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Electronic Payments and the U.S. Payments System

Walter W. Eubanks and Pauline H. Smale, Government and Finance Division

Updated June 27, 2002

Abstract. This report provides a framework for understanding the paper-based and electronic components of the current U.S. payments system. It begins with an overview of the payments system, explaining the relative size and growth of various methods of payment. It discusses paper-based payments and then examines the operations of wholesale and retail electronic payments. Finally, the report discusses some of the major policy issues concerning the regulation and supervision of electronic payments.

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Electronic Payments and the U.S. Payments System

June 27, 2002

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Electronic Payments and the U.S. Payments System

Summary

The electronic and paper-based payments systems consist of the various means buyers and sellers use to transfer monetary value among themselves. Electronic payments have been playing a critical role on the wholesale side of the payments system for decades. Trillions of dollars per day have been transferred routinely and securely through the wholesale payments system among parties, such as banks, corporations, the Federal Reserve, the Department of the Treasury, and other government agencies. More recently, electronic payment technologies have migrated to the retail side of the system, to households and individuals. In retail, however, the most popular methods of payment remain the more costly paper-based cash and check payments. In 2000, by one estimate, paper-based transactions accounted for two-thirds of all consumer payments, despite the promise of cost savings and convenience.

Nevertheless, the volume of electronic retail payments has increased more rapidly during the last decade. The increase in the volume of electronic payments using credit and debit cards grew from 14% of total consumer transactions in 1990 to 31% in 2000. Still, by 2010 consumers will still be making about 50% of their payments with paper, according to the Nilson Report, an industry publication.

With the great majority of wholesale banking transactions (institution to institution) being conducted electronically, the cost savings and convenience of electronic payments are a normal part of wholesale banking. A major step towards widespread electronic retail payments was the evolution of the automated clearing house (ACH) system to process wholesale and retail payments. The prevalent deployment of automated teller machines (ATMs) and point-of-sale (POS) terminals has supported the progress. The Internet and other technologies have also encouraged the use of electronic banking by individuals and households.

The migration of electronic banking to the retail side of the payments system raises concerns about whether current laws and regulations will adequately cover new technologies and new payment methods. Current statutes address consumer protections in financial transactions involving credit cards and electronic funds transfer. The regulatory agencies have focused on fostering safety and soundness while minimizing their intrusion into the innovation process so as to allow the marketplace flexibility for product development. In November of 2001 federal regulators jointly issued a report, mandated by law (P.L. 106-102), that reviews regulations affecting the delivery of financial products and services including online delivery. However, the speed with which electronic payment technologies are being developed increases the danger of being unprepared with the appropriate regulatory and supervisory policy to protect electronic payments users and providers in time of crisis. This report will be updated as legislative and financial developments warrant.

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Electronic Payments and the U.S. Payments System

Introduction

The payments system consists of the various means buyers and sellers use to transfer monetary value among themselves. Electronic banking has played a critical role on the wholesale side of the payments system for decades. Trillions of dollars per day have been transferred routinely and securely through the wholesale payment system between parties, such as the Federal Reserve, the Department of the Treasury, other government agencies, as well as financial institutions, and corporations. Now this technology has migrated to the retail side of the system to households and individuals, where the most popular methods of payment remain paper-based cash and checks.

Electronic delivery of financial services provides the promise of cost savings, and convenience. The vast majority of wholesale payment transactions are conducted electronically. The cost savings and convenience of electronic payments are a normal part of wholesale operations. However, there remains a strong reliance on traditional paper-based methods by individuals and households in the United States. Based on one estimate, in 2000 cash and checks still accounted for 65% of total consumer payment transactions. At the same time the volume of electronic retail payments has increased rapidly during the last decade. The increase in the volume of card transactions (including credit, debit, and stored-value) grew from 14% of total consumer payments in 1990 to 30.6% in 2000, according to the same estimate.¹

Congressional interest in new technologies, developments in electronic banking and changes to the payments system has been expressed mainly through oversight rather than legislation. Congress has held a number of hearings on specific issues of concern and what actions might ensure orderly development.² Most of the laws protecting consumer financial transactions were passed in the 1960s and 1970s. These laws addressed credit cards and electronic funds transfer. More recently, Congress passed legislation to facilitate the use of electronic financial services and products. The Debt Collection Improvement Act of 1996 (P.L. 104-134) requires federal payments (other than IRS refunds) to be made by electronic funds transfer.

¹ See “Consumer Payment System,” *The Nilson Report*, issue 753, Dec. 2001, p. 5.

² An extensive set of hearings was held in the mid-1990s by the House Committee on Financial Services, Subcommittee on Domestic and International Monetary Policy. *The Future of Money*. Hearings 104th Congress, 1st and 2nd sessions. 4 parts. The most recent hearings were held by the same subcommittee, *The Future of Electronic Payments: Roadblocks and Emerging Practices*, 107th Cong., 1st sess., Sept. 19, 2000.

In the Gramm-Leach-Bliley Act of 1999 (P.L. 106-102), Congress addressed the issue of privacy and safeguarding customer information. The Act also required four regulatory agencies (Federal Reserve, Federal Deposit Insurance Corporation, Office of the Comptroller of Currency, and Office of Thrift Supervision) to conduct a study of banking regulations regarding the delivery of financial products and services. The Act also required that the regulators report on recommendations on adapting existing legislative or regulatory requirements to online banking and lending. In 2000, the Electronic Signatures in Global and National Commerce Act of 2000 (P.L. 106-229) was enacted to facilitate the use of electronic records and signatures.

The federal financial regulators operate on the belief that the marketplace will provide the flexibility needed for the evolution of retail payment systems. The regulators have closely monitored electronic banking activities to ensure the safety and soundness of financial institutions. In general, the regulators have been trying to hold electronic payments products to existing consumer protections and revising the regulatory standards of the paper-based payments system to meet electronic banking operations.

This report provides a framework for understanding the paper-based and electronic components of the current U.S. payments system. It begins with a basic overview of the payments system, explaining the relative size and growth of various methods of payment. The report discusses paper-based payments and then examines the operations of wholesale and retail electronic payments. Finally, the report discusses some of the major policy issues concerning the regulation and supervision of electronic payments.

