1 billion checks were written compared with 37.6 billion checks in 2003 and paid checks decreased from 37.3 billion checks to 30.6 billion checks in the same period. The number of checks written differs from checks paid because paper checks that have been converted into automated clearing house (ACH) payments were included in the figure for checks written.¹² Additionally, the Federal Reserve concluded that the share of retail payments made electronically was growing, while the share of check payments of total noncash payments was declining. Electronic payments, including debit and credit cards, ACH payments (including check conversions), and electronic benefit transfers (EBT) amounted to two-thirds of the total number of noncash payments, which in 2006 totaled 93.3 billion.¹³ The share of check payments declined from 46 percent in 2003 to 33 percent in 2006 (see fig. 4).

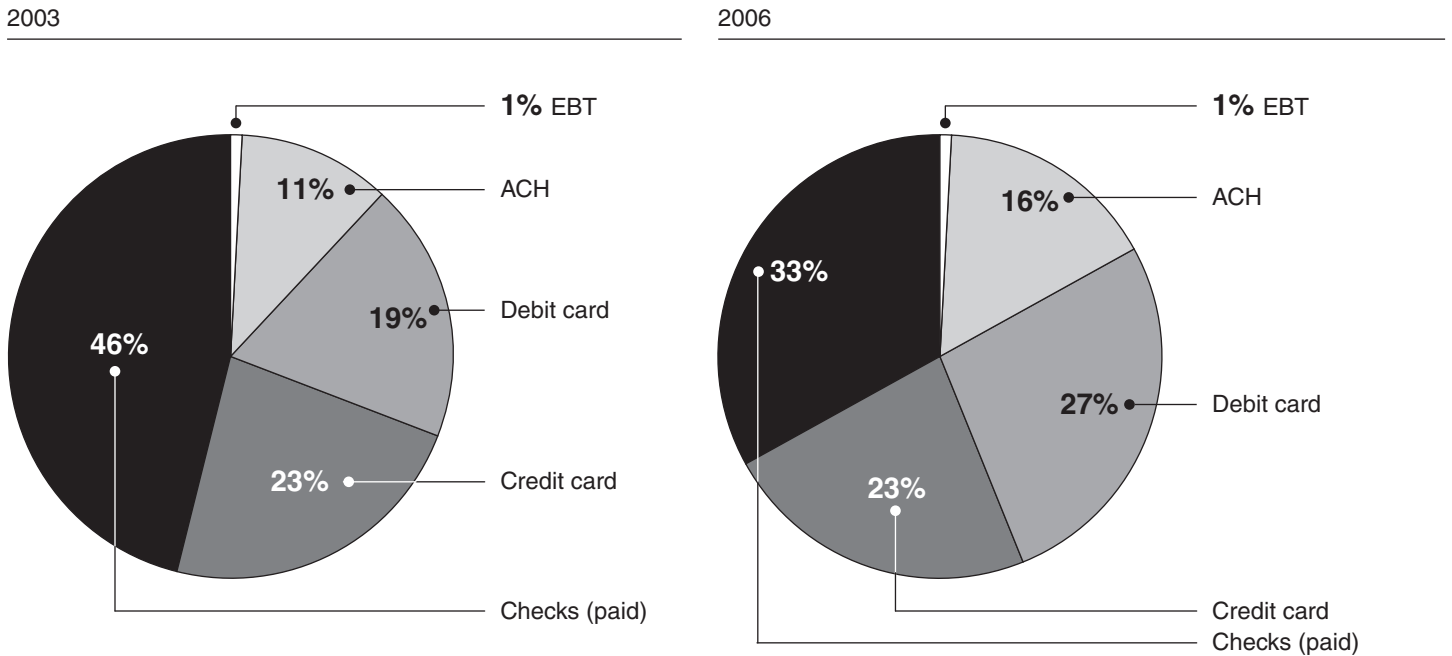
¹⁰[GAO/GGD-98-145](#).

¹¹Geoffrey R. Gerdes and Jack K. Walton II, "The Use of Checks and Other Noncash Payment Instruments in the United States," *Federal Reserve Bulletin* (August 2002), 360.

¹²In a check conversion, the paper check is used only as an information source and is converted into an ACH payment so that it can be processed on the ACH network. The ACH is an electronic batch processing system by which payment orders are exchanged among banks. By agreement, consumer checks can be converted into ACH payments by merchants at the point of sale or by billers that receive check remittances. Checks that are converted into ACH payments never enter the check collection system. The Federal Reserve reported that 2.6 billion paper checks were converted into ACH transactions in 2006.

¹³EBT was devised in the 1980s to meet the needs of the U.S. Department of Agriculture's Food Stamp Program. Its initial purpose was to transfer federal benefits electronically to eligible recipients under certain entitlement and grant programs.

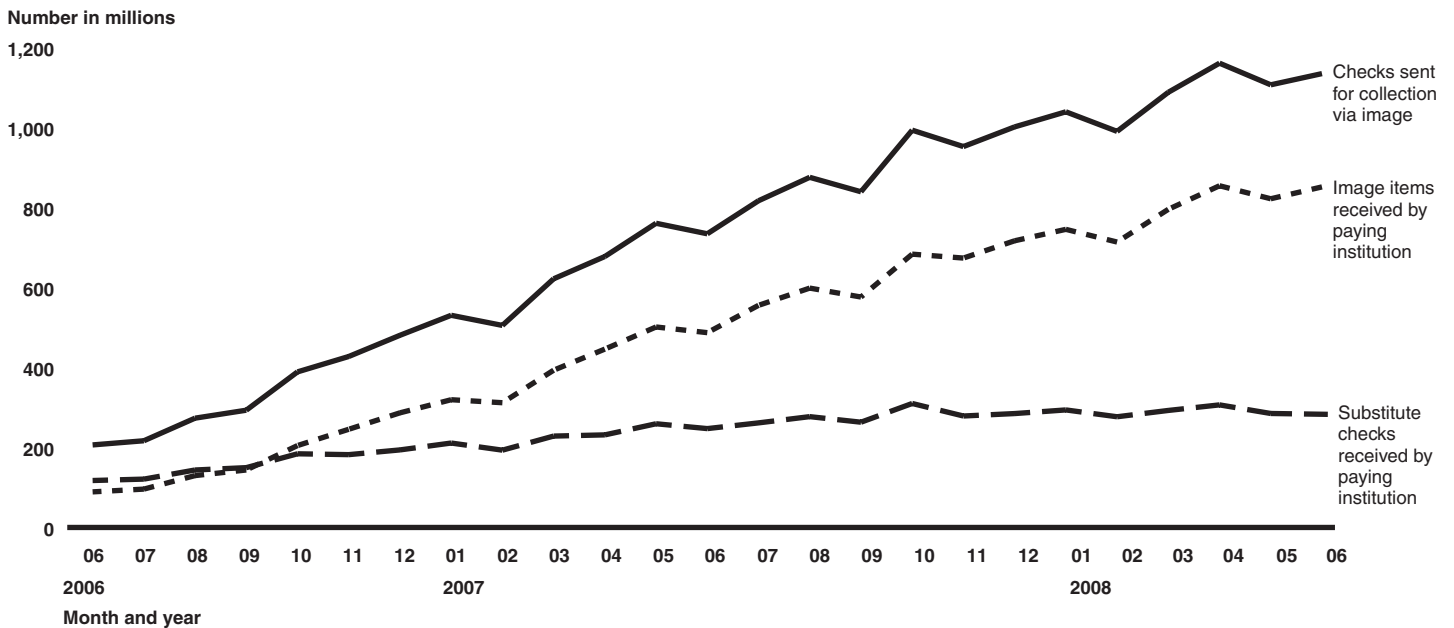
Figure 4: Distribution of the Number of Noncash Payments



Source: The 2007 Federal Reserve System Payment Study.

While check use has declined, check processing increasingly has become electronic. As shown in figure 5, from June 2006 through June 2008, the number of imaged checks deposited by collecting banks and received by paying banks has grown steadily. In June 2006 banks deposited 206 million checks as images compared with June 2008, when banks deposited 1.1 billion checks. Similarly, the number of checks received as images by the paying banks has grown. In June 2006, paying banks received 89 million items; by June 2008, they received almost 852 million items. However, the number of substitute checks has not declined, but has increased from 117 million in June 2006 to 283 million in June 2008. These checks represent paper that must be presented physically to paying banks through the collection system.

Figure 5: Number of Check Images Deposited and Received and Number of Substitute Checks Printed, June 2006–June 2008



Source: GAO analysis of ECCHO data.

Federal Reserve’s Role in Check Collection and Its Consolidation of Check Offices

The Federal Reserve operates a comprehensive, nationwide system for clearing and settling checks drawn on banks located throughout the United States. These offices accept paper check deposits and transport the paper checks to the paying bank. Since the effective date of Check 21, the Federal Reserve sends and receives images between banks. The Federal Reserve offers imaged check products—commonly referred to as the Check 21 products (Fed Forward, Fed Receipt, and Fed Return)—for a fee to banks that use its check collection services.¹⁴ According to the Federal Reserve Board’s 2007 Annual Report, of the approximately 10 billion checks (about one-third of the total 30.6 billion paid checks) processed

¹⁴FedForward is a service in which checks are deposited electronically for collection using image cash letters. (Cash letter is a group of checks packaged and sent by a bank to another bank, clearinghouse, or a Federal Reserve office. A cash letter is accompanied by a list containing the dollar amount of each check, the total amount of the checks, and the number of checks sent with the cash letter.) FedReceipt is a service in which the paying bank agrees to the electronic presentment of checks with accompanying images. FedReturn is a service in which checks to be returned are sent in image cash letters to the Federal Reserve, which will return the checks either in an electronic file or as substitute checks to the banks of first deposit.

through the Federal Reserve in 2007, 42.2 percent were deposited as images and 24.6 percent were received using Check 21 products. Further, in the month of July 2008, the proportion of checks deposited and presented as images using the Federal Reserve's Check 21 products increased to 77.8 percent and 54.4 percent, respectively.

As a result of the declining check volumes, the Federal Reserve developed a long-term plan for restructuring its check processing operations. In 2003, the Federal Reserve had 45 check offices. Since then, the Federal Reserve has closed a number of offices or gradually eliminated its check processing operations. In June 2007, the Federal Reserve announced that its check services system would be consolidated into four regional check processing sites. As of September 30, 2008, the Federal Reserve had 15 check offices and was working toward the objective of maintaining four offices at Atlanta, Cleveland, Dallas, and Philadelphia by the end of the first quarter of 2010. Given the significant declines in paper check deposit volumes, the Federal Reserve's Retail Payments Office believes that the Federal Reserve likely will accelerate the consolidation schedule even further, reducing its check processing offices to perhaps one office by mid-2010.

Check Truncation Has Not Resulted Yet in Overall Gains in Economic Efficiency for the Federal Reserve or for Banks, but Is Expected to Produce Efficiencies in the Future

Check truncation has not resulted yet in overall gains in economic efficiency for the Federal Reserve or for the banks we surveyed, but Federal Reserve and bank officials expect efficiencies in the future. The expectation for electronic processing of checks was that it would lead to gains in economic efficiency—that is, removing paper from the payment stream would lead to lower costs. Our analysis of Federal Reserve cost accounting data suggests that its costs may have increased since the passage of Check 21, which may reflect concurrent maintenance of its paper processing infrastructure, investments in equipment and software for electronic check processing, and incurred costs associated with closing check processing sites. Estimates varied on whether costs were lower for private banks as the result of the check truncation that Check 21 facilitated, reflecting differences in the ways in which different banks handle checks and payments and differences among cost accounting systems. For example, several of the 10 largest banks noted that maintaining a dual paper-electronic infrastructure to date had prevented them from achieving overall lower costs, although they had seen reduced transportation and labor costs. Check imaging and the use of substitute checks appear to have had a neutral impact on banks' fraud losses.

Federal Reserve Cost Accounting Data Do Not Indicate Gains in Economic Efficiency to Date, Partly Due to Maintenance of Dual Paper and Electronic Processing Systems

We found and the Federal Reserve's budget documents report that check truncation has not decreased Federal Reserve costs, although it contributed to decreased labor hours and transportation costs in Federal Reserve check services. To distinguish the effects of check truncation from other factors influencing the Federal Reserve's total costs for check clearing services, we modified econometric cost functions that Federal Reserve economists have used to assess the effects of check volumes on total costs. In particular, we sought to distinguish the effect of the increased use of check truncation following passage of Check 21 on total costs from the concurrent effects of

- the decrease in the number of checks written in the United States,
- changes in the volume of checks processed by the Federal Reserve,
- the Federal Reserve's consolidation of its check services, and
- costs of labor, software, and other expenses associated with the check processing services.

