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Report to the Chairman
Committee on Banking and Financial
Services
House of Representatives

June 1997

PAYMENTS,
CLEARANCE, AND
SETTLEMENT

A Guide to the Systems,
Risks, and Issues





United States
General Accounting Office
Washington, D.C. 20548

General Government Division

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The Honorable James Leach
Chairman, House Committee on
Banking and Financial Services
House of Representatives

Dear Mr. Chairman:

This report responds to your request that we provide information, about the nation's systems to effect financial transactions between purchasers and sellers of goods, services, and financial assets. As you know, these systems—often referred to as payments, clearance, and settlement systems—are a vital part of the smooth functioning of our nation's economy and the free flow of economic activity worldwide. They allow ownership of products, funds, securities, futures contracts, and other financial instruments to be exchanged and settled among consumers, financial institutions, businesses, and others. They also play a critical role in maintaining the stability of financial markets and reducing systemic risk.

As agreed, the objectives of this report were to

- describe the various payments, clearance, and settlement systems used in this country;
- describe various emerging products and services, which we refer to as electronic commerce;
- identify and describe certain risks associated with these systems, products, and services, and discuss how those risks are mitigated; and
- identify and describe some significant issues relating to the systems, products, and services that face users, regulators, and policymakers.

For purposes of clarity, we present the information on systems, products, and services in four major sections: (1) clearance and settlement of wholesale payment systems; (2) clearance and settlement of equities, Treasuries, futures, and options; (3) clearance and settlement of retail payment systems; and (4) new and emerging financial products and services. An overview precedes each section, highlighting some of the main characteristics and other information associated with each type of system, product, or service. Each section is organized in the same way—description and use, basic data, processes, regulatory oversight, and risk and risk mitigation. The final section of the report contains information on some significant issues raised by industry officials

concerning these systems, products, and services. The remainder of this letter includes background information, a short overview of the sections, our scope and methodology, and comments from the Federal Reserve Board of Governors.

Background

The general term payment system refers to a mechanism for the transfer of monetary value and related information. Transfer of value can occur, for example, when a customer writes a check to a company and the funds are then transferred from the customer's bank account to the bank account of the company. Related information exchanged at the same time might include the identification of the payee and the payor, bank account numbers, and the date of payment. Clearance is the process of transmitting, reconciling, and in some cases, confirming payment orders or securities transfer instructions before settlement takes place. Settlement is the final step in the transfer of ownership. In a banking transaction, settlement is the process of recording the debit and credit positions of the parties involved in a transfer of funds; in a securities transaction, settlement includes both the transfer of securities by the seller and the payment by the buyer.

In order to promote the smooth functioning of the nation's economic activity, payment systems must provide for a reliable and accurate exchange, a measure of security for transactions, and finality of payment (i.e., settlement that cannot be reversed or withdrawn at a later time). In most cases, there is a delay between the exchange of instructions and information concerning a transaction and its final settlement. For example, when an individual deposits a check into his or her bank account, the bank then instructs the bank on which the check was drawn (payor's bank) to pay the specified amount to the individual's bank, which will, in turn, credit that amount to his or her account. The actual settlement—i.e., the transfer of funds from the payor's bank to his or her bank account—may not occur until several days after the check was deposited.

There is a trade-off between the security and speed of settlement and its cost. Wholesale systems for the exchange of large-value payments or products tend to have greater security (greater risk controls) than do retail systems. The loss on one wholesale transaction could be thousands of times greater than that for a typical retail transaction. Speed of settlement also adds to security. With less time between clearance and settlement, there is less likelihood of a default by one of the involved parties, all other

things being equal. However, increased security and timeliness generally come at an increased cost. An electronic transaction that settles instantaneously may cost as much as 50 times more than a transaction in a system that settles in 24 hours or more.

Settlements can be "gross" or "net." Gross settlement means each transaction is settled individually. Net settlement means that parties exchanging payments will offset mutual obligations to deliver identical items (e.g., dollars and Deutsche Marks) at a time, such as the end of the day, after which only one net amount of each item is exchanged.

Each system or product has associated with it some type of risk and, in some cases, several types of risk. For purposes of this report, we discuss some of the most important risks and risk mitigations associated with these systems, products, and services. For example, counterparty/credit risk arises from the potential that a borrower or counterparty will fail to perform on an obligation. Operational risk arises from the potential that inadequate information systems, operational problems, breaches in internal controls, or unforeseen catastrophes will result in unexpected losses. Risk of fraud is risk of intentional deceptions that could result in monetary loss. Payment system participants, regulators, and service providers take steps to mitigate these risks. The risk mitigation strategies vary by type of system and are generally more rigorous for large-dollar transactions.

Overview

The United States has a wide variety of payments, clearance, and settlement systems. Some systems are used primarily for large-dollar payments, such as Fedwire¹ and the Clearing House Interbank Payment System (CHIPS),² others are used for the clearance and settlement of financial products, such as securities, futures, and options. These systems are mainly used by major financial players, such as banks and other corporations, and are generally referred to as wholesale systems. Other systems are used for the smaller dollar transactions with which most consumers are familiar—e.g., checks, credit cards, and automated clearing house payments (such as electronic deposits of paychecks or Social Security payments). Generally, these smaller dollar systems are referred to as retail systems.

¹Fedwire is the electronic funds transfer system operated by the Federal Reserve.

²CHIPS is a private-sector electronic funds transfer system run by the New York Clearing House Association (NYCHA).

New, consumer-oriented products, such as stored-value cards, are now being introduced. A stored-value card is a credit-card-sized device with an implanted computer chip, that has a certain value and can be used for a variety of applications including financial transactions. New services, such as electronic money, are also being tested and marketed. Electronic money is funds held in an online account that can be transferred over the Internet between any two parties, including consumer to consumer. These new products and services have not yet gained wide acceptance, but many private-sector companies are planning for the rapid expansion of these and similar products in the future.

The types of risk we discuss in this report are generally present in all payments, clearance, and settlement systems. For example, operational risk, such as the risk of computer failure, is inherent in all systems. One type of mitigation strategy for operational risk focuses on having adequate computer back-up systems. We do not discuss all relevant risks or mitigation strategies but focus on some of the more important ones.

Many significant issues have been raised by industry officials, regulators, and others regarding the operations, use, and regulation of payments, clearance, and settlement systems. For large-dollar transactions, some have raised the issue of the appropriateness of some institutions using less secure payment systems to reduce their costs of transfers. Others have raised issues about new and emerging products, such as stored-value cards and home banking. For example, some said these products are being offered, by both banks and their nonbank competitors, yet banks are subject to a much greater degree of regulation of these products than are nonbanks. Also, many have raised questions about the appropriate regulatory structure for these products and services. Security issues for both wholesale systems, such as Fedwire and CHIPS, and emerging services, such as home banking, have also been raised. The enormous volume and rapid growth in foreign exchange transactions have led to discussion and studies of how to better reduce risk in this market. Finally, many private industry officials, especially private payment system providers, have raised issues for some time about the ability of the Federal Reserve to be both a regulator of payment systems and a fair competitor in delivering these payment services.

Scope and Methodology

To obtain information on and describe retail and wholesale payments, clearance, and settlement systems; to identify risk and risk mitigation strategies;³ and to identify issues concerning these systems, we:

- interviewed officials from international and federal financial regulators, including the Bank for International Settlements, the Board of Governors of the Federal Reserve System; the Federal Reserve Banks of New York, Richmond, Boston, and San Francisco; the Office of the Comptroller of the Currency; the Federal Deposit Insurance Corporation; the Office of Thrift Supervision; and the Securities and Exchange Commission;
- interviewed officials and analyzed statistics and documents from various private-sector payments system providers and participants, including the National Automated Clearing House Association, the New York Clearing House Association, Visa International, the Society for Worldwide Interbank Financial Telecommunications (S.W.I.F.T.), the Chicago Board of Trade (CBOT), the Chicago Mercantile Exchange (CME), and their respective clearing organizations—the Board of Trade Clearing Corporation and the CME's clearing house division;
- interviewed officials and analyzed statistics and documents from various consumer groups.

To identify new and emerging products and services, their associated risk and risk mitigation strategies, and related issues, we interviewed officials, and analyzed statistics and documents from the following:

- consultants with expertise in the development of commercial sites on the Internet;
- representatives of software/hardware companies developing products for electronic commerce and electronic banking applications;
- law firms and others with knowledge of legal issues involved in the development of commercial applications for the Internet;
- representatives of stored-value card corporations; and
- officials from other organizations involved in the development of these products and services.

We did our work primarily in Washington, D.C., and New York between January 1996 and April 1997 in accordance with generally accepted government auditing standards.

³We did not test the adequacy of any of the risk mitigation techniques discussed in this report.

Federal Reserve's Comments and Our Evaluation

We requested comments on a draft of this report from the Federal Reserve Board of Governors. The Federal Reserve's written comments along with our responses appear in appendix I. In addition, the staff of the Board of Governors provided technical comments that were incorporated in this report as appropriate. We chose not to incorporate all of the Federal Reserve's complex, technical suggestions, because our purpose, as stated, was to provide basic information on the systems at a consistent level of detail.

The Federal Reserve expressed concern about the manner in which we categorized various risks in the payments systems. In addition, the Federal Reserve suggested that some types of risks, such as liquidity risk, were excluded from our discussion. The Federal Reserve also found our discussion of the legal and regulatory framework for the various payment mechanisms to be confusing because it addressed regulation of transactions in some instances and supervisory regulation of the parties in others. The Federal Reserve pointed out that in its view our draft report did not discuss similar payment systems in a manner that provided easy comparison or assessment of differences.

The Federal Reserve also raised concerns about our presentation of the issues concerning traditional wholesale and retail payments systems and new and emerging products and services. In some instances, the Federal Reserve suggested that our discussion of the issues was incomplete. In other cases, it noted that the potential problems we raised about new emerging products and services also apply to more traditional products and services such as credit cards and checks. Finally, the Federal Reserve suggested that on several issues our draft report did not fully account for the actions that the Federal Reserve has taken to mitigate potential problems.

As we state in our report, our purpose in providing information on risks and risk mitigations was to highlight some of the more important risks raised by payment industry officials and others with respect to specific payment systems. Our intent was neither to provide an exhaustive list of all types of risks present in all payment systems nor to evaluate which ones are more or less important. Many public- and private-sector organizations categorize risk in different ways; we attempted to be consistent but also tried to use the same terms used by our sources. Although the Federal Reserve expressed concern that liquidity risk was not specifically identified, liquidity risk generally was not one of the major risks raised by industry officials and others we interviewed.

Our purpose in discussing the legal and supervisory framework was to provide a general overview of the applicable laws, regulations, and where it might be unclear to the reader, the supervisory framework for these systems and products. For all the products and services, we discuss the legal and regulatory structure. In some instances, where we felt additional information would be helpful to the reader, we also discuss supervision of the products and services. Our report was not intended to provide a comprehensive survey of the supervision and oversight of these payment system products and services.

With regard to the ease of comparison of various payment systems, our purpose in this report was to provide basic information on each of these systems, products, and services, not to provide a comparative study of them. But we do present the information in a consistent format and report comparable statistics to the extent possible.

The purpose of presenting information on issues regarding payment systems was to highlight rather than discuss in depth, evaluate, or resolve potential problems and concerns that were raised by industry, public sector, and other officials. A detailed analysis of the various factors that would need to be taken into consideration in addressing these issues, or that could affect how these issues can be resolved, was beyond the scope of this report. Section 5 of the report is not designed to include a comprehensive list of all of the issues in the payments, clearance, and settlement environment.

With regard to issues related to new and emerging products and services, we agree that some of these issues may be applicable to more traditional payment systems. Again, our purpose was simply to highlight the issues raised by industry officials in connection with these new products and services. We have reviewed and incorporated where appropriate information the Federal Reserve has provided on actions it has undertaken to mitigate potential problems associated with some issues.

We are sending copies of this report to the majority and minority Members of the House and Senate Banking Committees, Agriculture Committees, and Commerce Committees, and to other interested parties. We will also make copies available to others on request.

This report was prepared under the direction of Susan Westin, Assistant Director, Financial Institutions and Markets Issues. Other major contributors to this review are listed in appendix II. If you have any questions about this report, please call me at (202) 512-8678.

Sincerely yours,



Jean Gleason Stromberg
Director, Financial Institutions
and Markets Issues

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Abbreviations

ABMS	Account Balance Monitoring System
ACH	Automated Clearing House
AMEX	American Stock Exchange
ASO	Additional settlement obligation
ATM	Automated Teller Machine
AVS	Address Verification Service

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BIS	Bank for International Settlements
BOTCC	Board of Trade Clearing Corporation
CBCH	California Bankers Clearing House
CBT	Chicago Board of Trade
CCH	Chicago Clearing House Association
CFTC	Commodity Futures Trading Commission
CHECCS	Clearing House Electronic Check Clearing System
CHIPS	Clearing House Interbank Payment System
CME	Chicago Mercantile Exchange
CNS	Continuous net settlement
CRA	Community Reinvestment Act
CST	Central Standard Time
CUSIP	Committee on Uniform Securities Identification Procedures
DCIA	Debt Collection Improvement Act of 1996
DM	Deutsche mark
DTC	Depository Trust Corporation
DVP	Delivery-versus-payment
EAF-2	Frankfurt Electronic Clearing System
ECHO	Exchange Clearing House
ECCHO	Electronic Check Clearing House Organization
ECP	Electronic check presentment
EDC	Electronic Data Capture
EFAA	Expedited Funds Availability Act of 1987
EFTA	Electronic Funds Transfer Act
EMS	Electronic Money System
EROC	East Rutherford Operations Center
ET	Eastern Time
FCM	Futures Commission Merchant
FDIC	Federal Deposit Insurance Corporation
FRBNY	Federal Reserve Bank of New York
FTC	Federal Trade Commission
GSCC	Government Securities Clearing Corporation
ICS	Issuer's Clearing House Service
IRS	Internal Revenue Service
MCA	Monetary Control Act of 1980
MICR	Magnetic Ink Character Recognition
NACHA	National Automated Clearing House Association
NASD	National Association of Securities Dealers
NOCH	National Organization of Clearing Houses
NSCC	National Securities Clearing Corporation

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NYACH	New York Automated Clearing House
NYCHA	New York Clearing House Association
NYSE	New York Stock Exchange
OCC	Options Clearing Corporation
OFAC	Treasury Office of Foreign Assets Control
OTC	Over-the-counter
PAX	Private ACH Exchange
PVP	Payment-vs.-payment
RTGS	Real-Time Gross Settlement System
S.W.I.F.T.	Society for Worldwide Interbank Financial Telecommunications
S-HTTP	Secure HyperText Transfer Protocol
SEC	Securities and Exchange Commission
SET	Securities Electronic Transaction
SSL	Secure Sockets Layer
TAP	Transaction adjusted payment
TLA	Truth in Lending Act of 1968
UCC	Uniform Commercial Code
WWW	World Wide Web

Overview of Clearance and Settlement of Wholesale Payment Systems

In this section of the report, we discuss the two primary wholesale payment systems in the United States, the Federal Reserve's Fedwire funds transfer service, and the Clearing House Interbank Payments System (CHIPS), as well as foreign exchange transactions.

Main Characteristics

- Wholesale payments are large-value payments made by major financial players, such as banks and other corporations.
- The Federal Reserve's Fedwire funds transfer service, primarily used for domestic payments, is a real-time, gross settlement system in which the Federal Reserve guarantees payment to the receiver of the funds. CHIPS, a private-sector multilateral netting organization, is used mainly to settle the U.S. dollar side of foreign exchange transactions.
- Foreign exchange transactions involving U.S. dollars, being an exchange of currencies, involve two settlements: dollars settled in the United States, and another currency settled in that currency's national payment system.

Statistical Information

In 1996:

- Fedwire funds transfer service's average daily transaction amount was \$989 billion, and the average amount per transaction was \$3.0 million.
- CHIPS' average total daily transaction value was \$1.3 trillion, and the average value per transaction was \$6.2 million.
- On average in early 1995, nearly \$1.2 trillion of foreign exchange trades were transacted globally per day.

Regulatory Information

- Fedwire's funds transfers are regulated under subpart B of the Federal Reserve's Regulation J.
- Funds transfers processed over CHIPS are regulated under New York State's version of the Uniform Commercial Code (UCC) Article 4A, and rules adopted by the New York Clearing House Association (NYCHA).
- Oversight of banks conducting foreign exchange transactions in different countries is provided by the bank regulators in those countries.

Risk Information

- The Federal Reserve is exposed to credit risk for those payments transmitted over Fedwire that generate daylight overdrafts in a participant's account.
- A CHIPS failure to settle could create systemic risk and, in recognition of this, a series of risk controls has been established.
- Settlement failure in foreign exchange transactions could transmit systemic problems internationally.

Fedwire Electronic Transfer of Funds

Description and Use

The Fedwire funds transfer system is one of the two primary large-dollar electronic payments systems in the United States.¹ In 1996, Fedwire's average total daily transaction value for the electronic transfer of funds was about \$989 billion; the average value per transaction was \$3.0 million. The Fedwire funds transfer service allows depository institutions to transfer funds on their own behalf or on behalf of their customers; most Fedwire payments are related to domestic transactions. The Department of the Treasury and other federal agencies also use Fedwire to disburse and collect funds.

Key Terms

D Daylight overdraft

A daylight overdraft is a negative position in an institution's Federal Reserve account at any time during the business day.

F Federal Reserve account

A Federal Reserve account is a noninterest earning account that depository financial institutions maintain with a Federal Reserve Bank. The balance in a Federal Reserve account is maintained for purposes of (1) satisfying the Federal Reserve's reserve requirements and/or (2) settling payments cleared through the Federal Reserve. The balances in these accounts play a central role in the exchange of funds between depository institutions.

Finality

Finality is an irrevocable and unconditional transfer of payment.

N Net debit cap

A net debit cap is the maximum dollar amount of daylight overdrafts an institution is permitted to incur in its Federal Reserve account. Under the Federal Reserve's policy, institutions are subject to two caps—a daily cap and a 2-week cap.

R Real-Time Gross Settlement (RTGS) system

An RTGS system is a system that is said to operate in real-time if it processes each transaction as it is initiated rather than processing it in a batch. Gross settlement means that the system settles each transfer individually.

¹The other large-dollar electronic payments system, the Clearing House Interbank Payments System (CHIPS), is discussed separately in this report.

Basic Data

Virtually all of the approximately 9,500 depository institutions with Federal Reserve accounts use them to transmit funds transfers over Fedwire. In 1996, the total volume of dollars transferred over the Fedwire funds transfer service was \$249 trillion. As shown in table 1.1, for the period of 1992 through 1996, the volume and the average daily transaction value of Fedwire funds transfers increased, but the average value of a Fedwire funds transfer transaction remained relatively constant at about \$3.0 million.

Table 1.1: Selected Data on Fedwire Funds Transfers

	1992	1993	1994	1995	1996	Percent change 1992-96
Average number of daily transfer messages	267,000	277,000	287,000	302,000	328,000	23%
Average daily transfer value	\$787 billion	\$824 billion	\$841 billion	\$888 billion	\$989 billion	25
Average value per transfer	\$2.9 million	\$3.0 million	\$2.9 million	\$2.9 million	\$3.0 million	3
Fees per transaction ^a	\$0.53	\$0.53	\$0.53	\$0.50	\$0.50	-6

^aBoth the sender and the receiver of a Fedwire funds transfer are charged a fee. In January 1997, the transfer fee was reduced to \$0.45.

Source: Federal Reserve Bank of New York.

Processes

Fedwire is a real-time gross settlement (RTGS) system. The Fedwire funds transfer system operates from 8:30 a.m. Eastern Time (ET) to 6:30 p.m. ET.²

The Fedwire funds transfer operating system essentially consists of two components:

- A high-speed, nationwide communications network (FEDNET) that electronically links all Federal Reserve Banks and branches with depository institutions;³ and

²Beginning on Dec. 8, 1997, the Fedwire funds transfer service is scheduled to open at 12:30 a.m. (ET) and close at 6:30 p.m. (ET).

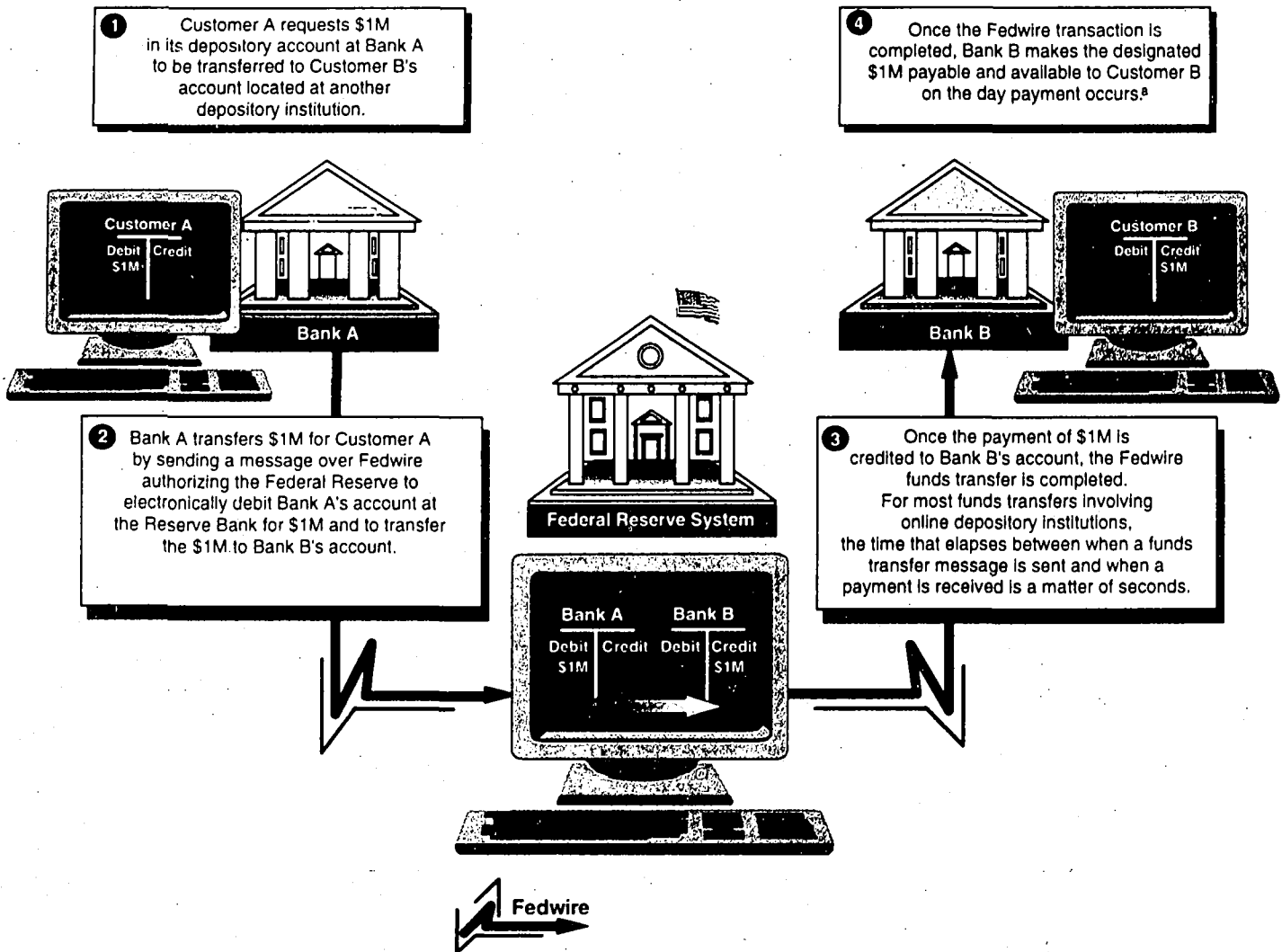
³This network is used by depository institutions to access a variety of Federal Reserve services, including Fedwire.

- A computerized capability to process and record individual funds and transfers⁴ as they occur.

Fedwire allows depository institutions to transfer funds on their own behalf or on behalf of their customers. Each depository institution using the Fedwire funds transfer system must have a Federal Reserve account with its respective Federal Reserve Bank. Figure 1.1 illustrates how a typical funds transfer transaction between two customers is transmitted over Fedwire.

⁴A separate system, the Fedwire securities transfer service is discussed in the securities section (Section 2) of this report.

Figure 1.1: A Fedwire Funds Transfer Transaction



^aAccording to a Federal Reserve Bank of New York publication, once a funds transfer is completed, the funds are generally available for immediate withdrawal.

Source: Federal Reserve.

Fedwire Offers Immediate Finality

A critical feature of Fedwire is that it offers immediate finality. Immediate finality of payment sets Fedwire apart from any other electronic payment system operating in the United States. Under Regulation J, the Federal Reserve "guarantees" the payment to the depository institution receiving the Fedwire transaction and assumes any credit risk if there are insufficient funds in the Federal Reserve account of the bank sending the payment.

Changes in Fedwire's Operating Environment

The Federal Reserve is undertaking several enhancements to Fedwire's operating environment for the purpose of reducing risk related to funds transfers and increasing the usefulness of Fedwire. Two significant changes affecting the Fedwire funds transfer service are the expansion of Fedwire's operating hours and a new, expanded message format for funds transfers.

As previously mentioned, the Fedwire funds transfer system operates from 8:30 a.m. ET to 6:30 p.m. ET. Beginning on December 8, 1997, Fedwire's funds transfer online operating hours are to be expanded to an 18-hour operating day, from 12:30 a.m. ET to 6:30 p.m. ET. The Federal Reserve's decision to extend Fedwire's funds transfer operating hours was part of its response in addressing the potential risk arising from the growing volume of cross-border payments. The extension of Fedwire's hours for funds transfers means that Fedwire would be open while major foreign financial centers are open. Cross-border payments are discussed in more detail in the Foreign Exchange segment of this section.

The Federal Reserve is in the process of expanding the Fedwire funds transfer message format, which is to be fully implemented by year-end 1997. The expanded transfer format is intended to improve efficiency in the payments mechanism by reducing the need for manual intervention when processing and posting transfers, and by making the format more compatible with the formats used by CHIPS and the Society for Worldwide Interbank Financial Telecommunication (S.W.I.F.T.). In addition, the expanded format permits the inclusion of additional originator and beneficiary information, as required by Treasury regulations.

Regulatory Oversight

Funds transfers through Fedwire are regulated under subpart B of Federal Reserve's Regulation J. This part of Regulation J generally incorporates Article 4A of the Uniform Commercial Code (UCC) as the governing law for the Fedwire funds system. The UCC is a set of model state laws governing

commercial and financial activities. UCC Article 4A sets out the rights and obligations of the various participants in a funds transfer, including those of the originator, intermediary institutions, and the beneficiary.

Subpart B of Regulation J also directs each Reserve Bank to issue operating circulars governing funds transfer operations. These circulars cover such matters as operating hours, security, authentication, and fees.

Risk and Risk Mitigation

For the purposes of this report, we discuss some of the most important risks and risk mitigations associated with Fedwire.

Table 1.2: Risk and Risk Mitigation for Fedwire

Risk	Risk mitigation
Counterparty credit risk	Net debit caps (including zero caps)
	Account balance monitoring system
	Daylight overdraft fees
Operational risk	Back-up facilities
	Automated recovery
Fraud risk	Data security:
	• Encryption
	• Authentication procedures
	• Access controls

Risk 1: Counterparty Credit

Because the Federal Reserve grants finality (i.e., final and irrevocable credit) to the recipients of funds sent over Fedwire, the Federal Reserve Bank assumes any credit risk if there are insufficient funds in the Federal Reserve account of the depository institution sending the funds. For example, if Bank A, in our hypothetical example (see figure 1.1), had an insufficient account balance to cover the funds transfer, the Federal Reserve, in its sole discretion, may allow Bank A to overdraw its account. While Bank A's account is overdrawn, the Federal Reserve would be at risk for any losses should Bank A fail. This credit risk, commonly referred to as a daylight overdraft, is present even for an overdraft position that occurs only briefly during the day. The Federal Reserve requires depository institutions to eliminate any daylight overdrafts by the close of Fedwire each day. From 1986 to 1996, the average daily peak daylight overdrafts for funds transfers increased from \$63 billion to \$68 billion.

Daylight overdrafts, if not repaid by the end of the day, could become unsecured overnight overdrafts. The Federal Reserve attempts to discourage overnight overdrafts by imposing high monetary penalties and taking administrative action against institutions that incur them repeatedly.

Mitigation

Net debit caps. In 1985, the Federal Reserve Board adopted a program of maximum limits, or net debit caps, for each depository institution. A net debit cap is a maximum level of daylight overdrafts that a depository institution may incur in its account at the Federal Reserve. The dollar amount of a specific net debit cap is determined by an institution's capital and is a multiple of the institution's capital. The multiple is to be based on the financial strength of each institution. The strongest institutions may obtain a higher cap multiple than that obtainable by riskier institutions. The most risky institutions are to be assigned a zero net debit cap and prohibited from originating a Fedwire funds transfer that would cause their account to become overdrawn, or, in an extreme case, the Federal Reserve may terminate the institution's online access to Fedwire. In some cases, the Federal Reserve may require weak depository institutions to collateralize their overdrafts. A recent Federal Reserve study found that net debit caps seemed to have restrained the growth of daylight overdrafts that are not related to securities transfers during the 1986 through 1993 period.⁵

According to the Federal Reserve's Policy Statement on Payment System Risk, depository institutions that use intraday Federal Reserve credit in amounts that exceed 40 percent of risk-based capital on a single day or, on average, over a 2-week period must establish their daylight overdraft caps by a self-assessment process. This process is required in order to establish a cap in any one of the Average, Above Average, or High categories. A high-cap multiple would permit the 2-week average of daily peak daylight overdrafts to be 1.5 times the depository institution's capital. Reserve Banks also have the authority to reduce an institution's Fedwire net debit cap unilaterally.

⁵Heidi Richards, "Daylight Overdraft Fees and the Federal Reserve's Payment System Risk Policy," Federal Reserve Bulletin, Dec. 1995.

Mitigation

Account balance monitoring. Net debit caps are permitted at the discretion of the Federal Reserve Banks. Using Fedwire's Account Balance Monitoring System (ABMS), the Reserve Banks can hold or reject funds transfers that may cause account holders to exceed their net debit caps. ABMS allows the Reserve Banks to monitor depository institutions' account positions and payment activity on a real-time basis.

Mitigation

Daylight overdraft fees. In September 1992, the Federal Reserve Board adopted a policy under which the Federal Reserve Banks would, beginning in April 1994, charge a fee to depository institutions for average daylight overdrafts in deposit accounts with Federal Reserve Banks as a supplement to the existing net debit cap policy. The Board set the initial fee at an annual interest rate of 10 basis points (0.10 percent) of chargeable daily daylight overdrafts.⁶ In April 1995, the fee was increased to 15 basis points.⁷ The chargeable overdraft is the institution's average per-minute daylight overdraft for a given day, less a deductible amount equal to 10 percent of its risk-based capital.

The Federal Reserve study mentioned earlier also found that the imposition of daylight overdraft fees resulted in a decline in the average per-day overdrafts by depository institutions. Specifically, the study showed that the aggregate intraday peak overdrafts fell approximately 40 percent, from nearly \$125 billion per day on average, during the 6 months preceding April 14, 1994, to about \$70 billion in the 6 months following the introduction of daylight overdraft fees on April 14.⁸

Risk 2: Operational

Because of the enormous value and importance of the funds transfers sent over Fedwire daily, any temporary outages in the Fedwire electronic system could pose significant economic and financial risks. Moreover, a prolonged outage of the Fedwire electronic system could cause an unacceptable disruption of the U.S. payment system.

⁶A basis point is one-hundredth of one percent.

⁷Originally, the Board had planned to increase the fee to 25 basis points as of Apr. 1996, but in early 1995, the Board determined that a smaller fee increase to 15 basis points would be more appropriate. In addition, the Board decided to wait 2 years before evaluating the results of the Apr. 1995 increase. This stated rate is based on the current 10-hour Fedwire funds transfer operating day. On Dec. 8, 1997, the stated rate for the 18-hour operating day is to be 27 basis points.

⁸Richards, p. 1071.

Mitigation

Back-up facilities. If an operational disaster should occur to the primary computer at the East Rutherford Operations Center (EROC), the Federal Reserve has designed Fedwire to automatically resume payment processing almost instantaneously at its back-up computer at the EROC site. If the entire EROC site is down, a remote database is designed to allow Fedwire to resume payment processing at its secondary back-up center (Federal Reserve Bank of Richmond) within 60 to 90 minutes of a decision to relocate operations. The infrastructure is in place to allow Fedwire to resume payment processing at its tertiary site should an operational disaster occur at both the primary and secondary data centers.

Mitigation

Automated recovery. Fedwire databases are duplicated for instantaneous availability in the event of a database device failure. If a database recovery is required, each participant has to retransmit only those payments that were previously sent on Fedwire and indicate the loss of payments through the recovery report. Fedwire tests its contingency plans in multiple mandatory exercises annually against a variety of simulated events, which include computer, site, and network outages.

Risk 3: Fraud

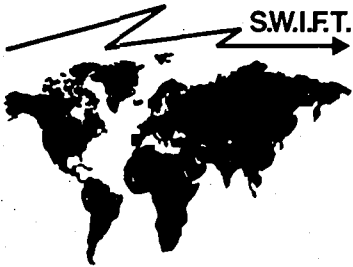
There is the potential that fraudulent transfers could be transmitted over Fedwire. For example, a computer hacker could make an unauthorized funds transfer over Fedwire, or a bank employee could perform unauthorized wire transfers.