The U.S. Payments System: An Overview

Trillions of dollars through billions of payments between consumers, businesses, and governments are conducted each year in the United States. The U.S. payments system participants and operations are often divided into two broad categories – wholesale and retail. The wholesale systems transfer funds, often large-value payments, for financial institutions, corporations, and government agencies. Moreover, wholesale operations are almost totally electronic. The number of transactions is largest on the retail side, but these are generally smaller dollar value transactions. Currency, coins, and paper checks still dominate retail payments. Electronic transfers of funds through both traditional systems (e.g., credit and debit cards) and new systems (e.g., smart cards and Internet banking) have had an increasingly important part in retail payments.

Estimates of the total monetary value of the transactions in the payments system and the exact number of them vary considerably among different sources. The data are usually gathered through surveys conducted at irregular intervals using different methods. No U.S. government agencies regularly collect data on the payments system. The Federal Reserve plans to commission regular payment systems surveys as follow-ups to its survey for 2000 (see below). Recently, for regulatory purposes, it has become more critical to have accurate and consistent estimates of the different modes of payment. Without better estimates of the growth of electronic payments,

which has rapidly changed the mix of electronic and paper-based payments, regulating and supervising financial institutions could be less effective.

In November 2001 the Federal Reserve published the results of three commissioned surveys of the U.S. Retail Payments System.³ Data were collected on checks and electronic payment instruments. The studies did not include cash payments or transactions at ATMs (mainly cash withdrawals), which is a significant omission. According to the surveys, 80 billion noncash payments were made during the year 2000 with a total value of \$54.7 trillion. Checks accounted for an estimated 60% of all non-cash payments compared to 85% in 1979. Electronic payments accounted for 38% of all non-cash payment or about 30 billion payments in 2000. Even though checks have declined from about 85% to 60% of all non-cash payments, the number of checks written has increased from an estimated 32 billion in 1979 to 49.6 billion in 2000.

Like most estimates of payments within the system, this study is faulted for most likely underestimating the number of payments; further, the study does not clarify whether or not the growth of check payments has begun to decline.⁴ It also does not clearly distinguish between wholesale and retail transactions. For example, it classifies automated clearinghouse (ACH) payments as only retail. Despite the lack of universal acceptance of the accuracy of these estimates, they clearly indicate that the mix of electronic payments and paper-based payments is changing. Retail electronic payments are growing faster than paper-based payments. Still, paper-based payments remain dominant, particularly if cash payments are included.

An Alternative Overview

An alternative to the Federal Reserve study is the Nilson Report. This study is narrower in some respects but broader in others and is based on the Personal Consumption Expenditures Reports of the Bureau of Economic Analysis of the U.S. Department of Commerce.⁵ The Nilson study is narrow because its focus is on consumer payments and therefore misses most, but not all business and government payments. At the same time it is broader than the Federal Reserve study because it includes cash payments (but not ATM cash withdrawals). Moreover, the Nilson reports are based on a regularly conducted government survey, and they have been published periodically since 1990.

³A *Snapshot of the Retail Payments System: Research Results from the Federal Reserve*. Federal Reserve System, November, 2001. 21p.

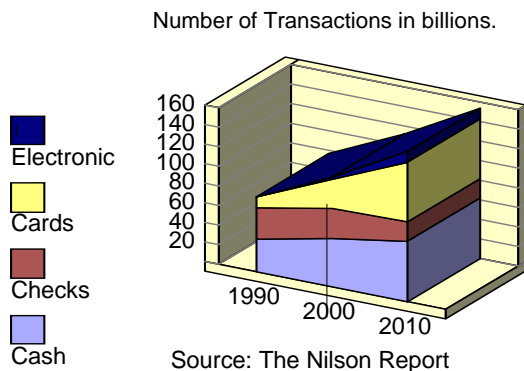
⁴Jennifer A. Kingson, Checks may be Losing Dominance, *The American Banker*, November 14, 2001, p. 2.

⁵The Nilson report figures are considerably smaller than the Federal Reserve commissioned study. The Nilson estimates are based on consumer expenditures data, while the Fed study's estimates are based on a survey of banking institutions' transaction data. See "Consumer Payment System," *The Nilson Report*, issue 753, Dec. 2001, p. 5.

Figures 1 and 2 summarize the study's estimates of the size of the payments system and make projections to 2010. The figures show that electronic and card⁶ forms of payment have become more popular and are an increasingly important part of the retail payments system. However, Figure 1 shows that the paper transactions – cash and checks – accounted for 85% of consumer payments in 1990. In 2000, cash and checks accounted for 65% of total consumer transactions. (In the more recent Federal Reserve study mentioned above, checks alone accounted for 60% of all retail non-cash payments.) And by 2010, the Nilson report expects consumers will be making about 50% of their payments by paper, and only 14% of all consumer payments with paper checks.

Figure 1 also shows a distributive shift in paper-based transactions in 2010. It projects that the growth in cash and check payments between 1990 and 2000 will turn into a decline between 2000 and 2010, mostly because of a 34% drop in check payments. The report suggests that payment cards will be used instead. In addition, the figure shows the number of card transactions growing rapidly while other electronic transactions increase at a more moderate rate.

Figure 1
Consumer Payment Transactions, 1990,
2000, 2010



The dollar value of the transactions in Figure 2 tells a similar story. Even though there was a 12% growth in dollar value of check payments between 1990 and 2000, the dollar value of checks in 2010 is expected to decline 20%. Figure 2 also shows that the dollar volume of transactions using cards is expected to accelerate. Partly based on demographic changes, cash use is expected to increase, which may indicate that cash may be substituted for the expected decline in check use.

While it is reasonable to expect that cards and electronic payments will continue to grow, many in the past have overestimated the decline in the use of paper checks

⁶ Electronic payments are defined as remote and preauthorized transactions and card payments include credit, debit, and stored-value.

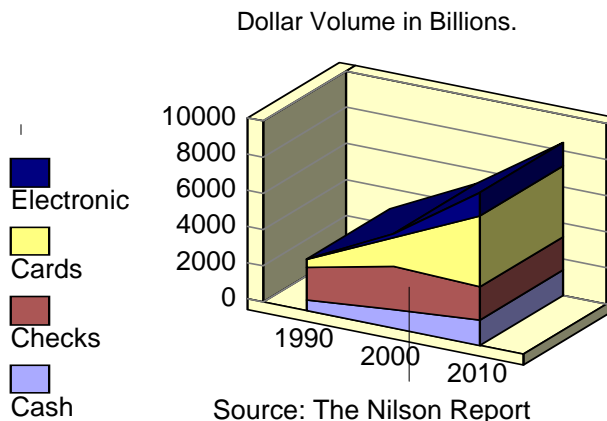
and the growth of electronic payments. U.S. News and World Report announced in 1974 that, “ After years of being carefully planned and nurtured in the back rooms of the nation’s financial community, electronic banking finally seems ready to blossom into reality.”⁷

However, the introduction to a 1979 report by the Bank Administration Institute recognized the failure of such predictions by making the following point:

In the 1960s, predictions of the growth of EFT [electronic funds transfer] services were such that sizable reductions in cash transactions and check transactions were expected within a decade, and a cashless, checkless society seemed to be on the horizon. This, as everyone now knows, has not been the case.⁸

A closer examination of the operations of the paper-based payments system followed by a similar examination of electronic payments may explain their relative positions in today’s system.