With this consolidation of check offices, the Federal Reserve has incurred an estimated \$115 million in costs from 2003 through 2007, including severance and other payments, which would increase total check services costs. However, the Federal Reserve did recover all costs for its check services from 2005 through 2007.¹⁵

Consistent with our results, the Federal Reserve's annual budget reports from 2006 through 2008 reported that the Federal Reserve's budget for check services experienced cost overruns. Most recently, the 2008 annual budget review reported that the expense overrun was due mainly to greater systemwide costs in preparation for additional restructuring of check services (costs included \$34.0 million for accrual of severance, equipment impairments, and other expenses).¹⁶ The 2007 annual budget

¹⁵Under the Monetary Control Act of 1980, Pub. L. No. 96-221 (March 31, 1980) (12 U.S.C. 248a) the Federal Reserve is to set fees charged to banks for providing priced services including check services to recover, over the long run, all direct and indirect costs of providing the services plus imputed costs, including the interest on items credited before actual collection (float), and a private-sector adjustment factor set to reflect costs that a private-sector firm would face. See 12 U.S.C. § 248a.

¹⁶Board of Governors of the Federal Reserve System, *2008 Annual Report: Budget Review* (Washington, D.C.: May 2008), 16.

review noted total expenses for check services were to increase to \$11.0 million reflecting higher costs for Check 21-related supplies and equipment, as well as additional resources necessary to facilitate further consolidation into five regional check-adjustments sites.¹⁷

Similarly, the 2006 annual budget review reported:

“Total check service expenses were budgeted to increase by \$5.7 million, or 0.9 percent from the 2005 estimate. The increase reflects one-time costs to prepare further consolidations of check operations, as well as other initiatives underway to improve the efficiency of check operations, including investments in Check 21 technology to accommodate increased volumes.”¹⁸

The Planning and Control System (PACS) is the Federal Reserve’s cost accounting system for recording expenses, which includes the costs of its check operations. We analyzed PACS data on check processing to determine whether electronic check processing had an effect on total processing costs. Our analysis builds on previous research by economists in the Federal Reserve.¹⁹ The analysis includes estimation of econometric cost functions using quarterly data from first quarter of 1994 through the fourth quarter of 2007. We chose 1994 as the beginning point for the analysis based on conversations with Federal Reserve officials about the data and in order to provide adequate coverage for the period before and after enactment of Check 21. These cost functions estimate the effects that different explanatory variables may have on total Federal Reserve costs for check services. Explanatory variables include the total volume of checks processed, the introduction of electronic processing or the volume of checks processed electronically, the number of return items, the number of Federal Reserve check processing offices, whether Check 21

¹⁷Board of Governors of the Federal Reserve System, *2007 Annual Report: Budget Review* (Washington, D.C.: April 2007), 17-18.

¹⁸Board of Governors of the Federal Reserve System, *2006 Annual Report: Budget Review* (Washington, D.C.: April 2006), 22.

¹⁹See for example, Ernst R. Berndt, *The Practice of Econometrics: Classic and Contemporary* (Mass: Addison-Wesley Publishing, 1996), chapter 3; Robert M. Adams, Paul W. Bauer, and Robin C. Sickles, Federal Reserve Bank of Cleveland, “Scope and Scale Economies in Federal Reserve Payment Processing,” *Working Paper 02-13* (November 2002); David B. Humphrey, “Scale Economies at Automated Clearing House,” *Journal of Bank Research* (Summer 1981), 71-81; and Paul W. Bauer and Dianna Hancock, “Scale Economies and Technological Change in the Federal Reserve ACH Payment Processing,” *Federal Reserve Bank of Cleveland Economic Review* (1995) vol. 31, no. 3, 14-29.

was in effect, and wage and price indexes. The cost functions permit isolation of the effect of Check 21 from the effects of other variables on the Federal Reserve's total costs for check services.

The results do not demonstrate any gains in economic efficiency as measured by lower costs in the Federal Reserve's check operations for the period since the passage of Check 21 through 2007. In particular, the variable that would measure a change in total costs following the effective date of Check 21 did not have a statistically significant effect on total costs.²⁰ See appendix II for a more detailed discussion of the estimated cost functions. In part, the results reflect costs associated with the concurrent closing of the Federal Reserve's check processing sites. While these closings should reduce costs in the long run, restructuring expenses incurred as part of the closings (such as severance pay for workers) represent up-front costs.

The need to maintain dual infrastructures for paper and electronic check services also may explain the results. While Check 21 removed a barrier to electronic processing by creating the substitute check, Check 21 did not require that paper be removed from the process. So, the Federal Reserve continues to process paper checks and must maintain the infrastructure to process paper checks as it invests in new equipment to electronically process checks. Further, the creation of the substitute check also required investment in new equipment to print those instruments. For instance, a Federal Reserve Retail Payment Office official noted that the high-speed printing machines for substitute checks cost approximately \$200,000 each and the Atlanta processing site had purchased about 12 of these machines.²¹

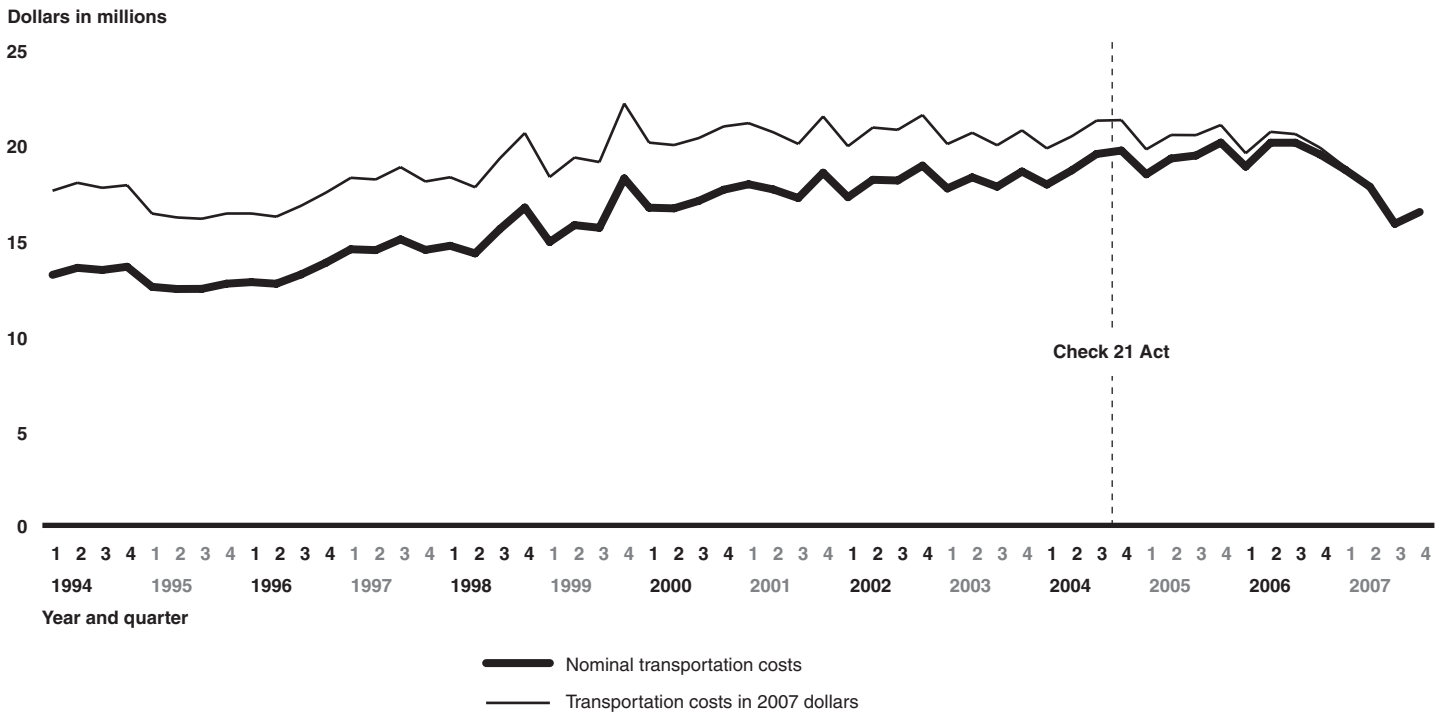
Although the move to electronic check services apparently has not led yet to overall cost savings, the Federal Reserve has seen decreases in transportation costs and work hours. With reduced paper volumes accompanying check truncation, the Federal Reserve's transportation

²⁰However, the magnitude of the cost effects that are based on this analysis vary considerably with different functional forms and are particularly sensitive to the explanatory variables included in the estimation process. Further, many of the explanatory variables are highly correlated, which inherently limits efforts to differentiate their effects on total costs. This issue, to which the econometrics literature refers as multicollinearity, also implies that the results could change if data on subsequent quarters were added.

²¹The Retail Payments Office, located at the Federal Reserve Bank of Atlanta, directs the Federal Reserve's Banks' retail payment activities.

costs for check services decreased approximately 11 percent from the fourth quarter of 2001 through the fourth quarter of 2007 (see fig. 6).

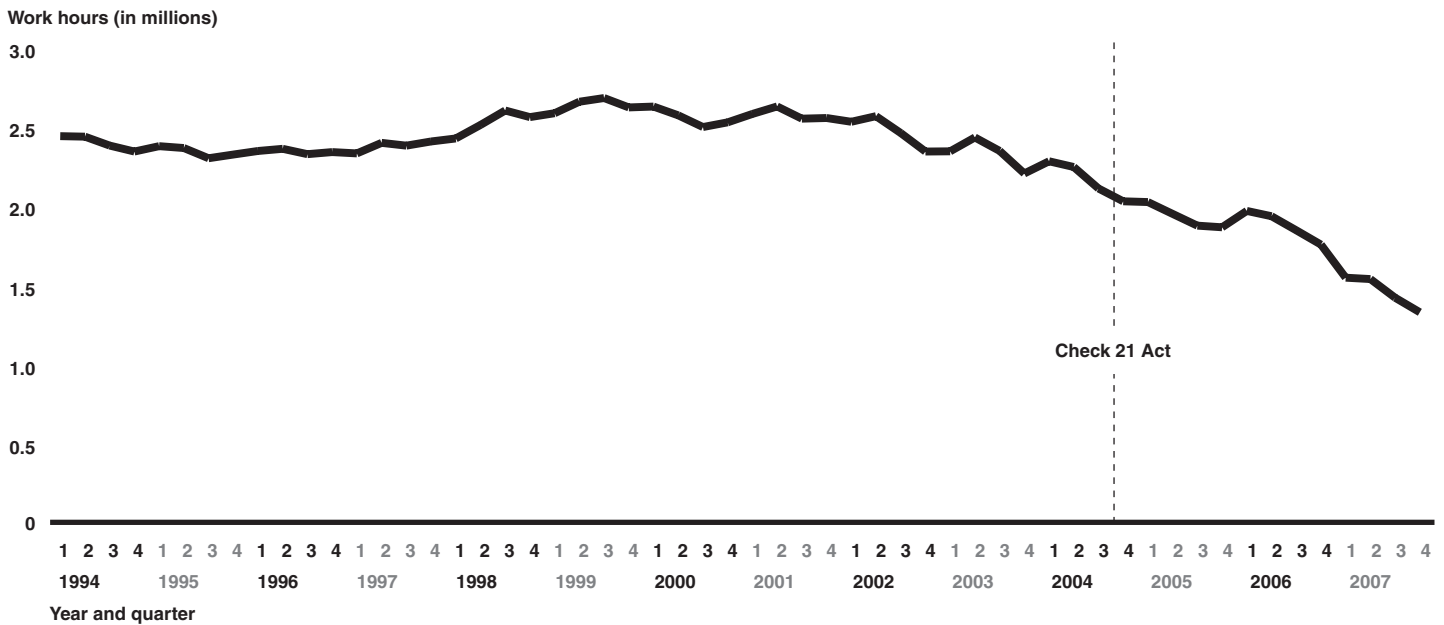
Figure 6: Federal Reserve's Transportation Costs for Check Services, 1994–2007



Source: GAO analysis.