Mitigation

Data security measures. The Federal Reserve has implemented a variety of data security measures to protect the integrity, confidentiality, and continuity of the Fedwire system. These measures include access, authentication, and verification controls; data encryption; procedural controls over such processes as application changes, data entry and database updates; physical security; and personnel standards. These controls are designed to prevent tampering with, destroying, or disclosing Fedwire data, either by Federal Reserve employees or outside hackers. For example, Fedwire messages between depository institutions and the Federal Reserve are encrypted and authenticated to prevent interception and alteration. Access controls, such as unique user identification codes and passwords, are also a primary means for preventing unauthorized transfers. For example, employees at a depository institution must use a valid and unique user identification code and password to enter and send a Fedwire message, and that message must come from a connection associated with that employee's institution.

Depository institutions also have strong incentives to establish security procedures to govern their initiation, verification, and receipt of Fedwire funds transfers as well as other funds transfers. In particular, a depository institution assumes full liability for any Fedwire funds transfers executed from its authorized connection to the Fedwire system. Furthermore, Article 4A of the UCC, through its allocation of liability for erroneous or fraudulent transfers, encourages the establishment of commercially reasonable security procedures. A review of depository institutions' funds transfer security procedures is also a component of the banking regulators' programs.

S.W.I.F.T.



Society for Worldwide Interbank Financial Telecommunications (S.W.I.F.T.), incorporated in Belgium, is a cooperative owned by over 2,800 banks from around the world, including over 150 from the United States (owning 13 percent of the shares). It operates a network that processes and transmits financial messages among members and other users in 137 countries. The United States accounts for more usage than any other country.

Users

S.W.I.F.T. messages convey information or instructions between financial institutions:

- Messages are formatted and contain information about the originator, purpose, destination, terms, and recipient.
- The largest use of S.W.I.F.T. is for payment messages, through which one institution transmits instructions to another to make payments.
- Other messages are used to confirm the details of a contract entered into between two users, such as a foreign exchange trade or an interbank deposit placement.
- For securities, S.W.I.F.T. messages can transmit orders to buy or sell or convey instructions concerning delivery and settlement.

Statistical Information

An average of 2.4 million messages of all types were processed by S.W.I.F.T. per day in 1995.

- S.W.I.F.T. estimates that the value of the payments messages was \$2 trillion per day.

Clearing House Interbank Payments System

Description and Use

The Clearing House Interbank Payments System (CHIPS) is one of the two large-value electronic payments systems in the United States. The other is Fedwire. CHIPS, which is privately owned and operated by the New York Clearing House Association (NYCHA), began operations in 1970 as an electronic replacement for paper checks in international dollar payments. Although Fedwire payments are principally related to domestic transactions, U.S. dollar payments related to "foreign transactions" (such as the dollar leg of foreign exchange and Eurodollar placements) flow primarily through CHIPS.

Although CHIPS transfers are irrevocable, they are final only after the completion of end-of-day settlement.⁹ CHIPS nets its transactions on a multilateral basis. Thus, if a bank receiving a CHIPS transfer makes funds available to its customers before settlement is complete at the end of the day, it is exposed to some risk of loss if CHIPS does not settle. However, in its 27 years of operation, CHIPS has never failed to settle.

⁹In contrast, Fedwire offers immediate finality of settlement—the Federal Reserve "guarantees" the payment and assumes any credit risk.

Key Terms

M Multilateral netting	Multilateral netting is an arrangement among three or more parties to net their obligations. The obligations covered by the arrangement may arise from financial contracts, transfers of funds, or both. The multilateral netting of payment obligations normally takes place in the context of a multilateral net settlement system.
N Net debit cap	Net debit cap is the quantitative limit placed on the debit positions that participants in a funds transfer system can incur during the business day.
S Systemic risk	Systemic risk is the risk that the failure of one participant in a transfer system, or in financial markets generally, to meet its required obligations will cause other participants or financial institutions to be unable to meet their obligations (including settlement obligations in a transfer system) when due.
S.W.I.F.T.	Society for Worldwide Interbank Financial Telecommunications (S.W.I.F.T.) is an international financial payment cooperative organization that operates a network that facilitates the exchange of payment and other financial messages between financial institutions throughout the world.

Basic Data

At year-end 1996, there were 103 CHIPS participants representing financial institutions from 29 countries. CHIPS participants may be commercial banks, Edge Act corporations,¹⁰ or investment companies. To be a CHIPS participant, a financial institution is required to maintain a branch or an agency in New York City. A nonparticipant wishing to make international payments using CHIPS must employ one of the CHIPS participants to act as its correspondent or agent.

As shown in table 1.3, both the volume and the average daily transaction value of CHIPS transfers have increased, although the average size of a transfer payment has remained relatively constant for the period 1992 through 1996. In addition, the number of CHIPS participants has decreased during the same period.

¹⁰Edge Act corporations are corporations chartered by the Federal Reserve to engage in international banking for financing trade. The Board of Governors acts on applications to establish Edge Act corporations and also examines the corporations and their subsidiaries.

**Section 1: Wholesale Payment Systems • CHIPS
Clearing House Interbank Payments System**

**Table 1.3: Selected Data on CHIPS
Transfers**

Data	1992	1993	1994	1995	1996
Average number of daily transfer messages	154,439	167,311	181,667	203,318	212,544
Average daily value of transfers	\$942 billion	\$1 trillion	\$1 trillion	\$1 trillion	\$1 trillion
Average value of a transfer	\$6 million	\$6 million	\$7 million	\$6 million	\$6 million
Average fee per transaction ^a	.15	.15	.15	.15	.15
Number of CHIPS participants	122	121	115	111	103

^aThe fee listed in the table is an average fee based on the three transaction fees that CHIPS charges its participants. CHIPS charges a participant 18 cents per transaction for the first 80,000 transactions per month that it sends or receives. After a participant sends or receives over 80,000 transactions per month, CHIPS charges the participant 13 cents per transaction. Also, CHIPS charges participants 40 cents per transaction for any transaction without an account number.

Source: CHIPS.

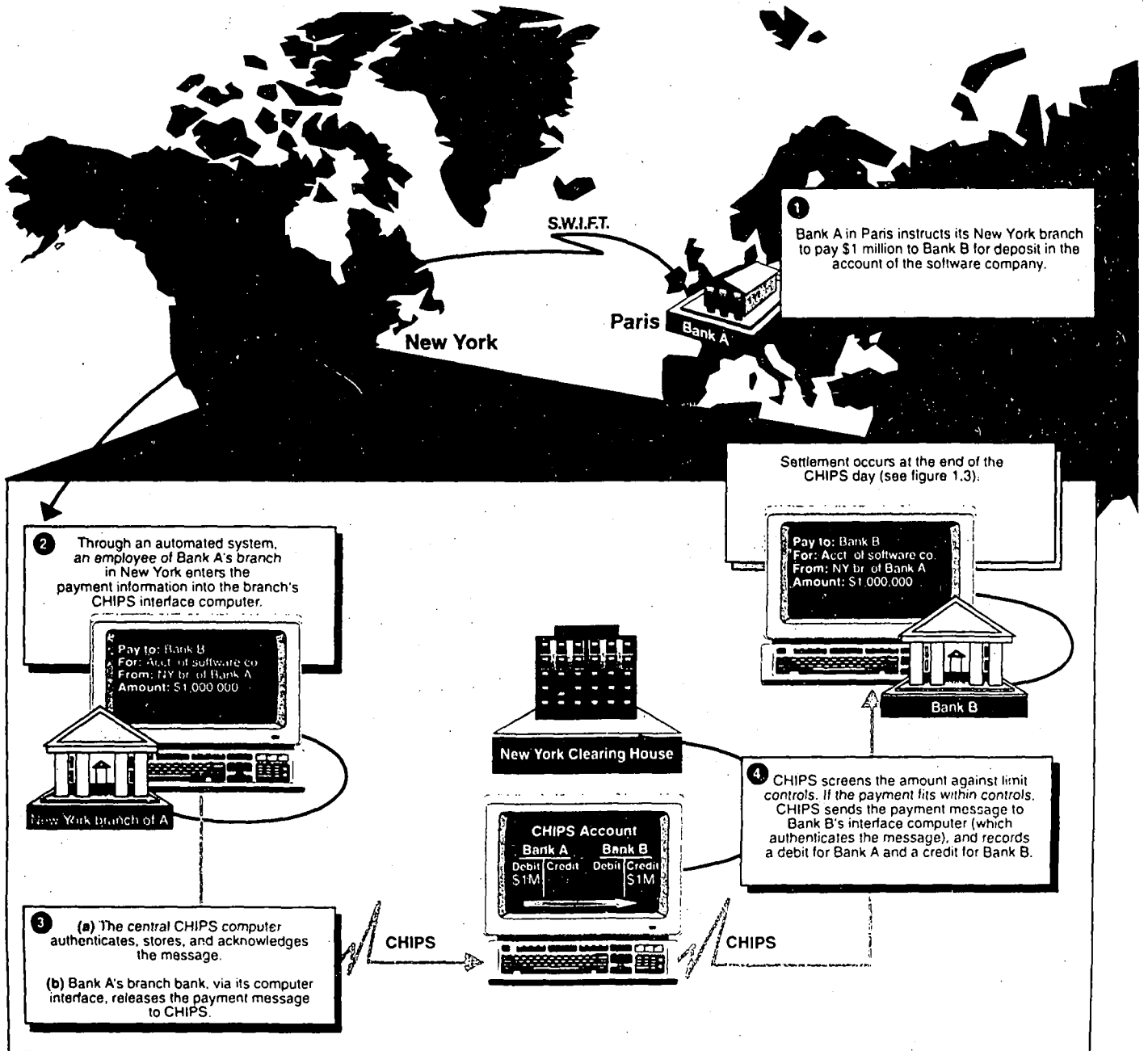
Processes

Figure 1.2 illustrates a typical CHIPS transfer.

Example: A wholesaler in Paris wishes to pay \$1 million to a U.S. software supplier for a shipment of consumer software. The French wholesaler instructs his bank in Paris (Bank A) to debit the French franc equivalent of \$1 million from his account and to arrange payment of the dollar amount to the U.S. supplier's account in Bank B in New York. This payment of dollars represents a typical CHIPS transaction. Bank A has a branch in New York. Both Bank A and Bank B are participants in CHIPS.

Section 1: Wholesale Payment Systems • CHIPS
 Clearing House Interbank Payments System

Figure 1.2: A Typical CHIPS Transfer



Source: NYCHA.

**Section 1: Wholesale Payment Systems • CHIPS
Clearing House Interbank Payments System**

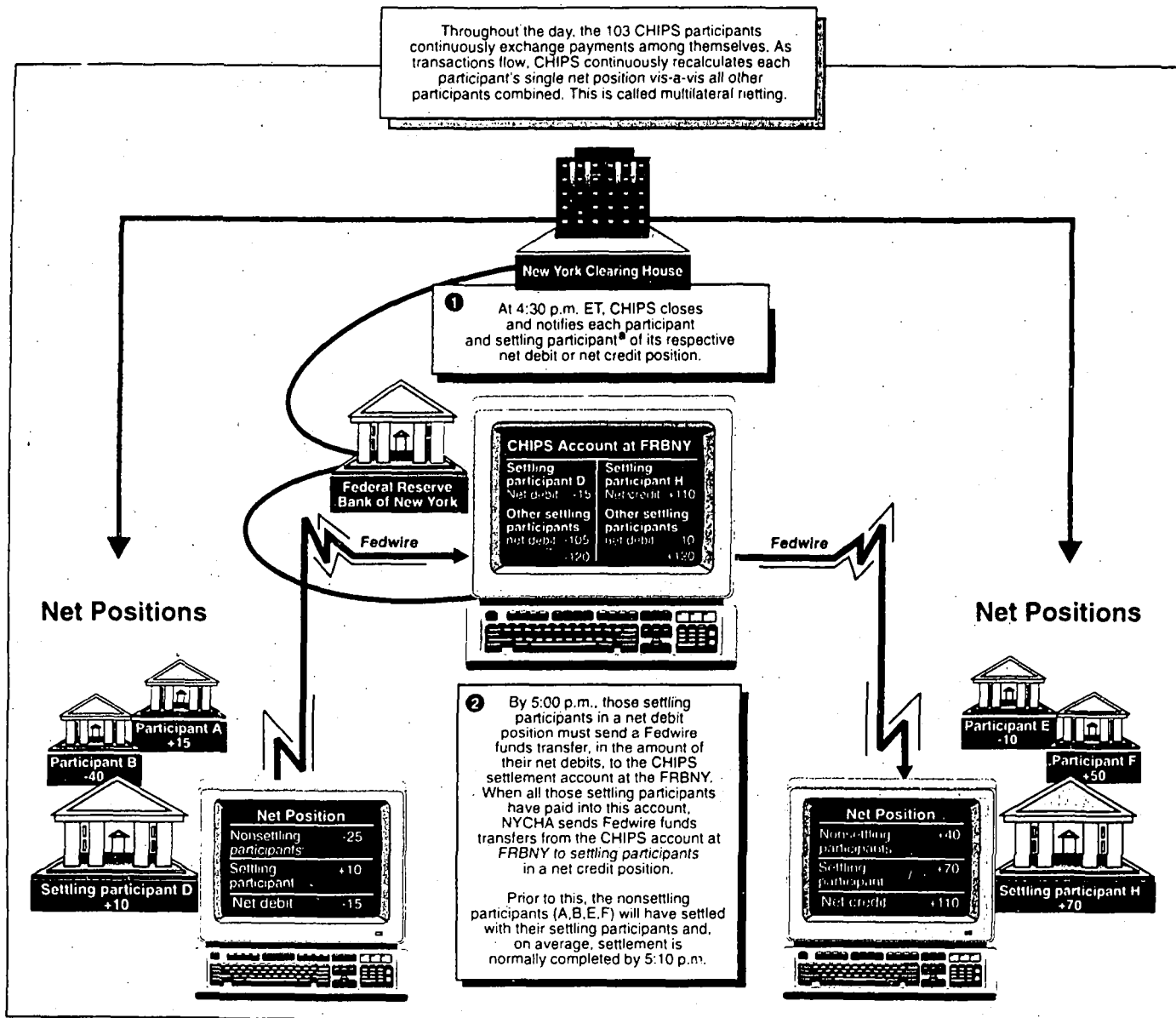
The transaction between Bank A and Bank B is not settled until CHIPS settles at the end of the day. If Bank B makes the \$1 million available to the U.S. software supplier prior to final settlement, Bank B could expose itself to some risk of loss.

**The Final Settlement of
CHIPS**

Figure 1.3 illustrates the final settlement of CHIPS. Throughout the day, the 103 CHIPS participants continuously exchange payments among themselves. As transactions flow, CHIPS continuously recalculates each participant's single net position vis-a-vis all other participants combined. This is called multilateral netting. (See discussion in foreign exchange transactions later in this section.)

Section 1: Wholesale Payment Systems • CHIPS
Clearing House Interbank Payments System

Figure 1.3: Final Settlement of CHIPS



**Section 1: Wholesale Payment Systems • CHIPS
Clearing House Interbank Payments System**

*Settling participants take part in the actual settlement of CHIPS by sending or receiving the Fedwire payments used to effect settlement. Participants that are not settling participants must designate a settling participant to settle for them and that settling participant must agree to the designation.

Source: NYCHA.

After all the settling participants that are in a net debit position have paid in funds and participants that are in a net credit position receive a Fedwire funds transfer from NYCHA, the CHIPS settlement account at the Federal Reserve Bank of New York (FRBNY) reaches a zero balance.¹¹ It is at this point that the transaction transmitted over CHIPS between Bank A and Bank B is settled and settlement is final.

Regulatory Oversight

All CHIPS participants are supervised by the New York State Banking Department or a federal bank supervisor. A coordinated interagency full examination is to be conducted of CHIPS every other year and a limited examination is to be conducted in the alternate years between the full examinations. CHIPS transfers are governed by UCC Article 4A. The UCC is a set of model state laws governing commercial and financial activities. UCC Article 4A sets out the rights and obligations of the various participants in a wire transfer.

Risk and Risk Mitigation

For purposes of this report, we discuss some of the most important risks and risk mitigations associated with CHIPS.

Table 1.4: Risk and Risk Mitigation for CHIPS

Risk	Risk mitigation
Operational risk	Back-up facilities
	Automated recovery
Systemic risk/counterparty credit risk	Same-day settlement
	Bilateral credit limits
	Net debit caps
	Loss sharing—backed up by collateral
	Membership requirements

¹¹FRBNY is not required to provide financial assistance to ensure completion of the CHIPS settlement.

Risk 1: Operational

Because of the trillions of dollars sent over CHIPS, any temporary outage in the CHIPS electronic system would pose significant economic and financial risks.

Mitigation

Back-up facilities. If an operational disaster should occur, the remote database, established by CHIPS, is designed to allow CHIPS to resume payment processing at its back-up center within 5 minutes of a decision to relocate operations.

Mitigation

Automated recovery. If the CHIPS database suffers damage, CHIPS has a computerized method for rebuilding its database. Each participant can automatically retransmit a payment previously sent if CHIPS indicates the loss of payments through the transmission of the recovery report. According to an NYCHA document, CHIPS quarterly tests its contingency plans against a variety of simulated events in mandatory exercises involving all participants.

**Risk 2: Systemic
Risk/Counterparty Credit**

The most significant risk to the financial stability of CHIPS is systemic risk. Systemic risk/counterparty credit risk occurs when one participant fails to meet its obligations and causes other participants not to meet their obligations. When high-dollar value payments are exchanged and the turnover of funds within the arrangement is also high, the degree of systemic risk is generally high as well.

Mitigation

Same-day settlement. In 1981, NYCHA instituted same-day settlement. Before same-day settlement, CHIPS transactions took up to 2 days to settle, except in the case of a weekend or holiday, when it could take up to 4 days to settle. According to an NYCHA publication, same-day settlement has eliminated overnight exposure to failures, reduced float in the banking system, and accelerated the availability of funds to customers.

Mitigation

Bilateral credit limits. Since October 1984, NYCHA has required each CHIPS participant to establish a bilateral credit limit with each of the other CHIPS participants. Each CHIPS participant is required to indicate whether or not it is willing to receive payment messages from other participants. If a CHIPS participant is willing to receive payment messages from another participant, it must set a limit on the maximum net-dollar amount that it is willing to receive from that participant.

The CHIPS operating system continuously and automatically monitors payment messages, checking them against bilateral limits. If a payment

message would cause a participant to exceed the bilateral limit that the receiving participant has set for it, CHIPS is designed to not allow the payment message to be released.

Mitigation

Net debit caps. In 1986, NYCHA established a net debit cap for each CHIPS participant. This cap limits a participant's overall net debit position to all other CHIPS participants. The significance of the net debit cap is that it limits the total amount of credit exposure that any one participant can pose to the CHIPS system. Thus, if a participant defaults, the potential net loss to all other participants can be no greater than its net debit cap. For each participant, the net debit cap is equal to 3.0 percent of the sum of the bilateral limits set for it by the other participants.

Mitigation

Loss sharing—backed up by collateral. In 1990, NYCHA established a loss-sharing arrangement supported by pledged collateral to ensure that CHIPS settles even if a participant fails. Under the loss-sharing arrangement, each participant that has established bilateral limits with the failed participant agrees to assume an additional settlement obligation (ASO), equal to its pro rata share of the failed participant's net debit position. To ensure funding of the ASO, each participant is to provide collateral in advance equal to the participant's "maximum ASO." The maximum ASO is equal to \$10 million or 5 percent of the highest bilateral limit granted to any other participant, whichever is greater. The collateral is U.S. Treasury securities, which are held in collateral accounts at FRBNY.

Mitigation

Membership requirements. CHIPS maintains membership requirements to ensure the financial stability of CHIPS and its participants. Moreover, to ensure the creditworthiness of CHIPS participants, NYCHA requires all participants to (1) be subject to a credit evaluation when they apply for membership, (2) submit copies of their financial statements, and (3) be subject to periodic review, which includes a credit review by the member banks.

Settlement of Foreign Exchange Transactions

Description and Use

A foreign exchange transaction is the trade of one currency for another, for example a trade of U.S. dollars for German marks (DM). Foreign exchange transactions are typically settled through transfers of bank balances (deposits) in the respective currencies. This is a wholesale activity conducted among financial institutions, especially banks, that may be trading for their own account or on behalf of others.

Foreign exchange transactions are generated by cross-border activities, such as international trade and the purchase or sale of foreign assets, as well as by speculation on—or hedging against—moves in exchange rates. The large financial institutions that offer to buy or sell foreign currencies for their customers commonly do a considerable amount of foreign exchange trading for their own account. This “proprietary” trading enables a financial institution to have better market information for its customers and itself and may also be conducted to hedge the institution’s own risks or in an attempt to profit from moves of exchange rates.

Key Terms

B Back office	Back office is a bank department responsible for recording and maintaining the official records of the bank and for processing transactions entered into by the bank.
C Correspondent bank	A correspondent bank is a bank that, by arrangement, holds the deposits of another bank and provides payments and other services for that bank.
H Hedging	Hedging is engaging in financial transactions to protect against potential adverse changes in the values of assets, liabilities, or off-balance-sheet activities.
N Netting	Netting is an agreed offsetting of obligations by trading partners. It can reduce a large number of individual obligations to a smaller number of obligations.
P Proprietary trading	Proprietary trading is buying or selling for the trading institution's own account, in contrast to trading the institution does on behalf of its customers.
S Speculation	Speculation is engaging in financial transactions, such as purchasing foreign currencies, in an attempt to profit from anticipated changes in market prices.
S.W.I.F.T.	Society for Worldwide Interbank Financial Telecommunications (S.W.I.F.T.) is an international financial payment cooperative organization that operates a network that facilitates the exchange of payment and other financial messages between financial institutions throughout the world.

Basic Data

On an average day, there are nearly \$1.2 trillion in foreign exchange trades transacted globally, according to a survey conducted by central banks in April 1995.¹² This figure—after adjustment for exchange rate changes—was 30 percent higher than that found in a similar survey conducted in 1992. Of the 1995 amount, 83 percent—almost \$1 trillion—involved U.S. dollars. To put this in perspective, the U.S. money stock at the end of 1995 was \$3.509 trillion.¹³ About two-thirds of foreign exchange transactions take place between bank dealers trading for their own account.

¹²Bank for International Settlements, "Central Bank Survey of Foreign Exchange and Derivatives Market Activity, 1995."

¹³U.S. money stock, M2 measure, is composed of currency outside banks, checking and savings deposits, small time deposits, retail money market funds, and traveler's checks.

Processes

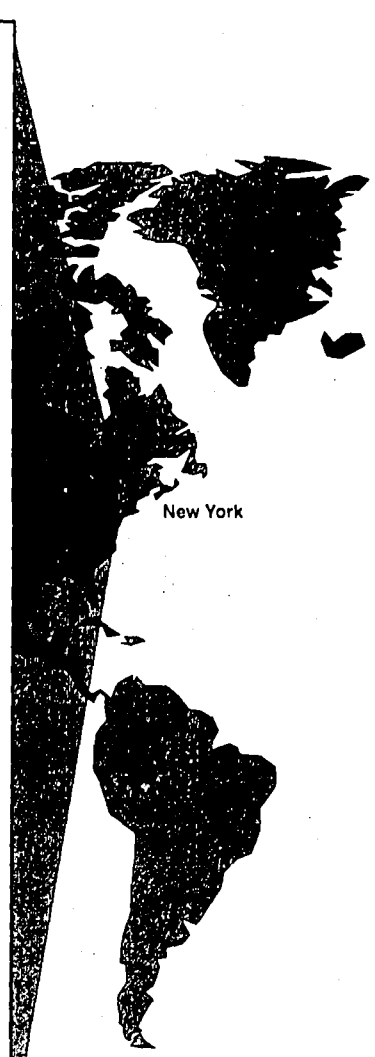
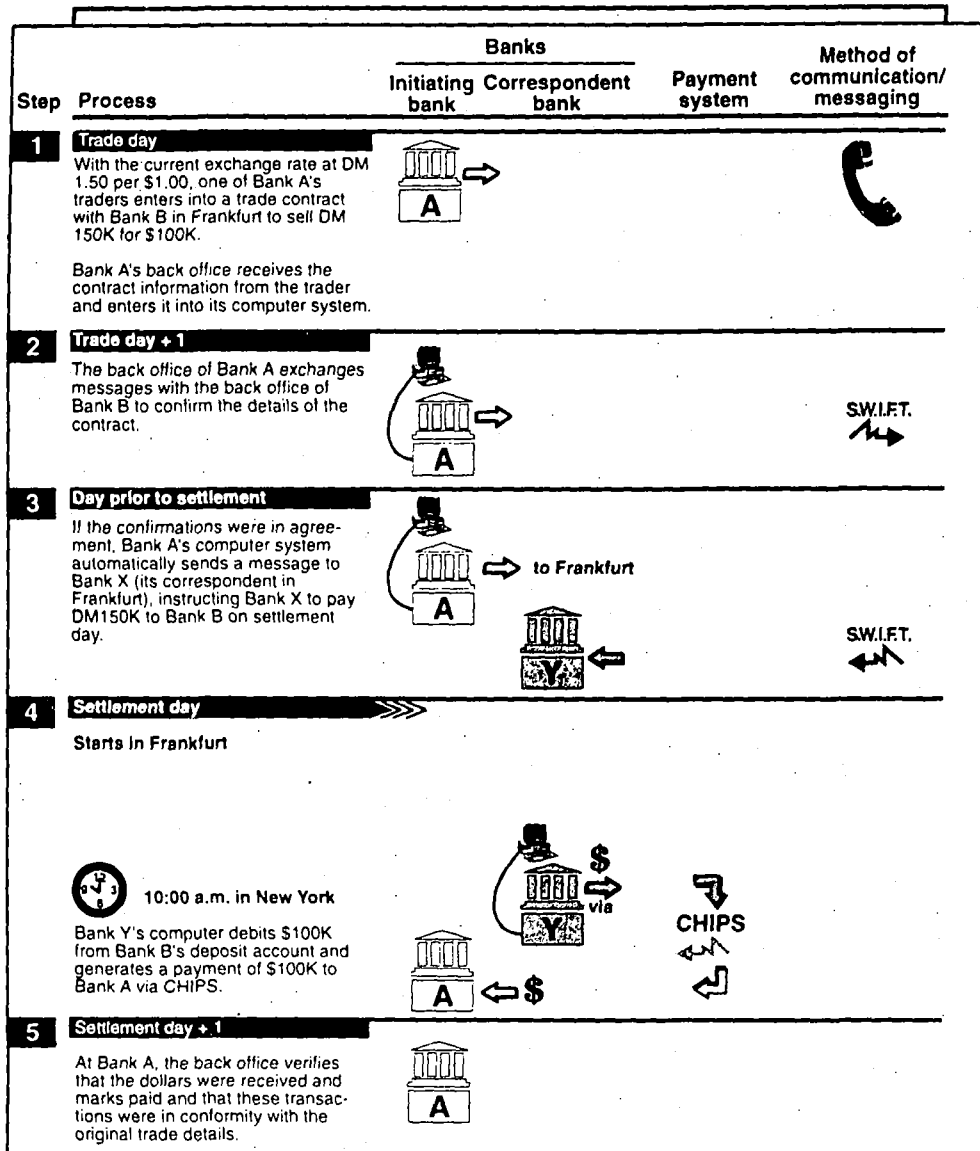
Example: A bank in New York (Bank A) has 200,000 German marks (DM200,000) on deposit with its correspondent bank in Frankfurt, Germany (Bank X) and wishes to sell DM150,000 of that amount in exchange for U.S. dollars. It might be initiating this trade for its own account or on behalf of a customer.

This will be a "spot" transaction, in which settlement will be 2 days after the trade is negotiated. Figure 1.4 illustrates how this transaction is processed.

**Section 1: Wholesale Payment Systems • Foreign Exchange
Settlement of Foreign Exchange
Transactions**

Figure 1.4: A Typical Foreign Exchange Transaction

New York



Initiating bank in New York City.



In New York City, correspondent bank of Bank B.



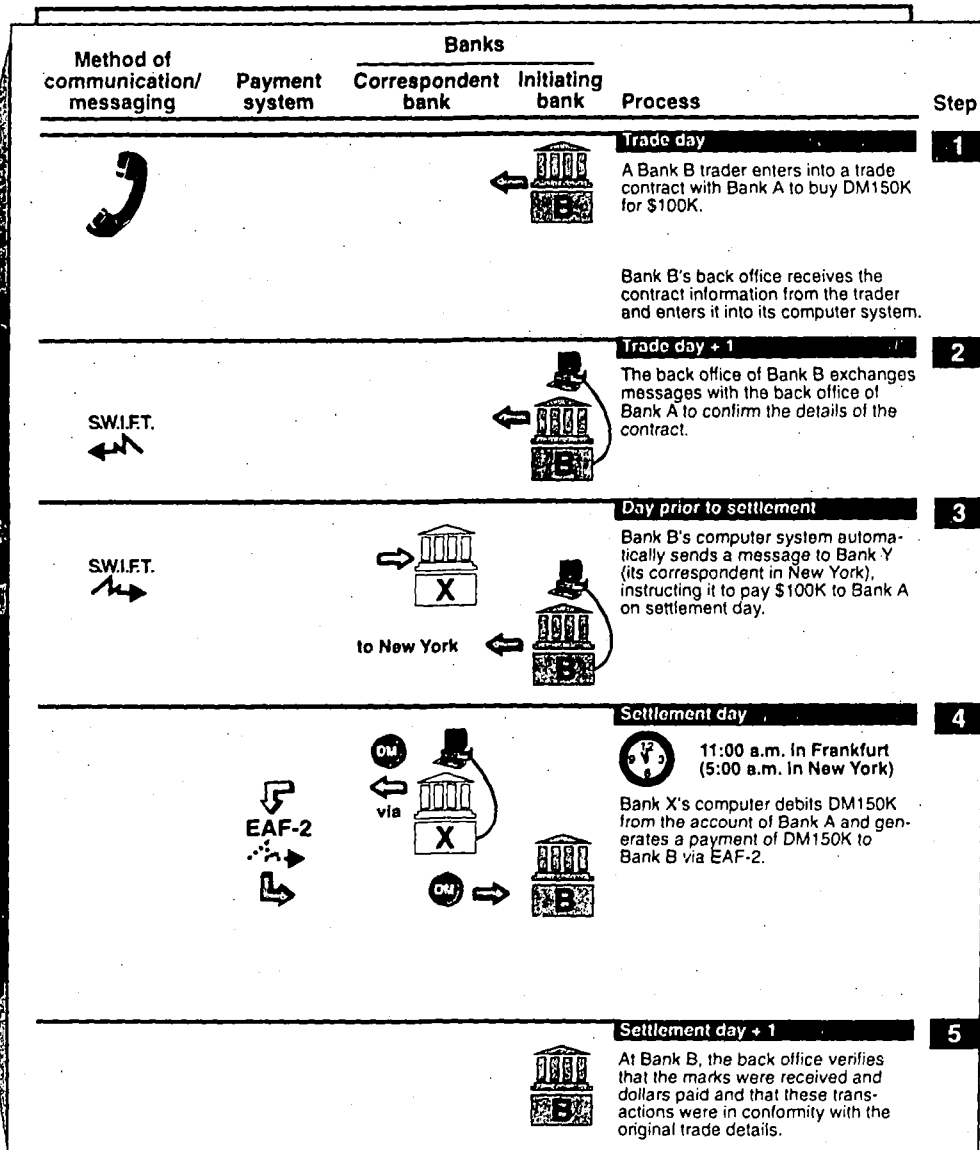
SWIFT. Society for Worldwide Interbank Financial Telecommunication. An organization that transmits payment and other financial messages between financial institutions worldwide.



CHIPS The Clearing House Interbank Payments System, in New York, which processes and settles dollar payments among banks.

Section 1: Wholesale Payment Systems • Foreign Exchange
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Frankfurt



Initiating bank in Frankfurt.



In Frankfurt, correspondent bank of Bank A.



EAF-2 Elektronische Abrechnung Frankfurt (Frankfurt Electronic Clearing System), the interbank payment system in Frankfurt.

Note: For more information, see S.W.I.F.T. and CHIPS.

Source: First Chicago NBD Corporation.

**Section 1: Wholesale Payment Systems • Foreign Exchange
Settlement of Foreign Exchange
Transactions**

The timing of the steps in Figure 1.4 is typical but not universal. For example, Step 5, shown as taking place on "Settlement day + 1," can take place as late as settlement day + 2 in some banks. Similarly, the times of the actions on settlement day (11:00 a.m. German time in Frankfurt, and 10:00 a.m. EST in New York) were chosen arbitrarily; these could occur at any time during the open hours of the payments systems in the respective cities.

Regulatory Oversight

Regulatory oversight of participating institutions in foreign exchange trading is in the hands of the central banks and other regulators in their respective countries. In the United States, this responsibility generally belongs to the bank regulators. These regulators oversee the foreign exchange trading activities of banks through their normal examination procedures.

Over the last 22 years, the central banks of the major industrial countries (the "Group of Ten," G-10 countries) have been working together on ways to improve and to better coordinate their supervision of foreign exchange trading.¹⁴ Since 1989, this group of central banks has issued a series of studies on this topic, which included recommendations for private-sector and central-bank actions that could decrease foreign exchange settlement risk. In 1994 through 1995, a committee of the G-10 central banks surveyed some 80 banks in their countries to determine current risk-control practices. This survey identified practices for reducing risk and shortfalls from these practices.

Risk and Risk Mitigation


For purposes of this report, we discuss some of the most important risks and risk mitigations associated with foreign exchange transactions.

