

*By Cathy E. Minehan, Paul M. Connolly, Sally G. Green, Krista M. Shields, and Chandler Perine.\**

Many people are unaware that there is something called a “payments system”. They only know that they can go anywhere in the United States or the world, pay for an item with something other than cash, have that payment accepted, and have the amount deducted from their account or added to their credit balance with ease. The payments system that makes this complicated process seem easy is a network of institutions, law, and technology that combine to enable consumers and businesses to exchange monetary value. Payments range from the small and simple — fifty cents at a newsstand for the morning paper — to the large and complex — a bank transfers \$500 million electronically to multiple banks in the U.S. and overseas.

In many respects the U.S. payments system is the envy of the world. It is reliable; it is safe; it works so well that it is almost invisible to its users. However, some aspects of the system leave room for substantial improvement, particularly with respect to smaller-value, or “retail,” payments. This essay describes the status of the retail payments system in the United States, and initiatives in the public and private sectors to improve that system.

Most of the dollars transferred through the U.S. payments system move through electronic networks. The Federal Reserve Banks operate funds and securities transfer systems which move large-value, or “wholesale,” payments between banks, primarily to meet the domestic needs of corporations, mutual funds, and other financial and non-financial institutions. Similarly, the New York Clearing House operates the Clearing House Interbank Payments System, or CHIPS, which moves large wholesale payments among banks, largely related to foreign exchange transactions. Reserve Banks either transfer directly or settle (in the case of CHIPS and other

smaller payment transfer systems) payments in excess of \$2 trillion each day.

While electronic wholesale payments comprise most of the dollars moving through the payments system, smaller-value retail payments account for most of the transactions. Checks, credit cards, debit cards, and direct deposits and payments through the Automated Clearing House, or ACH, account for more than 95 percent of the non-cash transactions on an average day.

U.S. consumers and those of most other nations use cash extensively. When cash is excluded, though, the U.S. has a more paper-based retail payments system than any other major country. In fact, the majority of all the paper checks written in the world are written in the U.S.

Most U.S. consumers and businesses are comfortable using checks. They are convenient; the check collection system operates within a well-developed context of laws and regulations; and checks are supported by a large, complex operational infrastructure. Check users may never think about how a check makes the round trip from the check-writer, to the person or organization being paid, back to the check-writer’s bank, and then to the check-writer in a monthly account statement. The Reserve Banks, private correspondent banks, and “clearinghouses,” or associations of banks, have developed large-scale operations and networks to support this complex process.

About 30 percent of the checks written in the U.S. are collected through the Reserve Banks. Every night institutions deposit 75 million checks at 45 Federal Reserve Banks, branches and regional processing centers where 5,000 employees process the checks, using high speed sorters, but doing a lot of required manual handling as well. Fleets of private air and ground couriers then transport the checks among the

Reserve Offices and on to nearly 20,000 commercial banks, thrift institutions, and credit unions. By the time a check has been returned to its issuer, it has been handled on average 12 times.

While the check collection system works remarkably well, it is labor-intensive, error-prone, and fraught with potential problems. Snowstorms and other “acts of God,” equipment and power failures, illegible information handwritten on the checks, and numerous other mishaps can combine to delay collection. Also, check fraud has become an increasing concern, with the retail industry estimating check fraud losses at \$10 to \$15 billion annually.

For many years pundits have been predicting the “checkless society.” One forecast from the 1960’s said that before the end of the 1980’s the check would be as obsolete as the barter system. Now, few dare to make such predictions. By recent estimates, annual volume has grown to about 68 billion checks, though the rate of growth in check issuance may have slowed considerably.

Efforts to encourage businesses and consumers to reduce their reliance on paper checks have been hampered by a number of factors. The users of checks often do not bear the full costs of the check system, at least not explicitly. Even today, banks sometimes compete for new customers by advertising “free checking”. In addition, some businesses and consumers attach value to “float,” or the time between the issuance of a check and the actual deduction of value from the check-writer’s account. Moreover, until recently check users have not had an adequate array of attractive electronic alternatives for making their payments.

Is the environment finally conducive to making fundamental changes to improve the retail payments system in the United States, particularly with electronics?

*continued on page 11*

Ever wonder about those funny-looking black numbers along the bottom of your checks? They are printed in magnetic ink, and follow the format of the Magnetic Ink Character Recognition (MICR) standard developed by the banking industry during the 1950's. This standard, and the collaborative efforts of the industry and the Federal Reserve, brought automation to the U.S. check collection process.

Until the middle of the twentieth century, check-writing was the prerogative of high-income people. After World War II, however, the steady rise in per capita income enabled an increasing number of people to afford the convenience of paying bills with checks. The result was a steady and rapid growth in the numbers of checks being processed. Nevertheless, checks continued to be sorted by hand, even when supported by mechanical equipment. As a result, the Federal Reserve and various banking organizations joined together to work to standardize and automate the check collection process.