The Federal Reserve also has seen a decrease in the number of work hours for check services. Total work hours dropped from 2.6 million in the fourth quarter of 2001 to 1.3 million in the fourth quarter of 2007, a decrease of approximately 48 percent (see fig. 7).

Figure 7: Federal Reserve Total Work Hours in Check Services, 1994–2007



Source: GAO analysis.

The Largest U.S. Banks Still Maintain Dual Paper and Image-Based Check Processing Systems for Check Collection and Noted Issues Affecting Costs and Implementation

Since the transition to imaging has been gradual throughout the banking industry, the 10 largest U.S. banks still are maintaining paper-based processing systems. As previously noted, Check 21 did not require banks to take any action other than the acceptance of the substitute check. The 10 largest banks in the United States, based on deposit size, generally have large national branch networks and process large volumes of checks; consequently, they have a financial incentive to reduce the amount of paper they have to sort and transport. In 2007, these banks individually had at least 350 million paper checks deposited by their customers and some of them had considerably higher deposits, up to approximately 5 to 7 billion checks.

But, the 10 banks have achieved various levels of electronic processing. Two of the 10 banks have not converted their check processing systems to imaging, but plan to do so by early 2009 and 7 banks have migrated to check imaging to some extent, but with imaging volumes at various levels. As of 2007, on the basis of our data collection instrument, the check volume of the seven banks that sent electronic check images ranged from almost 4 to 60 percent of their overall check deposits, although imaged

volumes have been growing for some of the seven banks. However, the seven imaging banks are maintaining dual processing systems to collect on checks deposited at their institutions. If a bank cannot receive an image, a bank or an intermediary must either print a substitute check of the image or present the original paper check.

Officials from four banks provided us with information on how the continued use of paper presentment has affected their transition to check imaging and their level of cost savings. Federal Reserve officials noted that the willingness of private banks to invest in the equipment needed to process check electronically demonstrated the bank's expectation of lower costs. One bank official told us that the bank still has to print substitute checks for presentment to the small institutions that cannot receive images, which adds to the bank's costs. Another bank noted that for banks that would prefer to receive only paper, it will deposit the image with either the Federal Reserve or another intermediary that then will print the substitute check to present for payment. An official representing this bank stated that the bank has to incur the additional cost of printing a substitute check or, if it goes through an intermediary, to pay the intermediary's prices. The same bank official added that maintaining paper operations has delayed the ultimate potential savings from electronic check processing because the bank had to keep in place its transportation network to continue delivering paper checks. A third bank official reported to us that fees paid to clear checks would be reduced as more and more banks converted to imaging. Finally, a bank official from the fourth bank advised us that mid-size and regional banks were behind in their conversion to imaging because they are too large to outsource their check business, but not large enough to have a financial incentive to invest in check imaging technology. Thus, they continued to use local clearinghouses where they could exchange their checks at very low costs. This official noted that these banks need a reasonable business case for investing in check imaging.

The declining volumes of paper checks also may be inhibiting the migration of some banks to check imaging. As previously noted, from 2003 through 2006, the number of checks paid had declined from about 37 billion to over 30 billion checks. According to one bank trade association, some banks are still undecided about converting to imaging because they recognize that check volume is declining and wonder why they should invest in check processing technology. During our interviews, some of the seven imaging banks raised the issue of declining check volumes as an additional complication preventing some banks from converting to check imaging. Officials from the Federal Reserve acknowledged while the

volume of checks is declining, paper checks would continue to be used long enough to warrant banks' investments in the technology for a more efficient check processing method. In both the paper-based and the image-based check processing systems, the bank of first deposit bears most of the cost of check collection; thus, it has the most financial incentive to convert to an image-based system. In addition, under EFAA, the bank of first deposit is required to release funds to the depositor within specified time periods; thus, it has an additional incentive for speeding up processing.²² The paying bank has the least market incentive to migrate to imaging because it does not incur the costs for collection, such as transportation and clearing fees.

Officials representing some of the four banks with the highest volumes of check image deposits and receipts raised concerns with us that some banks are refusing to migrate to the new imaging technology and some action may be needed to encourage them to do so. One official told us that paying banks should be paying more of the cost of check processing so that they would have a financial incentive to receive images. The official specifically stated that a group of banks has refused to implement the technology and accept images. Another bank official said that from approximately 5 to 7 percent of banks have refused to convert to imaging and may need regulatory pressure to adopt the technology.

Largest Banks That Migrated to Imaging Achieved Cost Savings in the Areas of Transportation and Labor, but also Incurred Technology Costs

Under a paper-based check system, paper checks have to be sorted and transported at every step until they are presented to paying banks; as a result, transportation and labor are among the banks' highest costs. From our analysis of responses to our data collection instrument, officials from largest banks told us that labor was their largest category of expenditures related to check processing followed by transportation. However, none of the seven banks that process checks electronically expect transportation to be a large expenditure category for future processing operations if imaging technology is fully implemented.

According to our bank interviews, air transportation networks of some of the largest U.S. banks have been reduced. Four banks (those with the highest volumes of check image deposits and receipts) have reduced

²²Pub. L. 100-86, title VI, Aug. 10, 1987, 101 Stat. 635 (12 U.S.C. 4001 et. seq.). The funds availability schedules are set forth at 12 U.S.C. 4002. The Federal Reserve's implementing regulations are set forth at 12 C.F.R. Part 229 (Regulation CC), Subpart B.

intrabank and interbank transportation routes for checks, particularly air routes. By the end of 2009, two of the four will have eliminated their air transportation networks entirely. However, three of the four banks have not reduced costs for couriers and local transportation to the same extent as for air transportation because they still transport paper to central processing offices or to local clearinghouses.

We were told by two bank officials we interviewed that as more paper checks are imaged at the branch level, the ground transportation costs of banks should be reduced. One bank official advised us that the earlier the bank can transmit the check information to its processing system and capture the checks as images, the lower the bank's costs. The official added that the bank is working toward implementing branch "capture" (that is, conversion to an image) because the institution achieves better float management and eliminates courier transportation from its cost equation.²³ Another bank official told us that because his bank's transportation costs (for paper checks going from the branches to the central processing office) would not be reduced until the branches could capture check images; the bank had developed a pilot program for capture in a few branches. Although imaging was expected to result in savings in labor and transportation, the costs associated with installing and maintaining imaging equipment and the need to continue to maintain paper processing and clearing capabilities has prevented the realization of cost savings. According to a third bank, it is unclear when it will recover its significant investment in imaging equipment, image archives, and image exchange enhancements, if ever, due in part to the absence of universal adoption of check imaging.

In contrast, we were told that transportation costs for banks that have not migrated to electronic processing may increase because as the overall volume of paper checks declines (due to check imaging and consumer preference) transporting the remaining checks will become more expensive on a per check basis. According to Federal Reserve officials, when fewer banks require the services of a particular transportation network, per-check transportation costs will increase for those banks still using the services because the network is transporting a smaller number of checks. The costs for the last bank on a specific route will be very expensive. According to one Federal Reserve official, in the future

²³In this instance, float refers to the interest associated with the quicker collection of funds associated with check deposits.

overnight mail may be the only practical option for these banks. In congressional testimony, the Director of the Federal Reserve Board's Division of Reserve Bank Operations and Payment Systems stated, "As banks improve their technological capabilities, they can reduce their reliance on air and ground transportation, especially shared transportation arrangements. The banks that remain tied to paper checks will continue to bear the costs of those arrangements."²⁴

Furthermore, bank officials told us that they had additional technology costs when they converted to a check imaging system. To exchange checks electronically with other banks, banks needed to adapt their systems both to send and receive images. The technologies required for electronic check processing include hardware and software to image checks, archive images, and transmit image cash letters for collection. From the analysis of responses to our data collection instrument, six banks projected that the technology costs would continue to be in the "great" or "greatest" range for the foreseeable future. On the basis of our interviews, the two largest imaging banks have recovered or will recover the investments they made for check imaging by 2009. An official representing one of the three banks stated that the bank recovered its investment in imaging mostly through savings in labor and transportation. Moreover, the bank had less equipment, lower maintenance costs on the remaining equipment, and needed less back office space because of electronic processing. The banks that have not recovered their investments still were investing in image archive and image exchange enhancements.

Similar to the Federal Reserve, banks have to deal with substitute checks and, thus, may be required to invest in the printing of substitute checks. From the analysis of responses to our data collection instrument, officials representing banks that have deposited images categorized expenditures for the printing of substitute checks in the "some" to "very great" range. In a follow-up interview, one bank official told us that the bank decided to outsource the printing because it decided not to make the investment since substitute checks were a temporary measure and would not be used once all institutions were image-enabled. Thus, this investment did not make sense for the bank. Another bank official acknowledged that

²⁴See Subcommittee on Financial Institutions and Consumer Credit, House Committee on Financial Services, Testimony of Louise L. Roseman, Director, Division of Reserve Bank Operations and Payment Systems, 109 Congr. 1st sess., April 20, 2005.

substitute check printing has cost the bank hundreds of thousands of dollars to implement.

A Few Smaller-Size Banks Have Seen Lower Costs for Transportation and Labor from Electronic Check Processing

Smaller banks also have been migrating to electronic check processing. But, according to our interviews with three smaller banks (in this case, one bank and two credit unions), they have migrated all of their volumes to electronic processing rather than operating two processing systems, as the largest banks have been doing. In addition, the three smaller banks told us that they typically will use a third-party processor, an image exchange processor like Endpoint Exchange, the Federal Reserve, or another intermediary, such as a correspondent bank. For example, a credit union deposited and received images through the Federal Reserve Banks, while a medium-size bank, with assets of \$4.4 billion, deposited and received images through an image processor and correspondent.

Officials representing the smaller banks told us that it may be easier for small banks to completely migrate to imaging because their check volumes are minuscule in comparison to the volumes of the largest banks and their back offices generally are less complicated than those of the largest banks. The bank with \$4.4 billion in assets received approximately 15 million checks for deposit in 2007, compared with the 10 largest banks in which the bank with the lowest volume of check deposits had 350 million checks deposited. Moreover, generally when these institutions migrate to check imaging, they acquire the imaging services of their intermediary or processor rather than creating their own.

In our interviews, representatives of the smaller banks described how check imaging had affected their operations and costs. The bank with assets of \$4.4 billion reduced its costs by reducing its transportation network. According to a bank official, the bank also expects to secure cost savings from its local courier routes in the future. But, the bank had to invest in software to transfer check images to its correspondent bank. An official from a small credit union told us that check imaging allowed it to reduce its labor costs by half, after spending almost \$6,000 for technology. Another credit union told us that they were able to eliminate three full-time equivalent positions because check processing and related operations (such as researching customer issues on payments) became more efficient. According to an official at the credit union, while the institution made some investments in technology and software, it had recovered the investment costs because of the staff reductions.

Use of Substitute Checks and Check Imaging Appears to Have Had a Neutral Effect on Fraud Losses

Based on a recent American Bankers Association's (ABA) survey of their members about fraud in deposit accounts, the analysis of responses to our data collection instrument, and our interviews with banks, we found that the use of substitute checks and check imaging has had a neutral effect on fraud losses.²⁵ In 2007, the ABA reported in its survey of members, more than 92 percent of the bank respondents answered that they had not incurred any losses from substitute checks in 2006. Of the 8 percent of banks that responded that they had incurred both fraud and non-fraud losses from substitute checks, more than 80 percent also responded that these losses did not occur because the instruments were substitute checks instead of original checks.

From the analysis of our responses to our data collection instrument, the six largest banks that have migrated to electronic check processing noted that check imaging and the use of substitute checks had not affected the prevalence of losses from bad checks and that imaging has had a neutral or minimal effect on check fraud. Officials representing two of these banks explained in subsequent interviews that in the post-Check 21 world, since checks are being processed faster banks can catch a fraudulent item sooner. A third official told us that he had seen a slight decline in fraud losses since Check 21. Finally, from the analysis of the responses to our data collection instrument, four of the largest banks noted that they had not taken additional actions to alleviate the potential threat of losses from images of bad checks.

²⁵ *ABA Deposit Account Fraud Survey Report 2007 Edition*. The survey was conducted from February through July of 2007. According to the report, a total of 176 institutions returned completed survey forms and most of the information presented in the report was for calendar year 2006.