Figure 2
Consumer Dollar Payments, 1990, 2000, 2010



Paper-Based Payments

A major factor behind the slow penetration of electronic payments into retail payment transactions is the high level of comfort and confidence the public has in using paper-based payments in the United States. Cash and checks are tested payment instruments accepted and used by governments, businesses, and consumers. While the volume of retail electronic payments is rapidly increasing, it is still difficult to attract customers away from time-tested and trusted paper-based systems.

⁷ U.S. News and World Report, August 5, 1974.

⁸ The Bank Administration Institute, *Checking Account Usage in the United States: A Research and Literature Survey*, September 1979. p. xiii.

Cash and checks also function as a sometimes self-imposed restraint on spending – compared, say, to credit cards – since they do not involve debt creation.

Cash

The use of coins and currency to pay for goods and services in the United States has been extensive. In 1999, the amount of circulating coin and currency in the country was about \$183 billion or approximately \$670 per capita.⁹ The use of cash is expected to continue to grow steadily with population growth because it will remain the most efficient and convenient way of making many types of payments. Cash is legal tender which means that if a debt is paid with cash, the debt is legally settled. The Treasury Department has the responsibility for money production in the United States; the U.S. Mint manufactures the nation's coins and the Bureau of Engraving and Printing produces the currency. The Federal Reserve System distributes coins and currency to the banking system for circulation. Payment is carried out by the physical transfer of fixed-denomination coins and currency notes.

Access to cash through electronic banking terminals has become increasingly commonplace over the last couple of decades. By March 2001, there were 324,000 ATMs (automated teller machines) operating in the United States.¹⁰ Thus, an electronic delivery system has made cash conveniently available throughout the country. Should the use of checks decline as many expect, cash, cards and other electronic payments are expected to replace those check payments.

Paper Checks

Paper checks are the oldest and most frequently used noncash method of payment in the United States. The infrastructure supporting a check transaction is reliably well established. According to the Nilson reports in 2000, there were more than 30 billion transactions in which personal checks were used, with a value of \$2.3 trillion. With almost half of all consumer expenditures payments by dollar value made by checks, it would be helpful to review how payments by checks are cleared and settled to understand how this critical part of the system works. Figure 3 graphically represents the process.

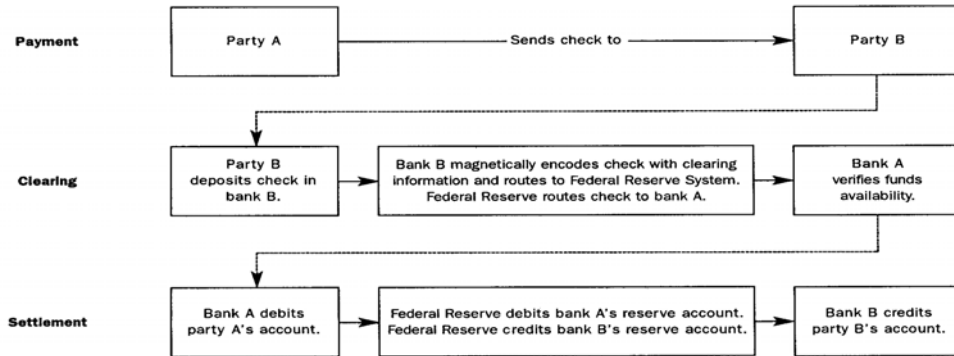
Let's say Angela (the payer), pays Barry (the payee) by check, then Barry deposits the check in his bank. It is possible that Angela and Barry have accounts in the same bank, in which case, the check would be settled as an "on-us" item. In the case of an on-us item, the depository institution would simply debit Angela's account and credit Barry's account in the amount of the check. It is more likely that Angela and Barry have accounts in different depository institutions. In the United States,

⁹ Edward Gramlich, Remarks at the Electronic Payment Symposium. Ann Arbor, Michigan. September 17, 1999.[<http://www.bog.frb.fed.us/speeches/htm>]

¹⁰EFT Data Book. *ATM & Debit News*. September 13, 2001, p.3.

there are almost 20,000 depository institutions – banks, saving associations, and credit unions.¹¹

Figure 3.
Check Clearing Through the Federal Reserve System



Note: Checks are also cleared through the same institution ("on-us") or through private third parties such as clearinghouses and correspondent banks.

Source: Federal Reserve Bank of Atlanta

There are a number of ways that depository institutions may clear and settle checks among themselves by the rules of interbank check settlement.¹² Over time the large volume of checks and check settlement demands has resulted in the creation of a complex infrastructure of processing mechanisms (including some that are electronic) and procedures. After Barry deposits Angela's check in his bank (bank B or the collecting bank), bank B can return the check to Angela's bank by mailing the check directly to bank A or by sending it through an intermediary. There are three categories of intermediaries: clearing house associations, correspondent banks, and the Federal Reserve Banks. Banks joining a clearing house have a central collection site to exchange checks with one another. Correspondent banks collect and settle checks for other depository financial institutions. The Federal Reserve System has a nationwide system, operated by the Reserve Banks, for clearing and settling checks.

Whichever of these methods is selected by bank B, according to the rules of interbank check settlement, in most cases the check must be physically returned to bank A before the bank makes good on the check. This means that checks must be physically transported to the bank they were drawn on before they are settled. Consequently, the checking clearing process is subject to travel delays.

Another legal requirement is that checks that are presented for payment must be paid at par value. Angela's bank, bank A, must pay Barry's bank, bank B, the full amount of Angela's check to Barry, despite incurring the bulk of the cost of

¹¹ The 2001 Federal Reserve study on the payments system estimated that 30% of the checks written in the United States are on-us items.

¹² The rules for interbank check settlement are governed by articles 3 and 4 of the Uniform Commercial Code and by the Federal Reserve Regulations J and CC.

collection. That cost cannot be deducted from the amount of the check as it once was in the distant past.