In 1954, the American Bankers Association established a subcommittee to work with all parties, including the Federal Reserve, large and small banks, check printers, and business and consumer interests, to find a way to make checks machine-readable. After studying all the available technologies, with the assistance of the Stanford Research Institute, in 1956 the subcommittee chose MICR for preprinting routing numbers and account numbers on all checks and for subsequently encoding the dollar amount on checks sent for collection. This was the preferred technology, based on such criteria as consumer acceptance, the ability of clerks to verify information, and the cost to printers and the banking industry. The next task was to develop equipment that could automate check sorting and processing of checks with this type of imprinting.

When the ABA Technical Subcommittee talked to possible manufacturers of check automation equipment, it determined that 13 firms might have the potential for building and servicing this specialized type of equipment. To provide operational and financial support for this key initiative, the Federal Reserve worked with and partially subsidized five firms that submitted acceptable proposals: the Burroughs Corporation, IBM, National Data Processing Corporation, the National Cash Register Company, and Ferranti-Packard. The latter two firms assembled systems using their own computers and check sorters made by Pitney Bowes. Five Reserve Banks — Boston, New York, Philadelphia, Chicago, and San Francisco — participated.

Each experimented with the equipment from one of these companies, and each worked with its local banks to encourage their use of the new MICR standard on the new checks they issued to their customers, so that the equipment could be tested with actual checks.

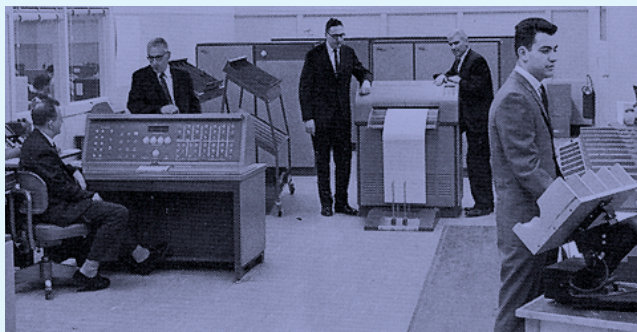
The Reserve Banks paid the full lease cost for the equipment they tested, even though the equipment was constantly being adjusted and modified. Thus, the Federal Reserve provided a financial incentive for the five manufacturers to participate. In addition, the Reserve Banks devoted staff time and used portions of their daily incoming check volumes to help the manufacturers to test their new equipment. The Banks hoped that, in the long run,

multiple firms would succeed. This would encourage competition among manufacturers and help create a network with common standards, benefiting all banks.

The Reserve Banks started this testing in 1960, and experienced the sorts of growing pains that often accompany the introduction of new technology. The Federal Reserve Bank of Boston's original building, opened in 1922, did not have elevators or stairways wide enough to accommodate a computer or a check-sorter, so the Bank took out windows on the third floor and lifted them in with a crane. Sometimes the checks passed through the sorter faster than the sorter could catch them, and flew around the room. Bank and vendor staff alike spent more than a few unplanned nights in the Bank nursing the computer-age technology along.

From these struggles came success. By 1965, most Reserve Banks and branches were running high-speed check sorting equipment supplied by Burroughs and IBM. Other manufacturers that participated in the Reserve Bank tests developed lower-speed equipment that many smaller commercial banks adopted. And as the technology progressed, most banks adopted the MICR standard and used it on their checks. In 1967, the Reserve Banks supported the banking industry further by announcing that checks without MICR would not be accepted for normal collection. This measure helped to put the critical standard "over the top".

*One of the first automated check processing systems installed by the Federal Reserve Bank of Boston in the early 1960's.*



Today U.S. consumers and businesses have several electronic payment choices available, with more on the horizon. Nevertheless, the paper check still dominates retail payments. As we try to accelerate the growth of electronics, it is useful to look back at the development of America's first electronic retail payment mechanism: the Automated Clearing House, or ACH. The banking industry and the Federal Reserve collaborated over a lengthy period to establish and expand the ACH.

In response to rapidly growing check volumes during the 1960's, and emerging computer technology, banking industry leaders sought to develop an electronic system to displace some of these paper checks. The ACH was conceived of as "the electronic check." Essentially, an electronic ACH record would carry the same payment information carried by the paper check document, and banks would send and receive these electronic records in much the same way as they exchanged checks among themselves.

As bankers developed the concept in more detail, they identified the need for regional entities to serve as clearing houses, or "switches," to enable the efficient interchange of electronic ACH records among large numbers of banking entities. Another need was a means to deliver these payments, mostly on magnetic tapes, since banks did not have systems to originate or receive these transactions electronically.