Most Bank Consumers Appeared to Have Accepted Changes to Their Checking Accounts from the Check Truncation Process Resulting from Check 21

On the basis of our structured bank consumer interviews, we found only a small percentage of consumers who preferred to receive canceled checks with their checking account statement. Of the bank consumers we interviewed, 12 (or about 11 percent) wanted their canceled checks returned, while 37 (or about 35 percent) preferred to use online banking capabilities to review their check payment activity. In general, consumers expressed a variety of preferences for how banks should provide them with the most complete information about their check payments activity. Also, most of the consumers were not concerned significantly about being able to demonstrate proof of payment using a substitute check or check image rather than a canceled check. Few of the consumers reported that they suffered errors from the check truncation process. In addition to conducting consumer interviews, we reviewed consumer complaint data provided by federal banking regulators and found relatively few consumer complaints relating to Check 21.

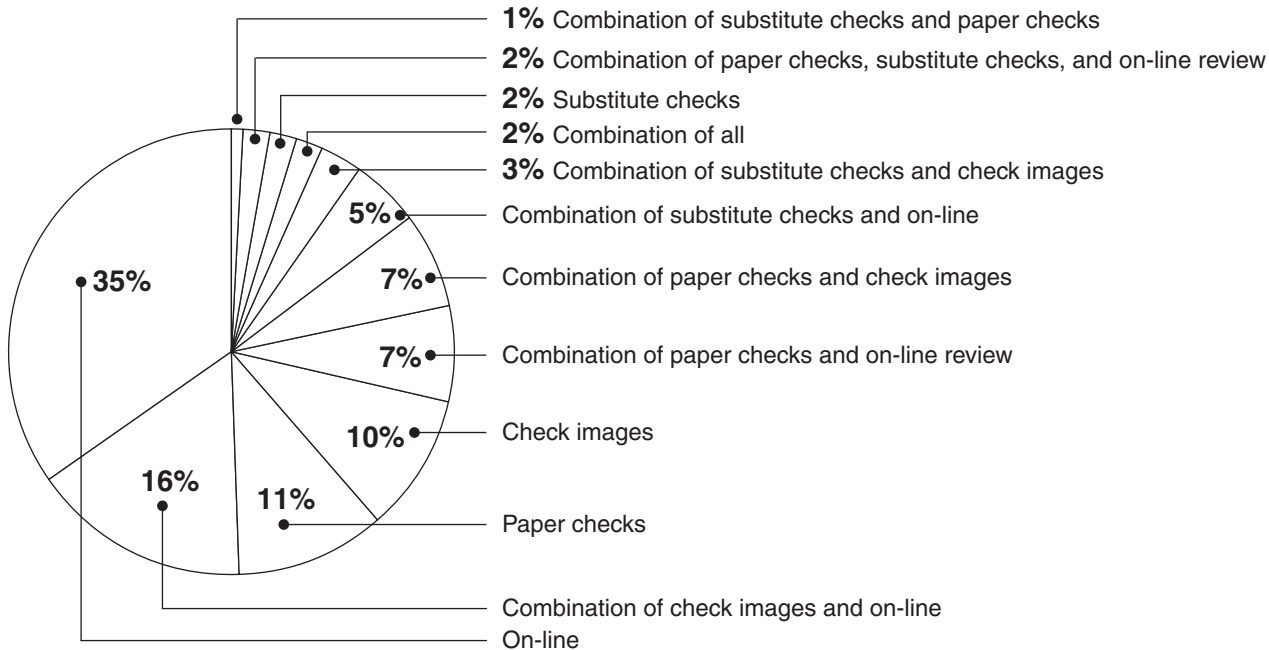
A Small Percentage of Bank Consumers Preferred Receiving Their Canceled Checks

We found that a small percentage of bank consumers in our structured interviews preferred receiving canceled checks, while the remaining consumers preferred reviewing their check payments activity online or in a less paper-intensive format, such as image statements. As we reported in an earlier report, perceptions about consumer preferences for the receipt of their canceled checks deterred the adoption of electronic check processing.²⁶ Based on the bank consumers we interviewed, it appears that their preference for canceled checks is diminishing. In our interviews, consumers expressed a variety of preferences for how banks should provide them with the most complete information about their check payments activity (see fig. 8).

²⁶[GAO/GGD-98-145](#).

Figure 8: Bank Consumer Preferences for Reviewing Check Payments Activity

Would you choose only one of these methods, a combination of these methods, or something else?



Source: GAO.

Note: Percentages are based on responses from 107 bank consumers.

In particular, 12 of the 107 consumers, or about 11 percent, told us that they preferred receiving their canceled checks with their checking account statement.²⁷ Some of these consumers believed that canceled checks were better for recordkeeping and more secure than electronic images in terms of protecting their privacy. Others in this group stated they wanted to be able to review their handwriting and other details of the canceled paper check to ensure that the checks were not counterfeit or the signatures forged. However, most bank consumers we interviewed accepted the use of online banking to review their check payments activity. Specifically, 37 of the 107 consumers, or about 35 percent, told us that they preferred

²⁷For this specific question, one interview participant did not respond to the question. Thus, the total number of responses for this question was 107, not 108.

reviewing check information and images online.²⁸ Several consumers stated that they did not need the “extra paper” from canceled checks and image statements and that online reviewing was more secure than receiving canceled checks. Some consumers stated that they enjoyed the convenience of reviewing their check payments activity online at any time. Twenty-eight of the 107 consumers, or 26 percent, preferred a combination of the various methods (check images, online review, paper checks, and substitute checks).

Most Bank Consumers Were Not Concerned Significantly about Demonstrating Proof of Payment Using a Substitute Check or Check Image

Most bank consumers reported that they were not concerned significantly about demonstrating proof of payment despite the changes to their checking accounts resulting from check truncation. For example, a consumer might pay a debt using a check, but the creditor might not properly record the payment, and then ask the consumer to demonstrate proof that he or she paid. Under the check truncation process, the consumer most likely would have access only to a substitute check or an image of the canceled check and not the original, canceled check.

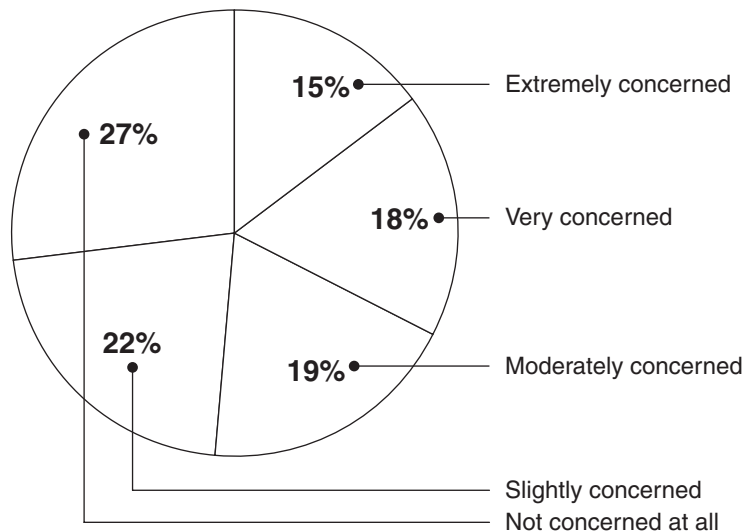
In our structured interviews, we asked consumers about their experience with demonstrating proof of payment. We found that 33 of the 108 consumers, or about 31 percent, had never been required to demonstrate proof of payment using canceled checks, substitute checks, or an image statement. We found that 58 of the 108 consumers, or about 54 percent, had used a canceled check to demonstrate proof of payment. We also found that 33 of the 108, or about 31 percent, had used a substitute check or image statement to demonstrate proof of payment. Most of these consumers reported that they had no difficulty using a substitute check or image statement, but some consumers reported that creditors would not accept an image showing only the front of the check so the consumer had to get copies of the front and back of the check from the bank.

We then asked consumers whether they were concerned about having to demonstrate proof of payment using a substitute check or image statement rather than a canceled check. We found that 53 of the consumers, or about 49 percent, were “slightly” or “not at all” concerned about their ability to demonstrate proof of payment using a substitute check or image statement

²⁸Furthermore, 69 of the 108 consumers, or about 64 percent, stated that they conducted some type of online banking, including activities such as account balancing, bill payment, and funds transfers.

(see fig. 9). In particular, many of these consumers were confident that a substitute check or image statement contained all of the information necessary to demonstrate proof of payment. However, 35 of the consumers, or 32 percent, were “extremely” or “very” concerned about using a substitute check or image statement. Many of these consumers were concerned that having an image of only the front of the check might not be sufficient, particularly if they had experienced such difficulty in the past.

Figure 9: Bank Consumer Concern about Demonstrating Proof of Payment Using a Substitute Check or Image Statement



Source: GAO.

Note: Percentages may not total to 100 percent due to rounding.

Few Bank Consumers Reported That They Experienced Errors from the Check Truncation Process

Few of the bank consumers we interviewed reported that they suffered errors from the check truncation process. We asked consumers whether they had experienced errors such as double-posting of an item, a forged signature on a check, a counterfeit check, or some other error involving canceled checks, substitute checks, and image statements.²⁹ The consumers reported more errors involving canceled checks than substitute checks or image statements. Specifically, 28 of the 108

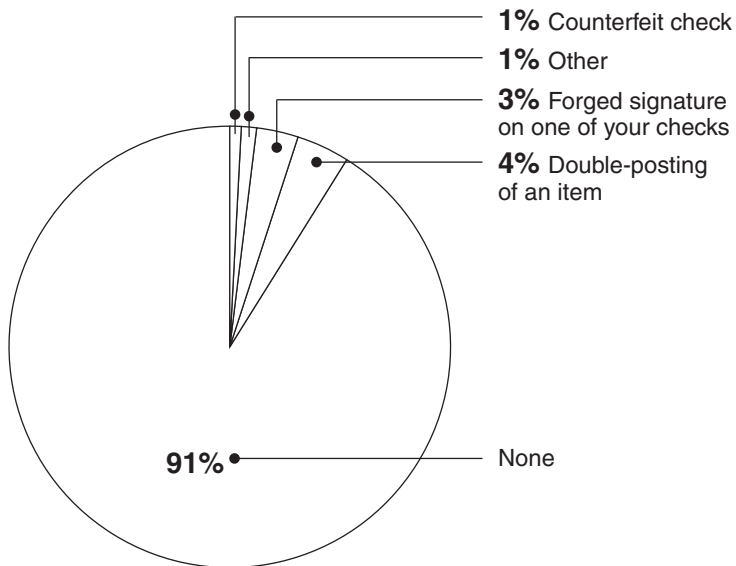
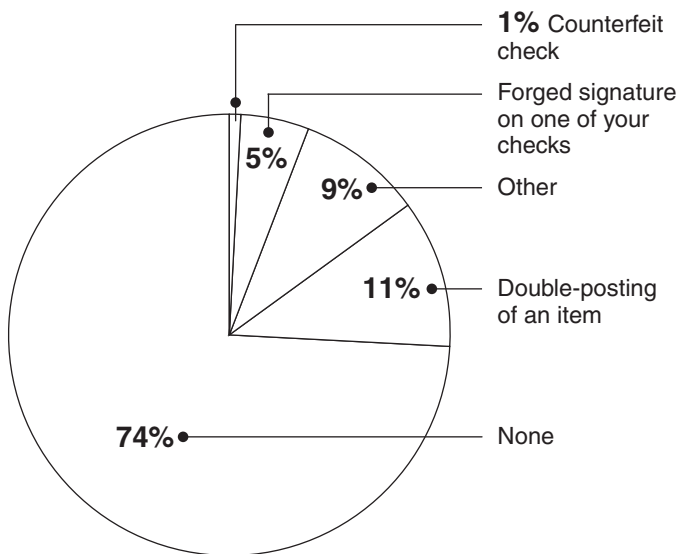
²⁹Double-posting or duplicate payment of a check refers to the same check being presented to the paying bank twice.

consumers, or about 26 percent, reported an error involving a canceled check and using it to resolve the error. In contrast, only one consumer we interviewed reported suffering an error related to double-posting of a debit and using a substitute check to resolve the error. Also, 7 of the 74 consumers who reported that they received image statements, or about 9 percent, reported errors involving an image statement and using it to resolve errors they experienced. See figure 10 for the distribution of reported errors involving canceled checks and image statements.