The Float. An important byproduct of the check clearing process is the float. The float is income earned by the writer of the check between the time a check is received as payment and the time it is settled. The writer of the check earns interest on the funds in the account on which the check is written during the time the check is being cleared and settled. A writer of a large check with long clearing and settlement delays is likely to find checks preferable to less costly means of payment with faster clearing time. In the example above, if bank A and bank B are in the same city, most likely Angela's check would clear in the same day. However, if Angela's bank is in a remote location, it may take several days before Angela's check gets back to bank A. As a result, Angela gains several days of interest while Barry loses several days of interest due to the delay in the process. If, in addition, Barry delays in depositing the check, Angela gains interest income with each day he delays.

Electronic Payments

Predictions of a checkless, cashless society have not been realized, but the figures above suggest the influence of electronic banking will continue to grow and play a larger role in the payments system. Electronic payments of all forms (wire transfers, automated clearing house, credit, and debit cards) accounted for 18% of all non-cash payments in 1990 and this figure grew to 32% in 2000.¹³ In the Nilson report's forecast for 2010, it is expected that electronic payments¹⁴ and card payments will account for 64% of all payments in 2010, with cards accounting for 49%. In the November 14, 2001, Fed non-cash payments study, electronic payments accounted for 38% of the 80 billion non-cash payments made in year 2000.

Wholesale Electronic Payments

The wholesale payments system transfers, disburses, and collects funds for depository financial institutions, corporations, and governmental agencies. These are usually time-sensitive payments and electronic payments networks provide security, efficiency, and convenience. There are two major large dollar electronic payments networks, Fedwire and the Clearing House Interbank Payments System (CHIPS). A network of Automated Clearing Houses (ACHs) processes smaller dollar wholesale and retail electronic fund transfers. Electronic payments are

¹³U.S. Congress. House. Committee on Banking and Financial Services Subcommittee on Domestic and International Monetary Policy. *The Future of Electronic Payments: Roadblocks and Emerging Practices*. Hearing, 106th Congress, 2nd session. Sept. 19,2000. P.80.

¹⁴ The electronic payment instruments Nilson measured were remote and preauthorized payments. Remote payments are made using a telephone, computer service, or the Internet. Also included are check conversion and utility-bill payments made at automated teller machines (ATMs), self-serve kiosks, and clerk-assisted electronic funds transfer machines at supermarkets. Preauthorized payments, such as insurance premiums and mortgages are handled electronically through an automated clearing house.

frequently facilitated by a private electronic message transfer system; the Society for Worldwide Interbank Financial Telecommunications (SWIFT).

Fedwire. Fedwire is the Federal Reserve's electronic funds and securities transfer system. Fedwire is used by approximately 9,500 depository institutions as well as the Treasury and other federal agencies. In addition, Fedwire offers net settlement services for payments cleared by private clearing houses. To use Fedwire, depository institutions must maintain a Federal Reserve account at a Federal Reserve Bank. Depository institutions use Fedwire to transfer funds on their own behalf and on behalf of their customers (including smaller institutions) to other institutions. About 8,200 users are on-line; these institutions have computers or terminals that communicate directly with the Fedwire system. These institutions account for over 99 % of total funds transfers. Depository institutions without an electronic connection can originate transfers off-line via telephone instructions. Transfer fees are based on monthly volume; they range from \$0.17 to \$0.33 per transaction. The surcharge for an off-line transaction is \$15.00.

Most Fedwire transactions are related to domestic payments. Because of its speed and security, Fedwire is virtually always used for large payments. In 2000, Fedwire averaged 380,000 transfers daily; the total daily transaction value was about \$1.5 trillion and the average value per transaction was \$3.5 million.¹⁵ All fund transfers are completed on the day they are originated, usually within minutes. A Fedwire payment is final and irrevocable. The Federal Reserve guarantees payment. In an example, First Union Bank in Charlotte North Carolina wishes to pay Mellon Bank of Pittsburgh Pennsylvania \$50 million. An operator at First Union simply types an instruction into a computer terminal telling its local Reserve Bank to send a transfer order to Mellon's Reserve Bank. The two Reserve Banks settle, confirming the transfer of \$50 million from First Union's account at a Reserve Bank to Mellon Bank's account at a Reserve Bank. Mellon Bank's computer is notified that it has received the payment and the funds may be used immediately.

The Clearing House Interbank Payments System (CHIPS). CHIPS is a large-value electronic payments network. This system is privately owned and operated by the New York Clearing House Association. CHIPS was organized in 1970 to transfer and settle international dollar payments electronically. To be a CHIPS participant a financial institution must have an office or subsidiary in New York City. The computerized network has 59 members from 22 countries. CHIPS members handle payments for themselves, for non-participating financial institutions, and for corporate customers. Approximately 95% of all dollar international electronic payments are processed by CHIPS. Payments are netted and settled in real time throughout the day. The CHIPS central computer and the computers of the individual banks track continuously each bank's net position relative to all the other banks.

To illustrate how this system works, suppose an Irish bank needs to pay a French bank \$100 million in U.S. dollars. The Irish bank executes a payment

¹⁵U.S. General Accounting Office, *Payments, Clearance, and Settlement*, GAO/GGD-97-73, (Washington, June 1997), p. 18.

through its branch in New York, if it has one, or through a New York bank in which it has a deposit. The payment is made to the New York branch of the French bank, if it has one, or through a New York bank at which the French bank has a deposit. Messages convey the information and payment instructions between the financial institutions often using the SWIFT system (see explanation of SWIFT below).

At 4:30 p.m., the CHIPS computer sends each participant a summary of the participant's payments for the day and of its final net position. Upon receiving the summary from CHIPS, each bank checks it against its own records for accuracy. If it has a net debt, it must transfer funds over the Fedwire to a special account at the Federal Reserve Bank of New York by 5:30 p.m. "Settling banks," some 20 in number, do this themselves; others have arrangements with the settling banks to do this for them. By 6:00 p.m., banks that are owed money receive payment out of the same special account.