In this era U.S. businesses and consumers had little experience with electronic payments and little

incentive to change their ways of originating payments. Commercial ACH volumes during the 1970's were very low and did not justify significant investments.

The New York Clearing House provided ACH services in its region, and continues to do so today. The Chicago Clearing House provided these services for a time. In many areas of the country, the bankers who had organized regional ACH associations began to ask their local Reserve Banks for support. At the national level, the Federal Reserve Board, and Governor George Mitchell in particular, saw that the Reserve Banks, with their network for presenting checks to all U.S. banks, might be particularly well positioned to help this nascent electronic payments mechanism to develop. Federal Reserve support for the ACH also was fostered by the United States Treasury, which, earlier than most businesses, embraced the electronic ACH as a potentially more efficient mechanism for many of the government's payments.

The Reserve Banks helped the banking industry to implement its idea for an electronic retail payment system. This support included computer processing and delivery of these "electronic" payments on tapes over the road, often on the same trucks used to deliver paper checks. Some of the payments destined for smaller banks actually had to be printed onto paper by Federal Reserve offices and delivered in paper form! During the first decade or more of life for the ACH, it might not have survived without the support of the Federal Reserve,

which had a mission to act in the public interest and support an innovation such as the ACH, with a poor short-term business case but the potential to improve the overall payments system in the longer run.

When the Monetary Control Act of 1980 (MCA) required that the Federal Reserve price its payments services, volumes still had not grown to a level at which full-cost pricing might not stunt the growth of the ACH. Accordingly, the Board of Governors determined, as allowed by the MCA, that it would serve the public interest for the Federal Reserve to subsidize its ACH services and phase in pricing over a multiyear period, which ended in 1985.

During the late 1980's and the 1990's, ACH volumes grew at impressive rates, frequently 20 percent or more annually, and they have continued to increase at double-digit rates. Banks now send and receive ACH payments via electronic transmission, with even the smallest institutions participating electronically, either directly or through correspondent banks or service bureaus.

Additional private-sector service providers have entered the ACH processing business and compete with the Reserve Banks. About one-half of U.S. workers now receive their wages and salaries through ACH "direct deposit." Only a small percentage of consumer and business bill payments are made via ACH, but many businesses and utilities just began to offer this service during the past five years or so. And the ACH may provide the "infrastructure" to support emerging Internet payment services.



*The New England Automated Clearing House Association (NEACH) and the Federal Reserve Bank of Boston work together to promote greater use of electronic payments. Shown here are, left to right, Steve Whitney, Senior Vice President, Paul Connolly, First Vice President, Michael Lenihan, Senior Vice President of State Street Bank, Harry Carlsson, President and CEO of NEACH, and Sally Green, Executive Vice President.*

# 1913



- collaboration
- efficiency
- innovation
- development



*funds  
availability  
act of 1987*

**From its earliest days, the Federal Reserve System has had improvement of the payments system as part of its mission.**

# FRB



The Reserve Banks believe so and are undertaking aggressive initiatives consistent with their mission in the payments system. **To foster the integrity, efficiency, and accessibility of the U.S. dollar payments and settlement systems in support of U.S. financial stability and economic growth in a global context.** The Reserve Banks' plans focus on four areas:

- extensive collaboration with the various stakeholders in the payments system to move towards a more electronic system;
- aggressive pursuit of efficiency improvements;
- innovative application of new technologies to provide easy, secure access to new payments products and services; and
- development of plans for the next generation of payments services.

The initiatives underway and planned by Reserve Banks over the next several years are described below in each of these four areas. First, it is useful to look briefly at why and how the Federal Reserve is involved in the retail payments system.

**RESERVE BANKS AND PAYMENTS SYSTEM CHANGE**

Why should the Federal Reserve System, the nation's central bank, play a role in the collection of small-value payments? Clearly it has a role, as do most other central banks, in regulating the payments system and in facilitating in one way or another the large-value payments through which the vast majority of the nation's daily financial values are transferred. However, few other central banks in developed countries play any "hands-on" role in retail payments — and certainly none is as centrally involved as the Federal Reserve. Part of the answer lies in the background to the formation of the Federal Reserve System.

When the Congress created the System in 1913, more than 25,000 independently chartered banks were operating in the United States, with each bank's operations essentially confined to a single state. About 40 percent of these banks were "non-par" institutions, which meant that they imposed an "exchange charge" on the payment for each check submitted to them for collection by banks outside their local trading area, effectively making the check worth less than its face value.

To avoid these charges, collecting banks generally tried to send each non-par check to a correspondent bank that had a reciprocal check-clearing arrangement with the institution on which the check was drawn. The practical result, unfortunately, was substantial circuitous routing of checks, which added time and confusion to the check collection process.