¹⁴The G-10 countries include: Belgium, Canada, France, Germany, Italy, Japan, The Netherlands, Sweden, Switzerland, United Kingdom, and the United States.

Section 1: Wholesale Payment Systems • Foreign Exchange
Settlement of Foreign Exchange
Transactions

Table 1.5: Risk and Risk Mitigation for Foreign Exchange Transactions

Risk	Risk mitigation
Herstatt risk (counterparty failure/default after one party has made payment)	Credit assessment and control Bilateral netting of gross payment obligations into smaller net obligations Multilateral netting
Risk of extended and enlarged exposures	Operations improvements Arrangements with correspondent banks to withhold payments
Risk of gridlock	

 Shaded cells indicate that mitigations have been adopted by some participants or providers but are not yet widely used. Unshaded cells indicate mitigations in general use.

Risk 1: Herstatt Risk

A foreign exchange transaction involves full settlements in two different national payments systems; in the case illustrated in Figure 1.4, on settlement day DM150,000 were paid through the Frankfurt Electronic Clearing System (EAF-2) system in Germany and \$100,000 through CHIPS. These systems are not linked in any way, and the settlements occur several hours apart. Bank A's correspondent in Frankfurt paid out the German marks before Bank A received the dollars. In other trades (e.g., Japanese yen for dollars), the gap between payment and receipt can be 17 hours. For the entity that pays first, the risk is that the other party may fail to carry out its payment. If this is due to computer or other temporary problems, the first entity faces liquidity problems; if the failure is due to bankruptcy of the second entity, the first entity is exposed to loss of up to the full amount that it paid. This latter risk is commonly called "Herstatt risk," after the name of a German bank whose closure in 1974 occurred after it had received marks due to it on foreign exchange trades but before the corresponding dollar amounts were paid in the United States. One result was a temporary but severe disruption of payments across CHIPS; for the next few days, banks withheld payments, resulting in a chain reaction of other payments not being made.¹⁵ Also, U.S. banks experienced losses.¹⁶

¹⁵See the section on CHIPS for the risk mitigations subsequently taken by that institution and its participants.

¹⁶In addition to the risk that one party may fail after the other has made payment, there is also the risk that a party can fail before either party begins settlement. In this case, the surviving party would not pay or lose its side of the trade, but—in order to obtain or sell the desired amount of currency—it would have to enter into a new foreign exchange transaction with a different counterparty. Because the new contract might be at a less favorable exchange rate than the original one, counterparty failure prior to settlement creates exposure to potential loss, but such a loss would be only a fraction of the amount that might be lost if there were a counterparty failure at settlement.

Mitigation

Credit assessment and control. A major defense against default risk in foreign exchange trading is adequate control of credit exposure. This control can be exercised through careful analysis and screening of potential trading counterparties, and the setting and enforcement of limits on exposure to each counterparty. These controls are not universally practiced. The survey by the G-10 committee found some banks in their countries that do not set any limits on their settlement exposures.

Mitigation

Bilateral netting of gross payment obligations into smaller net obligations. A way to reduce the magnitude of risk in foreign exchange settlement is through netting. For example, two U.S. banks that actively trade German marks might have entered into numerous contracts with each other for settlement in that currency on a particular day. With a netting arrangement in place, the two banks could replace these multiple contract amounts with a single net amount to be sent through the German payments system on that day. This can greatly reduce the amount of settlement risk between the two banks. Some large trading institutions have bilateral netting arrangements with each other. Not all banks surveyed by the G-10 do so, however.

Mitigation

Multilateral netting. Such a practice, which involves the netting of both sides of currency obligations among more than two trading institutions, could further reduce the amounts to be settled in foreign exchange trading.¹⁷ Little multilateral netting has been done thus far: one arrangement, called ECHO, has begun operation in Europe. A group of U.S. and Canadian banks plan to start another, called Multinet International Bank.¹⁸

Risk 2: Extended and Enlarged Exposures

Many banks assume that their exposure to settlement risk in foreign exchange transactions is only for one day's trades, and is only an intraday exposure. In fact, public- and private-sector studies have shown that these exposures commonly are at least overnight and that the exposure to settlement risk can be as high as the sum of 2 or 3 days' trades, depending on the institution's own internal operational practices and its arrangements with its correspondent banks. In Step 3 of Figure 1.4, Bank A in New York followed the custom of sending payments instructions to its

¹⁷In the United States, CHIPS, which serves as the medium for settling the dollar "leg" of most foreign exchange trades involving dollars, performs multilateral netting, but only for those dollar transactions sent across it. Proposals for multilateral netting of foreign exchange transactions would involve the multilateral netting of both sides of trades.

¹⁸The members of the Multinet project already net bilaterally among themselves trades in certain currencies, using the VALUNET system (see page 45).

correspondent bank (Bank X) a day in advance of settlement. If these banks' systems are fully automated, this instruction might be irrevocable. In that case, if Bank B (the German bank) was closed and declared insolvent on settlement day, Bank A might nonetheless make scheduled payments to Bank B not only on settlement day but also on the next day, without receiving incoming payments from Bank B on either day. The 1994-1995 G-10 committee survey of major trading institutions found that for some of these institutions the amount at risk, even to a single counterparty, could exceed the institution's capital.

Mitigation

Operations improvements. To make exposure limits meaningful, they must be buttressed by operations procedures that allow the institution to halt outgoing payments up to settlement day, and to know whether expected incoming payments have been received. The central banks' G-10 committee has recommended that all banks improve their operational controls and efficiency.

Mitigation

Arrangements with correspondent banks to withhold payments. Some banks have the ability to halt payments as late as settlement day, and, in some cases, late on that day. In the previous example, if Bank A in New York had appropriate arrangements with Bank X, its correspondent in Frankfurt, it might be able to have Bank X withhold the mark payments from the German payments system on settlement day until well after the opening of that system, thus further reducing the time gap between payment of marks in Germany and receipt of dollars in New York.

Risk 3: Gridlock

Tighter operations controls over outgoing payments are a two-edged sword because they create gridlock risk for the market at the same time that they protect the institution. If Banks A and X in figure 1.4 had an arrangement such as described above, Bank A might withhold payment to Bank B if it heard rumors that Bank B was in trouble, preferring to receive funds from Bank B before paying to it. Other banks might do the same vis-a-vis Bank B. Even if the rumors were false and Bank B were sound, the withholding of payments to Bank B could create a liquidity problem for the bank; with incoming payments not arriving until late in the day, the bank could find it difficult to make its own scheduled payments, possibly affecting others. This phenomenon occurred at the time of the attempted coup d'etat in the Soviet Union in 1991, when a number of banks withheld their payments to Soviet banks, thus making it difficult for the latter to meet their obligations. Were such payment-withholding applied to larger

numbers of banks or to larger banks, the resulting gridlock could involve broader systemic risk to financial markets more generally.

Bilateral and Multilateral Netting of Foreign Exchange Transactions

Bilateral and multilateral netting of payments in foreign exchange transactions can reduce the amount of exposure to counterparty risk. Bilateral netting can be arranged between any two banks. Nonetheless, three organizations provide systems to facilitate bilateral netting among members. As regards multilateral netting, there is one organization in operation, and another that expects to commence operation in 1997. The following explains the systems in detail.

Bilateral Netting Systems

- **Accord:** This is a service offered to members by S.W.I.F.T. Members subscribing to this service can have their payments messages matched and bilaterally netted by the Accord system. In May 1996, 27 institutions were using this system.
- **FXNET:** This system is owned by the U.K. subsidiaries of 12 major banks. In May 1996, 70 banks used this system for bilateral netting.
- **VALUNET:** This system provides bilateral netting services to 10 U.S. and Canadian banks for some of those banks' offices.



Multilateral Netting Systems

- **ECHO (Exchange Clearing House):** This system is based in London; in May 1996, 13 banks were using it. ECHO calculates multilateral netting of trades that are passed through it. For each currency, a user will have only a single payment obligation or expected receipt. Settlement takes place via traditional national payment systems into and out of ECHO accounts in each country.
- **Multinet International Bank:** This is a project of the U.S. and Canadian banks involved in VALUNET. Once in operation, it will be a clearing house to provide multilateral netting and settlement of foreign exchange transactions among its members, initially in U.S. and Canadian dollars and eventually in other currencies. For those trades that met its standards, Multinet Bank would become counterparty.

Overview of Clearance and Settlement Systems of Equities, Treasuries, Futures, and Options

In this section, we discuss the clearance and settlement systems for securities, such as equities and U.S. Treasuries, and derivatives, such as futures and options.

Main Characteristics

- The clearance and settlement systems of equities, Treasuries, futures, and options are similar yet distinctive to each particular market.
- The systems for equities and U.S. Treasuries center on the transfer of the ownership of securities from the seller to the buyer.
- The systems for futures and options center more on the transfer of risk and the value associated with that risk.

Statistical Information

- Thousands of these types of financial instruments are traded each day through either organized exchanges or in the over-the-counter (OTC) markets.
- Hundreds of billions of dollars of each type of financial instrument are cleared and settled through clearing organizations each year.

Regulatory Information

- The Securities and Exchange Commission (SEC) and the Commodity Futures Trading Commission (CFTC) are the primary regulators and oversee the actions of the clearing organizations under their jurisdictions to determine whether or not they are functioning in accordance with regulations and the law.

Risk Information

- The primary type of risk that clearing organizations face is counterparty, or credit risk.
- Clearing organizations can mitigate counterparty risk by having strict admission standards and continually monitoring their members, and by requiring their participants to post "good faith" deposits and/or make payments that cover any potential significant market movements.

Equities Clearance and Settlement

Description and Use

The National Securities Clearing Corporation (NSCC) clears and settles 98 percent of all equity (stock) and corporate and municipal bond transactions in the United States. For the purposes of clarity, we will focus only on equities. NSCC is the clearing corporation for eight stock exchanges and is owned equally by the American Stock Exchange (AMEX), New York Stock Exchange (NYSE), and the National Association of Securities Dealers (NASD).¹

The Depository Trust Corporation (DTC) tracks the transfer of equities and corporate and municipal bonds cleared through NSCC via an automated book-entry system. During settlement, NSCC instructs DTC on which equities to move from one account to another. DTC also performs securities custody services for its participating banks and broker-dealers.

Participants in the clearance and settlement of equities include exchanges; NSCC, and members of NSCC (referred to as Direct Participants); DTC; and settlement banks (banks that settle on behalf of direct participants).

¹One regional stock exchange, the Philadelphia Stock Exchange, has its own clearing organization.

Key Terms

B Bond	A bond is a debt security representing a loan by the buyer to the corporation or government issuing the bond; it may either pay interest, or it may be purchased at a discount in price from the value at maturity.
Book-entry system	A book-entry system is an accounting system that permits the transfer of assets (e.g., securities) without the physical movement of paper documents or certificates.
D Direct participants	Direct participants are financial institutions that transact with the clearing organization, and all customers come to the clearing organization through them.
E Equity/stock	Equity, or stock, is an instrument that represents ownership in a company.
L Locked-in trades	Locked-in trades are transactions in which the details of the trade are matched by a computer, usually at the place of the trade, before being sent to a clearing organization. As a result, the clearing organization does not usually perform a trade comparison.
O Open outcry	Open outcry is a competitive system in which floor participants verbally make bids and offers to each other at centralized exchange locations.
S Specialist	A specialist is a member designated by an exchange to be the sole market maker for a particular stock.

Basic Data

As of April 1996, NSCC served 1,974 brokers, dealers, banks, and other financial institutions through approximately 400 direct participants. NSCC processes over a million transactions on a daily basis that are worth billions of dollars, according to NSCC.

According to DTC officials, DTC holds approximately \$10 trillion of securities that make up almost 99 percent of all stocks and nonfederal bonds traded in the United States. (See table 2.1)

Section 2: Equities, Treasuries, Future, and Options • Equities
Equities Clearance and Settlement

Table 2.1: Data on NSCC and DTC

	1995
NSCC	
Average daily volume of transactions processed	1,875,600 transactions
Average daily value of transactions processed	\$92 billion
DTC	
Securities delivered through DTC's book-entry system	\$41 trillion
Value of securities in DTC's custody	\$10 trillion

Sources: NSCC and DTC 1995 data.

Processes

Equity shares trade, clear, and settle in a 3-day cycle referred to by industry participants as "T+3"—the cycle begins on the day of the trade ("T") and ends 3 days later (T+3) with settlement.

The Trading Process

Investors may purchase equity shares through a securities broker-dealer. Equities are traded in two different kinds of markets—exchanges and the over-the-counter (OTC) markets. Through exchanges, member firms act for themselves and as agents (brokers) for customers, bringing their orders to a central facility—the exchange floor—to be executed. In exchange trading, orders may be executed in two ways: (1) against other orders—a bid to buy equities matching an order to sell equities—or, if there is no such order at an acceptable price, by (2) a sale to or purchase from a specialist. Trading is done through "open outcry," or orders can be inputted into an order management system. NYSE officials said that 70 percent of their trades are done through their order management system (called Super DOT—Designated Order Turnabout System) and 30 percent are done through "open outcry." However, open outcry trades account for 70 percent of the dollar value of all trades because they typically include large transactions or block trades of 10,000 shares or more.

In the Nasdaq OTC market,² orders are handled by dealers working over the telephone or through a computerized small-order execution system; there is no central physical facility or trading floor. In this market, securities

²Nasdaq stands for the National Association of Securities Dealers Automated Quotation system. Nasdaq is the automated stock market for a portion of the non-exchange-listed securities. The OTC market for securities includes Nasdaq, the so-called "pink sheets"—privately published National Daily Quotation Sheets—and the OTC Bulletin Board.

firms can act as brokers or dealers with respect to any type of stock. A firm receiving a customer's order to buy stock can either sell the stock to the customer from the firm's inventory (if it is a dealer in that stock) or act as a broker by purchasing the stock from another dealer and then selling it to the customer.

The Clearance and Settlement Process

Equities are cleared and settled through NSCC and DTC. Clearance begins after the trade occurs and involves NSCC guaranteeing the trade and then netting the delivery and receipt of settlement obligations. Settlement usually occurs on T+3, with the equity shares settlement usually performed through book-entry moves at DTC and the money settlement through NSCC and settlement banks. Equities that are eligible for depository processing through DTC enter the Continuous Net Settlement (CNS) System, which, according to NSCC officials, is where the vast majority of equity trades settle. NSCC has three different settlement systems: one for depository-eligible issues, one for the settlement of nondepository-eligible issues, and one for trades that bypass the netting process and are settled separately.

Table 2.2: NSCC Clearance and Settlement Process for Depository Equity Shares

T+3 day	Clearance and settlement
T (trade date)	Trade occurs and trade information is sent to NSCC, mostly on a "locked-in" basis.
T+1	Results of trade comparison and matching are sent to direct participants.
T+2	NSCC determines participants' net settlement positions.
T+3	Settlement date—securities are delivered and payment is made.

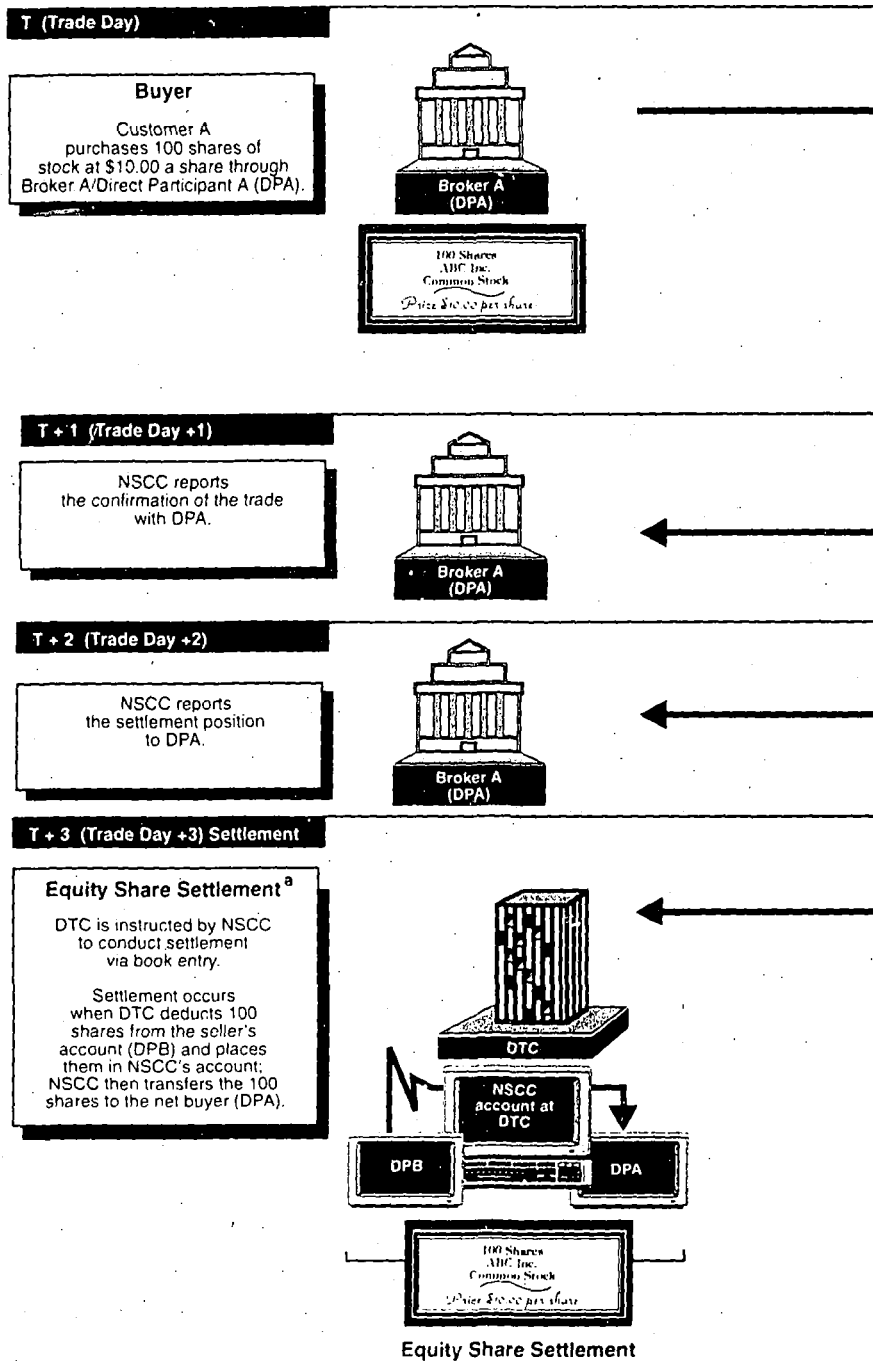
*NSCC officials said that the completion of transactions may not always occur on T+3.

Source: NSCC.

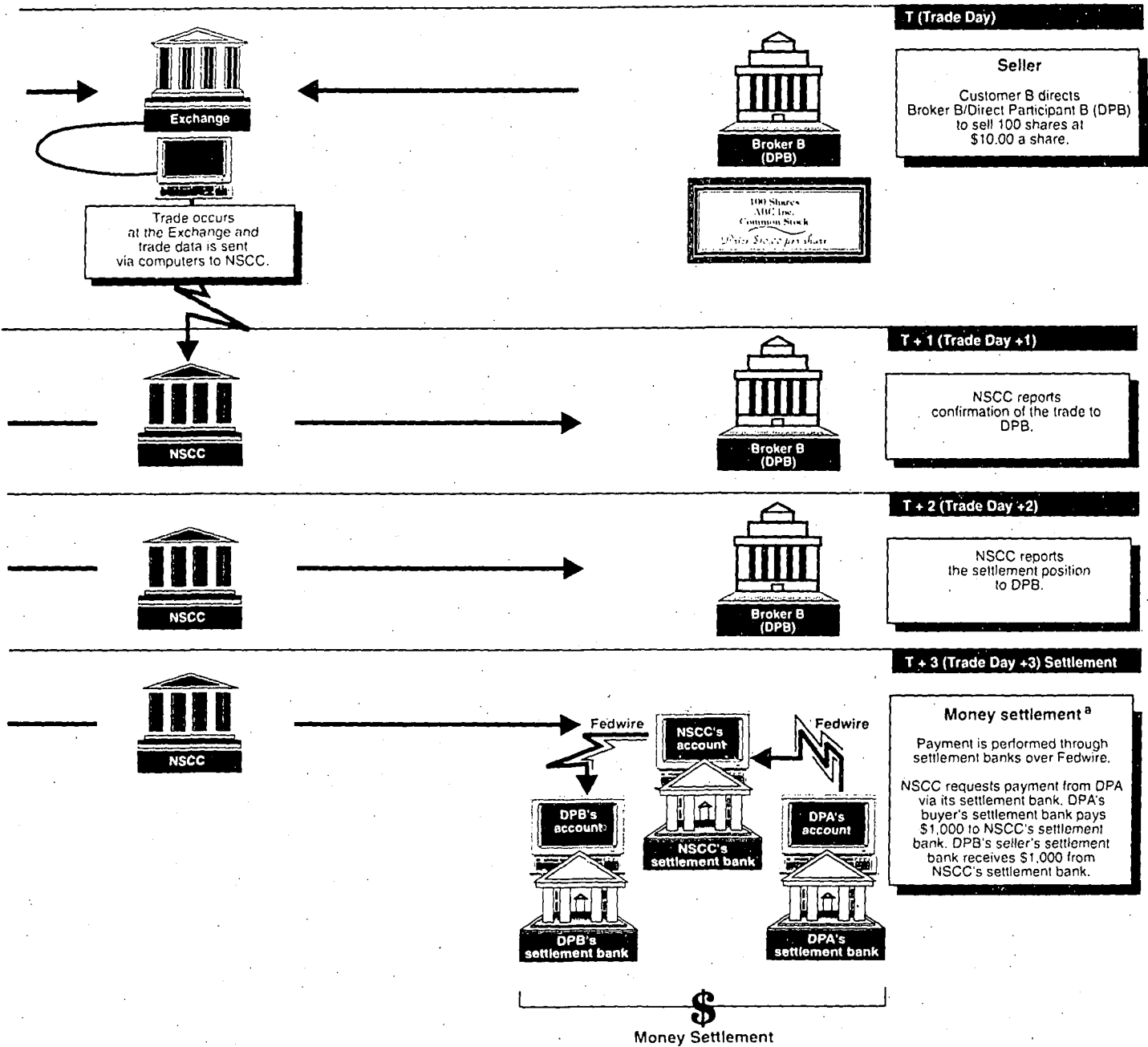
Figure 2.1 describes in a simplified manner the T+3 trading, clearance, and settlement of a single depository-eligible equity trade that is not netted with other trades.

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Equities Clearance and Settlement

Figure 2.1: T+3 Clearance and Settlement of Depository-Eligible Equity Shares



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^a Equity share and money settlement is normally done on a net basis such that the single purchase of 100 shares would be combined with DPA's and DPB's other trades to produce one net equity share settlement and money settlement.

Source: GAO analysis of NSCC data.

The 3-Day Clearance and Settlement Cycle

Trade Day (T)

The 3-day cycle of clearance and settlement for NSCC begins on the day of the trade (T). Trade information is recorded at the exchanges and then is transmitted to NSCC (via computers) through a variety of automated marketplace trading systems.

Most of the trades are transmitted as “locked-in” transactions—the details of the trades from the buyer and seller have already been matched by the computer systems of the exchanges or OTC market, which means that NSCC does not perform a trade comparison. However, if trades are not locked-in, the buy and sell data have to be reported by direct participants to NSCC, and NSCC then compares and matches the data.³ NSCC officials said that trades mostly occur on a locked-in basis.⁴

Once the trade data have been compared, NSCC guarantees the transaction. This is referred to as “novation” or the substitution of one party for another (NSCC becomes the buyer to every seller and the seller to every buyer). The guarantee begins on midnight of the day that the trade is reported back to direct participants as having been compared.

T+1

On T+1, results of the comparison and matching process are reported to direct participants. NSCC transmits to direct participants computerized reports (known as contracts) that show every buy and sell order reported by the participant and the marketplace on T, and also confirm that each transaction has been compared and is ready for settlement.

T+2

Participants are informed of their net settlement positions for trades that occurred on T and are due to settle on T+3. NSCC issues a report to direct participants that tells them what their net settlement is that day and projects what their net settlement will be on T+3. To do this, NSCC uses its CNS system, which “reduces or nets the total number of financial obligations requiring settlement.” Participants then are advised whether they are net buyers or net sellers for each issue of a stock.

T+3

T+3 is settlement day for trades that began on T—to the extent that securities are available for delivery, delivery will be made, and participants with payment obligations will be required to pay. The participants' net

³These types of trades are compared in either NSCC's Listed Comparison System for exchange-listed trades or the OTC Comparison System for trades in the OTC market.

⁴However, municipal bonds and corporate debt are submitted for two-sided comparison.

settlement positions are determined by the CNS system netting all their trades due to settle that day against the prior days' unsettled long (buy) and short (sell) positions (referred to as fail positions or unsettled positions) for each issue of equity.

Equity Settlement Has Two Parts

Equity share settlement. The settlement of equities has two parts—equity share settlement and money settlement. The first phase is equity share settlement. The movement of the shares takes place through DTC accounts. NSCC instructs DTC to move shares from the accounts of net sellers to NSCC's account and then from NSCC's account to the accounts of net buyers. If the amount of shares is insufficient to satisfy all delivery obligations, NSCC uses a random allocation algorithm to determine to whom securities should be delivered. The CNS automatic delivery process occurs in two cycles: (1) the night cycle at about 1:30 a.m. on (T+3) and (2) the continuous "day cycle" later that day.

Money settlement. The final phase of settlement is the money settlement. The CNS net money settlement is determined on T+3 and can be settled with a single payment between NSCC and participants through settlement banks.⁵ Every trading day, NSCC is to generate a settlement statement. This statement is to include a line item that tells each participant what its net CNS money obligation is, based upon the dollar value of the participant's equity shares delivered and the dollar value of its payment obligation. Each participant has a settlement bank that has guaranteed that it will pay or receive the money settlement on the participant's behalf.⁶ Settlement banks are required to make payment before Fedwire's funds transfer system⁷ closes.

Regulatory Oversight

The Securities and Exchange Commission (SEC) oversees the actions of NSCC to determine whether it is functioning in accordance with the law and SEC regulations. NSCC establishes the rules governing its clearance and settlement of equities, subject to SEC's approval.

⁵NSCC has operated a same-day funds settlement system since Feb. 22, 1996.

⁶In order to qualify as a settlement bank, each bank has to meet specific criteria established by NSCC.

⁷Fedwire refers to two separate electronic systems—one for the electronic transfer of funds, and one for the electronic transfer of book-entry securities.

Risk and Risk Mitigation

For purposes of this report, we discuss some of the most important risks and risk mitigations associated with equities.

Because NSCC guarantees the trades of its direct participants, it incurs risk from the time of the guarantee until the settlement of obligations and payments. As a result, NSCC is exposed to counterparty risk, and the amount at risk (or the exposure) is dependent on fluctuations in the market.

Table 2.3: Risk and Risk Mitigation for Equities

Risk	Risk mitigation
Counterparty/credit risk	Requirement of strict membership standards
	Arrangement with DTC
	Requirement of clearing fund account
	Marking to market prices of all unsettled securities

Source: NSCC.

Risk: Counterparty/Credit

When NSCC guarantees the matched trade, it becomes the buyer to every seller and the seller to every buyer. As a result, the clearing organization incurs counterparty risk—the possibility that the clearing member buyer or seller might default on its obligations.

The amount of counterparty risk that NSCC is exposed to is dependent on fluctuations in the market. If a direct participant does not meet its settlement and payment obligations, NSCC—because of the guarantee to the direct participant buyer and the direct participant seller—must liquidate the direct participant's positions, and thus is exposed to market risk (the exposure to the possibility of financial loss caused by adverse changes in the value of contracts).

Mitigation

NSCC mitigates counterparty risk by (1) setting strict admissions standards to determine that every member is creditworthy upon admission to NSCC; and (2) arranging with DTC that—in the event participants are unable to complete money settlement and NSCC ceases to act on their behalf—shares delivered that day are returned to NSCC, or DTC makes payment to NSCC.

NSCC requires all unsettled securities or fail positions to be marked to market prices and payment is to be made by direct participants to reflect changes in the market. The objective is to keep NSCC obligations as close to market prices as possible. In addition, NSCC requires participants to contribute to the clearing fund,⁸ which is designed to cover market risk exposure.

⁸According to NSCC, the clearing fund was established to secure direct participants' obligations to NSCC as well as other liabilities and losses if they occur.

Treasuries and the Fedwire Book-Entry Securities System

Description and Use

The Fedwire book-entry securities system services all marketable U.S. Treasury securities, many federal agency securities, and certain international agency securities. For simplicity, we will focus on Treasury securities.

According to Federal Reserve officials, 99 percent of marketable U.S. Treasury debt is in book-entry form. Treasuries settle through the Fedwire book-entry securities system, which is operated by Federal Reserve Banks.⁹ The Fedwire book-entry securities system is a real-time delivery-vs.-payment (DVP) gross settlement system that requires the immediate and simultaneous transfer of securities against payment.¹⁰ Depository institutions that maintain funds accounts at a Reserve Bank are eligible to maintain book-entry securities accounts at a Reserve bank, as are certain nondepository institutions, subject to certain settlement restrictions.

The Government Securities Clearing Corporation (GSCC) was established to provide a netting mechanism for the clearance and settlement of U.S. Government securities in both the primary and secondary markets for Treasury securities.¹¹ The primary purpose of issuing Treasury securities is to raise money for the U.S. government. A large secondary market also exists for Treasury securities, making it one of the most liquid markets (easy to buy and sell the securities without moving the price) in the world.¹²

Participants in the clearance and settlement of Treasury securities include the Federal Reserve, GSCC, members of GSCC referred to as Comparison members and Netting members, and clearing agent banks (banks that settle on behalf of members). GSCC and each of its members has a designated clearing agent bank that operates through the Fedwire book-entry for securities system.¹³

⁹Fedwire refers to two separate electronic systems—one for the electronic transfer of funds, and one for the electronic transfer of book-entry securities.

¹⁰Transfers of securities may also be made without payment.

¹¹Treasuries may settle outside of GSCC's process.

¹²Secondary markets consist of exchanges and OTC markets where financial instruments are bought and sold subsequent to original issuance, which took place in the primary market.

¹³For the purposes of this report, we focused on GSCC's process, which is one mechanism for clearing and settling U.S. government securities.

Key Terms

B Book-entry system	A book-entry system is an accounting system that permits the electronic transfer of assets (e.g., Treasury securities) without the physical movement of paper documents or certificates.
C Clearing agent banks	Clearing agent banks are Fedwire participants that are regularly engaged in the business of providing clearing services in eligible securities for members and GSCC.
Comparison member	Comparison members are primarily government securities broker-dealers and clearing agent banks that are capable of interacting with GSCC operations.
CUSIP	CUSIP stands for the Committee on Uniform Securities Identification Procedures. Each type and issue of security will have its own unique CUSIP number.
D DVP system	A DVP (delivery-vs.-payment) system is a system that ensures that the final transfer of one asset will simultaneously occur if, and only if, the final transfer of another asset (or other assets) occurs.
N Netting members	Netting members are primarily banks and government securities broker-dealers that are capable of participating in netting services through GSCC.
O Open outcry	Open outcry is a competitive system in which floor participants verbally make bids and offers to each other at centralized exchange locations.
R Real-time gross settlement	Real-time means a system that processes each transaction as it is initiated rather than processing by batch. Gross settlement means that the system settles each transfer individually.
Repurchase agreement	A repurchase agreement is an agreement between a buyer and seller (usually) of U.S. government securities whereby the seller agrees to repurchase the securities at an agreed-upon price and, usually, on a stated date.
T Trade comparison	Trade comparison is the receipt, validation, and matching of data on the long (buy) and short (sell) side of a transaction and the reporting of such match.
Treasury security	A Treasury security is a negotiable debt obligation of the U.S. government, backed by its full faith and credit, and issued with various maturities.
U UCC	The Uniform Commercial Code (UCC) is a set of model laws governing commercial and financial activities.

Basic Data

The trading volume of the treasuries market averages \$200 billion per day. According to Federal Reserve Bank of New York officials, the Department of the Treasury is the largest single issuer of debt in the world, with Treasury securities accounting for approximately \$3.5 trillion in par value or face value (represented by 62 bond issues, 144 note issues, and 52 bill issues) as of December 1996. According to Federal Reserve data, Treasury issues dominate the transaction volume in the book-entry securities system, representing roughly 70 percent of Fedwire securities transfer volume (see table 2.4).

Table 2.4: Data on GSCC and Fedwire

	1995
GSCC	
Annual dollar value of trades that GSCC processes for netting members	\$65.9 trillion
Average daily dollar value of trades that GSCC processes for netting members	\$263.6 billion
Annual dollar value of net settlement obligations	\$16.3 trillion
Average daily dollar value of net settlement obligations	\$65 billion
Fedwire book-entry securities system	
Annual origination (transfer) volume ^a	12.8 million
Annual payment value of transfers ^a	\$150 trillion
Average daily volume of Treasuries originations (transfers)	36 thousand
Average daily payment value of transfers ^a	\$597 billion

^aFigures include all Fedwire-eligible securities, not just Treasuries.

Sources: GSCC and Federal Reserve.