Figure 10: Errors Reported by Bank Consumers Involving Canceled Checks and Image Statements

Have you experienced any of the following potential errors involving your cancelled check?

Have you experienced any of the following potential errors involving a check image?



Source: GAO.

Note: Percentages in the first graphic are based on responses from 108 bank consumers. Percentages in the second graphic are based on responses from 74 bank consumers.

Based on interviews with trade association and service vendor officials, we found that some banks have been correcting errors associated with double-posting of a check before consumers experience them. They told us that double-posting initially was a significant problem for banks as they adopted check truncation technology. However, they also noted that many banks have now incorporated protection in their computer system to identify duplicates before they reach the consumer, so that many consumers never see them when they review their bank statements.

Federal Banking Regulators Reported Few Consumer Complaints on Check 21

We found that a small percentage of consumers complained to the federal banking regulators about matters relating to Check 21.³⁰ In its April 2007 report, the Federal Reserve Board found that less than 1 percent of all complaints received by federal banking regulators related to Check 21. The results of our review of consumer complaint data on Check 21 corroborated the Federal Reserve Board's conclusion. Specifically, we reviewed consumer complaint data from the four federal banking regulators from October 28, 2004, through March 31, 2008, and found 172 complaints were submitted about Check 21. In comparison, in each year from 2005 through 2007, the regulators received approximately 35,000 consumer complaints overall. Of the 172 complaints relating to Check 21, we found that 78, or about 45 percent, were from consumers who wanted to continue receiving canceled checks. The federal banking regulators responded to such complaints by noting that banks have no legal requirement to return canceled checks to consumers and that the return of canceled checks was dependent on the contractual agreement between consumers and their banks. However, in these instances, the data showed that the interested banks generally agreed to send canceled checks to consumers whenever possible. In addition, another 30 of the 172 complaints, or about 17 percent, were from consumers concerned about the quality or clarity of image statements. Some of the banks we interviewed also mentioned image quality as a prominent consumer complaint, but we learned that they continue to seek a solution to image quality problems.

³⁰We used data from the Federal Deposit Insurance Corporation, the Office of the Comptroller of the Currency, the Office of Thrift Supervision, and the Federal Reserve Board. We were unable to obtain specific consumer complaint data related to Check 21 from the National Credit Union Administration.

Bank Consumers Have Realized Benefits and Costs Relating to Faster Check Processing and Access to Information about Their Checking Accounts

To the extent that banks have implemented electronic check processing, bank consumers have realized both benefits and costs relating to faster processing and access to information about their checking accounts. Faster check processing has helped some banks extend the cut-off time for same-day credit on deposits, which can result in faster availability of deposited funds. In addition, bank industry officials and some of the consumers we interviewed believe it is beneficial to receive simpler checking account statements with check images rather than canceled checks. Also, bank industry officials cited benefits to consumers from immediate access to information about checking account activity and improved customer service. In addition, consumers can benefit specifically from a provision of Check 21 because they have the right to expedited re-credit of their checking accounts if banks make certain errors associated with substitute checks. However, on the basis of our consumer and bank interviews, the extent to which consumers have benefited from expedited re-credit is unclear. We also found that some consumers may incur fees related to receiving canceled checks and check images with their checking account statements. Based on our review of available data from 2001 through 2006, it appears that fees for canceled checks have increased and fees for check images have remained relatively flat. In addition, the amount of the fees can vary depending on the type of checking account the consumer maintains.

Some Bank Consumers May Experience Extended Cut-off Time for Deposits, but Broader Adoption of Electronic Processing by Banks Would Be Needed to Shorten Funds Availability Deadlines

We found that banks may have extended the cut-off time for accepting deposits for credit on the same business day, due to the check truncation process and other check-system improvements. Generally, banks had established a cut-off hour of 2:00 p.m. or later for receipt of deposits at their main or branch offices and a cut-off of 12:00 p.m. or later for deposits made at ATMs and other off-premise facilities.³¹ These cut-off times provided the banks with necessary time for handling checks and transporting them overnight to paying banks. The check truncation process and check imaging provide collecting banks with additional time to present checks to paying banks. As a result, banks may be able to establish a later cut-off hour, which would give consumers more time to deposit funds at the bank for same-day credit.

Bank officials told us that they have started to adjust their cut-off times in some geographic areas in response to the growth of check truncation. Of

³¹See 12 C.F.R. 229.19(a)(5)(ii).

the seven largest U.S. banks that have started to migrate to check imaging, five told us that they have extended some of their deposit cut-off times at certain branches. For instance, one bank on average extended its cut-off time by 2 hours in the Northeast, and another bank had plans in place to make a similar 2-hour extension in selected markets. A third bank told us that it has extended the cut-off time for accepting deposits for credit on the same business day at certain ATMs to 8:00 p.m. in several major cities such as Atlanta, Chicago, Los Angeles, and New York.

Although some consumers may have additional time for making deposits, they may not be able to withdraw their funds any sooner because the funds availability schedules of Regulation CC have not been amended following enactment of Check 21. The Federal Reserve Board recently concluded that much broader adoption of new technologies and processes by the banking industry must occur before check return times can decline appreciably and thereby permit a modification of the funds availability deadlines.³² The Federal Reserve Board found that the banks of first deposit learn of the nonpayment of checks faster than they did when EFSA was enacted, but banks still do not receive “most” local or nonlocal checks before they must make funds available for withdrawal.³³

However, the Federal Reserve’s decision to consolidate its check-processing regions has had a direct effect on consumers in terms of the availability of their deposited funds under Regulation CC. Specifically, the consolidations have increased the proportion of local checks and thereby reduced the maximum permissible hold period from 5 business days to 2 business days for many checks. As previously noted, the Federal Reserve’s check-processing regions are being consolidated into four check-processing regions by the first quarter of 2010. Because the processing regions are larger (and will become even more so), the number of local checks has been increasing.

In addition, based on the Federal Reserve Board’s study and our own research, it appears that banks are making depositor funds available earlier than EFSA-established funds-availability schedules. Specifically, the Federal Reserve’s Check 21 study found that banks make about 90 percent of all consumer deposits of local and nonlocal checks available

³²Board of Governors of the Federal Reserve System, *Report to the Congress on the Check Clearing for the 21st Century Act of 2003* (April 2007), 17.

³³*Check Clearing for the 21st Century*, 15.

more promptly than required by EFAA.³⁴ Moreover, it found that banks make funds available from the majority of consumer check deposits within 1 business day.³⁵ We reviewed the customer account agreements for 5 of the 10 largest U.S. banks and found that the general policy for each bank is to make funds available to consumers on the business day after the day of deposit.

Many Bank Consumers Have Realized Other Benefits Related to Access to Information about Check Payments

Bank industry officials and some consumers we interviewed noted that consumers may realize other benefits relating to access to information about check payments. For example, bank consumers may receive simpler checking account statements using image technology. So-called “image statements” include a sheet of paper with multiple pictures or images of checks that were written by the consumer and processed since the last statement. In our interviews with 108 bank consumers, 75 consumers, or about 69 percent, stated that they received image statements. When asked about their preferred method of receiving information about check payments, 11 of the 108 consumers interviewed, or about 10 percent, stated that they preferred receiving image statements over canceled checks or online review of check payments activity. Some of the 11 consumers told us that they preferred receiving image statements because, while they wanted a paper record of their check payments activity, they preferred not to handle and store canceled checks.

Bank consumers who prefer to manage their checking account electronically also might realize benefits from immediate access to information about check payments. With the check imaging process and online access to their checking accounts, consumers can review check payments and images of their paid checks as soon as they are posted to the account and may recognize a problem sooner. With paper check processing, consumers must wait until the checking account statement arrives in the mail to review their check payments activity. Also, improved access to information can be beneficial to consumers when they need to work with the bank to resolve a problem. Bank industry officials and some consumers we interviewed noted that consumers may realize other benefits relating to access to information about check payments.

³⁴*Check Clearing for the 21st Century*, 13.

³⁵*Check Clearing for the 21st Century*, 13.

Check 21's Expedited Recredit Is Considered a Consumer Benefit, but It Appears That a Limited Number of Consumers Filed for the Benefit

One of the expected consumer benefits of Check 21 is the right to expedited recredit, but the extent to which consumers have benefited is unclear. The expedited recredit provision is considered a benefit to consumers because other banking laws governing checks do not prescribe specific amounts or time frames by which banks must recredit a customer's account.³⁶ On the basis of our bank consumer and bank interviews, it appears that a small number of bank consumers have filed expedited recredit claims. The right to expedited recredit exists if the consumer asserts in good faith that the bank charged the consumer's account for a substitute check provided to the consumer and either the check was not properly charged to the consumer's account, or the consumer has a warranty claim pertaining to the substitute check.³⁷ The bank must recredit the customer's account unless it has provided the customer the original check or a copy of the original check that accurately represents all information on the original check and demonstrated to the consumer that the substitute check was properly charged to the consumer's account.³⁸

On the basis of our consumer and bank interviews, it appears that a small number of bank consumers have filed expedited recredit claims. In our interviews with 108 consumers, 9 or about 8 percent of the consumers we interviewed, stated that they had received substitute checks with their main checking account statement, and none had exercised the right to expedited recredit. On the basis of the data provided to us by the 10 largest banks through the data collection instrument (which are not representative of the entire industry), we found 3 banks received a small number of claims related to expedited recredit in 2007. Specifically, one bank reported that it fielded less than 1,000 claims; one received less than

³⁶See, *e.g.*, Uniform Commercial Code Articles 4-401 and 4-402.

³⁷Additional elements also must be satisfied. See 12 U.S.C. 5006(a) see also 12 C.F.R. § 229.54. Warranties pertaining to the substitute check provide that the substitute check meets all the requirements for legal equivalence and that there is no duplicate payment of a check. See 12 U.S.C. 5004; see also, Regulation CC, 12 C.F.R. §§ 229.52, 229.53.

³⁸If the bank has not acted on the claim before the end of the tenth business day after the banking day on which the bank received the claim, it must provisionally recredit the consumer's account up to the lesser of the amount of the substitute check or \$2,500. The bank must recredit any remaining balance greater than \$2,500 no later than the forty-fifth calendar day after the banking day on which the bank received the claim. 12 U.S.C. § 5006.

10 claims; and the third bank reported that it received 1 claim.³⁹ In an interview, a representative of another bank told us that the bank had not received any claims. Six other banks did not report any information on the number of claims received.

Some Bank Consumers Can Incur Fees for Receiving Canceled Checks and Image Statements

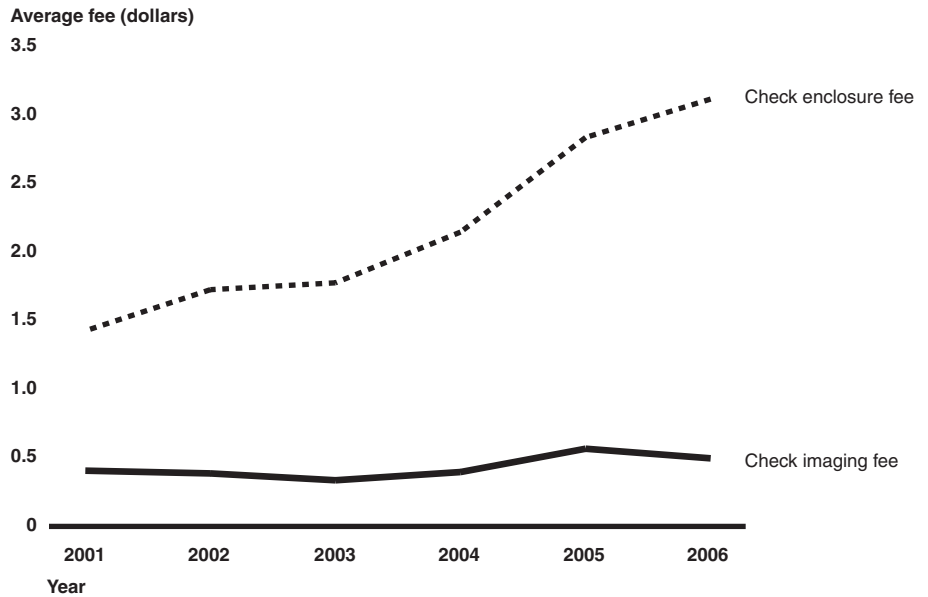
Some bank consumers can incur fees for receiving canceled checks and image statements, and the amount can depend on the type of checking account the consumer maintains. We reviewed data regarding bank fees for canceled checks and image statements acquired from Informa Research Services in conjunction with a report on bank fees.⁴⁰ The data indicated that the average amount of fees for obtaining canceled checks generally increased from 2001 through 2006, and the average amount of fees for obtaining image statements remained relatively flat. For example, as shown in figure 11, the average check enclosure fee more than doubled from \$1.42 to \$3.11. During the same period, the average check imaging fee rose from \$0.40 to \$0.49.⁴¹

³⁹We note that the bank with less than 1,000 claims is among the largest in the country, handling more than 3.2 billion checks in 2007. In addition, the institution reported that 75 percent of the claims were resolved in the customer's favor.