Congress was aware of the banking industry's failed check collection system and this was one of the reasons for the Federal Reserve Act. The Act, among other things, authorized the Reserve Banks to establish a national check collection operation, in effect making the Federal Reserve System — the nation's central bank — its first interstate banking network. From its earliest days, therefore, the Federal Reserve has had improvement of the payments system as part of its mission.

The Board of Governors of the Federal Reserve System has regulatory authority, delegated by Congress, to protect and enhance the payments system through regulations which have the effect of law. The Board also oversees the activities of the 12 Federal Reserve Banks which provide payment services to depository institutions.

In the 88 years since the Federal Reserve System was formed, commercial banks and other depository institutions developed their own networks to

collect checks. Still, the Reserve Banks collectively remain the largest processor of checks and retail electronic ACH transfers. It can be argued that this involvement ought to be transferred to the private sector; that it is not inherently a central bank role, nor should it be. Despite the logic of such an argument, private sector payments system participants, and Congress, have several times demonstrated their desire to have Reserve Banks retain their key role. The reasons for this are several.

- The U.S. banking system is far more fragmented than that of other developed countries. Thousands of small and medium-sized local and regional banks and depository institutions compete with each other, and with very large interstate banks. Both big and small banks choose to use Reserve Bank services; Reserve Banks are seen as "trusted intermediaries" for such purposes. Indeed, when asked by a Committee formed in the 1990's to look at Reserve Bank involvement in the retail payments system (The "Rivlin Committee"), even the Reserve Banks' biggest competitors in the check business did not want to see the Banks exit that business.
- Under the terms of the Monetary Control Act of 1980, Reserve Banks must price their payment services to cover the cost of those services, including mark-ups to recover imputed private sector costs and profits. This requirement assures other payment service providers and Congress that Reserve Banks are not using their central bank powers for competitive advantage. Fair competition drives efficiency, and the Reserve Banks have sought continued improvements in efficiency, both in a processing sense, and in the sense of improving the public's quick access to final funds. Congress made quick

*continued on page 15*

It may seem unusual for the nation's central bank to have a major role in the operation of the national check collection system, but this has been a Reserve Bank function since Congress created the Federal Reserve System in 1913. It is even more unusual for the central bank to compete with commercial banks in the provision of payment services. Here again, Congress enacted the Monetary Control Act of 1980 (MCA) with the intention of stimulating this competition and fostering efficiencies and innovations engendered by competition.

The MCA required the Reserve Banks to charge fees for the payment services it had been providing at no charge to banks that were members of the Reserve System. The Act also required that these services be offered to all banks, thrift institutions, and credit unions, most of which had been the customers of the large correspondent banks that were Reserve System members. Suddenly the Federal Reserve was sending bills to its members and competing with its own largest customers.

The MCA required the Reserve Banks to learn how to be effective service providers in a competitive marketplace. They had much to

learn about how to price payment services. In addition, they had to broaden their focus from a purely operational one to that of a market player needing to attract and retain customers.

Despite almost 70 years of experience in collecting checks nationwide, the Federal Reserve knew relatively little about the nuances of the check business. When pricing of check collection services began in the fall of 1981, the Reserve Banks adopted a relatively simple approach, with per-item, average-cost pricing. This approach lent itself to "skimming," whereby banks deposited with the Reserve Banks only checks that were costly to collect, using newly emerged, private clearing alternatives for the rest. The Reserve Banks' check volumes declined, and with the considerable fixed costs the Reserve Banks incurred handling checks, revenues proved inadequate to recover all costs.

Within their first year of experience with check pricing, the Reserve Banks moved to a more flexible pricing system. They introduced a more complex array of fixed and variable fees that reflected not just the overall costs of check collection but also the relative demand for particular check services. The Reserve Banks have tried to strike a balance

between precision and simplicity in their prices but over time they have brought more complexity, as well as more choices for their customers, into their pricing approaches, to reflect real economic differences and to maintain competitiveness.

Regarding depository institutions as "customers" was new for the Federal Reserve in the early 1980s. Prior to the MCA, the Reserve Banks felt little pressure to respond to market preferences. Internal efficiency and cost control generally were higher priorities than product innovation and responsiveness to market demand. However, the need to compete fostered a new culture of "customer focus" and a greater service orientation.

The Federal Reserve not only survived as a provider but exceeded the full-cost-recovery requirement in 1984, the first full year in which it sought to recover all costs related to its check service. Since then, the Federal Reserve has recovered its costs with revenues, developed many new check products, implemented more efficient operations, and used its role in check collection to promote a more electronic system.

*In the years since the enactment of the MCA, the Federal Reserve Banks have learned how to focus on the marketplace and become responsive service providers, using the internet and other innovations to do so.*



Maybe you have noticed on the reverse side of each check that you write some lines that divide the space into sections; or some instructions to the recipient to endorse the check in a particular area; or even a reference to “Federal Reserve Regulation CC.” These features of your checks support the “endorsement standard” that helps to return “bounced” checks as quickly as possible to those who need to know that checks they accepted have bounced.