Processes

For Treasuries that are cleared and settled through GSCC, the Fedwire book-entry securities system performs the book-entry transfer of the Treasury securities through designated clearing agent banks operating on behalf of netting members and GSCC. The Fedwire book-entry securities system ordinarily operates from 8:30 a.m. to 3:30 p.m. Eastern Time (ET).¹⁴

GSCC responsibilities include clearance (trade comparison, trade netting, and guarantee) and settlement. Treasuries that clear and settle through GSCC may clear and settle anywhere from "T+1" (trade date with next day settlement), to "T+15" (trade date with settlement in up to 15 days), to

¹⁴The Fedwire book-entry securities system opens early in rare instances to meet special needs and closes late under special circumstances.

"T+360" (in the case of repurchase agreements or "repos").¹⁵ Participants choose when they want to have the trade settled.

The Auction and Trading Process

Treasuries are typically issued by an auction conducted by Federal Reserve Banks accepting competitive and noncompetitive bids from individual and institutional investors. Treasuries can then be bought and sold in the secondary OTC market through commercial banks, broker-dealers, and other financial service companies. The secondary Treasury OTC market is primarily an institutional investors' market. According to GSCC officials, commercial banks, dealers, brokers, mutual funds, and pension plans rather than individual investors typically participate in this market. With respect to GSCC, each participant in the primary market and secondary markets for Treasury securities has to have a netting member—if they are not already a netting member—in order to clear and settle their Treasury trades through GSCC.

GSCC clears and settles various types of Treasury security trades, such as cash trades, forward trades (trades entered into today for settlement more than 1 business day away), and repurchase agreements.¹⁶ Members determine the types of trades they want as well as the settlement date.

The Clearance Process

Trade comparison is the first step in the clearance and settlement of Treasury securities. There are two types of comparisons, matched and locked-in. (See table 2.5)

¹⁵Cash settlement or Treasuries that settle on "T," or the day of the trade, will not clear and settle through GSCC. According to GSCC officials, cash settlement is a very common form of settlement.

¹⁶GSCC does not clear and settle options and futures on Treasuries. For more information see clearance and settlement of futures and options later in Section 2.

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Treasuries and the Fedwire Book-Entry
Securities System**

Table 2.5: Two Types of Trade Comparisons

Trade comparison type	Description
Locked-in	The Federal Reserve Banks electronically deliver Treasury auction purchases of GSCC participants in the primary market to GSCC on a locked-in basis—that is, the trades are already matched.
Matched	Treasury securities traded in the secondary market by GSCC participants are submitted to GSCC, which compares and matches the buy and sell sides of the trades. Comparison members submit the trade data by electronic transmission or magnetic tape by 10:00 p.m. on the night of each business day. ^a By 2:00 a.m., GSCC sends confirmation reports—generated electronically—to comparison and netting members that validate the comparison of the trade data.

^aThe comparison process goes on throughout the day and members may submit intraday data to GSCC.

Sources: GSCC and the Federal Reserve.

After a trade is compared and matched and is eligible for netting, it is netted through the netting system.¹⁷ The netting system combines a participant's total buy and sell obligations for each CUSIP number to arrive at a single net debit, credit, or flat amount for that netting member.¹⁸ Once net settlement positions have been determined and have been reported to GSCC members, GSCC becomes the legal counterparty to each party of the trade and, as such, guarantees to the buyer and seller that the trade will settle. This process is called novation, and it is usually completed before 2:00 a.m.

The Settlement Process

After net settlement amounts or positions have been determined and sent to netting members, settlement can take place. The settlement of Treasury securities includes (1) the Treasury securities transfer and (2) the simultaneous payment for the securities.

Treasury Securities Transfer and Payment

The Treasury securities settlement is done through clearing agent banks on behalf of the netting members, and GSCC. Each clearing agent bank

¹⁷In order for nonrepurchase agreement trades to be eligible for netting, they must meet the following requirements: (1) the trade must be compared on a final-money basis (including comparison on a locked-in basis); (2) the scheduled settlement date must be no more than a preestablished number of business days after the date of comparison; (3) netting must occur on or before its scheduled date; (4) data on each side of the trade must be submitted by a netting member or an authorized locked-in trade source; and (5) the underlying securities must be eligible for netting.

¹⁸Trades that have the same CUSIP number are netted together.

instructs the Federal Reserve which of its accounts to debit and which to credit for the transfer of securities and payment.

- Once net settlement positions have been determined by GSCC, a netting member's clearing agent bank is informed by the netting member of the securities to be delivered to or received from GSCC and the payment against which those deliveries or receipts are to be made. If the member of GSCC is a clearing agent bank, then it would do this on its own behalf.
- To the extent such deliveries or receipts must occur between clearing agent banks, the clearing agent bank sends Fedwire instructions to the Federal Reserve authorizing the Federal Reserve to transfer Treasury securities from its custody account (for the benefit of the net seller's account on the books of the clearing agent bank), to the account of the receiving clearing agent bank (for the benefit of GSCC's account on the books of the receiving clearing agent bank).¹⁹ This transfer is done in book-entry form.
- GSCC's clearing agent bank then instantaneously redelivers the securities to the net buyer's account on the books of its clearing agent bank. GSCC, however, is not obligated to deliver securities to member buyers until it receives securities from member sellers. Therefore, if a netting member's clearing agent bank fails to deliver the securities for any reason (including when the netting member does not have enough securities in its account), GSCC fails to deliver securities to the net buyer member.
- With respect to a clearing agent bank whose customer is a net seller of a security, the clearing agent bank (or a bank member of GSCC acting on its own behalf) will place a Fedwire securities delivery instruction to deliver securities from the clearing agent bank's account at the Federal Reserve Bank to the GSCC clearing agent bank's account at the Federal Reserve Bank, unless the transfer can be made on an intrabank basis. The only instruction necessary for transferring securities over Fedwire is made by the deliverer of securities; therefore, the delivery instruction from the net seller's clearing agent bank will result in a simultaneous debiting of funds from the GSCC clearing agent bank's account at the Federal Reserve Bank without any debit instruction from GSCC's clearing agent bank. If a clearing agent bank receiving securities has insufficient funds in its Federal Reserve account to pay for the securities, the Federal Reserve Bank will nonetheless complete the transfer (if it is within certain risk parameters), and the clearing agent bank will incur a daylight overdraft in its account at the Federal Reserve Bank.

¹⁹The transfer of securities can be done "intrabank," (i.e., both the net seller and GSCC use the same clearing agent bank).

Funds-Only Settlement

The funds-only settlement is separate from the delivery and payment of the Treasury securities settlement. It pertains to the net debit or net credit dollar amount that each netting member owes or is due for its accounts. For example, settlement has to be made on margin or on any open net settlement position, and payment has to be made on other positions, including fail to deliver or fail to receive obligations, and transaction adjustment payments (TAP).²⁰ The funds-only settlement occurs at 10:00 a.m. and 11:00 a.m. each day and is made via the Fedwire funds transfer system. Unlike the Treasury securities settlement, GSCC will make a funds-only settlement whether or not it has received all funds-only settlement due to it from members on that day.

Regulatory Oversight

The Securities and Exchange Commission (SEC) oversees the actions of GSCC to determine whether it is functioning in accordance with the law and SEC regulations.²¹ GSCC establishes the rules governing the clearance and settlement of Treasury securities that clear and settle through GSCC, subject to SEC approval.

According to Federal Reserve officials, Treasury/government securities transactions are governed by a combination of federal and state law as well as Reserve bank operating circulars. Each agency that issues securities on Fedwire has promulgated regulations that establish a federal legal framework governing the transfer of rights and interests in book-entry securities by a Fedwire participant. These regulations also specify the status of Fedwire book-entry securities under state law, which applies to the transfer of rights and interests in the securities in the absence of governing federal law. In most cases, UCC Article 8 is the state law governing the settlement phase of securities transactions.

Risk and Risk Mitigation

For purposes of this report, we discuss some of the most important risks and risk mitigations associated with treasuries.

²⁰TAP refers to the dollar difference between the amount at which these securities are to be delivered and received and the amount at which these securities are traded. Since trades included in the netting process have been entered into at varying prices, in order for netting to work, GSCC must establish a single-system price for each CUSIP. GSCC does so on each business day by use of either a third-party source or by a par-weighted average for all compared trades in each CUSIP on that date. The use of this system's price—market price for all compared trades—(plus accrued interest) should cause the delivery and receipt of securities to occur at amounts that are close to current market value, but different from contract prices.

²¹SEC is the primary agency that oversees GSCC, and the U.S. Treasury and the Federal Reserve are considered to be "secondary" regulators, according to GSCC officials.

Because GSCC guarantees the trades of its members, it incurs risk from the time of the guarantee until the settlement of obligations and payments. As a result, GSCC incurs counterparty risk, but the amount at risk (or exposure) is dependent on fluctuations in the market.

Table 2.6: Risk and Risk Mitigation for Treasuries

Risk	Risk mitigation
Counterparty/credit risk	<ul style="list-style-type: none"> • Requirement of strict membership standards • Monitoring members' creditworthiness • Marking open positions to market prices • Maintaining a clearing fund

Source: GSCC.

Risk: Counterparty/Credit

When GSCC guarantees the matched trade, it becomes the buyer to every seller and the seller to every buyer. As a result, GSCC incurs counterparty risk—the possibility that the member buyer or member seller might default on its obligations.

The amount of counterparty risk that GSCC is exposed to is dependent on fluctuations in the market. If a member does not meet its settlement of obligations and payments, GSCC—because of the guarantee to the member buyer and member seller—must liquidate the member's position, and thus is exposed to market risk (the exposure to the possibility of financial loss caused by adverse changes in the value of securities).

Mitigation

GSCC mitigates counterparty/credit risk by (1) setting strict admissions standards to determine that every member is creditworthy upon admission to GSCC and (2) routinely monitoring members' creditworthiness through financial reporting requirements and reviewing the clearing members' financial results.

GSCC requires all unsettled securities or fail positions to be marked to market prices and payment is made by members to reflect changes in the market. The objective is to keep GSCC obligations as close to market prices as possible. In addition, GSCC requires members to contribute to a clearing fund that is designed to cover market risk exposure.

Futures

Description and Use

A futures contract obligates the holder to buy or sell a specific amount or value of an underlying asset, reference rate, or index (called the underlying) at a specified price on a specified future date.²² For instance, if an investor were to purchase a December futures contract, an agreement would be made to pay a specified price for a specified quantity of a commodity, such as wheat, metals, or live cattle, for delivery in December. The buyer (or seller) would have an obligation to purchase (or sell) the underlying commodity. However, the buyer could satisfy this obligation either by receiving and paying for the commodity when the contract expired or by "offsetting"²³ the obligation prior to the contract expiring, which is how the majority of futures contracts are closed out. Futures previously were limited to commodities such as agricultural products and metals, but were extended in the 1970s to include financial futures on instruments such as Treasury bonds, foreign currencies, and stock indexes.

Market participants may use futures to hedge their assets or liabilities, or to speculate on market movements by correctly anticipating price movements. According to market officials, the main function of a futures contract is to shift risks from those less willing or able to bear them to those more willing or able to do so.

Participants in the clearance and settlement of futures contracts include exchanges, clearing organizations, clearing members, and settlement banks (or banks that settle exchange members' accounts). Futures are traded on 11 active exchanges in the United States. Nine futures clearing organizations serve the exchanges.

Futures clearing organizations may be either clearing houses, which are departments within an exchange, or clearing corporations, which are separately incorporated and independent from the exchange. During this report, we spoke to the Chicago Mercantile Exchange (CME) Clearing House Division and the Chicago Board of Trade (CBT) Board of Trade Clearing Corporation (BOTCC). For purposes of clarity, we will refer to the CME Clearing House Division and BOTCC as clearing organizations.

²²Underlyings include stocks, bonds, agricultural and other physical commodities, interest rates, foreign-currency rates, and stock indexes.

²³Offsetting means liquidating a purchase (sale) of futures contracts through the sale (purchase) of an equal number of futures contracts with the same delivery month, thus closing out a position.

Clearing members are financial institutions (generally large futures brokers) that transact with the clearing organizations; all futures customers and nonclearing members use a clearing member to clear their trades through a clearing organization. Clearing members must belong to the exchanges.

Settlement banks maintain the clearing accounts for the clearing organizations through which payments and deposits are made either to or from clearing members' accounts to or from the clearing organizations. Settlement in the futures market usually pertains to cash flow payments that reflect changes in the market price. The clearing organization officials we spoke to said they have designated up to eight banks as settlement banks.

Key Terms

F Floor broker	A floor broker executes trades for customers and may also execute trades for their personal or employer accounts.
Floor trader	A floor trader executes trades only for their personal accounts. A floor trader is also referred to as a "local."
Futures	A futures contract obligates the holder to buy or sell a specific amount or value of an underlying asset, reference rate, or index (called the underlying) at a specified price on a future date. Underlying assets include stocks, bonds, agricultural and other physical commodities, interest rates, foreign-currency rates, and stock indexes.
Futures commission merchant	A futures commission merchant is an individual, association, partnership, corporation, and trust that solicits or accepts orders for the purchase or sale of any commodity for future delivery on or subject to the rules of any contract market and that accepts payment from or extends credit to those whose orders are accepted. A futures commission merchant is the equivalent of a brokerage house in the securities industry.
H Hedging	Hedging means to protect oneself from market risk. Typically, hedgers have a position in the underlying commodity and use futures or options on futures to create an opposite position.
O Offsetting	Offsetting means liquidating a purchase (sale) of futures contracts through the sale (purchase) of an equal number of futures contracts with the same delivery month, thus closing out a position.
Open outcry	Open outcry is a competitive system in which floor participants verbally make bids and offers to each other at centralized exchange locations.
Options on futures	An option on a futures contract gives an investor the right but not the obligation, in exchange for a price (called a premium), to buy or sell a specified futures contract at a specific price (called the exercise price) within a specified period.
S Speculating	Speculating means to take on risk in an attempt to profit from changes in the values of financial instruments.

Basic Data

According to clearing organization officials, about 80 percent of the futures trading volume in the United States occurs at CBT and CME. CBT has its own separately incorporated clearing house—BOTCC—and CME has a clearing house division. Both clear and settle futures and options on futures traded on their respective exchanges.

Table 2.7: Data on BOTCC and CME, 1995

Clearing organization	Number of clearing firms	Number of futures contracts cleared and eventually settled	Average daily number of futures contracts	Number of options on futures contracts cleared and eventually settled
BOTCC	124	202,429,356	920,133	65,536,849
CME	83	159,787,862	634,079	43,366,350

Sources: CME and BOTCC.

Processes

Futures trade, clear, and settle in what is known as "T+0"—trades are done with same-day settlement. The "T" represents the trading, clearing, and settlement in one 24-hour period, starting at 6:40 a.m. CST and ending 24 hours later at 6:40 a.m. The "0" indicates that there are no additional days in the process.

The Trading Process

Most trading in the futures markets is done on the floor of the futures exchanges. The exchanges operate as auction markets where prices are determined by "open outcry." Trading is done in a tiered area of the exchange floor, called a "pit." In addition, electronic trading may occur during regular trading hours and/or during a night session.²⁴ Trades done electronically are automatically matched and then settled in the same manner as are pit trades.

Two types of traders execute trades on the floor of an exchange: (1) floor traders, or locals, are members of the exchange²⁵ and (2) floor brokers who may be independent or may be employees of firms referred to as futures commission merchants (FCM), which are members of the exchange. Floor traders trade exclusively for their own accounts. Floor brokers transact on the floor of the exchange on behalf of customers.²⁶

²⁴Electronic trading occurs on "Project A" at CBT and on "GLOBEX" at CME.

²⁵Locals may lease a seat on the exchange and, thus, they themselves may not be a member of the exchange.

²⁶In addition, floor brokers may execute customer orders and trade for themselves or their firm's account (proprietary trading) during the same trading session under limited circumstances, a practice referred to by industry officials as "dual trading."

The Clearing Process

The clearance of futures involves capturing, matching, and guaranteeing trades. Clearing organizations also clear and settle options on futures, which go through a clearance and settlement process similar to those of futures contracts.

Table 2.8: Steps in the Futures Clearing Process

Steps	Clearing process
(1) Capturing the trade data	Clearing firms (FCMS)/traders input their trade data to the clearing organizations. ^a
(2) Matching the trade data	After receiving the trade data, the clearing organizations match the data. Soon after the trade data are submitted, the data are matched.
(3) Guaranteeing the trade	Once pit trades have been matched, the clearing organizations guarantee the trades. ^b The clearing organizations guarantee to the clearing members that the settlement obligations of the trade will be met.

^aElectronic data do not have to be captured.

^bClearing organizations also guarantee trades of the exchange of futures for the underlying physical asset, but the guarantee does not become effective until after the day of the trade.

Sources: CBT and CME.

The Settlement Process

On a day-to-day basis, the settlement of futures refers to the settlement payment of funds between the clearing members and the clearing organization.²⁷ There are two types of payments included in the daily settlement in the futures market: (1) the performance bond (also referred to as a margin deposit or "good faith" deposit) and (2) the variation settlement (also referred to as the mark-to-market).

²⁷The final closeout of a futures contract occurs by (1) settlement by delivery, (2) cash settlement, or (3) settlement by offset. For futures contracts in which the underlying physical asset is to be delivered (settlement by delivery), the clearing organization ensures that delivery and payment is made. Futures may also be settled by cash settlement rather than actual physical delivery. Cash settlement means that the buyer receives the cash value of the physical asset instead of the physical asset. For settlement by offset, an order would be entered to sell (or purchase) futures contracts of the same delivery month purchased (or sold) during the earlier transaction. The difference in value at liquidation is simply credited to or debited from the clearing member's account.

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Table 2.9: Two Types of Settlement

Type	Settlement
Performance bond (or margin deposit) ^a	Every clearing member has to post performance bonds with the clearing organization. Performance bonds cover the anticipated one-day loss that a clearing member's portfolio and its customers open positions might incur. The amount required is based on the value of the clearing member's open positions and an assessment of the amount of risk those contracts involve. Performance bonds are calculated at least twice each day for each clearing member at BOTCC and CME. If the performance bond is below the level established by the clearing organization, the clearing member must make a deposit. ^b
Variation settlement	In addition to the performance bond, clearing members are required to meet variation settlements—the amount that is required when the clearing member's open positions are marked to the market prices. At least twice a day at the BOTCC and CME, the clearing organizations determine a settlement price for each type of futures and options on futures contracts and mark all open positions to that price, and payment is made to reflect the change in market prices. By marking open positions to the market price each day, clearing organizations prevent losses and gains from accumulating over time.

^aClearing organizations calculate the performance bond either on a gross or net basis. Gross margining requires clearing members to post margin on all of the long (buy) and short (sell) positions in their accounts. The long and the short positions cannot be used to offset each other in the case of a deficiency. Net margining requires margin to be posted on the difference between all long and short positions, calculated separately for the clearing members' accounts and its customers' accounts.

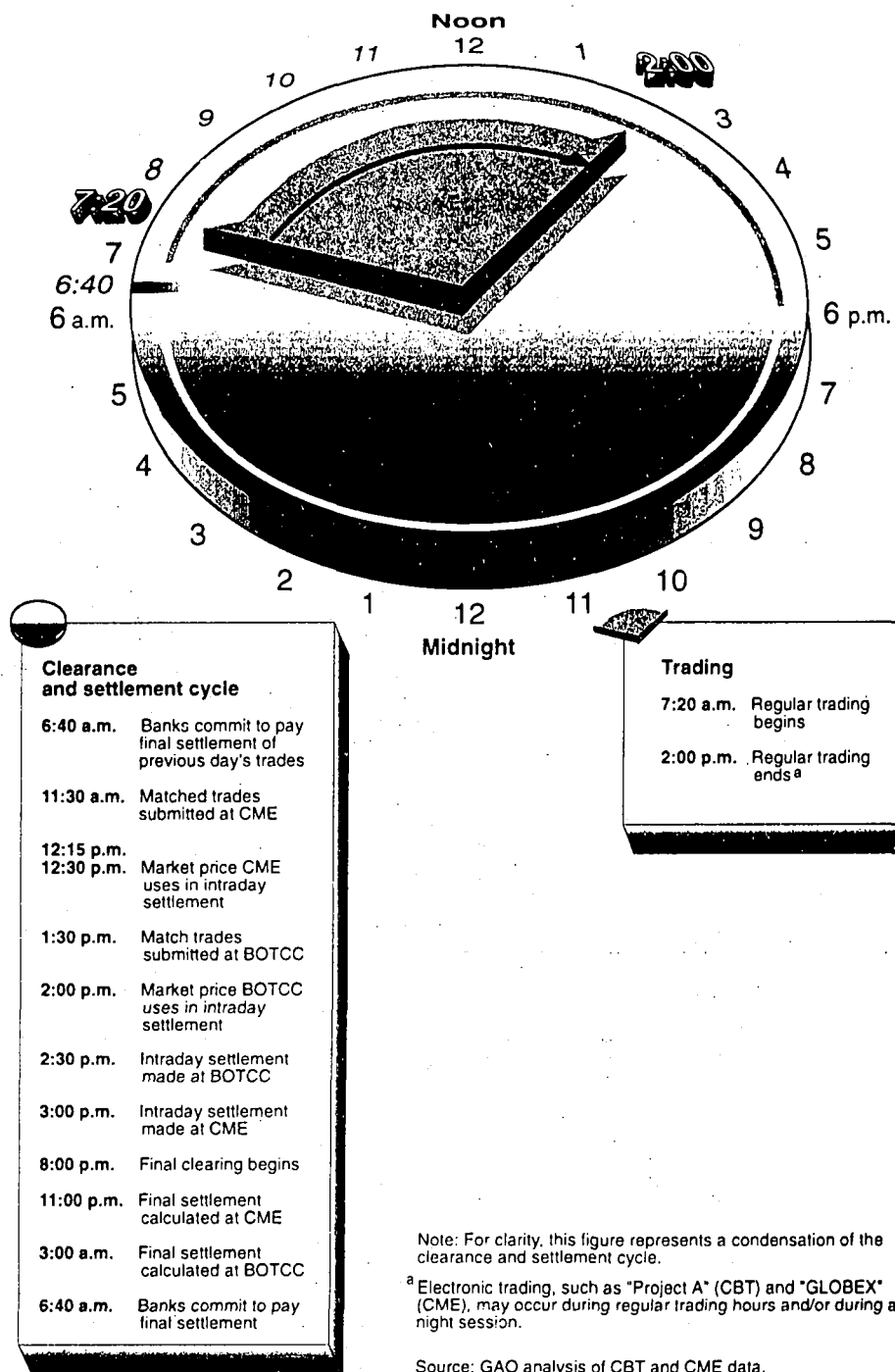
^bClearing organization officials said that if a clearing member's performance bond is below a certain level and that member is to receive a variation margin settlement profit from the clearing organization, then the clearing organization will keep the profit and apply it toward the clearing member's performance bond.

Sources: CBT and CME data.

Figure 2.2, along with the information that follows, describes in a condensed manner the events that take place during the T+0 trading, clearance, and settlement cycles.

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Figure 2.2: The 24-Hour Trading, Clearance, and Settlement Cycle



The 24-Hour Cycle

Hours	Cycle
6:40 a.m. (CST)	The 24-hour cycle begins—settlement banks commit to pay or receive final settlement on behalf of clearing members for the previous day's trades. ²⁸
7:20 a.m.	Regular trading begins at the exchanges.
11:30 a.m.	For CME, trades that have been matched since the start of the day plus any adjustments to existing positions are used in CME's intraday settlement calculation.
12:15 p.m.-12:30 p.m.	The market price is determined and is used in the intraday settlement calculation at CME.
1:30 p.m.	For BOTCC, trades that have been matched up until this time are used in BOTCC's intraday calculation.
1:30 p.m.-2:00 p.m.	Clearing organizations calculate an intraday-settlement and transmit reports showing the amounts of what is owed to or from the clearing members to the settlement banks. ²⁹ BOTCC uses the market price at 2:00 p.m. for its intraday settlement.
2:00 p.m.	Regular trading ends at the exchanges in most pits.
2:15 p.m.	BOTCC's intraday settlement is made by settlement banks on behalf of clearing members.

²⁸The settlement banks' commitment is irrevocable and will occur whether or not Fedwire opens. The settlement amount results from the previous days' trading and includes settlement on margin deposit changes and mark-to-market calculations done up to a specific time before 6:40 a.m. All payments between settlement banks are made in Fedwire funds.

²⁹The intraday settlement includes the daily mark to market of all open positions to the current market price variation settlement for the purposes of collecting the changes in market prices, including trades executed during the electronic trading sessions, and the current day's trades matched before 10:30 a.m. at CME and 1:30 p.m. at BOTCC. In addition, at CME, if the performance bond is below a particular level, clearing members must make a deposit on that as well. BOTCC requires performance bond settlements at 6:40 a.m. only.

3:00 p.m.	CME's intraday settlement is made, which is similar to its 6:40 a.m. settlement.
8:00 p.m.	Final clearing begins at the clearing organizations.
11:00 p.m.	Final settlement is calculated at CME. Reports are sent to the settlement banks.
3:00 a.m.	Final settlement is calculated at BORCC and includes all-night trading done up until 3:00 a.m. Reports are sent to the settlement banks.
6:40 a.m.	Settlement banks inform the clearing organizations that they will commit to pay on behalf of the clearing members, ending the 24-hour clearance and settlement cycle.

Regulatory Oversight

The Commodity Futures Trading Commission (CFTC) oversees the actions of the self-regulatory organizations—the clearing organizations and the exchanges—to determine whether they are functioning in accordance with the law and CFTC regulations. Futures clearing organizations are responsible for establishing the rules governing the clearance and settlement of futures and options on futures, which are subject to approval by CFTC.³⁰

Risk and Risk Mitigation

For purposes of this report, we discuss some of the most important risks and risk mitigations associated with futures.

Clearing organizations are exposed to risk from the time they guarantee settlement obligations to the time clearing members make settlement payments or offset (liquidate) their positions. As a result, clearing organizations are exposed to counterparty risk, but the amount at risk (or the exposure) is dependent on fluctuations in the market.

³⁰At CME, the exchange establishes the rules that cover the Clearing House Division.

Table 2.10: Risk and Risk Mitigation for Futures

Risk	Risk mitigation
Counterparty/credit risk	<ul style="list-style-type: none"> • Set admission standards • Monitor clearing members' creditworthiness • Audit departments • Capital requirements • Require performance bonds and variation margin settlements

Sources: CBT and CME.

Risk: Counterparty/Credit

When the clearing organization guarantees the matched trade, it becomes the buyer to every clearing member seller and the seller to every clearing member buyer; this process is called novation. As a result, the clearing organization incurs counterparty risk—the possibility that the clearing member buyer or seller might default on its obligations.

The amount of counterparty risk that clearing organizations are exposed to is dependent on fluctuations in the market. If a clearing member does not make settlement payments, the clearing organization—because of the guarantee to the clearing member buyer and the clearing member seller—must liquidate the clearing member's positions, but until it does so, the clearing organization is exposed to market risk (the exposure to the possibility of financial loss caused by adverse changes in the value of futures contracts).

Mitigation

Clearing organizations mitigate counterparty risk by (1) setting admissions standards to determine that every clearing member is creditworthy upon admission to the clearing organization, (2) routinely monitoring clearing members' creditworthiness through financial reporting requirements and a review of the clearing members' trading results, (3) having their audit departments go through a prescribed set of audit tests for each clearing member, and (4) having clearing members comply with exchange rules for minimum capital requirements. In addition, clearing organizations require

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(1) performance bonds that they consider sufficient to cover the maximum 1-day loss that a clearing member's portfolio might incur and (2) variation settlements in which all futures contracts are marked-to-market prices and payment is made to reflect the change in market prices. (See earlier section on settlements for further detail.)

Exchange-Traded Options

Description and Use

Options contracts give holders the right but not the obligation, for a price, called a premium, to buy or sell an underlying stock or other financial instrument at a specified price, called the "exercise" or "strike" price, before a specified expiration date. Options can be used to protect investors against losses in investments they own, lock in profits on positions they already have, or speculate on expected price movements.

An options contract can be terminated in three ways: (1) expiration, (2) exercise, or (3) closeout—the holder of the option enters into an equal and offsetting option contract. Options are usually bought and sold without being exercised.

Settlement in the options markets usually pertains to margin settlement, which is a payment that reflects changes in the value of the option. There is also a premium settlement that pertains to the amount that must be paid to buy the option, and an exercise and assignment settlement that pertains to an option that is exercised.

The Options Clearing Corporation (OCC) clears and settles all options traded on securities exchanges in the United States and is owned by five participating exchanges.³¹ All exchange-traded options are cleared and settled through OCC. Exchange-traded options include options such as equity options, currency options, and equity index options. Over-the-counter (OTC) options, which are privately negotiated, also exist. For the purposes of this section, we will only discuss exchange-traded options.

Exchange-listed options on futures are cleared and settled through futures clearing organizations. However, OCC officials said that they clear and settle some options on futures through one of their subsidiaries for three exchanges. (See the section on the clearance and settlement of futures for further detail.)

Participants in the clearance and settlement of options include exchanges, OCC and its members (referred to as clearing members), and settlement banks (or banks that settle clearing members' accounts).

Figure 2.3 illustrates an options listing, with an explanation of its various components.

³¹Exchanges include the Chicago Board Options Exchange, American Stock Exchange, Philadelphia Stock Exchange, New York Stock Exchange, and the Pacific Stock Exchange.

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Figure 2.3: An Options Listing

- **Strike price** is the price the underlying stock will be bought and sold for. For example, the Exxon Call will give you the right to buy Exxon shares at \$80, \$85, and \$90. So, at a Strike Price of \$90, you could buy 100 shares of Exxon for \$9,000.
- **Expiration** of the call and put options contracts.
- **Volume** of the call options traded.
- **Premium** (price of the option) for a call option. The price of an 80 Jan option is 8 1/2 (\$8.50) per share, which makes the options contract price \$850 (\$8.50 x 100 shares).
- **Volume** of put options traded.
- **Premium** for put options.

Listed Options Quotations						
Option/	Strike	Exp.	Call		Put	
			Vol.	Last	Vol.	Last
EXXON	80	Oct	137	8	1	1/8
87 1/2	80	Jan	89	8 1/2	1	1/2
87 1/2	85	Oct	412	2 3/8	50	3/16
87 1/2	90	Oct	75	5/16	20	1/8
87 1/2	80	Jan	138	1 1/2
87 1/2	80	Jan	37	1 1/2	15	4/8

- **Closing price** of the underlying stock for each row of strike prices. In the example, Exxon's stock is worth 87 1/2 or \$87.50 per share. Options buyers bid or make offers in 100 shares per option contract.
- **Name** of the underlying stock.

Source: GAO Analysis.

Options Can Be Used to Limit Losses or Make Profits

An investor who wanted to limit potential losses in investments already owned might purchase a "put option." If an investor owns 100 shares of Exxon stock valued at $87 \frac{1}{2}$ (\$87.50) a share—and wants to hold the stock in case the price of the stock rises—but thinks that the price of the stock may fall below \$80, the investor might purchase an "80 Jan Put," which will give the investor the right to sell Exxon stock at a locked-in selling price of \$80 per share at any time before the option expires at 11:59 a.m. EST on the third Saturday of January. If an investor wanted to make a profit and thought that the Exxon stock might rise above \$90 a share, the investor might buy a "90 Oct Call" at a locked-in buying price of \$90 a share. If the price rises above \$90 a share, the investor can exercise his or her right to buy Exxon stock at \$90 a share. The investor can then profit by reselling the shares at the market price. The investor could also sell the option contract at a profit.

Key Terms

C Call option	A call option is a contract that gives one the right, but not the obligation, to buy a specified amount of an underlying asset, such as stocks or currency, at a specified price by a certain date.
Clearing member	A clearing member is a financial institution that OCC determines is qualified to interact with it on behalf of market participants.
Currency option	A currency option is a contract that gives one the right, but not the obligation, to buy or sell a foreign currency at a particular price within a specified period.
E Equity index option	An equity index option is an option covering the price of a diversified stock portfolio that matches a designated stock-index (a statistical indicator used to measure changes in stock groupings).
Exercise	Exercise means to make use of the "rights" in the options contract. For instance, a buyer of a call option may exercise the right to buy the underlying asset at the particular price agreed upon (called the exercise or strike price) when the contract was purchased.
F Floor broker	A floor broker executes trades for customers and may also execute trades for their personal or employer accounts.
O Open outcry	Open outcry is a competitive system in which floor participants verbally make bids and offers to each other at centralized exchange locations.
Order-book official	An order-book official is an exchange official who accepts and executes limit orders from customers--orders to buy or sell when the market reaches a certain price.
P Premium	The premium is the amount that the buyer of an option pays the writer (or seller) of the option.
Put option	A put option is a contract that gives one the right, but not the obligation, to sell a specified amount of an underlying asset, such as stocks or currency, at a specified price by a certain date.

R Registered option traders	Registered option traders are those who trade on the exchange floor for their own account but have an obligation, similar to that of specialists, to make markets.
S Series of options	A series of options consists of options of the same class that also have the same unit of trade, strike price, and expiration date.
Settlement banks	Settlement banks maintain the settlement accounts for clearing members whereby payments and deposits are made.
Stock option	A stock option gives the holder the right to purchase or sell a certain number of shares of stock at a particular price within a specified period.
W Writer	An options seller is called a writer of options, a "covered" writer if owning the underlying asset and a "naked" writer if not. The writer of an option is obligated to sell (call option), or buy (put option), a specified amount of the underlying asset at a predetermined price when the buyer, or holder, exercises the option. The writer receives a premium paid by the buyer.

Basic Data

According to OCC officials, OCC has 147 clearing members composed of broker-dealers owned by U.S. securities firms and some of the major foreign banks and investment houses.

As shown in table 2.11, OCC clears and settles millions of options contracts annually. The primary type of option that OCC clears and settles is the equity, or stock option. OCC also clears a substantial portion of equity index options and a small portion of currency options.