In the past, CHIPS payments were like payment by checks or promises to pay. The promise to pay might "bounce"; a bank might be "unable" to pay at the end of the day. If this happened, all the banks which this bank owed would remain unpaid. For this reason, there are safeguards which include bilateral credit and debit limits between the banks. Moreover, all participants must post collateral. Today the entire process is done in real time. Consequently, even though the number of checks being cleared has grown, the average daily net payment has fallen over time. In 2000, CHIPS handled more than 371,000 payments daily, averaging more than \$1.6 trillion a day. But, because of the netting out process these payments resulted in settlements of only \$5 billion a day.¹⁶

The Society for Worldwide Interbank Financial Telecommunications (SWIFT). SWIFT is an industry owned co-operative electronic message transfer service company headquartered in Brussels. It was created in 1973 to provide a shared, worldwide data processing and communications links in a common language for international transactions. The United States is one of the largest users of the message transfer service. SWIFT facilitates the exchange of payment and other financial messages for customers including banks, broker-dealers and investment managers. The network now supplies services to more than 7,000 financial institutions in 194 countries. In 2000, SWIFT delivered 1.3 billion messages of all types, and the average daily value of payment messages was \$5 trillion.¹⁷ Fees for these messages are competitive with other international financial messaging services.

Automated Clearing Houses (ACHs). The ACH system is a major part of the U.S. payments infrastructure. The system can be used for wholesale or retail payments. This system was developed to enable corporations and consumers to make routine payments more efficiently than with paper checks. The ACH system is a large volume electronic payment processing system. Payrolls, recurring bill payments, and Social Security benefits are examples of typical ACH payments. The individual payments are small dollar compared to Fedwire and CHIPS transactions. The fees charged by ACH operators (to both the originator and receiver) for processing ACH

¹⁶See [<http://www.chips.org>], last visited Jan.10, 2002.

¹⁷ See [<http://www.swift.com>], visited January 8, 2002.

transactions are less than a penny. Because of its growing use, the ACH has become a major force behind the move away from a paper-based intensive payments system.

The National Automated Clearing House Association (NACHA) was formed in 1974 by the regional ACH associations to coordinate the establishment of rules to facilitate the nationwide clearing of ACH payments. Currently there are 40 regional ACH associations, whose participating members are all depository financial institutions. There are four major ACH operators/processors that serve as central clearing facilities; the Federal Reserve System and three private processors, the Electronic Payments Network (EPN), American Clearing House Association, and VISA NET ACH. The Federal Reserve processes all government ACH payments and the great majority (about 75 %) of commercial payments. In addition, in 1998, the Federal Reserve extended its ACH services to Canadian depository institutions, and they can be used by foreign banking with branches in the United States. EPN is the largest private ACH operator/processor and like CHIPS is operated by the New York Clearing House Association. NACHA statistics show that the ACH system processed over 6.8 billion transactions in 2000 with a total volume of \$20.3 trillion.¹⁸

The ACH system handles credit as well as debit transactions. As mentioned earlier, ACH operations are suited for repeated periodic payments. Every transaction has four participants; an originator, a receiver, an originating depository institution, and a receiving depository institution. In an example of a debit transaction, a homeowner authorizes her insurance company to take monthly payment from her bank (bank A) deposit account. The insurance company will do this by having its bank (bank B) send a withdrawal request for the funds each month via an electronic file to bank B's ACH operator. Bank B's ACH transmits the debit to bank A's ACH operator which presents the debit to bank A. Bank A would deduct the payment from the homeowner and send the transaction in an electronic file back through bank A's ACH for settlement, which is final when the insurance company's account is credited. An example of a credit transaction is a direct payroll deposit.

ACH payment instructions are usually executed over the computer networks. Members prepare files detailing all the payments to be made to customers and/or employees' accounts in different depository institutions. After the ACH receives these files, it collates them with their files of the depository institutions on their computers and deducts or credits the local bank's account at the Fed the amount of the payment. Transactions are value-dated which means the originator of an ACH transaction includes the settlement date in the payment instructions when it originates the transactions. The network is also often used as the underlying settlement mechanism for credit card, debit card, and ATM transactions. Net settlements between ACH operators are often done through Fedwire.

Retail Electronic Payments

While the ACH system is the backbone of a growing electronic component of retail payments, payment cards are the most familiar electronic payment instruments

¹⁸ The NACHA at [http://www.nacha.org/news/Stats/ACH_vs_Fed/ach_vs_fed.htm], visited March 14, 2002.

for households and consumers. Credit cards have been widely used in the United States for 40 years. Debit cards were introduced in the 1970s, but the volume of debit card transactions during the last decade has increased significantly. The deployment of electronic terminals, ATMs (automated teller machines) and POS (terminals at the point-of-sale) have helped to mainstream electronic transfers of funds in the United States.

Technological advances have introduced other new electronic payment mechanisms as well. Stored-value cards have the potential of providing a wide variety of financial and nonfinancial services. The Internet offers a new avenue for conducting financial transactions. Electronic money products are emerging for making payments over the Internet. Electronic check presentation could fundamentally change the mix of paper-based check transaction and electronic payments.

Credit Cards. Credit cards are well established and the most common form of electronic payments. Credit cards are used for the purchase of goods and services and for obtaining cash advances against a prearranged line of credit. One recent estimate calculated the total number of cards (in the United States) at year-end 2000 to be 531 million and annual credit card transactions at 14 billion for 2000.¹⁹ Today the two dominant types of credit cards are bank-issued universal purpose VISA and MasterCard credit cards. General purpose cards are also issued by nonbanks (for example, Discover card) and specialized credit cards are issued by merchants and vendors (for example, an oil company). The card issuer establishes the terms and conditions for the cardholder including the grace period, interest rate, annual fees, and penalties. Most credit card companies allow the cardholder to pay off the entire balance each monthly cycle or to make a minimum or partial payment and carry the interest-bearing balance forward. Discussions in this report are limited to bank issued credit cards.

Most credit card transactions involve five parties, the cardholder, the merchant, the card-issuing bank, the merchant's bank (also called the acquirer) and a credit card company. A typical transaction has three steps – authorization, clearance, and settlement. When the cardholder makes a purchase, the merchant will seek authorization from the card issuing bank, electronically, using an electronic data capture terminal which reads the information embedded in the magnetic stripe on the back of the card.²⁰ Clearing refers to the exchange of financial information. Settlement refers to the exchange of funds for both the transaction and the associated fees. MasterCard and VISA maintain the flow of information and funds between card issuers and acquirers using their data processing networks and settlement systems. Both VISA and MasterCard own and operate their own international processing systems.

¹⁹EFT Data Book. *ATM & Debit News*. September 13, 2001, p.3. (Includes VISA, MasterCard, American Express, and Discover)

²⁰Merchants can maintain MOTO (mail order, telephone order) or CNP (card not present) accounts with specific sets of rules that enable merchants to accept credit card payments by phone or mail.