In 1987, Congress responded to years of complaints from consumers about the “hold times” applied to the checks they deposited by passing the Expedited Funds Availability Act, or EFA. This Act had three major provisions. First, it specified the maximum hold periods that depository institutions could impose on most checks deposited by consumers. Second, it prescribed specific requirements for disclosure of check hold policies and notice to customers about hold periods under a variety of circumstances. Third, the Act granted new regulatory authority to the Federal Reserve, extending that authority to the collection process for all checks, not just those collected through the Reserve Banks, as had been the case prior to the EFA. Now the Board of Governors had authority, for instance, to require a bank to return a dishonored check to the depositor’s institution, known as the “bank of first deposit,” within specified times, to accelerate the return process; this requirement

reduced the exposure of the bank of first deposit to loss when that bank made funds available as required by the EFA without knowing whether or when the check might be returned.

The Board also used its new regulatory authority to propose and adopt an essential new standard that had proven difficult for the banking industry to achieve through other means. To accelerate the check return process, all participants in the check system needed a ready means to identify the bank of first deposit. To support this requirement, all depository institutions needed to follow standard practices in applying their endorsements on the reverse side of checks. As a bank of first deposit, each institution needed to identify itself clearly and conspicuously. A bank handling a check received from a bank of first deposit — for instance, a correspondent bank collecting the check on behalf of the bank of first deposit — would have to apply its endorsement in a different format and in a different area of the check, so as not to obscure the endorsement of any other bank. Even the consumer depositing the check for collection would have to endorse the check within a specified space.

The endorsement standard in place prior to the enactment of the EFA had proved inadequate to support the clear identification of each bank involved in the collection of a check. The banking industry, through the American National Standards Institute, or ANSI, had been at work during

the 1980’s on a more comprehensive standard. While the banks, equipment manufacturers, and check printers had made progress, they had not been able to agree on an adequate new standard, in part because of the competitive concerns of particular firms. To support the EFA, the Federal Reserve took all that had been accomplished with ANSI and added the features needed for an effective standard. After public comment, the new endorsement standard, promulgated by the Board, was widely adopted and has contributed significantly to the acceleration of the check return process.

Another very important Federal Reserve response to the EFA was the introduction of new Reserve Bank services to accelerate the return of checks. In effect, the Reserve Banks offered a “safe harbor” for institutions seeking a means to comply with the new requirements. As with the collection of checks, no U.S. depository institution was required to use Reserve Bank services. They could choose to do so, or to use other means. Since the implementation of the EFA, new private check return services and clearing arrangements have evolved. During the first few years after EFA, however, and to an appreciable extent even today, the readiness of the Federal Reserve to complement its regulatory requirements with enabling services has been essential to the successful implementation of the intentions of the Congress.



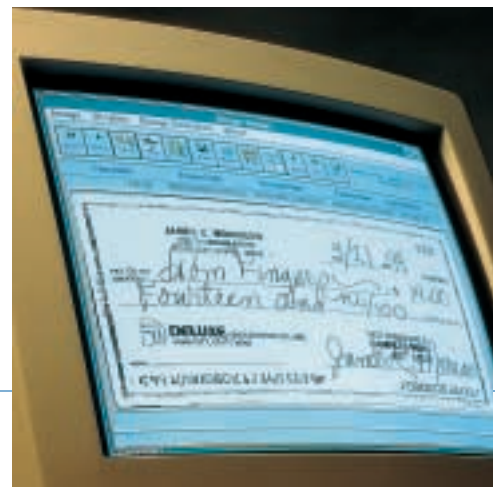
*While only about 1 out of every 100 checks bounces, the check return process is slow and costly.*

# point of sale



**Important innovations  
in retail payments  
have been brought  
about with Reserve  
Bank and private  
sector collaboration.**

## *ATM Networks*





access a role of the Federal Reserve under the Expedited Funds Availability Act of 1987.

- Finally, because they play such a large role in the retail payments system, Reserve Banks have often been involved in improving that system in collaboration with other key stakeholders. Automated check clearing, the development of the ACH, digitized check image processing, just to name a few important innovations, all were brought about with Reserve Bank and private sector collaboration. The “sidebar stories” accompanying this essay describe some of these important past payments system improvements, and illustrate that the Federal Reserve has played a variety of leadership roles.

Thus, the Federal Reserve through the Reserve Banks provides the benefits of trusted intermediation, competitive focus, and collaborative enhancement to a large and fragmented U.S. retail payment process. Arguably, this is a “public good” and appropriate as a central bank function. Certainly, Reserve Banks play an accepted and valued role in the retail payments system — a role that now must be focused on the changes needed in the future.