⁴⁰See GAO, *Bank Fees: Federal Banking Regulators Could Better Ensure that Consumers Have Required Disclosure Documents Prior to Opening Checking or Savings Accounts*, [GAO-08-281](#) (Washington, D.C.: Jan. 31, 2008). The Informa data typically were gathered from retail banks with large market shares in specific areas and are not statistically generalizable to other institutions.

⁴¹Informa defined the check enclosure fee as the fee charged to have cancelled checks returned with the statement and the check image fee as the fee charged to have images of cancelled checks returned with the statement.

Figure 11: Check Enclosure and Imaging Fees, Banks and Savings and Loans, 2001–2006



Source: GAO analysis of Informa Research Services data.

The Informa data also indicated that banks may charge different amounts for check enclosures and check imaging depending on the type of checking account. Specifically, the Informa data indicated that primarily non-interest, free checking accounts had the highest fees for check enclosures and check imaging.⁴² The lowest check enclosure and check imaging fees were found primarily with senior checking accounts.⁴³ For example, in 2006 the average check enclosure fees for a non-interest, free checking account and a senior checking account were \$3.75 and \$2.45, respectively, compared to \$3.11—the average check enclosure fee of all accounts Informa surveyed. Furthermore, the average check-imaging fee for a non-interest, free checking account in 2006 was \$0.84, and the average check-imaging fee for a senior checking account was \$0.18,

⁴²Informa defined a non-interest, free checking account as a free checking account that does not earn interest, has no monthly or transaction fees (such as debit per check fees or ATM/check card debit fees), and has no balance requirements.

⁴³Informa defined a senior checking account as a checking account exclusively for seniors (persons age 65 or older) that can be interest or non-interest bearing.

compared to \$0.49—the average check imaging fee of all accounts Informa surveyed.

A relatively small number of the bank consumers we interviewed reported that their bank charged a fee for obtaining canceled checks or image statements, and some of the banks we interviewed reported that they charged a fee for providing canceled checks. Specifically, 23 bank consumers, or about 21 percent of the consumers we interviewed, told us that their bank charged a fee for obtaining canceled checks. Two consumers stated that they switched to online review of their check payments activity to avoid paying a fee for receiving canceled checks. Also, as we reported above, 12 of the 108 bank consumers we interviewed preferred receiving canceled checks to review their check payments activity. Moreover, 18 bank consumers, or about 17 percent, reported that their bank charged a fee for obtaining image statements. Two of the banks we interviewed charged a fee if consumers wanted to receive canceled checks. For example, one bank stated that its customers paid \$2 for receiving canceled checks if they also paid a monthly service fee, but other bank officials we interviewed stated that their banks did not charge a fee for image statements.

In addition, faster check processing may cause consumers to lose “float.” Float is the time between the payment transaction and the debiting of funds from a bank consumer’s account. The check truncation process may result in checks clearing a consumer’s account more quickly than under traditional check processing. However, deposited funds may not be available to consumers more quickly because, as noted above, Regulation CC’s funds availability deadlines have not changed. According to our recent report on bank fees, consumer groups and bank representatives believe that the potential exists for increased incidences of overdrafts if funds were debited from a consumer’s account faster than deposits were made available for withdrawal.⁴⁴ However, we identified little research on the extent to which check truncation has affected occurrences of overdrafts and nonsufficient funds fees.⁴⁵

⁴⁴See [GAO-08-281](#).

⁴⁵See [GAO-08-281](#). See also Eric Halperin, et al., Center for Responsible Lending, *Debit Card Danger: Banks Offer Little Warning and Few Choices as Customers Pay a High Price for Debit Card Overdrafts* (Jan. 25, 2007).

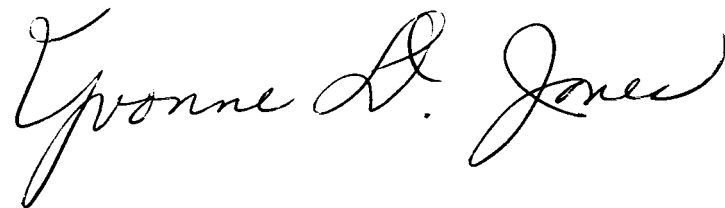
Agency Comments and Our Evaluation

We provided a copy of a draft of this report to the Federal Reserve Board, which provided us with written comments that are reprinted in appendix III. The Federal Reserve Board agreed with our overall conclusion that, over the past four years, the banking industry has made substantial progress toward establishing an end-to-end electronic check-processing environment. In commenting on this report, the Federal Reserve Board noted that the Federal Reserve Banks expect that by year-end 2009, more than 90 percent of their check deposits and presentments will be electronic. They also commented that the ongoing transformation to electronic check-processing environment has not been without cost. As noted in our report, the Federal Reserve Banks have reduced their transportation costs and work hours associated with their check services. And, according to the Federal Reserve Board, they earned a net income of \$326 million for providing check services from 2005 through 2007. The Federal Reserve Board concurred with a number of consumer benefits identified in the report: faster funds availability on check deposits due to later deposit deadlines, quicker access to account information, and improved customer service. In addition, they provided us with technical comments, which we incorporated as appropriate. We also sent a draft of this report to the Federal Deposit Insurance Corporation, Office of the Comptroller of the Currency, and Office of Thrift Supervision. Only the Office of the Comptroller of the Currency provided us with technical comments, which we incorporated as appropriate. We provided sections of the draft of this report to bank officials for their technical review and several of them provided us technical comments, which we incorporated as appropriate.

We are providing copies of this report to other interested Congressional committees. We are also providing copies of this report to the Chairman, Board of Governors of the Federal Reserve System; Chairman, Federal Deposit Insurance Corporation; Comptroller of the Currency, Office of the Comptroller of the Currency; Director, Office of Thrift Supervision; and other interested parties. We will also make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staffs have any questions regarding this report, please contact me at (202) 512-8678 or jonesy@gao.gov. Contact points for our Office 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 IV.

Yvonne D. Jones

A handwritten signature in black ink that reads "Yvonne D. Jones". The signature is written in a cursive style with a large, prominent "Y" and "J".

Director, Financial Markets and
Community Investment

List of Congressional Committees

The Honorable Christopher J. Dodd
Chairman
The Honorable Richard C. Shelby
Ranking Member
Committee on Banking, Housing, and Urban Affairs
United States Senate

The Honorable Barney Frank
Chairman
The Honorable Spencer Bachus
Ranking Member
Committee on Financial Services
House of Representatives

The Honorable Carolyn B. Maloney
Chair
The Honorable Judy Biggert
Ranking Member
Subcommittee on Financial Institutions
and Consumer Credit
Committee on Financial Services
House of Representatives

Appendix I: Objectives, Scope, and Methodology

The Check Clearing for the 21st Century Act of 2003 (Check 21) mandated that GAO evaluate the implementation and administration of Check 21. The report objectives are to: (1) determine the gains in economic efficiency from check truncation and evaluate the costs and benefits to banks and the Federal Reserve System (Federal Reserve) from check truncation, (2) assess consumer acceptance of the check truncation process resulting from Check 21, and (3) evaluate the costs and benefits to consumers from check truncation.¹

To estimate the gains in economic efficiency from check truncation and evaluate the costs and benefits to banks from check truncation, we separately analyzed costs for the check operations of the Federal Reserve and for a selected group of banks. We used data from the Federal Reserve cost accounting system, known as the Planning and Control System or PACS, for the period beginning 10 years prior to the effective date of Check 21 (1994) through 2007. We modeled the Federal Reserve's total check processing costs as different functions of variables, such as the volume of checks processed, the volume of returned checks, the number of Federal Reserve check processing offices, and the general indexes on wage and price. The specified cost functions allowed us to use standard econometric methods for estimating the effects of the variables on the Federal Reserve's total check processing costs for 1994 through 2007. Because data on prices of input factors associated with Federal Reserve's check processing operations are not available, we also used in our estimation data from the Department of Commerce's Bureau of Economic Analysis (BEA) and the Department of Labor's Bureau of Labor Statistics (BLS) as alternative measurements for the prices of these input factors. For example, we used average hourly earning for all private sectors from BLS as an alternative measurement for the Federal Reserve's labor cost, BEA's price deflator for equipment and software by nonresidential producers as an alternative measurement for communications equipment and transit cost, and BEA's Gross Domestic Product price deflator as an alternative measurement for costs of all other input factors. We assessed the quality of all the above data and found them to be sufficiently reliable for our purposes. We also discussed Federal Reserve check processing costs and our econometric cost model with staff at the Federal Reserve. See appendix II for a detailed discussion of our econometric cost functions.

¹For this report, commercial banks, financial institutions, thrifts, and credit unions will be collectively referred to as banks.

While the Federal Reserve has consistent cost accounting data, cost accounting varies throughout the banking industry, preventing a similar analysis for private-sector costs. To evaluate the costs and benefits to banks from check truncation, we focused our data collection and analysis on the 10 largest banks in the United States, based on deposit size as of March 25, 2008. The check volume at the 10 largest U.S. banks represents a significant segment of the check paid volume. In 2007, these banks presented almost 13 billion checks for collection out of approximately 30 billion checks, which were paid in 2006. Thus, we determined that these banks should have a financial incentive to reduce the amount of paper that has to be sorted and transported. We created a data collection instrument to obtain qualitative cost information about the following issues: (1) the extent to which the banks deposited and received checks as images; (2) the primary costs related to paper check processing; (3) the extent of the investment that banks made to exchange check images; (4) the level of cost savings banks achieved, if any, including changes in labor and transportation costs through the use of image technology; and (5) the impact of check imaging and the use of substitute checks on the prevalence of bank losses from fraudulent checks. Officials from the Electronic Check Clearing House Organization, commonly known as ECCHO, also reviewed the data collection instrument. We sent it to the 10 banks and received a response from 9. At an early stage of our engagement, we also interviewed an official representing the bank that did not provide a response. We conducted follow-up interviews with a number of the banks requesting clarification of their responses.

We also sent the data collection instrument to 12 smaller institutions, which included credit unions, to understand the small bank experience with check imaging. These banks' assets ranged from less than \$500 million to \$5 billion and were selected from ECCHO's list of participating members. In addition, our selection criteria included whether these smaller institutions were located in metropolitan or nonmetropolitan areas. We received completed forms from five of these institutions, but two had not migrated any of their volume to check imaging. We conducted subsequent interviews with the three institutions that had. We made several attempts to contact the nonrespondents through e-mail messages

and follow-up telephone calls. In addition, we interviewed officials from a corporate credit union and a banker's bank.²

To assess consumer acceptance of the check truncation process resulting from Check 21, we conducted in-depth structured interviews with a total of 108 adult consumers in three locations (Atlanta, Boston, and Chicago) in May 2008. We contracted with NuStats, Inc., a private research and consulting firm, to recruit a sample of consumers who generally represented a range of demographics within the U.S. population in terms of age, education level, and income. However, the consumers recruited for the interviews did not form a random, statistically representative sample of the U.S. population; therefore, we could not generalize the results of the interviews to the relevant total population. Additionally, the self-reported data we obtained from consumers are based on their opinions and memories, which may be subject to error and may not predict their future behavior. Consumers had to speak English and meet certain other conditions: having primary responsibility in the household for balancing the financial account that allows paper check writing; having received canceled original checks in paper form with the checking account statement at some point since 2000; and not having participated in more than one focus group or similar in-person study in the 12 months before the interview. We achieved our sample recruitment goals for all demographics, with the exception of the age category "65 plus" and the education category "some high school or less." In addition, our sample comprised 64 women and 43 men. We considered that the impact of not achieving these goals on our work was minimal. See table 1 for further demographic information on the consumers we interviewed.