How the Credit Card Process Works. A cardholder hands the credit card to the merchant to make a purchase. Once the switches determine that the credit balance at the cardholder's or issuing bank covers the purchase, the merchant bank reimburses the merchant's account for the purchase minus a fixed discount fee based on a percentage of the purchase. The bank immediately credits the merchant's account the discounted amount of the purchase. The issuing bank submits a payment of the full purchase minus "interchange" fee for the use of the VISA or MasterCard network. The network immediately deducts a fee (based on negotiated arrangements) for the exchange services it provided both banks and forwards a payment of the net discounted amount to the merchant's bank.²¹ The cardholder pays the issuing bank the price of the purchase, or at least the minimum payment it requires and the remaining balance is paid over time. It must be noted that the exchange fees are sometimes not calculated on a per transaction basis, but are negotiated fixed at various levels of transaction. In these cases, the cost may fall over certain the number of transactions.

The regional credit card interchanges are now consolidated into two international interchanges owned by VISA and MasterCard. Clearing is done by using settlement banks over Fedwire and international clearings and settlements are done through CHIPS. The credit card network computers track continuously each bank's net position relative to other banks and settle the accounts daily. The receipts the cardholders sign at the point of sale rarely leave the retailer, except in rare cases of fraud and inaccuracies.

Debit Cards. Debit cards are one of the fastest growing electronic payment instruments. Despite the similarity in looks to a credit card, the debit card involves no credit. A debit card transaction directly withdraws funds from an account as opposed to providing a line of credit. The first debit cards were issued by financial institutions to account holders as access cards for ATMs. To avoid confusion with the next generation of debit cards used with POS systems these cards are now often called bank cards or ATM cards. The cardholder uses the card in the terminal with a Personal Identification Number (PIN) to conduct a transaction. A cardholder can make cash withdrawals, pay bills, and transfer amounts between accounts, but the majority of ATM transactions are cash withdrawals. Participants in an ATM transaction include the customer, the cardholder's bank, the ATM owner, and communication networks. A seemingly simple cash withdrawal can involve a series

²¹ To illustrate the basic credit card process by making some assumptions about the fees, Let's say a cardholder hands the credit card to the merchant to make a \$100.00 purchase. Once the switches determine that the credit balance at the cardholder's or issuing bank covers the purchase, the merchant bank reimburses the merchant's account for the purchase minus a fixed discount fee: i.e., \$1.90 for the \$100 purchase. The bank immediately credits the merchant's account \$98.10. The issuing bank submits a payment of a \$100.00 minus "interchange" fee of \$1.30 to the VISA or MasterCard network. The network immediately deducts its fee of 10 cents for the exchange services it provided both banks and forwards a payment of \$98.60 to the merchant's bank. Thus, the merchant's bank paid the merchant \$98.10, but received \$98.60 from the network, which could mean a profit of 50 cents.

of complex interrelated processing steps. It is estimated that there were over 13 billion ATM transactions in 2001, almost equaling credit card transactions.²²

In the 1980s and 1990s point-of-sale (POS) systems expanded the capabilities of electronic terminals to allow the debit card to also be used in place of cash, check, or credit card for transactions at the merchant location. With a POS transaction the buyer's account is debited and the merchant's account is credited electronically. The debit card overcomes the major problem with accepting checks (insufficient funds); bad checks are eliminated because unless the purchaser has sufficient funds, the transaction is not authorized. A debit card transaction denies the cardholder both the float period for checks and the 25-day credit grace period of credit cards. Still, customers like the convenience and efficiency of paying with a debit card. POS systems can significantly reduce merchant administrative costs and accounts receivable. In addition, because no credit is extended, debit card transaction fees are lower than credit card fees. Fees paid by the merchant depend on network arrangements.

POS debit transactions are made through interlinked electronic networks. Participants in a POS transaction include consumers, merchants, card issuing banks, and merchant's banks. Debit card transactions can be online or offline. An online transaction results in an immediate electronic transfer of funds and requires the use of a PIN. A key factor in the recent growth of online POS is merchants allowing debit cardholders to withdraw cash in excess of the sale. With an offline transaction a debit is created against the buyer's account but the settlement is not made immediately. Instead, the debit is stored and processed within a few days (usually 2-3). Offline debit transactions require the customer to sign a receipt and transactions usually require authorization. Almost all offline cards can be used as online debit cards by entering a PIN instead of a signature. A key factor in the growth in offline debit has been the emergence of VISA and MasterCard offline debit networks which piggyback off their respective credit card infrastructures. The companies initiated a massive TV advertising promotion in the late 1990s. In 1995, there were 775.2 million online debit transactions; the annual total grew to 3.8 billion in 2000. In 1995, there were 668 million offline debit transactions; the annual total grew to 5.3 billion in 2000.²³ As a result, debit card POS transactions are about 2/3 the size of credit card transactions in 2000.

ATM and POS Systems. Electronic funds transfer through terminals has helped to expand public acceptance of electronic banking. The terminals have been deployed in great numbers. In March of 2001 there were 324,000 ATM terminals and 3,640,000 POS devices.²⁴ They provide easy and convenient access to a variety of financial services for millions of payment card holders. Depending on the ownership and network arrangements, one machine or POS device can be operated by several cards (both debit and credit).

²²EFT Data Book. ATM & Debit News. September 13, 2001,p.3.

²³Ibid. Offline are signature based VISA check and MasterCard Debit cards p. 3.

²⁴Ibid. p.4.

At first, ATMs were located on the premises of the depository financial institutions that owned them. The development of regional and national communication networks provided a way of sharing the costs of ATM technology and with them the number of off-premise machines grew. Networks allowed cardholders to access their accounts using ATMs owned and operated by institutions or nonbanks with which they had no account relationship. Networks can also provide switching services to facilitate connections between card issuers, terminal operators and multiple networks. Networks can provide settlement services.

The most popular merchant locations for POS terminals are supermarkets, gas stations, convenience stores, and fast food restaurants. Online POS systems use the same networks as ATM transactions. Offline POS systems operate through credit card networks. As network operations became more sophisticated so did the structure of fees charged to participants (merchants, cardholders, financial institutions, and terminal owners and operators). Fees associated with ATMs and POS can include network membership, transaction, switch, interchange, clearing, and settlement fees.

Electronic Funds Transfers at Point of Sale (POS). POS terminals connect the retailers' cash registers to the cardholders' bank computers. Specifically, these terminals are at the larger retail stores and supermarkets and are connected to the cardholder banks' computers through the ATM and credit card switches. During the 1980s and 1990s, the POS systems expanded the capabilities of electronic terminals to use debit cards along with cash, checks, or credit cards for transactions at the retail location. POS terminals significantly reduce merchant administrative costs and accounts receivable management.