**COLLABORATION TO MOVE TO A MORE ELECTRONIC PAYMENTS SYSTEM**

For what variety of purposes do consumers and corporations use checks, and what electronic substitutes might serve those purposes as effectively or more effectively?

The Federal Reserve is undertaking a research effort to develop more information to help the banking industry and others to address these questions. Research that the Reserve Banks completed in 1998, focused more specifically on consumer, corporate, and financial institution perceptions about electronic ACH direct deposit and direct payment alternatives, clearly indicates that broad-based education about electronic payments is needed.

The ACH has grown, with essential Federal Reserve support, into an important electronic alternative to the check (see “America’s First Electronic Retail Payment Choice”). About 50 percent of U.S. workers are paid through electronic deposit into their bank accounts. However, some employers still do not even offer direct deposit as an option. Also, many consumers perceive electronic payments to be less convenient and more risky than check payments, whereas often the opposite is true. To address these issues, the Reserve Banks, working with the National Automated Clearinghouse Association (NACHA), are pursuing education and marketing campaigns to engage corporations and financial institutions in the promotion of electronic payments, particularly for payroll deposit and for recurring household payments such as utility bills. Consumers can gain the convenience of automatic receipt of their pay and automatic bill payments, and the utilities and other corporations can save the costs associated with handling the paper checks.

While paper checks dominate U.S. retail payments, the U.S. Treasury has led a highly successful program to use electronics for the government’s payments. The Treasury has succeeded in converting more than 97 percent of government salary and allotment payments to direct deposit, while approximately 73 percent of all disbursements are made by electronic means. Furthermore, the Social Security Administration, working with the U.S. Treasury and the Reserve Banks, has advocated the use of ACH direct deposit for social security payments, and about three quarters of recipients now are paid that way. This success belies arguments that only the younger generations will accept electronic payments as substitutes for checks.

At the Federal Reserve Bank of Boston, 92 percent of employees receive their pay through direct

deposit. Over 95 percent of the Bank’s bills are paid electronically through the ACH. These experiences demonstrate that with education and focused campaigns, payroll checks and vendor payments can be replaced with electronic payments.

Substitutes also are beginning to appear for checks written for purchases at retail stores. A number of pilot programs allow a consumer’s check to be “swiped” through a device at the point of sale which reads the information on the check and then initiates an electronic payment, through the ACH or ATM networks, with authorization by the consumer. In collaboration with the U.S. Treasury, the Reserve Banks are providing for a similar type of conversion of paper to electronics for payments made to certain government agencies.

This concept of stopping the flow of paper at some point in the collection process and forwarding the information from the check electronically to complete the payment also can be applied to checks that have entered the bank collection stream. This is called “electronic check presentment,” or ECP. In June, 2000, the Federal Reserve Bank of Boston hosted a symposium with banking industry and Federal Reserve participants to identify collaborative actions they could take to move ECP forward. The participants agreed to work together on potential legal changes to reduce barriers to ECP; develop needed technical standards; explore opportunities to test ECP concepts, costs, and benefits; and prepare educational materials to provide more information about ECP to depository institutions and the public.

**AGGRESSIVE PURSUIT OF EFFICIENCY IMPROVEMENTS**

In their operations to support electronic and check payment processing, the Reserve Banks have launched major initiatives to increase efficiency. The Banks will

ECP



Technological changes will affect consumer, business, and bank expectations about payment product and service delivery.

smart card

*eft*



reduce internal costs and contribute to greater efficiencies in the overall payments system. It may seem contradictory to be advocating a more electronic retail payments system and at the same time be making check collection more efficient. However, by any reasonable expectation the U.S. will have tens of billions of checks to collect for years to come, and reducing the resources needed to collect them will save money for consumers and businesses. By contrast, a less efficient check system, with slower collection and return times and higher levels of float, could provide more incentive for some users of checks to resist more efficient electronic alternatives, and even increase opportunities for check fraud.

The Reserve Banks have achieved significant scale economies through consolidation of processing of electronic payments. Over the past five years, centralized software and consolidated processing have resulted in reductions in the price of ACH transactions from 1.6¢ to as low as 0.045¢.

The Reserve Banks now are undertaking one of the most ambitious ventures in their history, the standardization of check processing platforms across 45 offices nationwide. This program will require significant capital investment and retraining of 5,000 check staff. However, this important effort will improve operational efficiency and bring new efficiencies to the payments system by enabling Reserve Banks to bring innovations to market more quickly and reduce the costs of delivering check services nationwide.