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Table 2.11: Total Volume of Exchange-Traded Options Contracts Cleared in 1995

Types of options	Total volume of contracts cleared ^a	Percent of total volume	Average daily volume ^b	Average daily call volume ^b	Average daily put volume ^b
Equity options	174.4	60.7%	692.0	491.3	200.7
Equity index options	107.9	37.6	428.1	191.6	236.4
Currency options	5.0	1.7	19.8	8.7	11.0
Total	287.3	100%	1140.1	691.8	448.2

^aVolume in millions.

^bVolume in thousands. Columns do not total because the totals include interest rate options that are not included in the table.

Note: Numbers based on 1995 data.

Source: OCC data.

Processes

Options trade, clear, and settle in what is known as "T+1"—i.e., options are settled one day after (+1) the day in which they were traded, with the "T" standing for the day of the trade.

The Trading Process

Individual investors who want to purchase a call or put option may do so through a broker. The broker usually has a floor broker execute the trade on behalf of the customer. Exchanges also have automatic order execution systems for public customer orders.

Trading in the options markets is done on the floor of options exchanges. The exchanges operate as auction markets. U.S. exchanges that trade options operate with either (1) competing market makers (dealers) for each class of options and exchange officials such as floor brokers or order book officials or (2) designated market makers for each class of options, with additional market making provided by registered options traders.

The Clearing Process

OCC officials said that their clearance and settlement process starts when the exchanges provide computer data on matched trades—trades in which the sell side and the buy side of the trade have been compared and matched. (See table 2.12.)

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Table 2.12: Steps in the Options Clearing Process

Steps	Clearing process
(1) OCC receives matched-trade data from the exchanges via computer.	<p>(a) Exchanges submit the matched-trade data in a batch-once-a-day mode via computer to OCC no later than 1:00 a.m. after the day of the trade for clearance and settlement purposes.^a</p> <p>(b) OCC officials said that their clearance system runs independently for each options exchange, so that a problem at one exchange does not affect the other options exchanges.</p>
(2) OCC then guarantees the matched trades.	(a) When OCC has the matching trade data, it issues a new contract and becomes the buyer to every seller and the seller to every buyer. This process is called novation.
(3) OCC then performs what is known as exercise and assignment on a random basis. OCC receives an exercise notice from the holder's broker and then assigns the exercise notice to one of its clearing members.	<p>(a) Exercise and assignments occur when a holder decides to exercise his or her rights to buy or sell the underlying asset.^b Because OCC keeps the records of all of its clearing members, when a holder decides to exercise its right to buy or sell an underlying asset, its broker has to submit an exercise notice to OCC.</p> <p>(b) OCC assigns the exercise notice to a clearing member that has a position in the unit of trade, which in turn assigns one or more of its customers who hold positions in that series of options.</p> <p>(c) The assigned clearing member is then obligated to sell or buy the underlying asset at the specified strike price.^c</p>

^aExchanges also send OCC intraday trade information that OCC uses for risk management. But for clearance and settlement, exchanges submit trade data to OCC in a batch once a day. If an exchange is unable to provide matched trade information by the final deadline, OCC allows additional time.

^bIf an option is held until it expires and it is not in the interest of the option holder to exercise the option at expiration, then OCC does not settle the option. However, if the holder decides to exercise the option on the date of expiration, then the option goes through OCC's exercise and assignment process.

^cIn the case of equity options, OCC then arranges with a stock clearing corporation for the delivery of the shares of stock instead of the exercise settlement amount. All other DVP for options are exercised within OCC.

Source: OCC.

Settlement Process

OCC calculates the amount of money that is owed by buyers and due writers the day after a trade (T+1). In the case of the buyer, the entire amount of money owed to OCC is the amount of the premium which, while first paid to OCC, is then passed on to the writer of the option. In the case of the writer, settlement refers to two settlement amounts (1) premium settlement and (2) margin settlement.³² On the day after the trade (T+1), OCC notifies the buyer of the amount of cash premium that is due; at the same time, the writer of the option is notified by OCC of the amount of margin that is due. Both amounts are due on T+1. (See table 2.13)

Table 2.13: Two Types of Settlement

Participant	Type of settlement
Buyer	Premium settlement (in this case it is the price the buyer pays for the option).
Writer	(1) Premium settlement. (2) Margin settlement. ^a

^aOCC calculates the margin that the writer has to provide using its Theoretical Intermarket Margin System, which is an option pricing model that estimates what it would cost to liquidate an option given the size of a margin interval. According to an OCC official, the margin interval is the range of potential market scenarios over which the risk of the option is being evaluated by OCC.

Source: OCC.

At the end of each trading day, OCC calculates the net amount that each member either owes or is owed. The net figure includes (1) the cash premium that the writer is due on each option sold and (2) the margin due for each open position—a position that has not been exercised by buyers or holders.

As shown in table 2.13, the first component of the writer's settlement is the premium settlement due to the writer, which is the price at which the writer sold the option to the buyer. This settlement should reflect the current market price at the time of the trade. The premium settlement is due on the day after the trade (T+1).

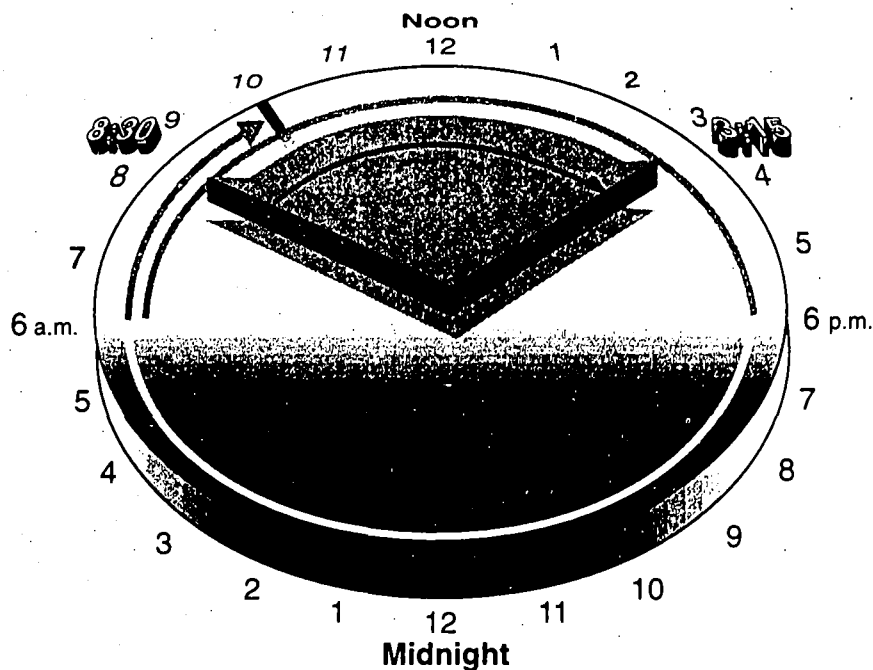
³²The final settlement of an option can be done either by exercise/assignment or by closeout. OCC officials said that only about 10 percent of options contracts are exercised/assigned. If a holder decided to close out its options prior to expiration, the holder would sell that option in the market. The option sold would be coded as a closeout option so that OCC's clearance and settlement system would eliminate the holder's open position.

The second component of the writer's settlement is the margin settlement, which is like a "good faith" deposit. One part of the margin settlement is the daily mark-to-market value of the option, which reflects the current market price of the option. For instance, as an option's price gains in value, the options writer pays margin to OCC and the buyer of the option gets a margin credit. If the options contract loses value, OCC reduces the amount of margin required from the writer.³³ The other part of the margin settlement is the daily risk value of the option, which reflects the potential change in the current market price of the option. OCC calculates and collects the margin settlement from the option writer until the option is terminated.

Figure 2.4, along with information that follows, describes in a condensed manner the events that take place during the T+1 trading, clearance, and settlement cycle.

³³Because the buyer of an option does not have to exercise the option contract unless it is in his or her favor, the buyer does not owe OCC money if the option price moves against him or her. Thus, if the price of the option continues to move against him or her, the option's buyer—by not having to exercise the option—only loses the premium settlement amount.

Figure 2.4: T+1 Trading, Clearance, and Settlement Cycle



Clearance and settlement cycle

- 6:00 a.m. OCC notifies settlement banks of final settlement amounts
- 9:00 a.m. OCC paid final settlement
- 10:00 a.m. OCC pays final settlement
- 8:00 p.m. Matched trade data submitted to OCC
- 3:00 a.m. Margin requirements are calculated

Trading

- 8:30 a.m. Trading begins
- 3:10 p.m. Trading ends
- 6:00 p.m. Currency option trading begins and will end at 2:00 p.m. the next day (20 hours later)

Source: GAO analysis of OCC data.

Trading, Clearance, and Settlement Cycle

Hours	Cycle
6:00 a.m. (CST)	Settlement banks are notified of the final—margin and premium—settlement amounts due from each clearing member, resulting from the previous day's trading.
8:30 a.m.	Trading begins for stock and stock index options at the exchanges for the new trade day (T). ³⁴
9:00 a.m.	All final settlement amounts are due to OCC by each clearing member for the previous day's trading—the T+1 settlement.
10:00 a.m.	OCC pays final settlement due members, resulting from the previous day's trading—also T+1 settlement. OCC does not pay members money owed them until it has received the money it is owed at 9:00 a.m.
3:15 p.m.	Trading ends for stock and stock-index trading.
6:00 p.m.	Currency option trading begins, and it will end at 2:00 p.m. the next day (20 hours later).
8:00 p.m.	Exchanges submit matched-trade data to OCC until 1:00 a.m. Currency option trade data from the previous day's trading are processed along with the stock and stock-index option data.
3:00 a.m.	OCC updates the clearing members' positions for the end of the trading session and calculates the members' settlement requirements, both margin and premium. This settlement amount will be the final settlement that is due by the clearing members at 9:00 a.m. and paid by OCC at 10:00 a.m., which will end the T+1 trading, clearing, and settlement cycle.

³⁴The Pacific Stock Exchange operates from 6:00 a.m. to 1:50 p.m. Pacific Time.

Regulatory Oversight

The Securities and Exchange Commission (SEC) oversees the actions of OCC with regard to exchange-traded equity options, equity index options, and currency options to determine whether it is functioning in accordance with SEC regulations and the law. The Commodity Futures Trading Commission (CFTC) oversees the actions of OCC with regard to options on futures (see the futures section for further information on options on futures). OCC establishes the rules governing the clearance and settlement of options, subject to the approval of SEC, or of CFTC in the case of options on futures.

Risk and Risk Mitigation

For purposes of this report, we discuss some of the most important risks and risk mitigation associated with exchange-traded options.

OCC carries risk from the time it guarantees a trade until the resulting position is terminated. As a result, OCC is exposed to counterparty risk, but the amount at risk (or the exposure) is dependent on fluctuations in the market.

Table 2.14: Risk and Risk Mitigation for Options

Risks	Risk mitigation
Counterparty/credit risk	<ul style="list-style-type: none">• Monitoring of the clearing member's creditworthiness• Possible requirement of additional margin for less creditworthy clearing members• Guarantee of matched trades only• Requirement of margin that acts as collateral• Maintaining guarantee fund

Risk: Counterparty/Credit

OCC guarantees the performance of each clearing member to the other clearing member of each trade. As a result, it incurs the risk that a clearing member might default on its obligations.

The amount of counterparty risk that OCC is exposed to is dependent on fluctuations in the market. If a clearing member does not make settlement, OCC—because of the guarantee to the clearing member buyer and clearing member seller—must liquidate the clearing member's positions, but until it does so, OCC is exposed to market risk (the exposure to the possibility of financial loss caused by adverse changes in the value of options).

Mitigation

OCC mitigates counterparty/credit risk by (1) monitoring the creditworthiness of its clearing members and (2) having the ability to require additional margin for less creditworthy clearing members. In addition, OCC requires a margin from each clearing member (see the section on settlement) and maintains a guarantee fund³⁵ that OCC may use when it needs to.

³⁵The guarantee fund is funded by OCC assessing clearing members on their past month's open positions. The assessment is an amount that members pay once a month and is calculated separately from the other settlement amounts.

Overview of Clearance and Settlement of Retail Payment Systems

In this section of the report, we discuss small-dollar retail payment systems, including checks, credit cards, and the automated clearing house (ACH).

Main Characteristics

- Retail payments are primarily small-dollar payments that are used by consumers or businesses in payment for goods and services.
- Unlike checks, ACH transactions can be either credit or debit transactions.
- In ACH credit transactions, funds flow from the originator (payor) to the receiver (payee). Settlement for an ACH credit transaction is generally final by the opening of business on the banking day following the settlement day.
- In ACH debit and check payments, the payee collects funds from the payor. The interbank settlement for check and ACH debit transactions is typically final by the opening of business on the banking day following the day checks are presented or ACH debit transactions are provisionally settled.

Statistical Information

- In 1996, approximately 63 billion paper checks were written in the United States.
- In 1995, credit card transactions accounted for approximately 14.9 billion transactions.
- In 1996, approximately 4.0 billion payments totaling \$12.1 trillion were processed on ACH.

Regulatory Information

- Checks are governed by articles 3 and 4 of the Uniform Commercial Code (UCC); the Expedited Funds Availability Act (EFAA), implemented by the Federal Reserve Board of Governors' Regulation CC, "Availability of Funds and Collection of Checks"; and, when handled by the Federal Reserve Banks, subpart A of the Federal Reserve's Regulation J.
- The primary regulations for credit cards are the Equal Credit Opportunity Act of 1974 and the Truth in Lending Act of 1968, implemented by the Board of Governors of the Federal Reserve System's Regulations B and Z, respectively.
- The basic rules that govern ACH are the National Automated Clearing House Association (NACHA) Operating Rules and Guidelines. In addition, ACH is governed by UCC Article 4A for commercial ACH credit transactions, 31 CFR 210 for transactions originated by the federal government, the Electronic Fund Transfer Act and the Federal Reserve's Regulation E for consumer transactions, and the Reserve Banks' ACH operating circular for transactions processed by the Federal Reserve.

Risk Information

- Consumer delinquency and default are the principal risks that confront the credit card industry.
- Depository institutions that originate ACH debit transactions and that collect checks are exposed to the potential risk that some of the checks/debit transactions will be returned unpaid.
- Depository institutions that originate ACH credit transactions are exposed to potential temporal credit risk if a corporate customer does not fund the payment on settlement day.

Checks

Description and Use

The paper check, the most frequently used and oldest noncash payment instrument in the United States, is used by individuals, businesses, and governments to pay for goods and services. According to the National Organization of Clearing Houses (NOCH), over 63.4 billion paper checks were written in the United States in 1996.¹ Paper checks constitute the largest volume of noncash payments made in the United States. In this section, we discuss the clearance and settlement of commercial checks drawn on financial institutions.²

As illustrated in figure 3.1, a paper check includes the names of the payor and the payee, the amount of the check, and the name of the paying bank. In addition, the magnetic ink character recognition (MICR) line at the bottom of the check permits checks to be processed on high-speed equipment. It includes a number that identifies the bank upon which it is drawn and the account number of the check writer. Before checks are processed, the amount of the check is also encoded in magnetic ink at the bottom of the check.

¹Estimates of the total number of checks written for any given period must be considered imprecise estimates because the specific number of checks that are cleared through clearing houses, correspondent banks, and by direct presentment is unknown. A comprehensive survey of the number of checks written has not been conducted since 1979.

²In 1996, the Federal Reserve Banks processed nearly 436 million paper checks for the federal government; however, the volume of government paper checks is expected to decline as a result of the enactment of the Debt Collection Improvement Act (DCIA) of 1996, Pub. L. No. 104-134, Section 31001, which requires that all federal payments, except Internal Revenue Service (IRS) payments and payments to individuals who certify that they do not have bank accounts, be issued via electronic funds transfer by Jan. 1, 1999.

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Checks

Figure 3.1: An Example of a Paper Check

Payor's name
Number of the check
Routing number is repeated in a different format from that shown below and is used in manual processing.

No. 687
12-345
00

Consumer A
123 Main Street
Anywhere, U.S.A. 00000

January 1, 1997

Pay To
The Order Of Company B \$ 75.00

Seventy Five and ⁰⁰/₁₀₀ Dollars

First National Bank
Anywhere, U.S.A.

Memo
Consumer A

:121908288:0981234567:0687 0000007500

MICR Number: Magnetic ink character recognition number

Payor's bank

Payee

Payor's account number

Check number

Dollar amount is printed by the first bank receiving the check.

Check digit: This number, combined with the first eight digits, verifies the routing number's accuracy.

Payor's bank: These four digits are the payor bank's institutional identifier.

Check routing symbol: The first two digits identify the payor bank's Federal Reserve district.
The third digit identifies the Federal Reserve office (head office or branch) or special collection arrangement.
The fourth digit shows the payor bank's state or special collection arrangement.

Source: The Story of Checks and Electronic Payments, Federal Reserve Bank of New York.

Depository institutions have the following alternative methods of clearing and settling checks.

On-us checks. When checks are deposited into the same bank on which they were drawn, banks will settle these items in-house. Such checks are referred to as "on-us" checks.

Interbank checks. Interbank checks are checks not drawn on the depository institution at which they were deposited.

- **Direct presentation.** Depository banks can present checks directly to the paying bank.
- **Correspondent banks.** Correspondent banks can settle the checks that they collect for other institutions, known as respondents, by using accounts on their books or by sending Fedwire funds transfers.
- **Clearing house association.** Banks can form a voluntary association that establishes a meeting place for the exchanging of checks drawn on those banks. Typically, banks participating in check clearing houses use the Federal Reserve's net settlement service to effect settlement for the checks exchanged each business day.
- **Federal Reserve Banks.** The Federal Reserve System operates a comprehensive, nationwide system for clearing and settling checks drawn on depository institutions located in all regions of the United States.

There are approximately 150 check clearing house associations in the U.S. Three of the large clearing house associations in the U.S. are the California Bankers Clearing House (CBCH), the Chicago Clearing House Association (CCH), and the New York Clearing House Association (NYCHA). NYCHA, established in 1853, is the nation's first clearing house association. Smaller depository institutions typically use the check collection services of correspondent banks or of the Federal Reserve.

Table 3.1: Major Organizations That Process or Exchange Checks

Federal Reserve System	The Federal Reserve System processes commercial checks through its 12 Reserve Banks, 24 branches, and 10 regional check processing centers. Also, the Federal Reserve processes federal government checks and postal money orders.
CBCH	CBCH provides check exchange services to over 100 depository institutions located mainly in California.
CCH	CCH provides check exchange services to its 8 member banks and its 260 affiliate members.
NYCHA	NYCHA provides check exchange services to its 10 member banks and to 131 other depository institutions.

Sources: Federal Reserve Board, CBCH, CCH, and NYCHA.

Key Terms

C Cash letter	A cash letter is a group of checks, accompanied by a listing of the checks, which is sent to a clearinghouse, a correspondent bank, or the Federal Reserve for collection.
Check	A check is a written order from one party (the payor) to another (the payee) requiring the payor to pay a specified sum on demand to the payee or to a third party specified by the payee.
Check clearing	Check clearing is the movement of a check from the depository institution at which it was deposited back to the institution on which it was written; the funds move in the opposite direction, with a corresponding credit and debit to the involved accounts.
Check truncation	Check truncation is the practice of holding a paper check at the bank at which it was deposited (or at an intermediary bank) and electronically forwarding the essential information on the check to the bank on which it was written. A truncated check is not returned to the writer.
D Depository bank	A depository bank is the bank at which a check is first deposited.
F Float	Float is checkbook money that appears on the books of both the check writer (the payor) and the check receiver (the payee) while a check is being processed.
M MICR-line information	MICR-line information refers to data characters at the bottom of a check. The magnetic ink character recognition (MICR) line at the bottom of a check includes the routing number of the payor bank, the amount of the check, the number of the check, and the account number of the customer.
P Paying bank	A paying bank is the bank at which a check is payable and to which it is sent for payment or collection.
Presentment fee	A presentment fee is a fee that a bank receiving a check may impose on the bank that presents the check for payment.

Basic Data

Table 3.2 shows the volume of checks handled by the Federal Reserve and three major check clearing houses from 1992 to 1995. In 1995, the Federal Reserve Banks handled 15.5 billion checks, a decrease of 19 percent from

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Checks

the volume of checks they handled in 1992.³ The following factors have contributed to this decline:

- adoption of the same-day settlement regulation;⁴
- increased competition from private clearing houses; and
- banking consolidation, resulting in more “on-us” checks, which do not need to be cleared.

Table 3.2: The Volume of Checks Processed, 1992-1995

	1992	1995	Percent change
Federal Reserve ^a	19.1 billion	15.5 billion	-19%
CBCH	1,294 million	1,554 million	+20
CCH	384.7 million	562.8 million	+46
NYCHA	492.6 million	335.7 million	-32

^aThese numbers refer only to commercial checks; they do not include federal government checks and postal money orders that are processed by the Federal Reserve.

Sources: The Federal Reserve System 1995 Annual Report, CBCH, CCH, NOCH, and NYCHA.

At the same time, the volume of checks processed by two of the three major private clearing houses, CBCH and CCH, has increased for the period of 1992 through 1995, as shown in table 3.3.

³Annual Report: 1995, Board of Governors of the Federal Reserve System, p. 303.

⁴Before the Board of Governors adopted the same-day settlement rule, which became effective on Jan. 2, 1994, private collecting banks, unlike the Federal Reserve Banks, did not have the right to present checks to paying banks and to demand settlement in same-day funds. Since the same-day settlement rule became effective, more collecting banks have begun to present checks directly to paying banks. Banks have historically had bilateral agreements with each other under which they have exchanged checks directly. In some cases, paying banks imposed presentment fees, but not in all cases. Even today, banks exchange checks directly at later times than permitted under the same-day settlement rule using bilateral agreements.

Processes

As previously mentioned, banks have several alternative methods for clearing and settling checks. Figure 3.2 describes how the Federal Reserve System processes and clears checks. The Federal Reserve System operates a comprehensive, nationwide system for clearing both local and nonlocal checks. When checks are processed by the Federal Reserve, they are sorted through a check sorter and settled by debits to the Federal Reserve accounts of the paying banks and credits to the Federal Reserve accounts of the collecting banks. In order to facilitate the clearing of checks nationwide, the Federal Reserve uses both air transportation and ground transportation networks to deliver checks. Checks, which are drawn on banks in regions far from the payee bank, are frequently shipped by air to the city in which the payor bank is located. Locally, checks are delivered by ground transportation.

Processing a Check

Figure 3.2 shows how a paper check would be processed through the Federal Reserve System, using the following example.

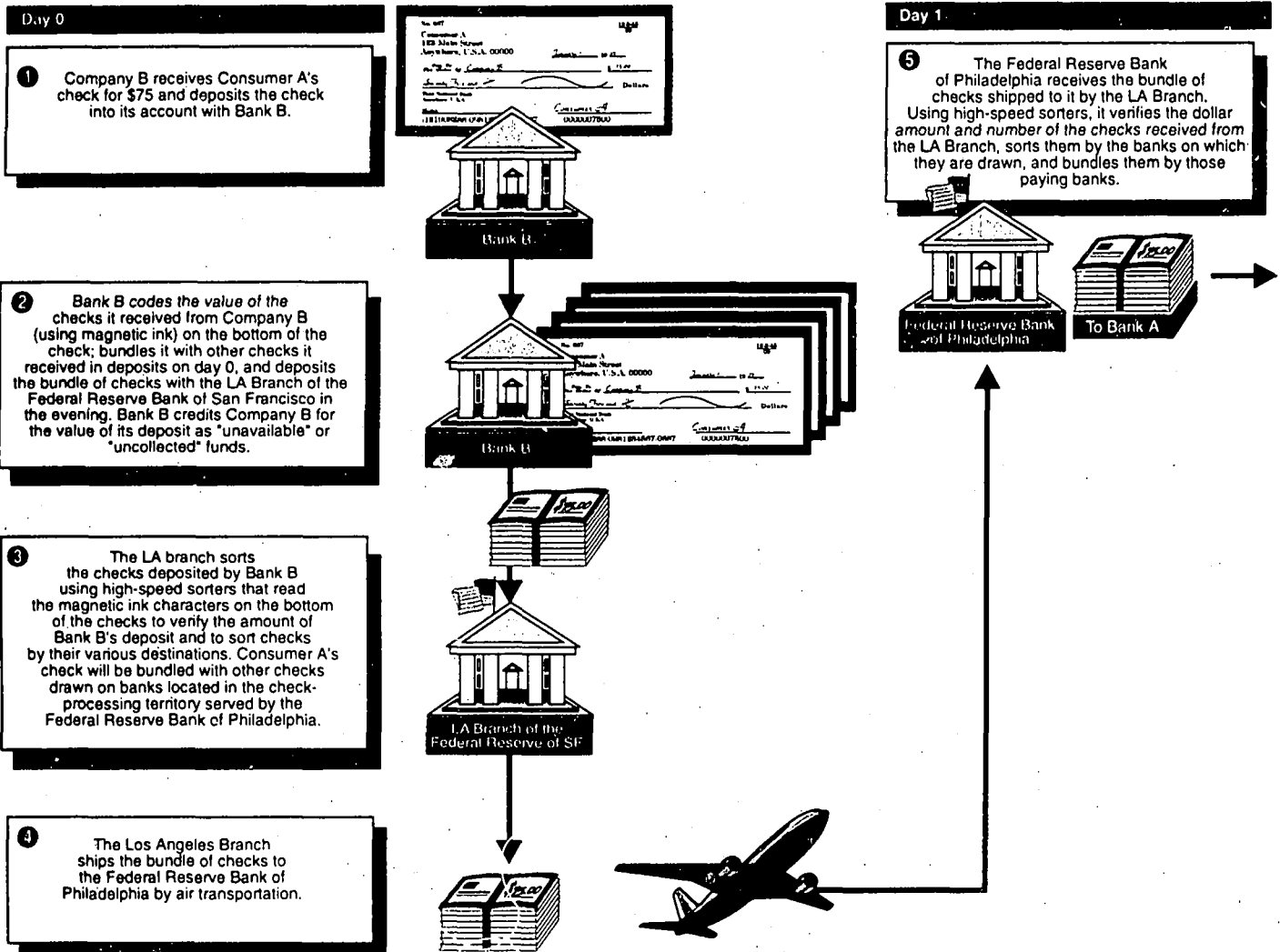
Example: A consumer (Consumer A) in Philadelphia orders four books from a book company (Company B) in Los Angeles.

The total cost of the order is \$75.

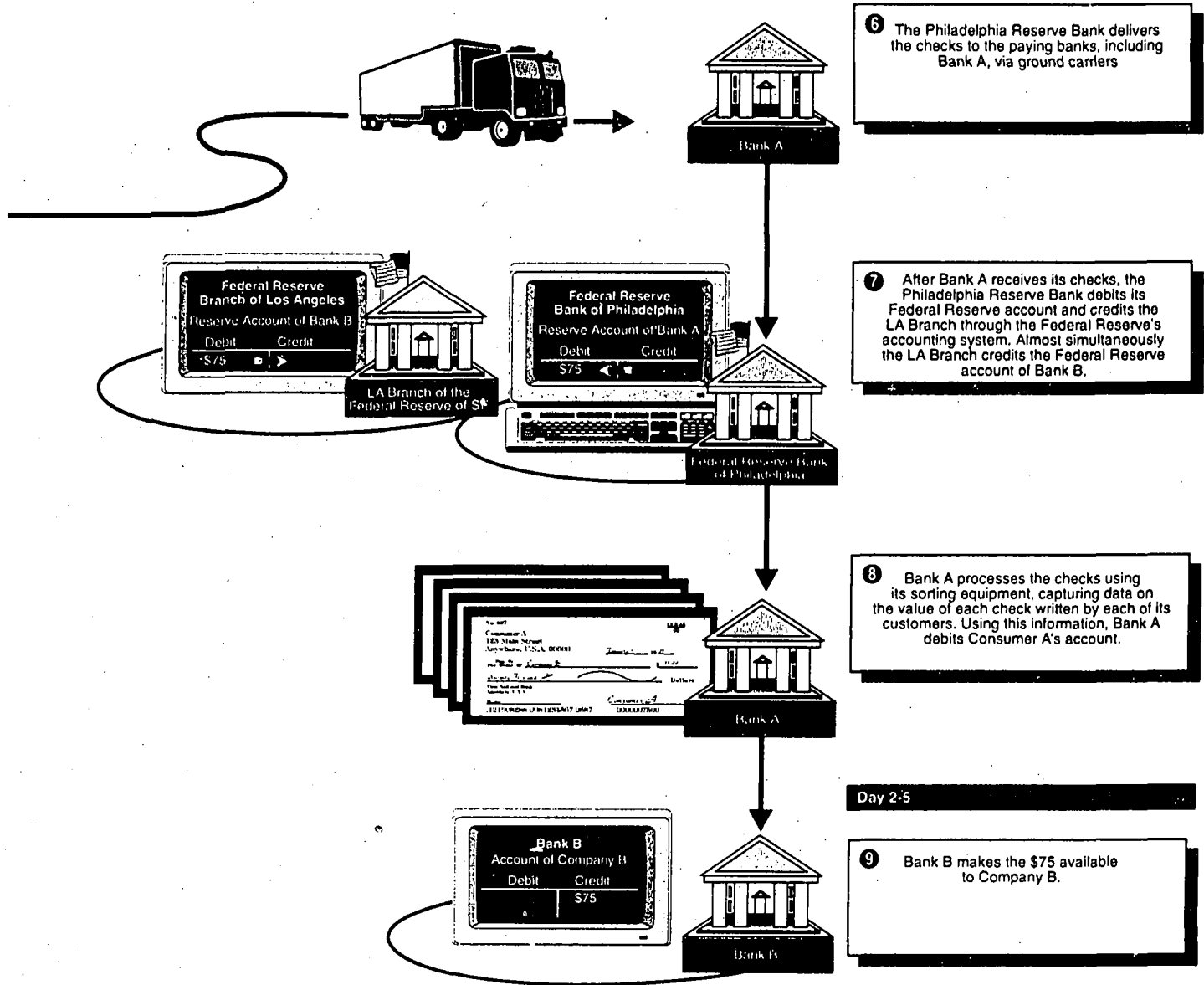
The consumer pays for the books by mailing a check to Company B.

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Figure 3.2: The Federal Reserve System for Processing a Paper Check



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Source: GAO analysis of information provided by the Federal Reserve Board.

According to industry officials, extensive use of the paper check contributes to some of the inefficiency that is present in the U.S. payment system. One of the goals of any payment system is to facilitate the safe, sound, and efficient transfer of value between receivers and providers of goods and services in a timely manner. According to a payment system expert, paper instruments, such as checks, are considered substandard from a payment system design perspective.

New Technologies in Check Processing

In the last few years, clearing house associations, the banking industry, and the Federal Reserve have been actively developing and pursuing a new technology that may shorten the amount of time it takes to clear and settle checks and, thus, improve the overall efficiency of the payment system. This new check technology is called electronic check presentment (ECP). ECP is a process by which the MICR-line information is sent electronically to the paying bank. A number of large commercial banks participate in the Electronic Check Clearing House Organization (ECCHO), formed in 1990. ECCHO drafts rules and designs formats for electronic check processing among its members. Banks that are ECCHO participants can exchange electronic check data among themselves before the paper checks are physically presented for payment.

ECP may include check truncation and may be supported by check imaging technology. Check truncation is a process by which the paper checks are retained at some point in the collection process, and only the check information is sent forward to the paying bank. ECCHO is developing a set of national rules for check truncation. Check imaging is a process by which a picture is taken of the front and back of the check, and the images are stored on electronic media for retrieval when needed.

The Federal Reserve also offers ECP products to paying banks. During 1996, the Federal Reserve presented electronically to the paying bank nearly 1.4 billion checks, or 9 percent of checks collected by the Federal Reserve. This is an increase of approximately 100 percent over the 1994 level.

As of January 1996, 2,221 depository institutions used the Federal Reserve's ECP service. This is a 37-percent increase over the number of depository institutions that were using the Federal Reserve's ECP service in January 1995. In 1992, NYCHA created the Clearing House Electronic Check Clearing System (CHECCS), in which ECP is a key component.

Although the use of check truncation and imaging is steadily increasing, it is not clear how much check volume will be affected by these methods in the foreseeable future. The reluctance of some banks to invest in the technology, and consumer preference for their returned checks, may restrain substantial growth in check truncation and imaging. One Federal Reserve official predicted that check truncation would not be widely used until consumers accepted the fact that their checks would not be returned to them. Moreover, under current law, depository banks must physically present checks to paying banks to obtain settlement for the checks.

Regulatory Oversight

Articles 3 and 4 of the Uniform Commercial Code (UCC) provide the legal framework for check processing. In 1987, Congress enacted the Expedited Funds Availability Act (EFAA), which limits the time that banks can withhold funds from checks deposited into customer accounts before the funds are made available for withdrawal. The law was implemented in September 1988 through the Federal Reserve Board of Governors' Regulation CC, "Availability of Funds and Collection of Checks." Regulation CC also includes a number of provisions designed to accelerate the collection of checks and the return of unpaid checks to the banks of first deposit. Among other things, EFAA and Regulation CC generally require institutions to make funds from local checks available by the second business day after the day of deposit; funds from nonlocal checks are to be available by the fifth business day after the day of deposit.


Also, those checks that are collected or returned through the Federal Reserve are governed by subpart A of the Federal Reserve's Regulation J. Regulation J establishes the procedures, duties, and responsibilities of the sending and paying banks.

Risk and Risk Mitigation

For purposes of this report, we discuss some of the most important risks and risk mitigations associated with checks.