POS debit transactions are made through interlinked electronic networks. Participants in a POS transaction include consumers, merchants, card issuing banks, and merchants' banks. Using a debit card at a POS, the amount of the purchase is deducted immediately from the cardholder's deposits and credited to the merchants' deposit account minus bank and switch fees. Debit card use at a POS is particularly popular with those retailers that operate on very narrow margins, leaving little room for the discount charged for credit card transactions. Debit card fees are lower than credit card fees. Furthermore, in the early 1980s when depository institutions and MasterCard and VISA lowered their fees to these retailers with lower profit margins, supermarkets also began accepting credit cards as well as debit cards. A credit card purchase at a POS uses the same switches as a debit card to clear and settle the transaction.

Electronic Check Clearing. Some economists believe that a major step in moving the payments system from the less technically efficient paper-based system to the more efficient electronic-based system is to process paper checks electronically. As pointed out earlier, checks remain the most popular non-cash method of payment, accounting for approximately 60% of the total number of non-cash payments in 2000. In that year alone an estimated 49.6 billion checks were

written in the United States.²⁵ The Federal Reserve has proposed legislation to Congress that would allow for universal adoption of electronic check presentation (ECP),²⁶ a process that electronically clears checks, thus eliminating the need to physically present checks.

Electronic check presentation is a collection process that settles a payment transaction by using electronic information encoded on the check instead of the paper check itself. Another way to describe ECP is that each check is “truncated” at the institution where it is first deposited. The information on the check is converted into electronic form and the check remains at that institution. Only in cases of suspected fraud and accounting inaccuracies would this check leave the first depository institution.²⁷

Today, roughly 20% of the checks processed by the Federal Reserve are presented electronically, either in truncated form or with checks to follow the ECP process. In the case of checks to follow, the paper check is eventually sent to the paying bank, negating some of the cost savings that result from full truncation but still making the check collection process more efficient and certainly much faster. However, the Fed handles only 25% to 30% of the checks processed nationally. The majority are processed by private clearinghouses and large financial institutions. Many of these checks are “on-us” transactions, business-to-business, merchant-to-bank, or bank-to-bank transactions, which are less costly to clear and settle. Recent financial institution mergers have also decreased check clearinghouse activities as more check transactions are converted into on-us transactions.²⁸ Thus, even though the number of checks being written remains high, the number of checks being cleared by the Fed and other clearing houses has fallen.

If the Check Truncation Act that is being proposed by the Fed becomes law, and electronic check presentation is universally adopted, only the coins and currency part of the paper-based system would remain. But, ECP would also eliminate major consumer advantage of paying with checks – the float that benefits the payer. That means that the banking industry as a whole would be the main beneficiary of the lower processing cost.

Internet Banking. Internet banking could also significantly reduce the use of paper checks. The term Internet banking refers to conducting banking business

²⁵ *A Snapshot of the Retail Payments System: Research Results from the Federal Reserve.* Federal Reserve System, Nov. 2001. 21p.

²⁶ Michele Heller, “Fed Offers Check Truncation Plan,” *The American Banker*, Dec. 28, 2001, p.1.

²⁷ U.S. Library of Congress, Congressional Research Service, *Electronic Banking: The Check Truncation Issue*, by Walter W. Eubanks, CRS Report RS21064 (Washington: November 29, 2001), p. 4.

²⁸ Fed Check Volumes Fall, But Debits Role is Uncertain, *ATM & Debit News*, August 23, 2001, p. 1.

over the Internet.²⁹ Banking institutions that offer their customers Internet banking are usually providing a range of services, including checking balances, transferring funds between accounts, applying for credit, paying bills electronically, and presenting bills for the bank to pay from the depositor's account. In bill presentation payees send their bills via the Internet to a payer's bank, which pays it from the payer's account. Internet banks also often offer insurance, and brokerage services. Businesses can apply for loans, initiate wire transfers, and use cash and payroll management services.

Internet banking is conducted by depository institutions with physical offices or with Web sites only. Most Internet banks are brick and mortar establishments offering banking services through both channels. The other form of Internet banking is also called "virtual" banking, which provides Internet access only. At the heart of these institutions are computer servers which may or may not be located at the legal address of the virtual bank. Virtual banks take deposits and allow withdrawals primarily through automatic teller machines and through the U.S. Postal Service.

Internet Bill Paying. Banks usually provide the Internet banking channel of services to customers free or at minimal cost. The customer is required to provide an access number, usually a Social Security number, a personal identification number, and a codeword. The bank sets up the Internet account, which the customer accesses through an Internet service provider (ISP), such as America On Line (AOL) or Microsoft Network (MSN). To pay bills the customer provides the bank with a list of payees. With this list attached to the account (s), the customer may instruct the bank to make fixed-amount periodic payments, i.e., monthly or quarterly, or pay bills one at a time as they are received. This can be particularly convenient if the customer also has direct deposit of paychecks and other income.

The Internet bill paying process usually has a minimum waiting period after the bank receives the instruction to pay the bills. For example, if the customer requests a bill to be paid on the first of the month, the earliest the bank may pay the bill may be 5 to 10 business days after the request was made. Internet banks, as a rule, never make the payment on the day that the customer requests it. In addition, the bank has discretion in the instrument it uses to make the payment. If the bank uses e-pay (electronic payment), the payee usually receives payment on the day that the bank notifies the customer that the payment would be made. E-pay transfers money directly into the account of the payees in other banking institutions through the electronic networks. However, if the bank pays the bill with a check, the payee would receive payment as much as a week later than the bank's date of payment. Since most banks deduct the funds from the customer's account at the time the check is presented for payment, the customer does not lose the float.

The Growth of Internet Banking. While growing rapidly, particularly after the Terrorist attacks on New York and Washington and the Anthrax incidents,³⁰

²⁹CRS Report RL31327, *Internet Banking: Changing Expectations and Regulation*, by Walter Eubanks. 9p.

³⁰Maria Bruno, "Coming of Age For e-Payments," *Bank Technology News*, Jan. 2, 2002.

(continued...)

Internet banking transactions are not yet a significant part of the national payments system. There are limited data on how widely Internet banking is being used. However, a September 2000, Comptroller of the Currency study concludes that most customers using Internet banking are concentrated in a few large banks. Five banks account for about 36% of users. Furthermore, even the most successful banks offering Internet banking are currently serving a relatively small share of their customer base. It was estimated that the number of households with online banking was about 5 million in 1999. This number is expected to grow to about 32 million by the end of 2002, but it still would account for only about one-third of the 93 million households with banking relations. Most banking transactions today are taking place at the branch, through the mail, by telephone or over ATM networks.