²Corporate credit unions are nonprofit financial cooperatives that are owned by natural person credit unions (that is, credit unions whose members are individuals), and provide lending, investment, and other financial services to these credit unions. Additionally, corporate credit unions offer automated settlement, securities safekeeping, data processing, accounting, and electronic payments services, which are similar to the correspondent services that large commercial banks have traditionally provided to smaller banks. Bankers' banks were created as unique entities to provide community banks a noncompeting institution to offer correspondent and other financial services.

Appendix I: Objectives, Scope, and Methodology

Table 1: Demographic Characteristics of Consumers Interviewed

Demographic	Atlanta		Chicago		Boston		Total	
	N	%	N	%	N	%	N	%
Income								
Less than \$25,000	9	23%	7	18%	5	17%	21	19%
\$25,000 to \$44,999	7	18%	10	26%	4	14%	21	19%
\$45,000 to \$64,999	10	25%	8	21%	7	24%	25	23%
\$65,000 to \$100,000	9	23%	10	26%	5	17%	24	22%
More than \$100,000	5	13%	4	10%	8	28%	17	16%
Total	40	100%	39	100%	29	100%	108	100%
Age								
25-34	7	18%	9	23%	7	24%	23	21%
35-44	10	25%	9	23%	6	21%	25	23%
45-54	9	23%	9	23%	6	21%	24	22%
55-64	8	20%	9	23%	6	21%	23	21%
65+	6	15%	3	8%	4	14%	13	12%
Total	40	100%	39	100%	29	100%	108	100%
Education								
Some high school or less	4	10%	4	10%	0	0	8	7%
Completed high school	10	25%	10	26%	8	28%	28	26%
Some college	10	25%	11	28%	9	31%	30	28%
Completed college	11	28%	7	18%	8	28%	26	24%
Graduate school	3	8%	4	10%	3	10%	10	9%
Other education	2	5%	3	8%	1	3%	6	6%
Total	40	100%	39	100%	29	100%	108	100%

Source: NuStats, Inc.

During these interviews, we obtained information about the experience of consumers with, and their opinions about, changes to their checking accounts resulting from the check truncation process. Our interviews included a number of standardized questions, and more tailored follow-up questions as necessary to more fully understand their answers. All consumers were asked about their current experience with their checking accounts and preferred method of making retail payments. The interview focused on consumer experience with canceled checks, substitute checks and check images, and the possible changes to their checking accounts since Check 21. More specifically, the structured interview of the 108 consumers included questions on the following issues: (1) bank fees charged to them to receive canceled checks, substitute checks or image statements; (2) instances and subsequent resolution of errors involving

their checking accounts; (3) their preferred method of receiving information from their bank about check payments activity (such as receiving their canceled checks, reviewing information online, or reviewing an image statement); (4) instances in which they had to demonstrate proof of payment using a canceled check or a check image and their resolutions; (5) their level of concern about using a check image as a proof of payment; and (6) whether their bank had extended its cut-off time for accepting deposits and the consumer's opinion about the merits of such an action. In addition, we asked nine questions about the consumers' experience submitting complaints to banks and federal banking regulators. This report does not contain all the results from the consumers' interviews. We reproduced the text from our structured interview instrument and tabulated the results from the questions in Questions for Consumers about Check 21 Act ([GAO-09-09SP](#)).

To evaluate the benefits and costs to consumers from check truncation, we interviewed staff from the federal banking regulators—the Board of Governors of the Federal Reserve, the Federal Deposit Insurance Corporation, the National Credit Union Administration, the Office of the Comptroller of the Currency, and the Office of Thrift Supervision—and collected consumer complaints about the implementation of Check 21 that were submitted to these agencies from October 28, 2004, through March 31, 2008. Our analysis of the consumer complaint data helped us identify the issues that we pursued in our structured interviews of 108 consumers. While the regulators' consumer complaint data may be indicative of the relative levels of different types of complaints, we did not rely solely on these data because these voluntary reporting systems rely on complainants to self-select themselves; therefore, the data may not be representative of the experiences of the general public. We also interviewed representatives from consumer advocacy groups, including Consumers Union, the Consumer Federation of America, and the U.S. Public Interest Research Group. Furthermore, we interviewed officials from the American Bankers Association and third-party processors.

The data collection instrument discussed above also included questions about the potential benefits and costs of Check 21 for consumers. For example, we asked the banks for information about (1) their policies on returning canceled checks before and after Check 21; (2) the fees they charged to consumers for the return of canceled checks and image statements; (3) their assistance to customers in showing proof of payment using a canceled check, a substitute check, or a check copy; (4) the instances of expedited claims they received on substitute checks and their resolution; and (5) the complaints they have received about matters

relating to Check 21 and whether they had changed their cut-off times for deposits at automated teller machines or branches in the last 2 years.

In addition, we analyzed the conclusions and the methodology applied in the Federal Reserve Board's Report to the Congress on the Check Clearing for the 21st Century Act of 2003, published in April 2007, to determine whether we could use the results in our report. The study constituted the Federal Reserve Board's assessment of the banking industry's implementation of Check 21 to date, as well as the continued appropriateness of the funds availability requirements of Regulation CC.³ We interviewed staff from the Federal Reserve Board about the methodology and conclusions in the report and we examined the design, implementation, and analysis of the survey instrument used for the study. We considered the overall strengths and weaknesses of the Federal Reserve's data collection program, as well as specific questionnaire items relating to Regulation CC. On the basis of our review, we concluded that we could use the results in this report.

To determine whether consumers may incur fees for receiving canceled checks and check images since the implementation of Check 21, we reviewed and analyzed data purchased from Informa Research Services (Informa) that included summary-level fee data from 2001 through 2006.⁴ The data included information on check enclosure and imaging fees. Informa collected its data by gathering the proprietary fee statements of banks, as well as making anonymous in-branch, telephone, and Web site inquiries for a variety of bank fees. It also received the information directly from its contacts at the banks. The data are not statistically representative of the entire population of depository institutions in the country because the company collects fee data for particular institutions in specific geographical markets so that these institutions can compare their fees

³Regulation CC implements both the Expedited Funds Availability Act of 1987 and the Check Clearing for the 21st Century Act of 2003. Among other things, Regulation CC sets forth requirements that banks make funds deposited in transaction accounts like checking accounts according to specified time schedules and banks disclose their funds availability policies to their customers. The regulation also establishes rules for the collection and the return of unpaid checks. Subpart D of the Regulation CC describes the requirements for substitute checks, the reconverting bank's duties, and expedited re-credit for consumers and banks, among other things.

⁴We originally purchased these data in connection with our analysis of bank fees. For more information, see GAO, *Bank Fees: Federal Banking Regulators Could Better Ensure That Consumers Have Required Disclosure Documents Prior to Opening Checking or Savings Accounts*, [GAO-08-281](#) (Washington, D.C.: Jan. 31, 2008).

against their competitors. That is, surveyed institutions are self-selected into the sample or are selected at the request of subscribers. To the extent that institutions selected in this manner differ from those which are not, results of the survey would not accurately reflect the industry as a whole. Informa collects data on more than 1,500 institutions, including a mix of banks, thrifts, credit unions, and Internet-only banks. The institutions from which it collects data tend to be large ones that have a large percentage of the deposits in a particular market. Additionally, the company has access to individuals and information from the 100 largest commercial banks.

The summary-level data Informa provided us for each data element included the average amount, the standard deviation, the minimum and maximum values, and the number of institutions for which data were available to calculate the averages. They also provided these summary-level data by institution type (banks and thrifts combined, and credit unions) and size (as shown in table 2). In addition, Informa provided us with data for nine specific geographic areas: California, Eastern United States, Florida, Michigan, Midwestern United States, New York, Southern United States, Texas, and Western United States.

Table 2: Definition of Institution Size Categories

Institution size	Asset size
Small institutions	Assets of less than \$100 million
Mid-size institutions	Assets from \$100 million to \$1 billion
Large institutions	Assets of more than \$1 billion

Source: GAO analysis of Informa Research Services data.

We interviewed representatives from Informa to gain an understanding of their methodology for collecting the data and the processes they had in place to ensure the integrity of the data. Reasonableness checks were conducted in 2007 on the data and identified any missing, erroneous, or outlying data and Informa Research Services representatives corrected any mistakes that were found. Also, in 2007, we compared the average fee amounts that Informa had calculated for selected fees for 2000, 2001, and 2002 with the Federal Reserve’s “Annual Report to the Congress on Retail Fees and Services of Depository Institutions.” The averages were found to be comparable to those derived by the Federal Reserve. While these tests did not specifically include check enclosure and check image fees, they did confirm our assessment of the Informa data system. Because the assessment conducted for our January 2008 report encompassed the

checking fee data we used, we determined that the Informa Research Services data were sufficiently reliable for our current report.

We conducted this performance audit from September 2007 to October 2008 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: Econometric Analysis of Check 21 for Economic Efficiency in the Federal Reserve's Check Services

The Check Clearing for the 21st Century Act of 2003 (Check 21) was intended to make the check payment system more efficient and less costly by facilitating wider use of electronic check processing without demanding that any bank change its current check collection practices.¹ Prior to Check 21, a bank was required to present an original paper check to the paying bank for payment unless the paying bank agreed to accept presentment in some other form. This required the collecting bank to enter into agreements with all or nearly all of the banks to which it presented checks. Because of these impediments, banks were deterred from making the necessary electronic check processing investments. Check 21 addressed these impediments by authorizing a new paper negotiable instrument (a substitute check), which is the legal equivalent of the original check. Other than accepting the substitute check, the act does not require banks to adopt electronic check processing, but it enables banks that want to truncate or remove the original paper checks from the check-collection system to do so more easily. Check 21 facilitates electronic check processing by allowing banks to use imaging technology for collection and create substitute checks from those images for delivery to banks that do not accept checks electronically.

To assess the implications for economic efficiency in the Federal Reserve System's (Federal Reserve) check processing since Check 21 took effect in October 2004, we conducted a standard econometric analysis of the Federal Reserve's quarterly accounting cost and volume data for the period from 1994 through 2007. This approach allowed us to model total check operating costs as a function of the total check presentment volume and the timing of Check 21, while separating cost effects from other relevant factors such as check return volume, number of check clearing offices, and labor wages.

Description of the Econometric Models

As suggested by microeconomic theory of the firm, we model the Federal Reserve's total cost for its check clearing operations as a function of outputs and input prices as shown in equation (1).²

$$(1) \ln C_t = \alpha_0 + \sum \beta_k \ln (P_k) + \alpha_1 \ln (N_t) + \alpha_2 \ln (R_t) + \alpha_3 \ln (O_t) + \alpha_4 D_{c21} + \varepsilon_t$$

¹For this report, we refer to banks, thrifts, and credit unions collectively as banks.

²Many microeconomic textbooks have detailed discussions on cost function. For example, see Hal R. Varian, *Microeconomic Analysis*, 3rd edition (New York, N.Y.: W.W. Norton & Company, 1993), chapter 5.

The total check operating cost at time t (C_t) depends on the number of checks (items) processed during that period (N_t) and the number of return items (R_t). Total operating cost is expected to have a positive relationship with both the total number of items processed and the number of return items; that is, positive α_1 and α_2 in equation (1).³

Concurrently with the growth in electronic processing, including check truncation, the Federal Reserve has been consolidating its check processing operations, reducing the number of check processing sites from 45 offices in 2000 to a planned 4 offices by early 2010. While a reduction in the number of check processing offices (O_t) is expected to result in savings, the Federal Reserve has reported that it incurred consolidation and reorganization charges. Thus, the expected sign for the coefficient of O_t [α_3 in equation (1)] is ambiguous; it may be positive in the case of a cost savings or negative in the case of an increase in total costs.

The coefficient of primary interest is that of D_{c21} , (α_4). The dummy variable D_{c21} is constructed to have a value of 1 for periods on and after October 2004 when Check 21 took effect and a value of zero otherwise. As Check 21 was intended to facilitate electronic clearing of checks, the hypothesis is that after the effective date of Check 21 the Federal Reserve's total operating costs would decrease; that is, a negative α_4 in the estimation. Consistent with microeconomic theory, we expect an increase in input prices (p_k) will lead to an increase in total cost. For example, higher labor wage rates are expected to lead to higher total cost, seen as positive coefficients for input prices in the estimation.