Table 3.3: Risk and Risk Mitigation for Checks

Risk	Risk mitigation
Return item risk	Credit monitoring
	Large-dollar return notifications
	Electronic check presentment
Check fraud risk	Positive pay
	Electronic check presentment

 Shaded cells indicate mitigations that have been adopted by some participants or providers but are not yet widely used. Unshaded cells indicate mitigations in general use.

Risk 1: Return Item

A check will be returned to the depository bank unpaid if the paying bank determines not to pay the check. This is called a return item. Return item risk is a major risk facing institutions that collect checks. Some of the reasons for which a check may be returned are insufficient funds in the account, a closed account, a stop payment order, a fraudulent signature, or the failure of the paying bank. A recent Federal Reserve survey on returned checks processed by the Reserve Banks showed that it takes, on average, 5.5 calendar days for local and nonlocal checks to complete a full return cycle from the depository bank to the payor bank and back to the depository bank.⁵

The risk faced by depository banks depends on when they make funds available to their customers. Banks are obligated under EFAA to make funds available to their customers in accordance with mandatory funds availability schedules. Thus, a depository bank may be required to make funds available to the customer before a check is returned to the depository bank unpaid. When the depository bank receives a return item, it will charge back its depositing customer's account for the item even if it has already made the funds available to the depositing customer. The depository bank may be exposed to some risk if the customer does not have sufficient funds in his or her account to cover the returned check. When a paying bank returns the item to the depository bank, the paying bank does not necessarily have to return the item through the same clearing mechanism from which it received the item.

⁵Report to the Congress on Funds Availability Schedules and Check Fraud at Depository Institutions, Board of Governors of the Federal Reserve System, Oct. 1996, p. 22.

Mitigation

Credit monitoring by financial institutions. For the purpose of reducing the return item risk faced by depository banks, the Federal Reserve recommends that depository institutions perform a credit assessment of those customers for which they collect large-dollar volumes of checks. Also, the Federal Reserve recommends that institutions monitor the payment activity of their customers and take appropriate action when credit limits are exceeded.

Mitigation

Large-dollar return item notification. Federal Reserve Regulation CC requires that when a paying bank decides to return a check of \$2,500 or more, it must provide a notice of nonpayment to the depository bank. The notice must be received by 4:00 p.m. local time for the depository bank on the second business day following the banking day on which the check was presented to the paying bank. A paying bank can send the notice of nonpayment by several means, including the return of the check to the depository bank; a telephone call or telex to the depository bank; a special, nonvalue Fedwire funds transfer notice; or a telephone call to a Reserve Bank with a request to forward the notice.

Mitigation

Electronic check presentment. The exchange of electronic check information may reduce risk to the depository banks because it permits them to deliver check data to paying banks more quickly than is currently done with paper checks. The shorter time for check information delivery could permit the paying banks to (1) identify checks that cannot be paid and (2) notify the depository bank about those returned checks, using an electronic return notice, up to 1 day earlier than would occur with the physical exchanging of paper checks. If a depository bank could be notified of a return item earlier, then the risk might be reduced because the depository bank would know sooner that the check was not being paid and that funds should not be made available to the depositing customer.

Risk 2: Check Fraud

Check fraud is a problem for the banking industry. The same Federal Reserve survey on check fraud and check returns estimated that in 1995, the value of all check-fraud losses at commercial banks, credit unions, and savings institution was \$615 million for 529,000 cases of check fraud.⁶ Also, for that year, commercial banks' check fraud losses (\$487 million) represented approximately 1 percent of their profits. The survey also found that local checks accounted for about 72 percent of the total dollar losses reported in the Board's survey.

One example of check fraud is check kiting. Check kiting may take many forms, but often it involves the writing of checks on two or more banks for the purpose of fraudulently obtaining interest-free unauthorized loans. Other types of check fraud include forgery, altered checks, counterfeit checks, and paperhanging. Forgery occurs when a person forges the account holder's signature or the endorsement. Altered checks are checks that have information, such as the amount, altered without the payor's approval. Counterfeit checks are imitations or copies of genuine checks. Paperhanging refers to checks that are deliberately written on closed accounts.

Mitigation

Positive pay. Corporations use positive pay to guard against check fraud. Under these arrangements, a corporation sends an electronic file of information on all checks issued to its bank. The bank compares this information with electronic information about checks presented for payment. If a check presented for payment is not included in the positive-pay information, the corporation is notified and requested to make the pay/no pay decision.

Mitigation

Electronic check presentment (ECP). As in the case of return item risk, ECP may reduce check fraud by providing the depository bank with information about unpaid checks earlier than the information is currently provided. By speeding the transmission of the MICR information, ECP may allow the paying bank to identify checks that cannot be paid earlier and to notify the bank of first deposit earlier of an impending returned check, possibly before the funds are made available to the depositing customer.

⁶Report to the Congress on Funds Availability Schedules and Check Fraud at Depository Institutions, Board of Governors of the Federal Reserve System, Oct. 1996, p. 5.

Electronic Funds Transfer

Electronic Funds Transfer (EFT) is the transfer of funds from one account to another by electronic rather than by paper-based instructions, such as checks. EFT can save time and money in the payment system by eliminating paperwork.

Types of EFT Systems⁷

Electronic Funds Transfer

- Consumer electronic payments are small-dollar payments, such as transactions made via the ACH,⁸ at automated teller machines (ATM), point-of-sale payments using debit cards, and the use of telephones or personal computers to initiate bill payments.
- Electronic benefits transfers are electronic payments for social security, pension, and welfare payments; student loans; and unemployment compensation.

Statistics

In 1994, federal and state governments transferred about \$500 billion in benefits to recipients.

- Federal benefits: approximately \$400 billion.
- State benefits: approximately \$95 billion.

The Financial Management Service of the U.S. Treasury estimates that it costs the government 42 cents to issue and mail a paper check but only 2 cents to process an electronic payment.

Developments

The number of EFT transactions should increase as a result of the passage of the Debt Collection Improvement Act of 1996, which will substantially reduce the use of checks as a federal payment instrument by January 1999. The EFT provisions of DCIA require that all federal payments (except IRS tax refunds and payments to individuals without bank accounts) be issued by EFT.

⁷Wire transfers, such as Fedwire, are considered electronic funds transfers.

⁸ACH is discussed later in the retail payment systems section.

Credit Cards

Description and Use

A credit card is a payment card issued to a person for purchasing goods and services and obtaining cash against a line of credit established by the issuer. Credit cards can be of two types: those issued by merchants and vendors, such as department stores or oil companies, and general purpose credit cards issued by banks, such as VISA and MasterCard. Credit cards allow a consumer cardholder to pay off his or her entire outstanding balance or to make minimum monthly payments and carry over balances, on which interest is charged. In addition, a cardholder may be able to receive cash advances under a preapproved line of credit with a credit card, either through a bank teller or an automated teller network (ATM), for which the cardholder is charged a finance charge.

The two dominant bank-issued general purpose credit cards are VISA and MasterCard. Before 1971, participating banks could not be a member of both VISA and MasterCard; this was changed as a result of antitrust concerns. Today, issuers can issue both VISA and MasterCard credit cards. A number of nonbank companies also issue credit cards, such as American Express, Discover, and Diners Club.

Key Terms

C Credit card company

A credit card company is a company that owns the trademark of a particular credit card, and it may also provide a number of marketing, processing, or other services to the members using the card services.

Credit line

A credit line is the maximum amount of credit available in an open-ended credit arrangement, such as a bank credit card, which the lender may change at any time. The line is disclosed in the credit card agreement.

E EDC

Electronic Data Capture (EDC) is a point-of-sale terminal that reads the information embedded in the magnetic stripe of banks cards. These terminals electronically authorize and capture transaction data, thus eliminating the need for a paper deposit.

Basic Data

The use of general purpose credit cards in the United States has grown substantially since 1981. In 1995, credit card transactions accounted for approximately 14.9 billion transactions.

As shown in table 3.4, since 1990, VISA and MasterCard have increased the number of cards in use by 84 percent and 63 percent, respectively.

Table 3.4: The Number of Major U.S. Credit Card Companies' Cards, 1990-1995

Credit card company	Number of cards		Percent change
	1990	1995	
VISA	120.1	221.1	84%
MasterCard	88.2	144.1	63
American Express	25.9	26.7	3
Discover	37.8	45.1	19

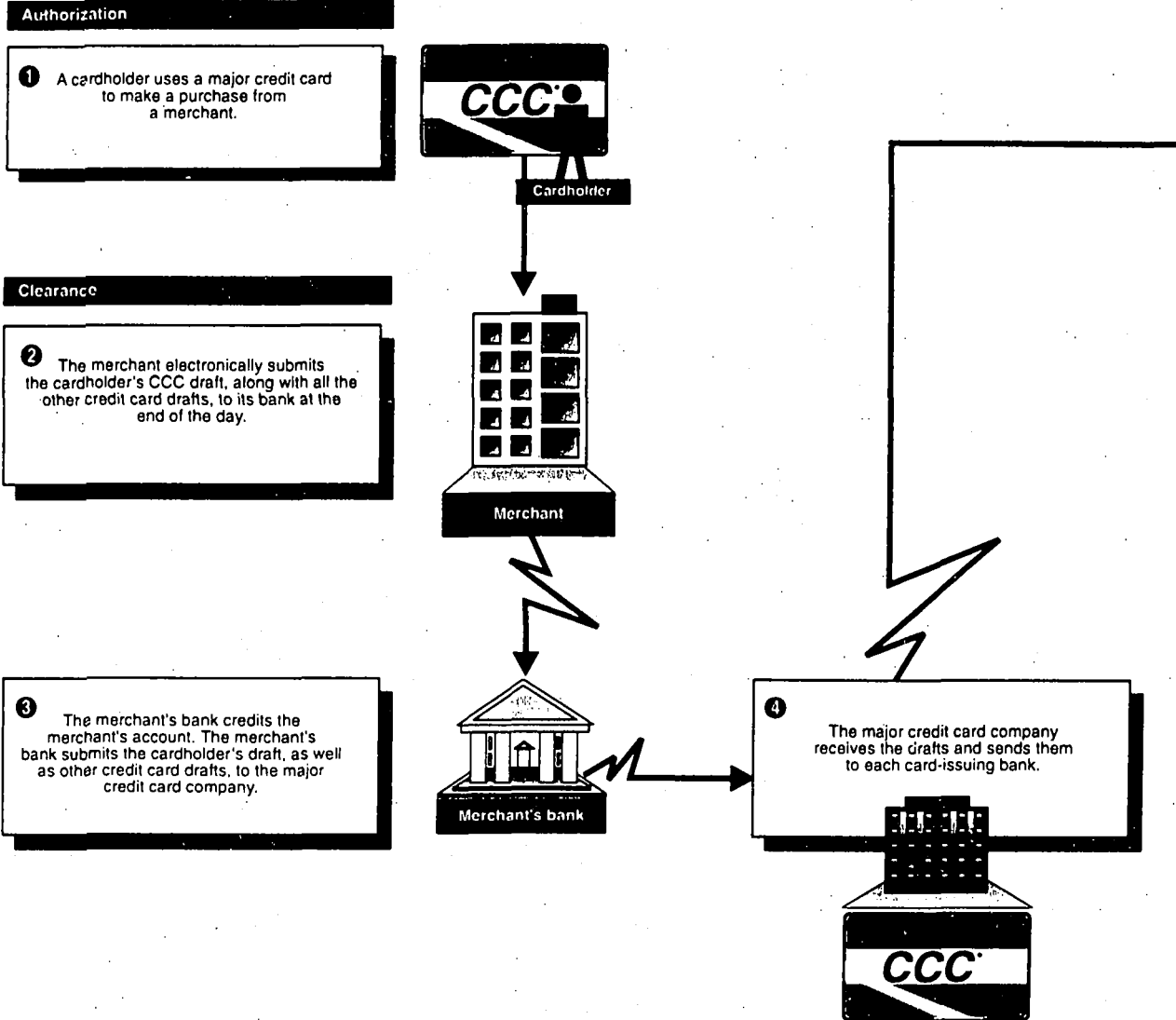
Source: Faulkner & Gray.

In 1995, the total charge volume of VISA, MasterCard, American Express, and Discover was \$70.9 billion, which was a 318-percent increase from 1985.

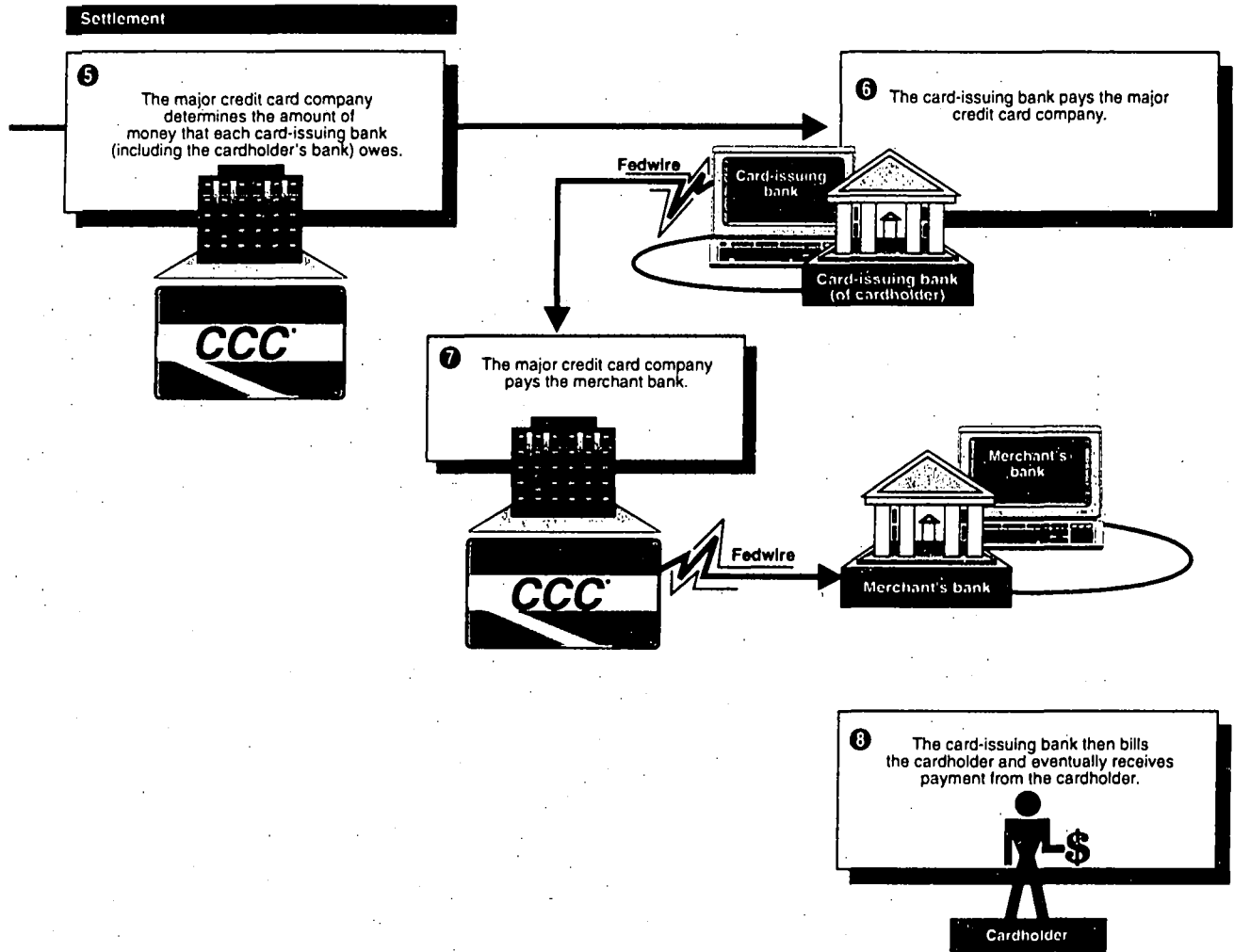
Processes

The clearance and settlement of credit card transactions involve three parts—authorization, clearance, and settlement. Authorization is the process by which the issuer of a credit card (card-issuing bank) approves (or declines) a transaction at the point of sale. Clearance is the process by which a credit card company collects data about a transaction from a bank (referred to as an acquirer or the merchant's bank) and delivers the data to the card-issuing bank, which will use the information to post the transaction to the cardholder's account. Settlement is the process by which a credit card company collects funds from the card-issuing bank and pays funds to the merchant's bank for the cleared transactions. Figure 3.3 illustrates how a credit card transaction clears and settles after a credit cardholder makes a purchase at a store (merchant). Every credit card transaction involves the cardholder, the card-issuing bank, a credit card company, a merchant, and the merchant's bank.

Figure 3.3: Clearance and Settlement Cycle of Credit Cards



Section 3: Retail Payment Systems • Credit Cards
Credit Cards



Note: Major credit card companies operate a multilateral settlement system.

Source: GAO.

Authorization (Step 1)

A cardholder selects goods or services from a store (or merchant) and presents a credit card as payment. The sales clerk of the store swipes the card through one of the store's EDC terminals and keys in the amount of the transaction. The authorization request is transmitted electronically through the credit card company to the issuer of the credit card.⁹ The card-issuing bank then approves or declines the transaction based on the cardholder's account status, and the approval or disapproval is transmitted electronically to the store through the credit card company. If the transaction is approved, the salesperson then produces a sales draft for the customer to sign.

Clearance (Steps 2 Through 4)

At the end of the day, the merchant submits all of its credit card transaction data electronically (credit card drafts) to its bank(s). The merchant's bank then credits (or pays) the merchant for its transactions. At this point, the store has been paid and is out of the cycle.¹⁰ The merchant's bank is then responsible for getting paid for the transaction, and sends the transaction data electronically to the credit card company. The credit card company electronically sends the credit card drafts (transaction data) to each card-issuing bank.

Settlement (Steps 5 Through 8)

After the card-issuing bank receives the transaction data, the credit card company collects funds from the card-issuing bank's account and transfers funds to the account of the merchant's bank, thus ending the cycle for the bank. The card-issuing bank will then present the transaction as an item on the cardholder's next monthly statement, and once the cardholder pays the card-issuing bank, the cycle will be complete.

The payment and receipts of member banks (card-issuing banks and merchant banks) of the credit card company are done through each member (or its correspondent bank) and the credit card company's settlement banks over Fedwire Funds Transfer System (see section on Fedwire Funds Transfer for details on how it works).¹¹ For each card-issuing bank, the credit card company adds up the credit card company's transactions for the bank and sends it the net settlement

⁹If a member bank or its designated processor serve as both the card-issuing bank/processor and the merchant's bank/processor, then authorization, clearing, and settlement may be handled entirely by the member bank or processor as "on-us" transactions. In this case, a credit card company would not be directly involved in processing the on-us transaction.

¹⁰The merchant will get paid an amount minus a merchant discount fee, which is retained by the merchant's bank.

¹¹VISA's settlement banks have to meet specific operational and credit rating type criteria.

amount.¹² Payment is made by the card-issuing bank submitting payment to the credit card company (through its settlement banks over Fedwire) for transactions plus fees and charges due to the credit card company. The credit card company then pays the merchant's bank for the transactions and collects fees and charges from the merchant's bank.

Because of the international aspect of a credit card company's business, the major credit card companies operate on a daily processing cycle on Greenwich Mean Time, which starts at 7:00 p.m. EST and ends 24 hours later at 7:00 p.m. EST. Thus, settlement for the merchant's bank in the United States usually occurs 1 calendar day after a transaction is submitted to the credit card company because of the hours of Fedwire. Settlement for the card-issuing bank occurs once it has received payment from the cardholder.

Each member bank of a major credit card company may be required to maintain collateral with the credit card company. The collateral is meant to cover the potential losses that the credit card company may incur if the member bank fails.¹³

Regulatory Oversight

The primary federal laws governing credit card issuance and operation are the Equal Credit Opportunity Act of 1974 and the Truth in Lending Act of 1968 (TLA). These laws are implemented through Federal Reserve Regulations B and Z, respectively. Regulation B prohibits lenders, including credit card companies, from discriminating against credit applicants and establishes guidelines for gathering and evaluating credit information. Regulation Z requires uniform methods for computing the cost of consumer credit and disclosing credit terms, prohibits the unsolicited issuance of credit cards, and limits cardholder liability for unauthorized use.

Other laws applying to credit cards are the Fair Credit and Charge Card Disclosure Act of 1988, the Fair Credit Billing Act of 1974, and the Fair Credit Reporting Act of 1970. The Fair Credit and Charge Card Disclosure Act amended the TLA to require that applications for credit cards that are sent through the mail, canvassed by telephone, or made available to the public (e.g., at counters in retail stores) must contain information about key terms of the account. The Fair Credit Billing Act amended the TLA to

¹²According to VISA officials, most of the netting for VISA is done on a multilateral basis.

¹³If a card-issuing member bank fails, VISA may have paid a merchant's bank for the transactions but be unable to collect funds from the member bank.

specify how creditors must respond to billing complaints from consumers, requiring that creditors handle consumer accounts fairly and promptly. The Fair Credit Reporting Act entitles consumers to know the source for the credit information and allows them to correct errors in the reported information.

Risk and Risk Mitigation

For purposes of this report, we discuss some of the most important risks and risk mitigations associated with credit cards.

Table 3.5: Risk and Risk Mitigation for Credit Cards

Risk	Risk mitigation
Fraud risk	Neural network
	Address verification service
	Issuer's clearing house service
Credit risk	Credit monitoring

Risk 1: Fraud

Risk from fraud involving credit cards includes unauthorized use of lost or stolen cards, fraudulent applications, counterfeit or altered cards, and the fraudulent use of a cardholder's credit card number. Lost or stolen credit cards account for approximately 50 percent of all credit card fraud, and fraudulent and counterfeit cards account for approximately 7 percent and 11 percent of credit card fraud, respectively. If cardholders report the loss of their credit cards, they are responsible, at most, for \$50. The issuing bank or the merchant pays the costs of any fraud involving credit cards. The merchant is responsible for paying any costs related to credit card fraud if the merchant does not do at least one of the following three things: obtain an authorization, the cardholder's signature, or the electronic imprint of the card. According to an industry official, usually the issuing banks are responsible for paying approximately 70 percent of the cost of credit card fraud while the merchants are responsible for paying the other 30 percent.

Mitigation

Neural network. The neural network allows a card-issuing bank to track the cardholder's spending patterns and to detect any spending discrepancies and thereby prevent potential credit card fraud. For example, if a cardholder, who typically purchases airplane tickets to domestic destinations, starts purchasing an excessive number of airplane tickets to international destinations, the neural network may alert the issuing bank and the cardholder of potential fraud.

Mitigation

Address Verification Service. The mail-order catalog industry developed a program called Address Verification Service (AVS). AVS allows mail and telephone order companies to verify a cardholder's billing address online. This program is designed to reduce fraudulent use of a cardholder's credit card number. Using AVS, the mail and telephone order companies can verify the address the customer provided as well as the billing address on file with the card issuer. If the two addresses are different, then the mail or telephone order company may suspect fraud.

Mitigation

Issuer's Clearing House Service. VISA and MasterCard have developed a type of clearing house database, Issuer's Clearing House Service (ICS), to detect fraudulent credit applications. ICS allows issuing banks to compare credit card applications against a database of invalid addresses and Social Security numbers. The ICS database includes information such as Social Security numbers, names, and dates of birth of credit card applicants.

Risk 2: Credit

Consumer delinquency and default are the main credit risks involving the use of credit cards. If a cardholder fails to pay for the charges, then the issuing bank is liable to pay the merchant's bank.

Mitigation

Credit monitoring. The card-issuing bank is responsible for monitoring and controlling credit risk resulting from consumer delinquency and default. Issuing banks can mitigate the risks of consumer delinquency through the normal authorization process of charges and credit reviews of cardholders. For example, during the authorization process, when the credit card is swiped, the card-issuing bank can deny authorization of a transaction if the consumer had been delinquent in paying the credit card bill. The issuing bank can establish financial standards to be used during the application process to protect itself from delinquent consumers.

Automated Clearing House

Description and Use

An automated clearing house (ACH) network is an electronic batch processing system by which payment orders are exchanged among financial institutions. The ACH began, in 1972, as a system operated by the Federal Reserve Banks at the request of members of local ACH associations. It is designed for high-volume, predominantly small-dollar recurring payments, such as payroll, mortgage, car loan, or Social Security.

An ACH payment can either be a credit transaction or a debit transaction. In an ACH credit transaction, funds flow from the originator to the receiver, and in a debit transaction, funds flow from the receiver to the originator. Every ACH transaction, regardless of whether it is a credit or a debit transaction, must have an originator of the transaction, a receiver of the transaction, an originating depository institution, and a receiving depository institution. Listed in table 3.6 are examples of ACH credit and debit transactions.

Table 3.6: Examples of ACH Credit and Debit Transactions

ACH credit transactions	ACH debit transactions
Payrolls	Consumer bill payments: <ul style="list-style-type: none"> • Mortgage and loan • Insurance premiums
Government benefit payments: <ul style="list-style-type: none"> • Social Security • Federal employee retirement • Disability 	
Corporate payments to contractors and vendors	Corporate cash concentrations
Corporate tax payments	Corporate tax payments

Source: Federal Reserve.

There are four ACH processors operating in the United States that process ACH transactions:

- (1) American Clearing House Association (American), (2) Federal Reserve System (Federal Reserve), (3) New York Automated Clearing House (NYACH), and (4) VISANet ACH (VISA).

The Federal Reserve and VISA are national ACH providers. NYACH and American are regional ACH providers.

Key Terms

A ACH operator/processor	An ACH operator/processor is a central clearing facility that receives batches of ACH credit and debit transactions from originating depository institutions, edits, sorts, and distributes the transactions to receiving depository institutions, and facilitates the settlement among participants.
B Batch processing	Batch processing is the transmission or processing of a group of related electronic payment instructions.
C Clearing house	A clearing house is a voluntary association of depository institutions that facilitates the exchange of payment transactions, such as checks, automated clearing house transactions, and large-value funds transfers, and the settlement of participants' net debit or credit positions.
F File	A file is a group of entries transmitted by originating institutions or to receiving institutions by ACH operators. A file may contain one or more batches of entries.
O Originator	An originator is a person or an organization that initiates an ACH entry.
Originating depository institution	An originating depository institution is a financial institution that initiates and warrants electronic payments processed through the ACH network on behalf of its customers.
R Receiver	A receiver is the individual or organization that has authorized an originator to initiate an ACH credit or debit transaction entry to the receiver's account with the receiving depository institution.
Receiving depository institution	A receiving depository institution is a financial institution that maintains accounts for individuals and corporations that receive ACH credit and debit transactions.
Return item	A return item is a transaction that has been returned by a receiving depository institution because it cannot be posted. For example, the receiving customer may not have an account with the institution or may not have sufficient funds in his/her account to fund a debit transaction.

Basic Data

The volume of ACH payments has been increasing rapidly. In 1996, approximately 4 billion payments, totaling \$12.1 trillion, were processed on the ACH. This is a 55-percent increase in the volume of payments since 1992.

The Federal Reserve processes both commercial and government ACH payments. In 1996, the Federal Reserve processed approximately 2.4 billion commercial ACH transactions, almost 80 percent of all interbank commercial ACH payments. Currently, all government ACH payments are processed by the Federal Reserve.¹⁴ Moreover, as a result of the Debt Collection Improvement Act of 1996, Section 31001(x), the volume of government ACH transactions is expected to increase substantially. DCIA Section 31001(x) requires that all federal payments, except Internal Revenue Service payments and payments to individuals who certify that they do not have bank accounts, be issued via EFT by January 1, 1999.

NYACH serves nearly 800 commercial banks, savings banks, savings and loans, and credit unions, and processes approximately 10 percent of the ACH's commercial transaction volume in the United States. VISA serves over 290 financial institutions in the United States, and the American ACH serves approximately 100 financial institutions. As shown in table 3.7, the volume of all ACH providers is increasing.

Table 3.7: Volume of ACH Transactions Processed by the Four ACH Providers, 1992-1996

Items in millions			
ACH provider	1992	1996	Percent change
Federal Reserve: commercial	1,275	2,372	86%
Federal Reserve: government	531	625	18
NYACH	185	317	71
American	49	93	90
VISA	151	311	106

Note: Double counting exists in the volume figures for the private processors. The volume figures for NYACH, American, and VISA include some ACH entries that are sent or received from the Federal Reserve.

Sources: Federal Reserve Board's 1995 Annual Report, American National Automated Clearing House Association (NACHA), NYCHA, and VISA.

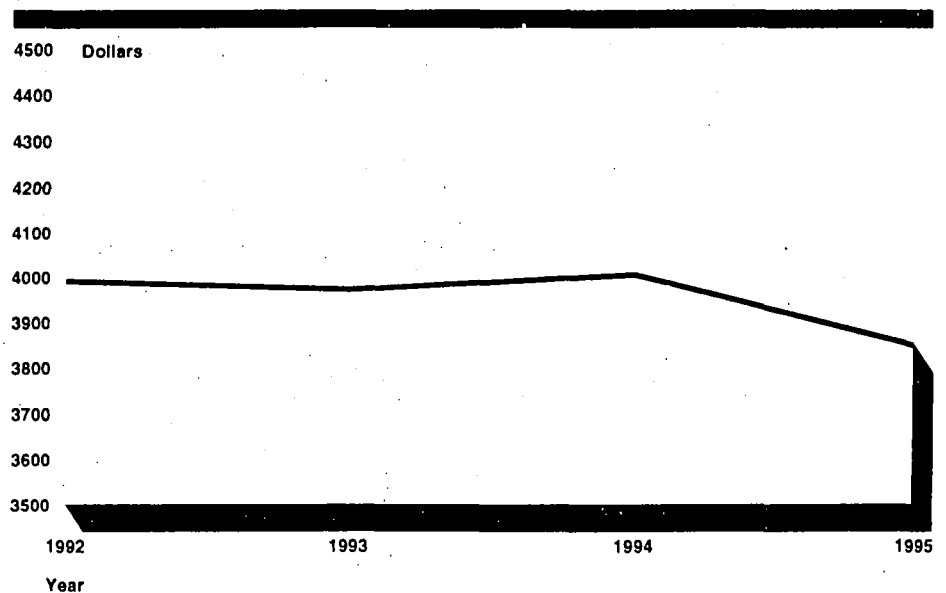
The fees charged by ACH providers for processing ACH transactions are significantly lower than the fees assessed for Fedwire funds transfers and

¹⁴Government payments refer only to payments originated by the federal government. All other ACH payments are referred to as commercial, including those originated by state and local governments. Although the Federal Reserve processes ACH government payments for the Treasury, the Treasury is not statutorily mandated to use the Federal Reserve.

the Clearing House Interbank Payment System (CHIPS)¹⁵ transfers. For example, the separate fees charged the originator and the receiver are typically slightly less than a penny. As of January 2, 1997, the fee charged to the sender and the receiver of a Fedwire is \$0.45 per transfer. The fee for a CHIPS transfer ranges from \$0.13 to \$0.40, depending upon the participant's monthly transaction volume and other factors.

As shown in figure 3.4, the average value of an ACH transaction has stayed consistently around \$4,000; in 1995, the average value of an ACH transaction was \$3,847. In comparison, in 1995, the average value of a Fedwire funds transfer was \$2.9 million.

Figure 3.4: The Average Value of an ACH Transaction, 1992-1995



Source: NACHA.

Table 3.8 shows the total dollar amount of ACH transactions for each of the four ACH providers for the period 1992 through 1996.

¹⁵Fedwire is an electronic funds transfer network operated by the Federal Reserve for large-dollar value transfers. CHIPS, the other large-dollar electronic payment system, is owned by NYCHA. For more discussion on Fedwire and CHIPS, see the Fedwire Funds Transfer and Clearing House Interbank Payments System subsections in Section 1.

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Automated Clearing House

Table 3.8: Total Amount of Dollars Processed by Each ACH Provider, 1992-1996

ACH provider	1992	1996	Percent change
Federal Reserve: commercial	\$6.5 trillion	\$8.7 trillion	34%
Federal Reserve: government	860 billion	1.3 trillion	51
American	76.7 billion	174.7 billion	128
NYACH	2.0 trillion	2.6 trillion	30
VISA	N/A	656.0 billion	

N/A: Not available.

Note: Double counting exists in the dollar-value figures for the private ACH processors. The dollar-value figures for NYACH, American, and VISA include some ACH entries that are sent to or received from the Federal Reserve.

Sources: Federal Reserve Board, American, NYCHA, and VISA.

Processes

The ACH operates by a batch processing system in which groups of transactions are transmitted to ACH operators throughout the day. As the groups of transactions are received, they are edited for conformance with the operating rules of NACHA, settlement data for the originating and receiving depository institutions are captured, and individual transactions are sorted to the receiving depository institutions.

Unlike Fedwire transfers, which are processed and settled immediately, ACH transactions are valued-dated, that is, the originator of ACH transactions includes the settlement date in the payment instructions when it originates the transaction. ACH credit transactions may be originated up to 2 business days before the settlement date, and the ACH debit transactions may be originated 1 business day before the settlement date. Government entries can be originated up to 4 days before the settlement date.

Depository institutions that use the Federal Reserve as their provider can deposit files of ACH transactions at the Federal Reserve Bank anytime during the day. ACH transactions may be destined for institutions located in the same Federal Reserve district or in another Federal Reserve district. The Federal Reserve processes ACH transactions nearly 24 hours a day.¹⁶

¹⁶All Federal Reserve ACH processing is done at the East Rutherford (New Jersey) Operations Center of the FRBNY.