In another major check processing improvement, the Reserve Banks will leverage the knowledge acquired from lengthy research and testing of the application of digitized image capture technology to check processing (see "Development of Check Image Technology"). Today,

images, or "electronic pictures" of all government checks are captured at Reserve Banks, and the U.S. Treasury handles the accounting and research related to these checks electronically. Building on this experience, the Reserve Banks will implement a national check image archive during the next two years to support commercial check services. Use of Reserve Bank image services will allow commercial banks to provide corporate customers with more information faster, facilitating daily investment decisions and check fraud detection. Growing consumer acceptance of image or other forms of "checkless" account statements, coupled with increasing corporate reliance on check images, will enhance the industry's ability to stop the flow of the paper earlier in the collection process. Image services also can help many smaller banks to re-engineer their operations and reduce their paper processing.

Taken together, standardization initiatives and investments in new technological "infrastructure" will support banking industry efforts to reduce the costly infrastructure required to support current retail payment processes.

**INNOVATIVE APPLICATION OF NEW TECHNOLOGIES TO MEET THE NEEDS OF A CHANGING MARKETPLACE**

Recent technological changes — advances in networking technologies, the Internet, more rapid application development tools, and the ability to provide simpler user interfaces — are affecting consumer, business, and bank expectations about product and service delivery. Banks initiate and receive electronic payments and information and perform a variety of other transactions through more than 12,000 electronic connections with the Reserve Banks. During the next few years, all of these connections will be replaced with new forms of connections that rely on state-

of-the-art technologies. The largest commercial banks will use a new network that will meet their needs for increased speed and capacity. For the medium-sized and smaller financial institutions, the Reserve Banks will provide two new platforms that will offer more flexibility, value-added information, and easier access to Reserve Bank services. One platform will use a Windows operating system and the other will be based on web technology.

Eventually, the Reserve Banks plan to provide access to all payments services over the Internet. However, today's technology does not provide for secure delivery of billions of dollars of payments using the Internet. A challenge for the Banks will be to work with the industry and technology providers to develop and implement new security methods that will ensure the safety and security of the payments made by consumers and businesses.

Chip technology will offer new forms of payment choices for the public. In support of the U.S. Treasury and the Department of Defense, the Reserve Banks have provided military personnel in Bosnia with stored-value cards, or "smart cards". These cards are used as a substitute for cash and checks. Value can be added to the balances stored on the cards electronically, at an ATM-type terminal, and the value can then be transferred to merchants for the purchase of goods and services. Use of these cards has allowed the Department of Defense to reduce the amount of cash and check handling at the six military bases in Bosnia and at one base in the U.S., with expanded use of the cards planned. The Reserve Banks will seek to apply experience from this project to collaborative efforts on the broader payments system.

The Federal Reserve is pursuing multiple paths to ensure that the benefits of check image technology will be realized. The Board

of Governors staff is working with financial institutions, consumers, and other payments system stakeholders to draft legislation that could provide a legal framework for the use of images of checks in lieu of the paper checks. If adopted by Congress, this legislation could facilitate the growth of electronic check presentment. Simultaneously, the Reserve Banks are pursuing pilots, such as a project in the State of Montana, to test and determine the costs and benefits of a fully image-enabled electronic check collection system.

The use of check images also could improve the process for returning “bounced” checks. This “return item” process always has been the slowest, costliest, and most risky dimension of the check collection system. While the process has been improved in recent years (see “Making Bad Checks Bounce Back Faster”), the time required to collect and then return a check still delays the availability of funds to consumers and increases check fraud losses for retailers. The Reserve Banks have been working with large and small banks to improve the check return process through innovative application of digital image technology. Collaborative tests of this new check return system will be another critical step in the evolution towards a more electronic payments process that will provide significant benefits to consumers and businesses.

**DEVELOPMENT OF THE NEXT GENERATION OF PAYMENTS SERVICES**

The technological advances noted above are changing the payments landscape. More payment options will be available to consumers, as evidenced by the proliferation of bill presentment and payment alternatives on the Internet. Electronic commerce alternatives for corporations also are burgeoning, with the development of on-line auctions and various

forms of marketplaces on the web. However, behind these new alternatives reside the traditional ACH, and even check payment processes. Roughly half of the payments initiated through bill presentment and payment services on the Internet actually are completed by forwarding a check to the biller. The ACH often is used as a reliable, low-cost means to collect and settle the payments once the instructions for payment are provided through various forms of on-line consumer and corporate services. A key question is whether it is preferable to enhance the ACH and other established mechanisms to support such new ways of making payments, or whether new mechanisms could bring even greater levels of efficiency, integrity and accessibility.

Simultaneously, the Reserve Banks will be addressing with others the critical success factors to accelerate the migration toward electronic payments. One example is standards. With rapid and widespread innovation comes fragmentation. The development of payments system standards to allow diverse systems to interface seamlessly with each other will be critical. For instance, consumers may not want to have to go to multiple sites on the Internet to pay their bills because the bills from different corporations cannot be presented in a standard format with standard options for payment in one location. Providing support for the development and adoption of standards that can improve the retail payments system is a leadership role the Reserve Banks have played in the past and can play in the future to facilitate progress toward a more electronic system.