Other Instruments of Electronic Payments.

Electronic Benefit Transfers (EBT). POS systems are being used for Electronic Benefit Transfer programs. This electronic payment system was created in the 1990s for the delivery of state-administered government benefits. Currently, electronic benefit transfer systems are the primary delivery vehicles for food stamp payments. Some states are using EBT for other benefit programs, such as the supplemental nutrition program for women, infants and children (WIC). EBT systems use POS terminals to debit a recipient's account for purchases made, and credit the retailer's bank account.

To illustrate how the system works, once a food stamp applicant has been accepted into the food stamp program, an account is established in the participant's name and the benefits are deposited electronically each month. The recipients use an access card with a PIN number at the POS terminals to purchase groceries. Food stores and other outlets are approved for participation by the Department of Agriculture. States work with EBT vendors to set up EBT systems. There are federal regulations covering EBT system deployment and performance. The federal government shares the costs of the food stamp program with the states. Recently, the Treasury Department began working on a program that provides the option of accessing both direct federal payments (such as Social Security) and state administered benefits with one card.

Stored-Value Cards. The stored-value card is an emerging electronic method of payments that has not yet generated widespread interest in the United States, especially in its most sophisticated form. This instrument allows a prepaid balance of funds to be recorded electronically on a card. Cards can be reloaded with additional funds. The technology can use a magnetic strip or embedded computer chips. The chips can turn stored-value cards into smart cards that can be used for a great variety of purposes, such as providing access to financial and nonfinancial services, as well as storing and monitoring information such as medical and employment records. Most stored-value cards are single-purpose cards, such as telephone cards or mass transit cards. Value from the card is electronically transferred by equipment contained in the phone or tollbooth, for example.

³⁰(...continued)

[<http://www.Banktechnews.com/btn/articles/btnjan02-03.sht>]. Last visited Jan. 15, 2002.

Multipurpose cards are relatively expensive to manufacture and involve greater investment by the merchants in the infrastructure to process the transactions and therefore require a large pool of users to be successful.

Electronic Money. Electronic money products are being created for payments over the Internet. A variety of electronic cash products are being developed and tested to allow payments to be transferred over widely accessible computer networks. These methods of payment include digital cash, electronic currency and electronic checks. Electronic money will enable payments between consumers and merchants, and consumer to consumer without the services of a financial institution. A number of these arrangements have been tried; one that has become prominent among computer users is known as “pay pal.” Clearing and settlement processes are also under development that would allow consumers to load credit from their bank account onto an internet card, which could be downloaded directly into the Internet merchant’s account. While these instruments are available, there is significant consumer resistance to them, because of the concerns regarding identification theft.

Regulating and Supervising Electronic Payments

Federal financial regulatory agencies have traditionally exercised restraint in regulating innovative changes in the financial services industry. This policy has not changed with the ongoing migration of electronic payments to the paper-based retail side of the payments system. But, some analysts believe that the regulatory agencies should take a more proactive role than they have because changes in the current electronic payments environment are occurring at increasingly rapid cycles.³¹ Corrective enforcement actions in case of financial stress might be too late to prevent serious damage to the payments system if regulators and supervisory agencies are too removed from the market development of electronic payments.

On the other hand, premature regulation could stifle innovation by locking the industry into technologies that may be less efficient, convenient, and safe. For example, if regulatory agencies had developed regulations tailored strictly to telephone lines, those regulations might not be fully applicable to wireless financial transactions. While either system could be made to operate successfully, they might be subject to different privacy and security concerns: for example, wireless banking transactions could introduce the necessity for protecting radio frequencies from interception. Each innovation brings different and often new risk exposures to the payments system.³²

Federal financial regulators have closely monitored developments in retail electronic banking activities to ensure they are conducted consistent with bank safety

³¹ Osterberg, William P. and James B. Thomson, Network Externalities: *The Catch-22 of Retail Payment Innovations*, Federal Reserve Bank of Cleveland Research Department, February 15,

³² Stewart, Jamie B. Jr., Changing Technology and the Payments System, *Federal Reserve of New York Current Issue*, Oct. 2000, p. 1.

and soundness. In addition, they have sought to reduce uncertainty over permissible activities and to guard against unreasonable risks. In this regard the Board of Governors of the Federal Reserve System, the Federal Deposit Insurance Corporation (FDIC), the Office of the Comptroller of the Currency (OCC), and the Office of Thrift Supervision (OTS) both individually and jointly have issued compliance guidance and clarification of rules concerning electronic financial products and services. In addition, in conjunction with the Federal Financial Institutions Examination Council (FFIEC) the agencies have reviewed regulations and issued guidance. Examples of supervisory issues covered include security monitoring of computer networks, authentication in an electronic banking environment, electronic banking examination procedures, and security risks associated with the Internet. Each agency provided an overview of steps taken in the report discussed below.

Report to Congress. The Gramm-Leach-Bliley (GLB) Act of 1999 required the Federal Reserve, FDIC, OCC, and OTS to conduct a study of banking regulations regarding the delivery of financial products and services. The report was to include recommendations on adapting existing legislative or regulatory requirements to online banking and lending. The agencies published the report on November 13, 2001.³³ In it each agency summarized the initiatives already undertaken to adapt regulations to facilitate, support and ensure safety and soundness in electronic banking activities. Also included in the report is information on the privacy provisions of GLB. The agencies discussed other steps taken such as the formation of task force groups (within the different agencies) that focus on electronic banking concerns, consumer protection, and the publication of comprehensive handbooks on business and technical issues. Each agency outlined the methodology used to satisfy the requirements of the GLB ACT for the report. This included separate federal register requests for comments on how individual agency banking regulations affect the electronic delivery of financial products and services. The agencies summarized the comments they received and plans for further modifications in response.

The agencies concluded that existing regulations generally accommodate the electronic delivery of financial products and services. They stated that they would continue to monitor developments in banking practices and technology. In addition, the agencies remain committed to updating their respective regulations and guidance as needed. Finally, the agencies stated they will continue to work to foster the growth of electronic banking activities in a safe and sound manner and to ensure both consumer protection and access.

³³Federal Reserve, FDIC, OCC, and OTS, *Report to Congress on Review of Regulations Affecting Online Delivery of Financial Products and Services*. 89p. Report can be found on the web sites of the four agencies.