In 1994, NYACH, VISA, and American established the Private ACH Exchange (PAX). Since the establishment of PAX, New York, American, and VISA can exchange transactions directly without using the Federal Reserve as an intermediary processor. PAX handles about 1 million transactions monthly. Previously, the three ACH private processors had to use the Federal Reserve's ACH service to deliver ACH transactions among themselves. For example, when American sent an ACH file to VISA, American would send the file first to the Federal Reserve, where the transactions were processed and distributed to VISA for its members. Now, using PAX, American can send the ACH file directly to VISA.¹⁷

The Federal Reserve provides settlement services to all three processors—net entries are posted for members of VISA and American; gross entries are posted for NYACH. Net settlement allows participants that use private processors to settle their net positions either through Fedwire funds transfers, using special settlement accounts at Reserve Banks, or by accounting entries, which are posted to participants' reserve accounts by Federal Reserve Banks. Currently, VISA is the only one of the three private ACH processors that uses the Fedwire funds transfer service for settlement.

Examples of one ACH credit transaction and one ACH debit transaction follow.

Example of an ACH Credit Transaction

Figure 3.5 illustrates how a company's payroll is transmitted over the ACH. Example: Company A, headquartered in Washington, D.C., with offices located in Chicago, Los Angeles, and New York, pays all of its employees by direct deposit using the ACH network.

Originator of the ACH payment: Company A.

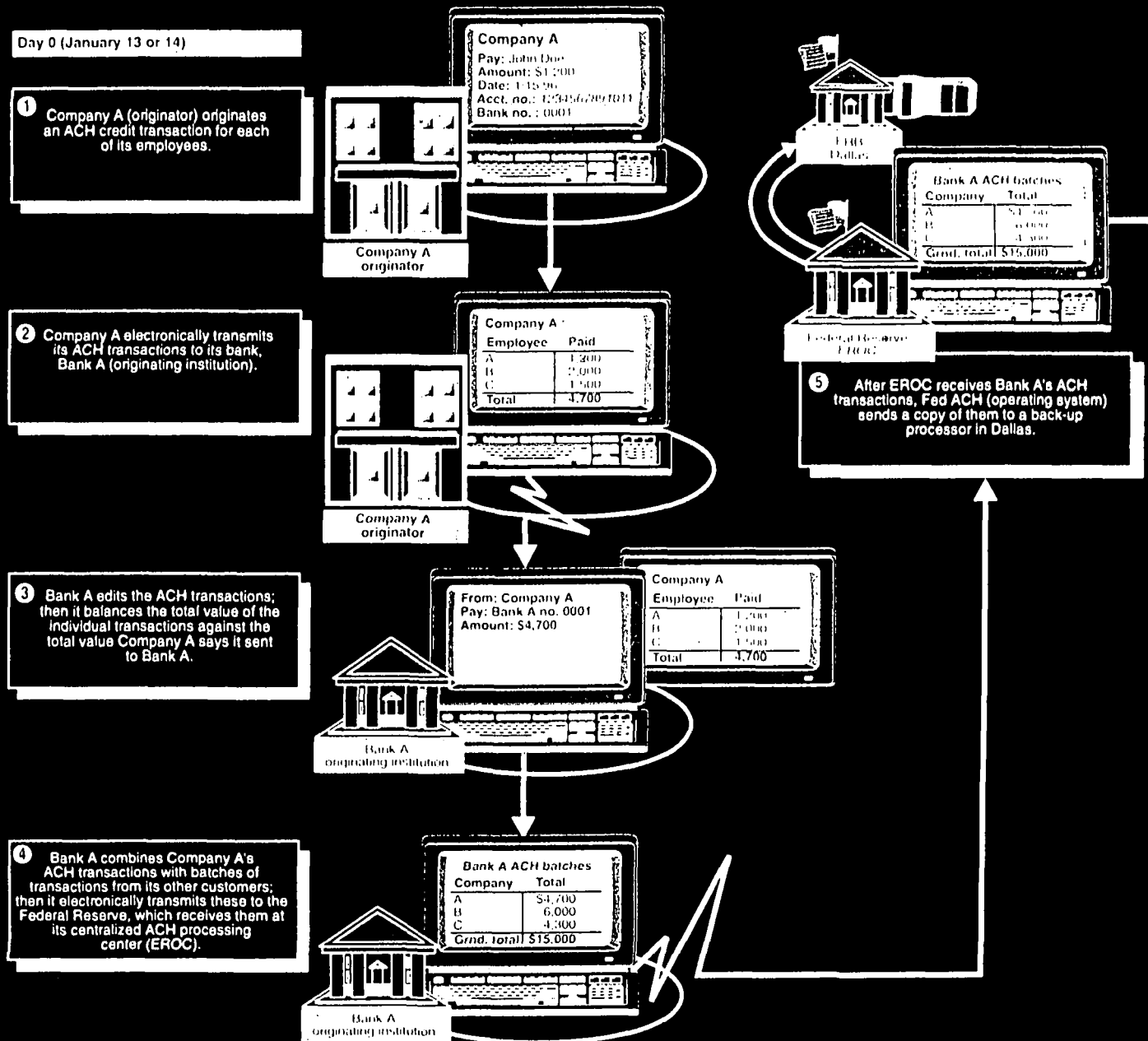
Receiver of the ACH payment: Company A's employees.

Originating depository institution: Bank A.

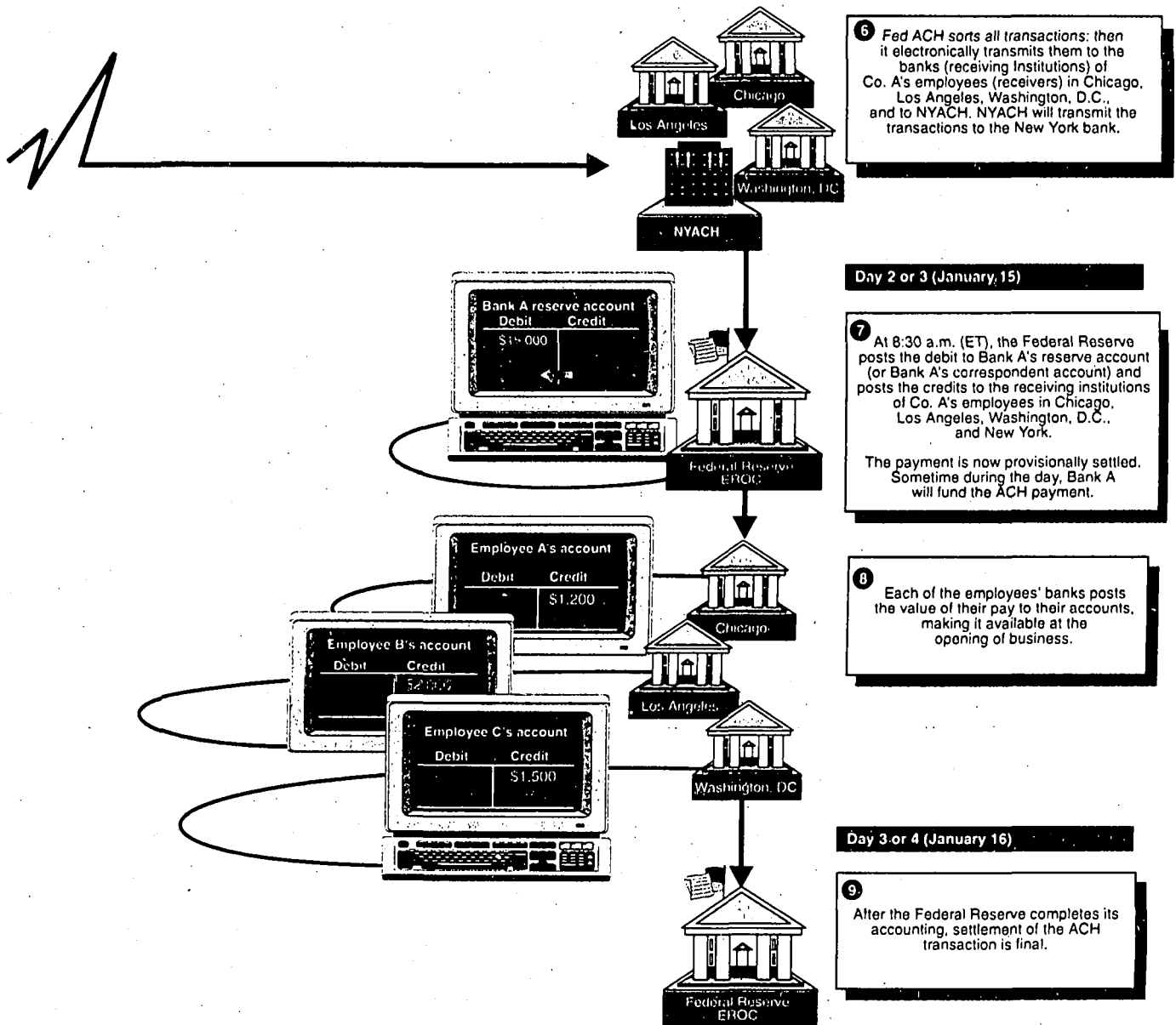
Receiving depository institutions: Banks in which Company A's employees have their accounts.

¹⁷Private ACH operators still continue to use the Federal Reserve to deliver a significant number of transactions.

Figure 3.5: Typical ACH Credit Transaction—The Direct Deposit of a Payroll



Section 3: Retail Payment Systems • ACH
Automated Clearing House



(Figure notes on next page)

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Automated Clearing House**

Note: The Federal Reserve retains the right to reverse a credit given to a receiver of an ACH credit transaction until the Federal Reserve's books have been closed, which generally occurs during the night of the settlement day. The Federal Reserve could reverse a credit to the receiving institutions on the night of Jan. 15, but not later than the morning of Jan. 16.

Source: GAO analysis of information provided by the Federal Reserve Board.

Example of an ACH Debit Transaction

Figure 3.6 illustrates an example of an ACH debit transaction in which a homeowner sends his or her mortgage payment to a mortgage company through the ACH system. In this example, both the originating depository institution and the receiving depository institution are using private ACH providers to process the ACH transaction.

Example: A homeowner in New York authorizes its mortgage company, which is located in California, to make a withdrawal of \$2,000 each month from the customer's deposit account for the purpose of paying his or her monthly mortgage.

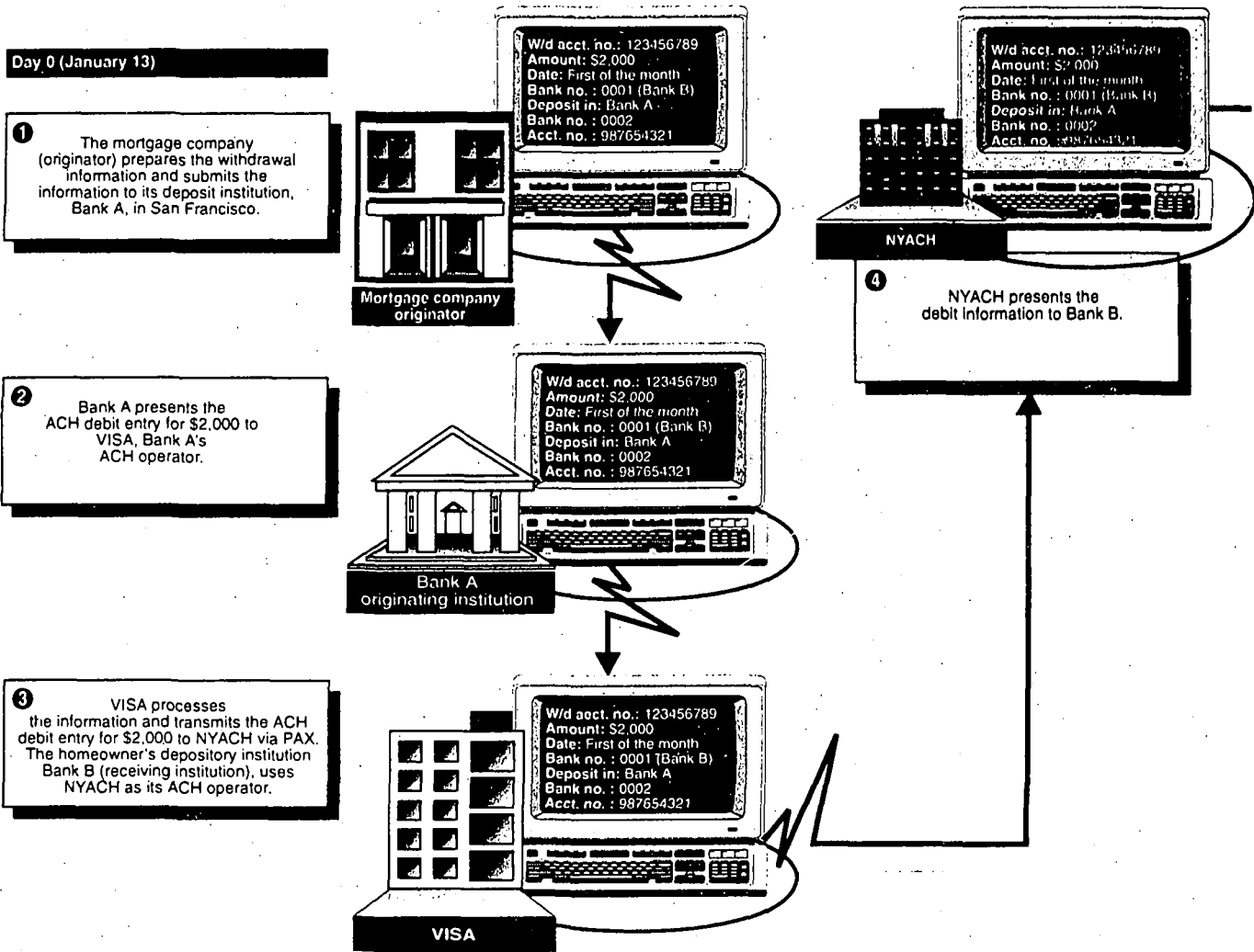
Originator of the ACH transaction: Mortgage Company.

Receiver of the ACH transaction: Homeowner.

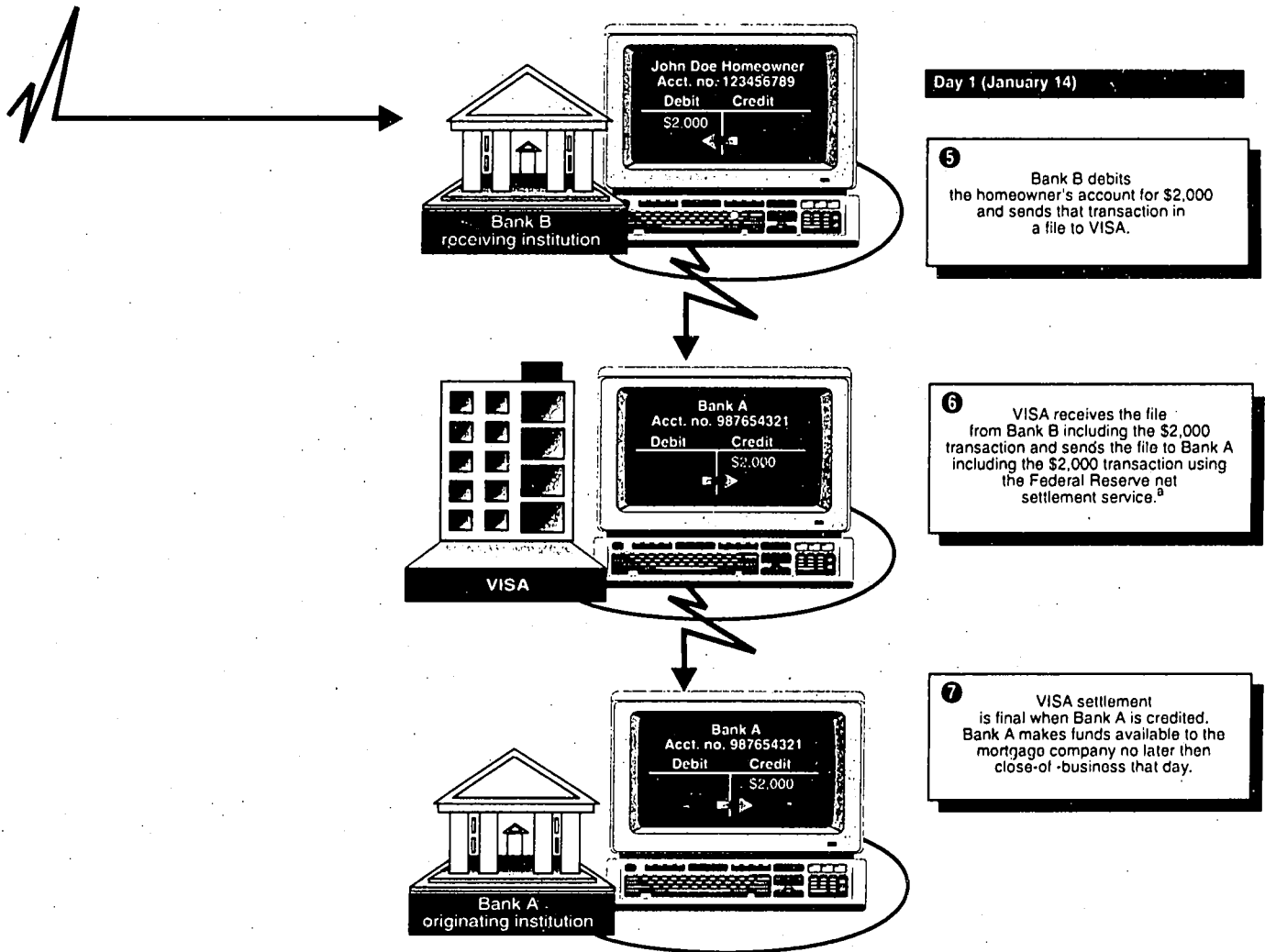
Originating depository institution: Bank A in San Francisco.

Receiving depository institution: Bank B in New York.

Figure 3.6: Typical ACH Debit Transaction—Bill Payment



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^aVISA settles its ACH entries through a special settlement account at the Federal Reserve Bank of San Francisco. Each VISA participant in a net debit position sends a Fedwire funds transfer for the amount of its net debit position. When all participants in net debit positions have sent Fedwires to fund the account, VISA sends Fedwires equal to each of the remaining participants' net credit positions.

Source: NACHA.

Regulatory Oversight

The ACH is governed primarily by rules written by the private sector, NACHA Operating Rules and Guidelines, which are supplemented by the rules of local ACH associations. The National Automated Clearing House Association (NACHA) is a nonprofit banking trade association that promulgates the rules and operating guidelines for electronic payments through the ACH. NACHA represents 38 regional ACH associations and their more than 14,000 depository institution members. The Federal Reserve recognizes NACHA as the informal rulemaker for ACH transactions. According to a Federal Reserve official, NACHA, however, has no enforcement authority over depository institutions that use the ACH or over ACH providers to ensure compliance with its rules.

Depository institutions using the Federal Reserve's ACH services must comply with the Reserve Banks' uniform ACH Operating Circular, which incorporates the operating rules of NACHA by reference and indicates any rule that the Federal Reserve has not determined to incorporate in its uniform circular. In addition, depository institutions that originate and receive consumer ACH transactions must comply with the regulations that the Board of Governors of the Federal Reserve System promulgates in Regulation E, which implements the Electronic Funds Transfer Act. Corporate ACH credit transactions are governed by UCC 4(A). When the federal government is the originator, the transactions are governed by the Treasury Department's regulations, 31 CFR Part 210.

Risk and Risk Mitigation

For the purposes of this report, we discuss some of the most important risks and risk mitigations associated with the ACH.

Table 3.9: Risk and Risk Mitigation for ACH

Risk	Risk mitigation
Temporal credit risk	Credit monitoring
Return item risk	Credit monitoring

Risk 1: Temporal Credit

The originating institution of an ACH credit transaction is obligated to pay for any ACH credit entry that it initiates. Because the ACH credit transactions may be originated up to 2 business days before the settlement date and a customer may not fund its obligation until late on the settlement day, the originating depository institution may be exposed to credit risk for nearly 3 business days. This type of risk is called temporal risk.

Mitigation

Credit monitoring by financial institutions. According to the Federal Reserve's payments system risk policy, depository institutions that originate ACH credit transactions should

- perform a credit assessment of all customers originating large-dollar volumes of ACH credit transactions;
- establish interday credit limits for originating customers that originate ACH credit transactions based on each institution's credit assessment;
- monitor compliance with the credit limit across all processing cycles for a given settlement date; and
- require the customer either to prefund its account, provide collateral, or deposit the ACH file on the night cycle preceding the settlement day if the customer's financial condition is deteriorating.¹⁸

Risk 2: Return Item

The major risk facing institutions that originate ACH debit transactions is return item risk. Return item risk occurs when institutions receiving ACH debit transactions are unable to fund payment requests and the transactions must be returned to the originating institutions. Receiving institutions may return ACH debit transactions for a number of reasons, including insufficient funds, the existence of a stop payment order, or an unauthorized transaction. The risk to depository institutions originating

¹⁸Guide to the Federal Reserve's Payments System Risk Policy, Board of Governors of the Federal Reserve System, p. 57.

debit transactions depends on when they make funds available to their customers. Originating depository institutions typically make funds from ACH debit transactions available to their customers at the opening of business on the settlement date for the transactions. Receiving institutions must return ACH debit transactions so that the originating institutions receive the returned transactions by the opening of business on the second business day following the settlement day.

Mitigation

Credit monitoring by financial institutions. The Federal Reserve's payment system risk policy recommends that depository institutions originating ACH debit transactions perform a credit assessment and monitor the return experience of their customers. Depending upon the results of these analyses, depository institutions are expected to take steps to protect themselves from losses, such as delaying availability for all or some portion of funds collected or requiring balances or collateral to cover the value of potential return items.

Overview of New and Emerging Financial Products and Services

In this section we discuss emerging payment technologies. These include stored-value cards, electronic banking, and financial transactions made over the Internet. These technologies have the potential to alter the way many everyday payments are made.

Main Characteristics

- All of these technologies take advantage of advances in computer chips, communications, and software.
- Some have the potential to reduce the cost and increase the convenience of making payments. Over time, these technologies may displace some transactions that are currently made by cash and check.

Statistical Information

- Most technologies are in the testing and implementation stage.
- In October 1996, 2.1 million U.S. households were banking online.
- Tests of general purpose stored-value cards have been conducted for several years, but nowhere in the United States are they available for general use.
- In 1995, an estimated quarter of a billion dollars of credit card purchases were made over the Internet. The dramatic increase in the number of Internet users and businesses offering products over the Internet suggests that this volume will increase rapidly.

Regulatory Information

Regulators will have to adapt existing regulations, and perhaps adopt new regulations, to accommodate these new technologies. For example, they must decide to what extent regulations governing electronic funds transfer (EFT) should be applied to stored-value cards.

Risk Information

Conducting financial transactions over the Internet creates new opportunities for counterfeiting, money laundering, and tax evasion. Securing payments over the Internet will involve the implementation of new and unproven security measures.

The Internet

Microsoft
Internet
Explorer



The Internet is a network of networks connecting millions of desktop computers in homes, businesses, universities, and governments.

Background

- The Internet began in the 1960s as a Department of Defense effort to link a number of independent computer systems so that researchers around the country could share a few super computers.
- The Internet is largely self-governing.
- The Internet is an open communications system with no built-in means to protect privacy of information, such as a consumer's credit card number.

Developments

The number of desktop computers connected to the Internet increased dramatically in the mid-1990s as several developments made the Internet increasingly useful and easy for nonexperts to use. These developments are

- availability of simplified e-mail systems;
- establishment of the World Wide Web (www),¹ a collection of documents interlinked by a shared language, and
- development of user-friendly www browsers, programs designed to read documents on the www.

¹Many people confuse the World Wide Web and the Internet. As stated earlier, the Internet refers to the overall network of networks.

Stored-Value Cards

Description and Use

Recent developments in encryption, microchips, and computer network technology have enabled consumers to make electronic payments through the use of a stored-value card, a credit-card-sized device in which money value is stored digitally.² Although stored-value cards resemble credit or debit cards, transactions made with stored-value cards resemble transactions made with currency or coin. For instance, users of stored-value cards do not need a deposit account at a financial institution nor do merchants have to verify a cardholder's identity when purchases are made. Stored-value cards are intended for repetitive, low-value transactions too small for economical use of a credit or debit card, such as payments for mass transit or fast food.

Stored-value cards have features that resemble traveler's checks, in that the card purchaser surrenders cash value in exchange for obligations of an issuer, which may not be a financial institution. However, unlike traveler's checks, stored-value cards are designed for small-dollar value purchases and can be used only with hardware devices equipped to accept payments. The maximum dollar value that can be held on a stored-value card is determined by the issuer. One industry representative predicted that this amount would be about the same as the maximum withdrawal from an automated teller machine (ATM).

Two types of multipurpose stored-value cards exist: **disposable** stored-value cards, which are loaded with a fixed dollar value and are discarded once all the stored cash is spent, and **reloadable** cards—such as the Mondex card—which can be replenished by inserting the card in a specially equipped ATM, a specially equipped telephone, or an electronic wallet.³ In the near future, individuals may be able to transfer funds to a stored-value card using a personal computer connected to a network.

²One type of stored-value card is the single-purpose card, e.g., a card used to pay for telephone calls and transit fares. In this report, we will focus on general purpose cards that can be used to buy goods and services from a variety of vendors.

³A device that looks like a calculator and is designed to transfer value from one card to another.

Key Terms

D Debit card	A debit card is a bank card that draws funds directly from a consumer's checking or savings account.
E Electronic wallet	An electronic wallet is a small portable device that loads and reads stored-value cards.
Encryption	Encryption is the process of disguising a message (using mathematical formulas called algorithms) in such a way as to hide its substance.
S Stored-value card	A stored-value card is a credit-card-sized device, implanted with a computer chip, with stored money value. A <i>reloadable</i> stored-value card can be reused by transferring value from an automated teller machine or other device. A <i>disposable</i> card cannot be reloaded.

Basic Data

General-purpose stored-value cards are still in the early stage of development. Tests of disposable and reloadable stored-value cards are being conducted in about two dozen countries, including the United States. Banks, credit card companies, and technologically based companies see the automation of small transactions as one of the frontiers of payment technology. Table 4.1 describes a few of the most extensive tests of stored-value cards.

Table 4.1: Stored-Value Card Tests

Location	Description
Swindon, England	<p>In July 1995, Mondex, a venture of two British banks, began conducting a test of stored-value cards in Swindon, England, a city with 190,000 residents. The cards and the merchant hook-ups were provided free of charge.</p> <ul style="list-style-type: none"> • Swindon residents were offered reloadable cards to be used at a majority of the city's stores, parking meters, pay phones, and buses. • 8,000 residents actually used the cards. • 750 merchants out of the 1,000 in Swindon signed up to accept the cards.
1996 Olympics in Atlanta, GA	<p>At the 1996 Olympics in Atlanta, VISA and the three largest banks in the southern United States conducted the largest experiment with stored-value cards.</p> <ul style="list-style-type: none"> • About 2 million stored-value cards were made available in denominations of \$10, \$20, \$50, and \$100. • All of the 85,000 spectators at the opening ceremonies were to be given \$5 cards. • In July 1996, 198,000 transactions were made with VISA cash cards.
Manhattan, NY	<p>Chase Manhattan Bank, Citibank, MasterCard, Mondex, and VISA announced an extensive pilot project on the upper west side of Manhattan to begin in October of 1997.</p> <ul style="list-style-type: none"> • Between 50,000 and 100,000 bank customers are to be offered reloadable cards that will be subject to predetermined dollar limits. • The banks are expected to charge for the cards, although some may be offered at a nominal cost or for free. • About 500 merchants are expected to accept the cards.

Source: GAO analysis of industry data.

Initial results of these pilots suggest that consumers will be slow to adopt stored-value cards. According to press reports, in neither the Mondex nor the VISA trials did the number of users meet issuers' expectations.

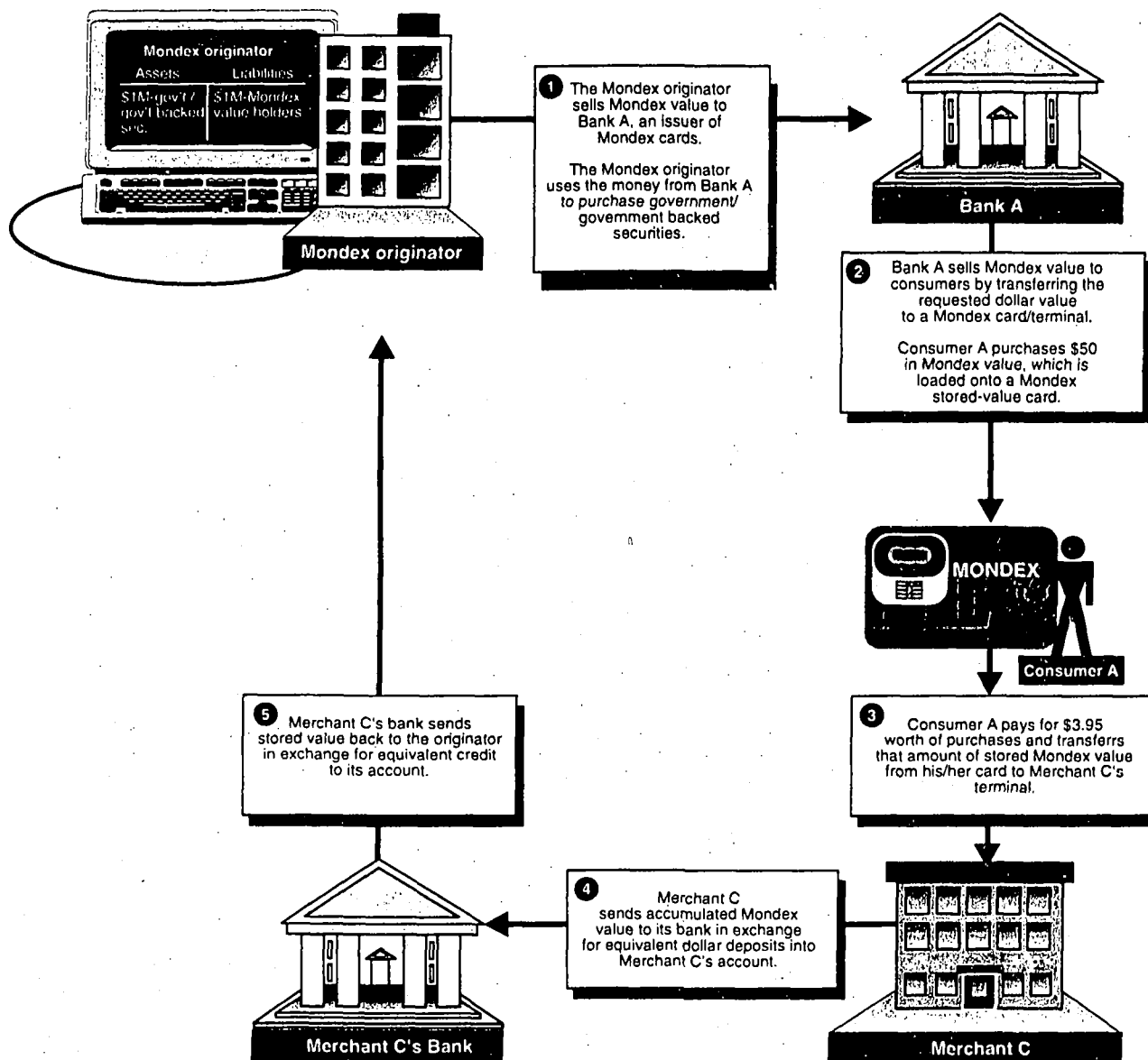
The economic viability of stored-value cards has yet to be proven. Since stored-value cards cannot be read by existing ATMs or the card readers attached to cash registers, an initial investment in card reader machines will be required. These costs should decrease over time as the capacity to read stored-value cards is incorporated into POS terminals and other devices.

Processes

Figure 4.1 illustrates how Mondex anticipates processing a transaction using a Mondex stored-value card.

Example: A consumer purchases a stored-value card to make purchases. After the consumer makes the purchase, using stored value as payment, the merchant exchanges the stored value for a bank deposit.

Figure 4.1: A Typical Mondex Card Transaction



Source: GAO analysis of industry data.

Regulatory Oversight

Nonbanks offering electronic cash, such as stored-value cards, are not subject to the bank supervisory regime. Similarly, nonbanks are not subject to any of the statutory and prudential limits that apply to banks.⁴ Banking institutions that issue such cards would be examined by their respective regulators, such as the Federal Reserve or the Comptroller of the Currency. Currently, there are no federal regulations that specifically address the regulatory oversight of stored-value cards. There are, however, regulations that may apply to stored-value transactions, such as the Federal Reserve's Regulation E.

Regulation E is intended to protect consumers in electronic funds transfers. In March of 1996, the Federal Reserve Board proposed to amend its Regulation E, "Electronic Funds Transfers," to exempt from coverage stored-value cards meeting specific criteria. Among other things, the regulation requires that consumers be provided with a written record of electronic transactions and generally limits consumer liability for unauthorized electronic funds transfers to \$50. The Board proposed to exempt from Regulation E stored-value cards with a maximum value of \$100 or less and stored-value cards that are not linked to any central database.⁵

The Economic Growth and Regulatory Paperwork Reduction Act of 1996 contained provisions instructing the Federal Reserve not to finalize any amendments to the Electronic Funds Transfer Act (EFTA) for at least 9 months from the date of enactment (September 30, 1996). It also instructed the Federal Reserve to conduct a study of electronic stored-value products to determine whether the provisions of EFTA could be applied to such products without adversely affecting the cost, development, and operation of such products.