Standards also must take into account the increasingly global nature of the payments environment. As a provider of payments services, the Reserve Banks are developing products, such as cross-border ACH services, to

meet consumer, corporate, and governmental needs to send and receive payments internationally. Emphasis also will be placed on the development and implementation of systems and standards that will mitigate risks in the collection and settlement of international payments.

**CONCLUSION**

The U.S. retail payments system will become decidedly different during the next several years. Research and pilot initiatives will have identified and begun to resolve consumer, corporate, and financial industry barriers to the use of existing and emerging forms of electronic payments. Product development and promotional efforts will increase awareness and acceptance of electronic means of payment. Although cash and checks will continue to be the primary methods of payment for smaller value transactions, more users of the payments system will make use of electronic payment methods. For payments initiated by checks, the collection process will be largely electronic, and users will be accepting of alternatives to the return of paper checks. While this may seem evolutionary, the impact will be revolutionary for payments system infrastructure, among the Reserve Banks and in the private sector.

Perhaps the most daunting challenge in the midst of all of this change will be the successful integration of the constant advances in technology to meet the changing demands of consumers, businesses, financial institutions, and the Treasury. Responding to this challenge will require the concerted attention of the Federal Reserve System, the banking industry, and other stakeholders, working together to achieve significant gains in payments system efficiency, integrity and accessibility, and to lay the groundwork for the U.S. retail payments system of the future.

Some consumers receive from their banks “image statements”, or pictures of the checks they have written, instead of an envelope full of cancelled checks. This is one example of how image technology can help to make the U.S. check collection system more electronic. The Federal Reserve Bank of Boston has played a major role in the development of this technology since 1984.

Digitized images are electronic pictures. Essentially, image technology converts paper documents into computer-readable form — into bits — so that users can handle the documents electronically, look at them on computer monitors, transmit them electronically from place to place, and handle them as they handle all other electronic data. Even in the early 1980’s, the technology was not new. Conceptually it offered promise to improve efficiency in the check collection system, which depended entirely upon the repetitive handling, processing, and transportation of the physical paper document for the transfer of value between check-writer and recipient. However, while the concept had been discussed for some time, actual application of image technology to check processing was quite limited in 1984. Technology to capture high-quality images of checks, both front and back sides, at high speeds, and to store and retrieve those images, had not been developed. Therefore, most of the potential for the application of this technology to the check system had not been explored.

Virtually all banks and many corporations relied upon microfilm to keep permanent records of

the checks paid against their accounts or the accounts of their customers. The U.S. Treasury’s Financial Management Service (FMS) maintained microfilm records of U.S. government checks, which accumulated at a rate of more than 600 million annually. When these government checks entered the banking system for payment, banks deposited them with their local Reserve Banks, which paid the checks, produced microfilm copies, and sent the microfilm to the FMS. The delays in the microfilming process, the persistent quality problems with microfilm images of checks, which passed through high-speed sorters at rates of 30 to 40 per second, and the labor-intensive processes needed whenever the FMS had to retrieve a microfilm copy on behalf of a federal agency or a member of the public, all gave the FMS impetus to seek a “better mousetrap” — specifically, to find out whether digital image technology could improve upon this microfilm-based system.

The perceived high costs of conducting basic research into the applicability of image technology to check processing and the uncertainty about that applicability had discouraged commercial banks and check equipment manufacturers from pursuing the technology. The Federal Reserve saw both the specific business need of the Treasury and the potential of image technology to make the payments system less paper-bound in the long run. Near the end of 1984 the Federal Reserve Bank of Boston, on behalf of all Reserve Banks, reached agreement with the FMS to pursue a research and development program focused on

image technology and the government check application.

The Reserve Banks and the FMS worked through the remainder of the 1980’s and much of the 1990’s on this program, using competitive procurement to engage the best thinking and specific proposals from multiple hardware and software vendors in a multiphased progression from basic research toward the specific application. At one early stage of the research, an equipment manufacturer simulated high-speed check image capture by taping one check to a cylinder, spinning the cylinder so that the check passed a particular point 40 or more times per second, and taking a digital photograph of the check with a freestanding camera. The required research was at that basic a level!

Finally, in 1998, a nationwide government check image capture, storage, and retrieval system went into full production, and it remains in production today. Image has proved to be the better mousetrap to serve the FMS and its constituents. Just as important, as the Federal Reserve’s research program progressed and demonstrated that high-speed, high-quality image capture was feasible, equipment manufacturers and large banks moved ahead with numerous applications for the technology. The Reserve Banks now also deploy image technology to provide a variety of value-added features in their commercial check collection services for U.S. depository institutions. Looking ahead, image technology is expected to play an essential supporting role in the implementation of a substantially more electronic check collection system.