Based on econometric studies, including some that specifically considered economies of scale for check processing, we modified the basic approach of equation (1) to control for quarterly fluctuations and trends over time, and to consider the potential effects of Check 21 on the presence of scale economies in check clearing operations.⁴ That is, we modified our

³We do not account for float in the model. Float refers to the time between the payment transaction and the debiting of funds from an account.

⁴Some of these studies include Ernst R. Berndt, *The Practice of Econometrics: Classic and Contemporary* (Mass: Addison-Wesley Publishing, 1996), chapter 3; Robert M. Adams, Paul W. Bauer, and Robin C. Sickles, Federal Reserve Bank of Cleveland, "Scope and Scale Economies in Federal Reserve Payment Processing," *Working Paper 02-13* (November 2002); David B. Humphrey, "Scale Economies at Automated Clearing House," *Journal of Bank Research* (Summer 1981), 71-81; and Paul W. Bauer and Dianna Hancock, "Scale Economies and Technological Change in the Federal Reserve ACH Payment Processing," *Federal Reserve Bank of Cleveland Economic Review* (1995) vol. 31, no. 3, 14-29.

equation (1) to include a structural break associated with Check 21.⁵ This specification better reflects the cost effect of the technology shift from processing paper checks to processing checks electronically. A negative coefficient of the output variable multiplied by the dummy variable for Check 21 will imply a more cost-efficient cost structure for the period after Check 21; a positive coefficient will imply a higher cost structure. *QTR*, *time* and *time*₂ are dummy variables to control for quarterly fluctuation and trends over time.

$$(2) \ln C_t = \alpha_0 + \sum \beta_k \ln(P_k) + \alpha_1 \ln(N_t) + \alpha_2 \ln(R_t) + \alpha_3 \ln(O_t) + \alpha_4 D_{c21} \lambda_1 time + \lambda_2 time^2 + \sum_{j=1}^3 \alpha_j QTR_j + [\alpha_{p0} + \sum \beta_{pk} \ln(P_k) + \alpha_{p1} \ln(N_t) + \alpha_{p2} \ln(R_t) + \alpha_{p3} \ln(O_t) + \alpha_{p4} D_{c21}] \times D_{c21} + \varepsilon_t$$

Results

We estimated equation (2) with quarterly data from the Federal Reserve's Planning and Control System (PACS) for the period from 1994 through 2007. Table 3 shows the summary statistics for selected variables.

Table 3: Summary Statistics of Some Selected Variables

Variables	Mean	Maximum	Minimum	Standard deviation
Logarithm of total check operating cost	18.94	19.23	18.67	0.16
Logarithm of total presentment ^a	22.05	22.21	21.61	0.17
Logarithm of check clearing offices	3.66	3.85	2.94	0.28
Logarithm of returned checks	17.50	17.69	17.14	0.16
Logarithm of price deflator for equipment and software ^b	4.62	4.76	4.55	0.08
Logarithm of wage ^c	2.61	2.83	2.39	0.13
Logarithm of Gross Domestic Product ^d	4.63	4.79	4.50	0.09

Source: GAO analysis of PACS data.

^aTotal presentment includes presentment by traditional paper checks, legacy paper checks, check images, and substitute checks.

^bThe price deflator for equipment and software by nonresidential producers (2000=100).

⁵Because the focus of our analyses is to examine the relationship between Check 21 and total cost of check processing, we used a parsimonious specification of a simple log-linear cost function (equation 2) in our estimation instead of more sophisticated specifications in other studies.

^eAverage hourly earning for all the private sector in 2000 dollars.

^gGross Domestic Product deflator (2000=100).

Results Using Total Check Presentment

We estimated the logarithm of total check processing cost against the logarithms of total presentment items—image, paper, legacy, and substitute—and other related variables.⁶ Table 4 presents the results. The basic specification in table 4, which does not account for a possible different cost structure in check processing, yields mostly statistically insignificant coefficients. However, the coefficient for the total number of items presented is significant and positive, implying that a 1 percent increase in total presentment will result in a 1.34 percent increase in total cost.

However, the coefficient for the Check 21 dummy variable (Check21), while negative, is not statistically significant. This result does not provide any support for the hypothesis that the introduction of Check 21 led to a decrease in Federal Reserve costs, although it is not possible to determine the extent to which this may be driven by the concurrent consolidation of Federal Reserve check services sites.

⁶Because deposit and presentment are almost mirror images of each other, we opt to use presentment as the independent variables in our estimations.

**Appendix II: Econometric Analysis of Check
21 for Economic Efficiency in the Federal
Reserve's Check Services**

Table 4: Estimation of Logarithm of Total Check Operating Cost, 1994–2007

Description	Basic		With structural break	
	Coefficient	Std. error	Coefficient	Std. error
Constant	-23.41	21.16	-17.73	23.39
Logarithm of total presentment	1.34	0.43	0.84	0.58
Logarithm of total presentment*Check21	—	—	-0.25	1.21
Logarithm of returned checks	0.35	0.19	0.49	0.28
Logarithm of returned checks*Check 21	—	—	-0.95	0.90
Logarithm of number of offices	-0.098	0.17	-0.041	0.32
Logarithm of number of offices*Check 21	—	—	-0.13	0.48
Logarithm of wage	1.01	1.14	3.77	1.96
Logarithm of wage*Check 21	—	—	-5.42	4.37
Logarithm of price deflator for equipment and software	0.025	1.70	0.63	2.16
Logarithm of price deflator for equipment and software*Check 21	—	—	-3.65	9.14
Logarithm of Gross Domestic Product	0.99	3.99	0.55	4.48
Logarithm of Gross Domestic Product *Check21	—	—	2.27	4.25
Check 21 ^a	-0.023	0.048	43.17	46.36
Quarter 1 dummy	-0.008	0.036	-0.052	0.043
Quarter 2 dummy	-0.036	0.019	-0.039	0.022
Quarter 3 dummy	-0.0023	0.016	-0.006	0.018
Trend	-0.017	0.028	-0.031	0.030
Trend squared	0.00039	0.00016	0.0004	0.00017
AR(1) ^b	0.41	0.16	0.36	0.20
Number of observations	55		55	
R-squared	0.95		0.96	
Adj R-squared	0.94		0.94	
Log likelihood	107.43		111.75	
F-statistic	61.83		42.57	
D-W stat	1.68		1.71	

Source: GAO analysis of PACS data.

^aOne on and after October 2004; zero otherwise.

^bAR (1) is the coefficient of the first order of autocorrelation, which is to control of the correlation between the current and the previous periods.

Table 4 also shows the results of the estimation incorporating a structural break in the cost function for periods before and after the act as described in equation (2). Though insignificant, the coefficient of total presentment is positive and less than 1, and the coefficient of the interacted variable of

total presentment and Check 21 dummy is negative (-0.25). If significant, the sum of two coefficients would imply that the cost structure for the check operation in the post-Check 21 period would be different from the pre-Check 21 period. However, the relatively short time series data for the post-Check 21 period increase the standard errors for all the coefficients of the interacted variables. Also, although insignificant, the coefficient of the Check 21 dummy is positive, implying that the total cost, on average, is lower in periods before Check 21 than after.

In addition to the estimation results shown in table 4, we estimated alternative functional forms used in other similar studies for the relationships in equation (2).⁷ Because these functional forms generally require constructing a substantial number of interacted variables, the subsequent multicollinearity and the limited data available make the results subject to high estimation errors and thus difficult from which to draw clear inferences. We also tested the effects on the estimates of imposing a constraint suggested by economic theory.⁸ The standard errors for most of the coefficient estimates decrease, suggesting a decrease in multicollinearity, but the results are otherwise similar to the results without the constraint in table 4.

Potential Limitations of the Analysis

While we believe that this analysis provides a reasonable basis for our findings and conclusions regarding the effects of Check 21 on Federal Reserve costs, we recognize the limitations inherent in the analysis. First, our econometric analysis only uses Federal Reserve data on check operations, which may not be representative of the operations of private financial institutions. Second, the time series data on post-Check 21 cost and volume may not be long enough to reliably estimate the effect on cost of the accelerating use of electronic presentment and clearing, particularly

⁷For example, we estimated some parsimonious versions of the separable quadratic cost function as used in the study by Robert M. Adams, Paul W. Bauer, and Robin C. Sickles, Federal Reserve Bank of Cleveland, "Scope and Scale Economies in Federal Reserve Payment Processing," *Working Paper 02-13* (November 2002).

⁸This constraint of linear homogeneity is to ensure that the cost function is consistent with microeconomic theory—if one doubles the price of the input factors, one would expect to double total costs. Mathematically, it means that the sum of β_k should add up to 1,

$$\sum_{k=1}^{k=N} \beta_k = 1$$

To impose this constraint, we made some adjustments to the total costs and input price. See William H. Green, *Econometric Analysis* (Prentice Hall, N.J.: 1993), 503-507.

given the changes in technology embodied in electronic presentment and check truncation. These results are likely to change with additional quarters of data and the expected continuing increase in the electronic presentment as a share of the Federal Reserve's check processing.

Also, as previously mentioned, the Federal Reserve's ongoing effort to close check clearing office facilities has resulted in one-time consolidation and reorganization charges. These charges are included in the total cost operating costs, and although we try to control for their effect by including the number of offices variable, it is plausible that the positive sign of the Check 21 dummy in our estimations may be a result of these charges included in the total costs. Similarly, our analysis implicitly assumes that the Federal Reserve's consolidation decisions are independent of the volume of checks that it processes. However, the data are not sufficient to explicitly model a relationship between the volume of checks and expectations about future volumes.

Appendix III: Comments from the Board of Governors of the Federal Reserve System



BOARD OF GOVERNORS
OF THE
FEDERAL RESERVE SYSTEM
WASHINGTON, D. C. 20551

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

October 16, 2008

Ms. Yvonne D. Jones
Director
Financial Markets and Community Investment
United States Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Ms. Jones:

We appreciate the opportunity to comment on the GAO's report titled *Check 21 Act: Most Consumers Have Accepted and Banks Are Progressing Towards Full Adoption of Check Truncation*. We agree with the GAO's overall conclusion that, over the past four years, the banking industry has made substantial progress towards establishing an end-to-end electronic check-processing environment. Today, more than three-quarters of checks deposited with the Federal Reserve Banks for collection are deposited electronically, and more than half are presented electronically. The Federal Reserve Banks expect that by year-end 2009, more than 90 percent of their check deposits and presentments will be electronic.

This ongoing transformation to an end-to-end electronic check-processing environment has not been without cost. The banking industry and the Federal Reserve Banks have made significant technological investments to facilitate an electronic check-clearing system and have incurred incremental transition costs associated with processing both paper and electronic checks. The Federal Reserve Banks' investments, however, have enabled them to significantly reduce their transportation costs and paper check-processing infrastructure. These cost reductions have been critical to the Reserve Banks' ability to recover all of their actual and imputed costs of providing check services from 2005 through 2007 and earn a net income of \$326 million.

We are pleased that consumers are beginning to obtain the benefits associated with Check 21 and that this major transformation from paper to electronic check clearing is being accomplished with few consumer complaints. The report reviews a number of these consumer benefits: faster funds availability on check deposits due to later deposit deadlines, quicker access to account information, and improved customer service. In addition, as the report notes, another important consumer benefit that has flowed from Check 21 has been a shorter maximum permissible hold period on an increasing number of check deposits. By facilitating the electronic collection of checks, Check 21 has enabled the Reserve Banks to close most of their check-processing offices, resulting in the consolidation of many Federal Reserve check-processing regions. Because Congress tied the determination of whether a check is local or nonlocal to whether the depository bank and the paying bank are located in the same check-

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processing region, many checks that were previously classified as nonlocal checks subject to a five-day maximum permissible hold are now classified as local checks subject to a maximum two-day hold period. It is likely that within the next several years, all checks will be classified as local, subject to the shorter permissible hold period.

Again, we appreciate the opportunity to review and comment on the GAO's report and the efforts and professionalism of the GAO's team in conducting this study.

Sincerely,

A handwritten signature in black ink, appearing to read "Louis L. Rose". The signature is fluid and cursive, with a long horizontal flourish extending to the right.

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Yvonne D. Jones (202) 512-8678 or jonesy@gao.gov

Staff Acknowledgments

The following individuals made key contribution to this report: Debra R. Johnson, Assistant Director; Joanna Chan; Philip Curtin; Nancy Eibeck; Terence Lam; James McDermott; Carl Ramirez; Barbara Roesmann; and Paul Thompson.

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