On July 16, 1996, FDIC issued an opinion describing what kinds of stored-value cards could qualify for deposit insurance. Observers believe that most stored-value cards will not be covered. FDIC observed that the principles discussed in the opinion also would apply to stored-value computer network systems that allow consumers to access stored-value using personal computers.

⁴See, for example, OCC interpretive letters regarding Huntington National Bank (Aug. 19, 1996) and Wells Fargo Bank, et al (Dec. 2, 1996), giving national banks permission to invest in limited liability companies that will operate stored-value card systems.

⁵Like debit cards, stored-value cards that require online authorization at the time of transaction would be subject to most Regulation E requirements. Certain off-line stored-value cards—those with balances maintained on a separate database—would be subject to only the initial disclosure requirements of Regulation E.

Risk and Risk Mitigation

For purposes of this report, we discuss some of the most important risk and risk mitigations associated with stored-value cards.

Table 4.2: Risk and Potential Risk Mitigation for Stored-Value Cards

Risk	Risk mitigation
Credit risk	Restrictions on issuers
Fraud risk	Issuer security measures



Shaded cells indicate that mitigations are not in general use since stored-value cards are still in the developmental stage.

Risk 1: Credit

When people purchase stored-value cards, or when merchants accept stored-value as payment for goods and services, they expose themselves to the credit risk that the issuer of the stored-value card will be unable to redeem the value stored on the card.

Mitigation

Restrictions on issuers. The major stored-value tests in the United States are being conducted by nonbanks such as VISA, MasterCard, and Mondex. These issuers' operations are not covered by bank regulation, but industry representatives believe that they could be covered by applicable state regulations such as those governing nonbank "money transmitters"—firms that issue "instruments for the transmission of money," such as traveler's checks and money orders.⁶ The state regulations provide a number of safeguards for users of these nonbank services. Issuers must generally be licensed and bonded, are required to hold a minimum level of capital, may be required to hold reserves equal to 100 percent of outstanding value, and are also subject to periodic examinations and audits.

⁶According to the Federal Reserve, 44 states have enacted such laws, which industry representatives believe would apply, or will be amended to apply, to multipurpose stored-value cards.

Risk 2: Fraud

Recognizing that stored-value cards could be attractive targets for computer criminals, vendors have made security a high priority. Some researchers assert that a flaw may make it possible to counterfeit certain kinds of stored-value cards currently used in Europe and being tested in the United States.

Mitigation

Issuer security measures. Stored-value cards are constructed in such a way that their chips are likely to be destroyed if an attempt is made to tamper with them. Card issuers are studying sophisticated cryptographic techniques to prevent fraud. Card issuers may also periodically replace cards with new cards that offer alternative safeguards against fraud.

Electronic Banking

Description and Use

Advances in data communications and computer technology have enabled depository institutions as well as securities brokerage firms and other nonbank financial service providers—including commercial online services—to offer electronic banking services.⁷ Electronic banking services may be delivered by means of automated teller machines (ATM); specially equipped telephones, such as screen telephones;⁸ and personal computers equipped with modems and communication software.

Many consumers may choose one or more of these means to pay bills, access information about account balances, transfer funds between checking and savings accounts, and purchase mutual fund shares, among other banking-related activities. Specific options available to consumers vary by depository institution. Table 4.3 lists banking services accessible through electronic means.

Table 4.3: Consumer Financial Activities Accessible by Electronic Means, 1996

Type of transaction	Method of payment			
	ATM	Screen telephones	Telephones	Computers
Pay bills	Yes	Yes ^a	Yes ^a	Yes ^b
Transfer funds between personal accounts	Yes	Yes	Yes	Yes
Inquire about account balances	Yes	Yes	Yes	Yes
Purchase Certificate of Deposit (CD)	No ^c	No	Yes	Yes
Purchase mutual fund shares	No	Yes	Yes	Yes
Apply for loan	No	Yes	Yes	Yes
Obtain currency	Yes	No	No	No

^aCapability to make payments is generally limited to certain preidentified businesses, such as telephone companies.

^bPayment of bills through home computers is generally accomplished using the services of a third-party service provider.

^cSome, but not most, ATMs offer opportunities to purchase CDs.

Source: GAO analysis of industry data.

⁷Electronic banking is the use of electronic means to access banking services. Examples of electronic banking include accessing an account balance via an ATM, transfer of funds between personal accounts using the telephone, and payment of bills using a computer.

⁸Screen telephones are telephones that have a small viewing screen attached and that may have a keyboard. Some home banking services use these devices.

Depository institutions and other financial service providers (e.g., nonbanks⁹) compete in offering many electronic banking services—including services for paying bills, purchasing CDs and mutual funds, and processing loan applications. In addition, some foreign banks are using the Internet to provide various services, including the sale of securities.

Key Terms

C Commercial online service

A commercial online service is typically an integrated package of services providing news, e-mail, special-interest forums, information resources, shopping, and other services accessed by consumer and business computer users with proprietary software and a modem (e.g., America Online, Microsoft Network, CompuServe, etc.).

E Electronic banking

Electronic banking is banking activity accessed by electronic means.

Electronic funds transfer

Electronic funds transfer refers to any transfer of funds between accounts through an electronic terminal, telephone, computer, or magnetic tape, without the use of checks or other paper.

I Internet

The Internet is an open, worldwide communication infrastructure consisting of interconnected computer networks that allows access to remote information and the exchange of information between computers.

Basic Data

Accurate data on electronic banking are difficult to obtain and interpret because of both the rapidly evolving means of delivery and the varied ways in which electronic banking can be done. One study suggests that banks plan to reduce the number of traditional “bricks and mortar” branches and replace them, at least in part, with alternative electronic delivery means, including increasingly sophisticated ATMs that offer many new services and products, such as the sale of mutual funds and insurance.¹⁰ The study also estimates that telephone banking transactions will grow by 50 percent by 1998. Finally, the study predicts continued explosive growth in PC-based banking for the foreseeable future.

⁹For purposes of this report we use the term “nonbank” to refer to any nondepository financial service provider, including providers such as CheckFree.

¹⁰“Creating the Value Network: 1996, American Bankers Association and Ernest & Young, 1996, p. 11.

Processes

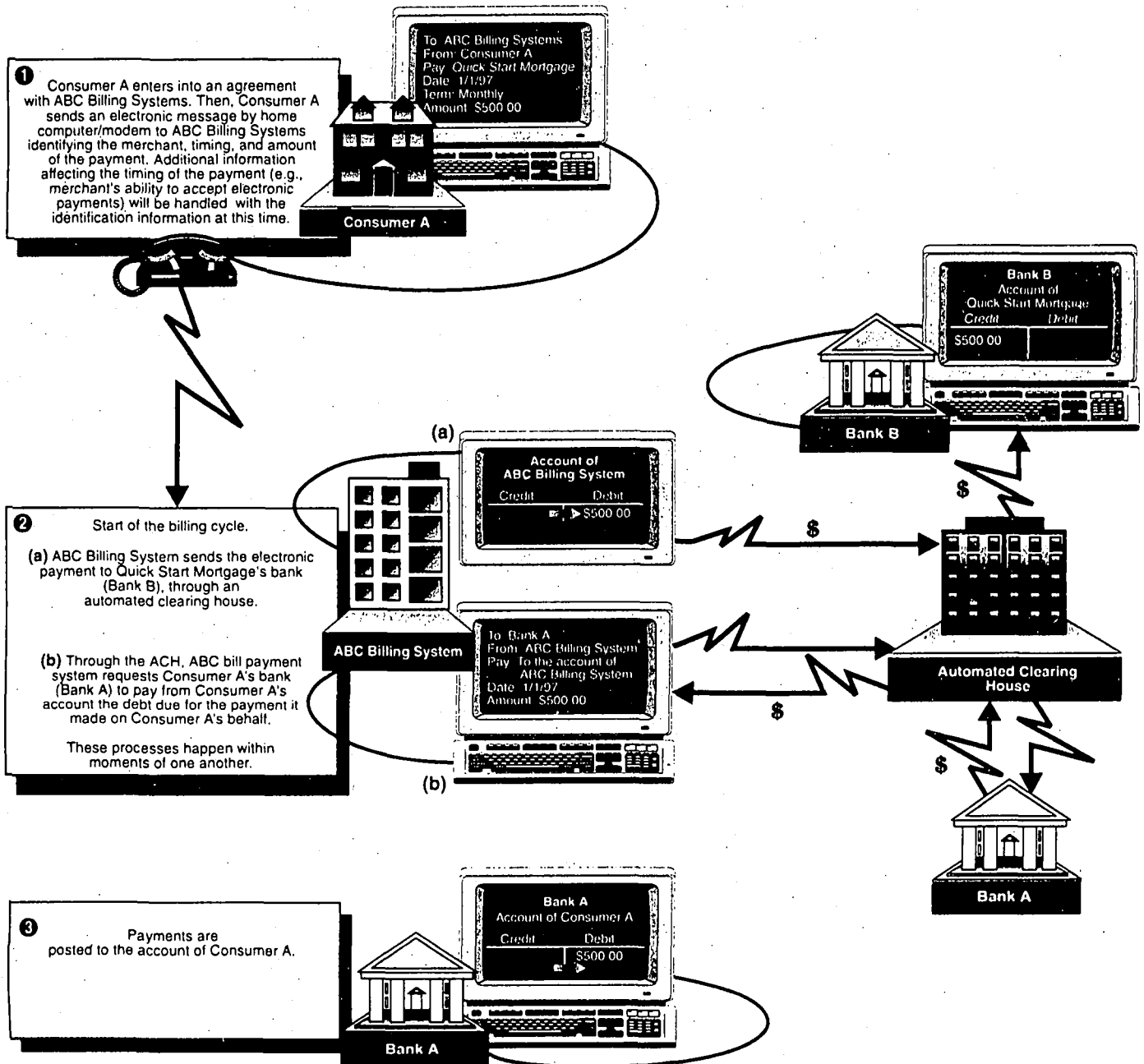
Electronic bill payment is a service offered by banks and nonbanks. For a fee, electronic bill payment services pay designated bills, after authorization, on a consumer's behalf. Bill payments may be made electronically or by printed paper check. If the payee does not accept electronic payment, the bill-paying service would print and mail a check on behalf of the consumer. This type of payment system is not very different from a customer writing checks. The only difference is that a centralized computer system is involved in delivering the check to the payee. A representative of Intuit, one of the electronic bill payment services, told us that about 40 percent of merchants are equipped to receive payment electronically, and only a fraction of those merchants—about 20 percent—will accept payment without a guarantee of the payment from the electronic payor. As a result, at least 60 percent of all bills paid by this service are paid by paper check.

There are almost 1 million users of electronic bill payment services provided by the two market leaders—CheckFree and Intuit. As of June 30, 1996, CheckFree had 729,000 users, and Intuit had approximately 200,000. Both CheckFree and Intuit are nonbank financial service providers.

A bank may provide bill payment services in-house to its customers, or it may contract with an outside electronic bill payment service to provide the service for the bank's customers. In addition, consumers may contract independently with an electronic bill payment service; in such case, no contractual relationship exists between the bank and the service.

The electronic bill payment process illustrated in figure 4.2 is that of a nonbank providing the service to a consumer without a contractual relationship with the consumer's bank. The merchant in this case can accept electronic payments. To communicate with the bill payment system, the consumer uses a home computer equipped with a modem and appropriate software. Messages are transmitted over a private communication network (not the Internet).

Figure 4.2: Illustration of an Electronic Bill Payment Process



(Figure notes on next page)

Note: Electronic bill payment providers recommend that consumers schedule payments 3 to 4 days before they are due in case the payment has to be sent through the mail instead of electronically and also to allow for settlement time for ACH.

Source: GAO analysis of industry data.

Regulatory Oversight

Financial institutions that offer electronic banking services are regulated by their respective regulators. Banks are regulated by OCC and the Federal Reserve. Brokerage firms are regulated by their self-regulatory organization. Businesses other than banks and brokerage firms that offer electronic banking services are subject to investigation by the Federal Trade Commission (FTC), which operates under a broad mandate to regulate interstate commerce. FTC conducts investigations in response to complaints, but it does not regularly and routinely conduct examinations of entities under its jurisdiction because it is not concerned with the financial soundness of those it oversees.

The specific electronic banking transactions are governed by the Electronic Fund Transfer Act of 1978, and the Federal Reserve Board's corresponding Regulation E, which is intended to protect consumers against losses due to unauthorized electronic funds transfers. A consumer's liability for unauthorized transactions involving an electronic fund transfer generally is limited to \$50 but can be as much as \$500 if the consumer fails to timely notify the institution that an access device was lost or stolen. Regulation E also requires financial service providers to inform customers of their rights in the event an unauthorized transaction occurs. That disclosure must be made when an account is opened or before the first electronic transfer is made. Additional disclosure must be made periodically during the life of the account. Also, the customer must receive a written receipt when an electronic transfer is initiated and periodic statements describing each transfer.¹¹


¹¹The receipt requirement applies to transfers at electronic terminals but not to transfers initiated by consumers over the telephone, such as home banking transactions.

Risk and Risk Mitigation

For purposes of this report, we discuss some of the most important risk and risk mitigations associated with electronic banking.

Table 4.4: Risk and Risk Mitigation for Electronic Banking

Risk	Risk mitigation
Fraud risk	Use of mechanisms to provide authentication, verification, and security of information systems and message transmissions
Security risk	Regulatory review of computer security Use of firewalls and other security mechanisms

 Shaded cells indicate that mitigations are not in general use. Unshaded cells indicate mitigations in general use.

Risk 1: Fraud

Electronic banking poses risks of financial loss due to unauthorized transfers by electronic intruders. Both financial service providers and consumers engaged in EFTs are exposed to this risk.

Mitigation

Use of mechanisms to provide authentication, verification, and security of information in electronic banking activity. Passwords, PIN numbers, encryption, and other methods are commonly used to help ensure secure management of financial information in electronic banking activities.

In addition, several efforts are under way to legislate the legality and use of digital signatures. Digital signatures are the electronic counterpart of requiring a driver's license or passport. They enable a person to verify his or her identity for the electronic transfer of funds or some other transaction.

Risk 2: Security

Banking regulators have recognized that systems delivering financial products and services face risks posed by individuals with a desire to disrupt systems rather than to realize any financial gain. The damage from viruses or other forms of attack could be significant. If a virus caused the system of a bank to malfunction, for example, customers could lose access to their accounts. Consumers' computer systems are also at risk of viruses and other forms of attack communicated through use of the Internet.

Mitigation

Regulatory review of computer security. The U.S. bank regulators are required to perform extensive reviews of banks' computer facilities as part of their routine bank examinations.

Mitigation

Use of firewalls and other security mechanisms in a security strategy. Some financial institutions use firewalls and other methods of filtering information coming from the Internet to computers to prevent viruses and other malicious programs from damaging computer systems. A firewall is a set of security procedures designed to block off intruders by limiting the information that can pass to the server. Most firewalls involve either looking at the "packets" of data individually or resending all data destined for an organization through a single "gateway" or checkpoint.

Financial Services Over the Internet

Description and Use

An increasing number of merchants and financial service providers are using the Internet as a communications infrastructure for financial activities. In this section, we discuss purchases over the Internet with payment by credit card and electronic money, and the use of the Internet as an avenue for information and communication to facilitate trading of government and corporate securities.

Many retail merchants have established World Wide Web (www) sites to enable consumers to make online purchases using credit cards. In 1996, a private research firm estimated that by 2000, the value of online purchases by credit card will likely be more than \$6 billion. The major difference between a more traditional credit card transaction—whether by telephone, fax, or at a sales counter—and a credit card transaction over the Internet is in how the customer provides credit card information to the merchant, including special procedures used to secure confidential information.

For purposes of our discussion, the term “electronic money” includes a wide variety of emerging strategies and mechanisms—many of them still in a developmental stage—to enable a consumer to make online payments on a cash basis without the use of physical cash, credit cards, or a standard checking account.¹² In Internet transactions, online merchants would redeem electronic money for the appropriate value from the issuer. Electronic money was not widely used in Internet transactions as of October 1996. An attorney we interviewed, who has a practice dealing with issues concerning electronic commerce and payment systems, told us that over 20 electronic money systems were under development or operating as of October 1996. A few of the versions of electronic money offered or under development¹³ include the following:

- **E-Cash:** DigiCash was the first company to license the technology of electronic money, which it calls e-cash. Its creators claim that e-cash combines the speed of the present bank-based wire system with the anonymity of cash. As of October 1996, e-cash was offered by one U.S. bank, the Mark Twain Bank in St. Louis, MO. E-cash is a string of digits that has been given the value of a digital coin by the issuing bank. These digits are stored on the customer's hard drive. The customer uses these digits to pay for the transactions that he or she makes. In an e-cash

¹²This is referred to as online scrip in the June 1996 Congressional Budget Office study, Emerging Electronic Methods for Making Retail Payments.

¹³The examples were selected for purposes of illustration only, without any intention to endorse any of the featured products.

transaction, when a customer pays for e-cash, the bank's deposit liability to the customer is reduced, and in its place is a new, e-cash liability for that amount. After the customer transfers the e-cash to a merchant, when the merchant deposits e-cash, the deposit reduces the e-cash liability and increases the deposit liability. This means that there is a conversion from e-cash to funds available for the merchant to withdraw.

- Electronic Money System: Citibank's Electronic Money System (EMS) is designed to provide secure, real-time transactions over any network, including the Internet. EMS offers a blend of anonymity and disclosure. According to a Citibank official, each electronic transaction would have an audit trail that could be traced, but the identity of the parties would remain anonymous.

In recent years, the Internet has also been used to provide information to potential investors about exchange-traded government and corporate securities. It has also been used by investors for communication of buy and sell orders and even to create electronic bulletin-board-based trading mechanisms for shareholders of off-exchange corporate securities. SEC has also allowed a brokerage firm to use the Internet to establish a market for qualified investors in private placement investments. As of October 1996, securities transactions payments were not made over the Internet; such payments were cleared and settled conventionally.

Key Terms

A Authentication

Authentication is the process of verifying the identification of the true sender of a message and also that the text of the message itself has not been altered.

E Encryption/decryption

Encryption is the process of disguising a message (using mathematical formulas called algorithms) in such a way as to hide its substance. Decryption is the restoration of encrypted data to its original text.

P Payment processor or credit card association

A payment processor or credit card association is an association dedicated to the settlement and clearance of transactions using credit cards. Examples of such associations are VISA and MasterCard.

V Verification

Verification is the ability to positively identify and authenticate a particular encrypted communication.

Basic Data

While statistics on the total value of Internet transactions are not available, many vendors offer merchandise that can be purchased online with a credit card. With increased use and sophistication of home computer technology and www services, Internet-assisted financial services are expected to increase.

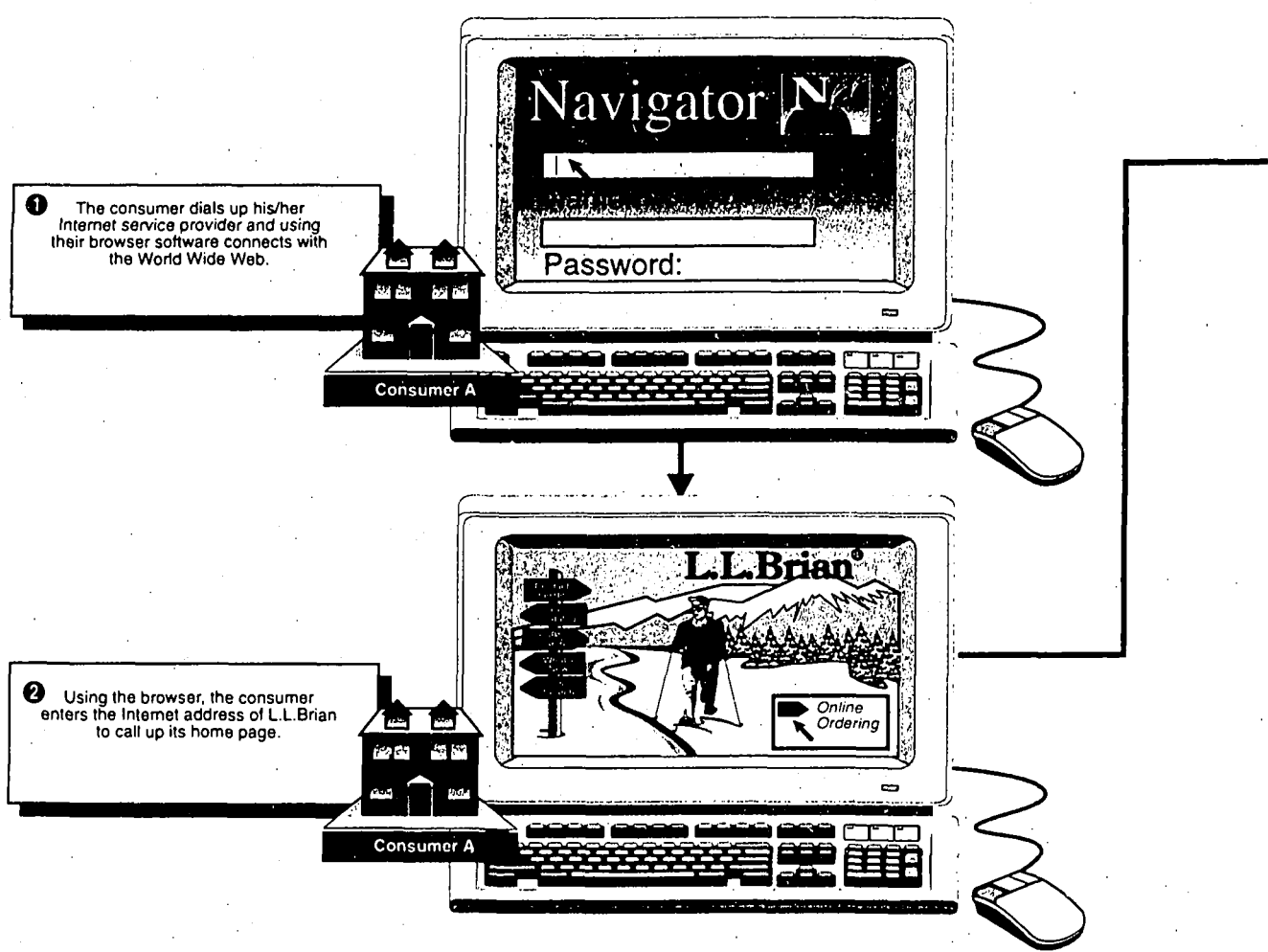
- In 1995 about a quarter of a billion dollars of credit card purchases were made via the Internet.
- In 1995, one bank (The Mark Twain Bank of St. Louis, MO) offered electronic cash that could be used to make purchases from a few vendors equipped to take electronic payments.
- In 1996, more than 20 electronic money systems were available or under development.

Processes

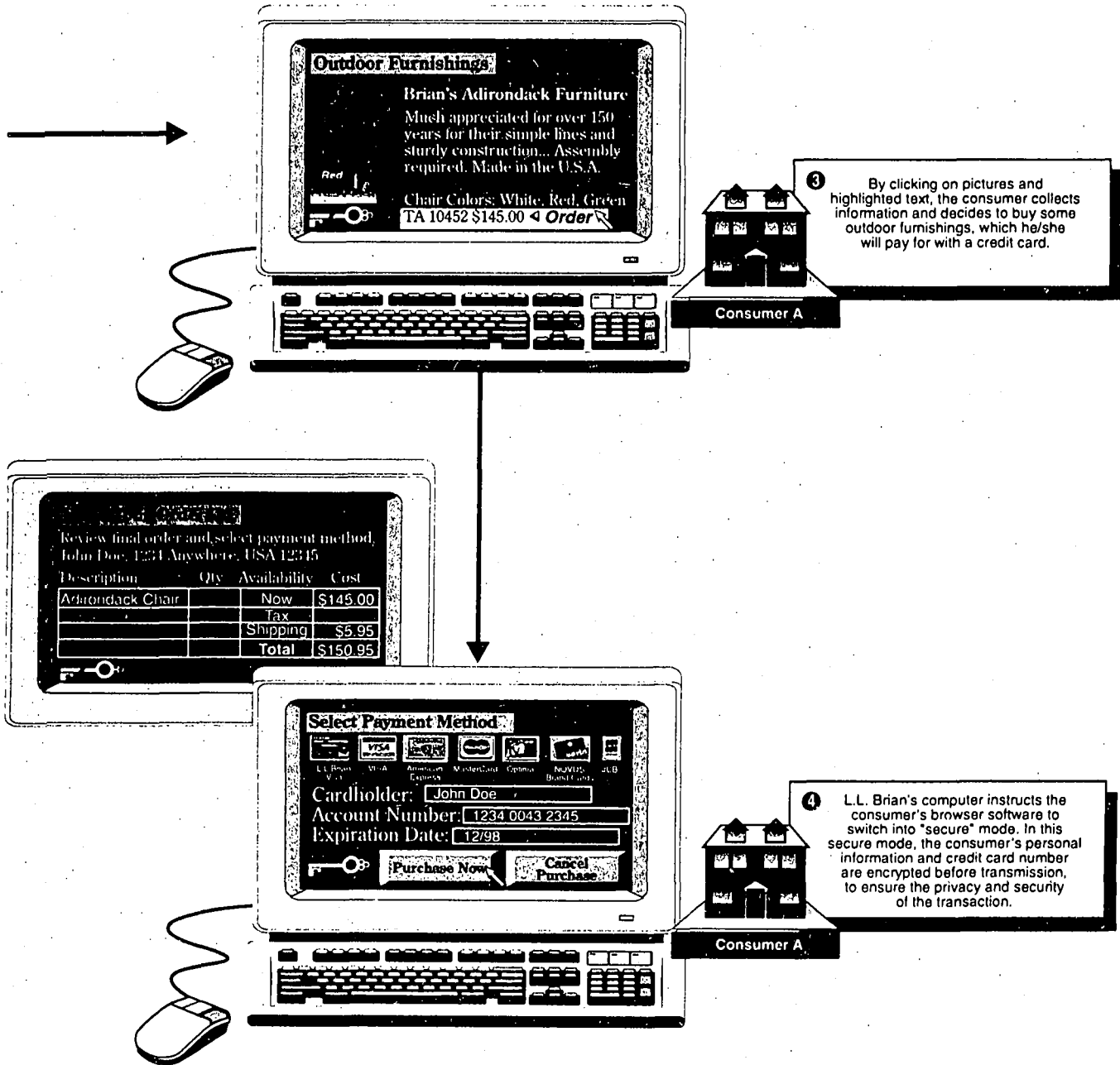
Example: A consumer is planning to purchase an outdoor chair. He or she decides to shop online by connecting to L.L. Brian's www site.

Section 4: New and Emerging Products and Services • the Internet
Financial Services Over the Internet

Figure 4.3: Credit Card Payments Over the Internet



Section 4: New and Emerging Products and Services • the Internet.
Financial Services Over the Internet



Source: GAO analysis of industry data.

Regulatory Oversight

Regulatory oversight for financial services on the Internet is determined largely by the type of entity providing the service. Depository institutions, brokerage firms, stock markets, and nonbank financial service providers are subject to varying degrees of oversight by a variety of federal and state agencies. The Internet itself is generally not regulated by the states or the federal government.¹⁴

Depository institutions are subject to oversight by federal and state banking agencies. They are regularly and routinely examined to help ensure safety and soundness and compliance with consumer protection and civil rights laws and regulations, including the Federal Reserve Board's Regulation E, "Electronic Funds Transfers," which, among other things, limit the amount of consumer liability for an unauthorized electronic transfer of funds. Internet-transmitted activities in which depository institutions are involved would not be exempt from the scrutiny of federal examiners. Depository institutions issue credit cards, distribute electronic money, and sell securities. Under certain conditions, banks may also underwrite initial public offerings and assist in private placement investments.¹⁵

¹⁴Domain names, the Internet addresses that are used to mark the network space of an institution, are assigned by an organization known as the Internet Network Information Center (InterNIC). InterNIC is a nonprofit organization. It currently subcontracts the actual business of domain registration to a private contractor. A number of consortia, such as the World Wide Web Consortium, promote uniformity in communication standards used on the Internet.


¹⁵Banks are allowed to conduct certain securities activities, such as brokerage services, within any licensed bank. However, if a bank wishes to engage in securities underwriting, it may do so only through what is known as a Section 20 affiliate. This institution is a subsidiary of the bank's holding company rather than the bank itself.

Risk and Risk Mitigation

For purposes of this report, we discuss some of the most important risk and risk mitigations associated with financial services on the internet.

Table 4.5: Risk and Risk Mitigation for Financial Services on the Internet

Risk	Risk mitigation
Security risk	Encryption Avoidance of the Internet for transmission of sensitive information Firewalls

 Shaded cells indicate that mitigations are not in general use.

Risk: Security

Intruders using advanced programming techniques may be able to break into a computer system over the Internet and obtain information they are not authorized to have. The security of the systems is of particular concern because a break-in could result in an immense amount of information—such as credit card numbers—getting into unauthorized hands. Further, if information is not secured before transmission over the Internet, an intruder could obtain a copy of the information being transmitted or change the message. A report published by the Bank for International Settlements (BIS) on the security of electronic money has recognized security concerns and noted that “. . . no single security measure or set of measures . . . can be said to be sufficient for a particular product. It is a combination of measures, together with the rigor with which they are implemented, that will serve to reduce the risk most effectively.”¹⁶

Mitigation

Use of strong encryption systems. Systems that transmit credit card information and electronic cash generally use encryption systems to prevent electronic intruders from obtaining information—such as credit card numbers—that could be used to make an unauthorized transfer of funds. Two major secure-communication protocols have been used in the Internet/www commerce market: Secure Sockets Layer (SSL) and Secure HyperText Transfer Protocol (S-HTTP). Information Law Alert describes the difference between SSL and S-HTTP as similar to the difference between an armored car, which protects the channel, and an envelope, which secures the specific data being transmitted.

¹⁶BIS is an organization of central banks based in Basle, Switzerland. It is the principal forum for consultation, cooperation, and information exchange among central bankers.

On February 1, 1996, VISA and MasterCard announced their support for a new set of technical standards—to be known as Secure Electronic Transaction (SET)—for making secure credit card purchases over open networks such as the Internet. SET is to include universally accepted standards for encrypting credit card numbers and verifying their use; the standards are to be incorporated into Internet-related software—most notably software browsers widely used to access the www. Among other things, SET would help prevent merchant misuse of credit card numbers. Instead of receiving an encrypted credit card number to be decrypted by the merchant, the merchant would receive and pass the encrypted credit card number to the credit card association, which would then decrypt the number and transmit an authorization code to the merchant. This standard was not expected to be operational until early 1997.

Mitigation

Avoidance of the Internet for transmitting credit card numbers. Some firms allow shoppers to make credit card purchases over the Internet without transmitting their credit card information. One firm, for example, will take a shopper's credit card information over the telephone and then act as an intermediary between the shopper and the Internet seller.

Mitigation

Use of firewalls and other security mechanisms in a security strategy. Some financial institutions use firewalls and other methods of filtering information coming from the Internet to computers to prevent viruses and other such malicious programs from damaging computer systems. The firewall attempts to block off intruders by limiting the information that can pass to the server. Most firewalls involve either looking at the packets of data individually or resending everything destined for an organization through a single gateway or checkpoint.

Issues Related to Payments, Clearance, and Settlement Systems

In this section, we highlight issues we identified in doing our work on payments, clearance, and settlement systems. As discussed in the scope and methodology section of this report, many of these issues were raised by payments system users, providers, and regulators. In addition, we identified some issues from our review of documents, data, and other materials. Some of the issues relate to specific payments systems; others are broader in nature. We did not seek to evaluate or resolve any of these issues in this report.

Issue: the Safety of Traditional Retail Payment Transactions

Retail payment transactions are generally small-value, large-volume payments, such as paper checks for consumer purchases, paychecks, Social Security fund transfers, and other payments made via an automated clearing house (ACH). Individually, these types of payments represent a fairly low level of risk. However, to the individual expecting to receive an electronic payment, the failure to receive the payment could become a potentially serious problem. In addition, when retail payment mechanisms are used for large-dollar transactions, risk can escalate. Thus, proposals have been made to enhance the safety of retail payment systems.

The Use of ACH to Transmit Large-Dollar Payments

In general, use of an ACH network involves considerably more risk than the use of more secure payments systems such as Fedwire. Unlike Fedwire, ACH payments are provisional in nature until final settlement, which can occur as many as 2 days after payment instructions are received.

As previously mentioned, ACH networks have largely been used for small-dollar payments in which the dollar-value risk if a payment were to be returned unpaid would be correspondingly small. Also, the price for an ACH transaction is much lower than that for a Fedwire transaction. The price differential can be as great as \$0.01 for an ACH transaction versus \$0.45 for a Fedwire transaction. Thus, there is a price incentive to use ACH for increasingly larger dollar-value transactions. Currently, the ACH format does not allow any ACH transaction greater than \$100 million. However, some industry officials told us that this dollar cap has been circumvented in cases when the originator of the ACH transaction cuts a large value ACH payment into several smaller ACH payments to remain under the \$100 million cap for each individual payment.

Some industry officials have expressed concerns about ACH being used for any large-dollar transactions, even those substantially below the \$100-million cap. One industry official has suggested that the ACH dollar

cap should be as low as \$100,000. Moreover, these officials told us that the failure of several large-dollar transactions could expose counterparties to risks that go beyond those borne by the individual originating institution. However, other industry officials we spoke to said they did not believe in the necessity of imposing such dollar limits. They argued that the risk is borne by the individual financial institution that chooses to use an ACH for large-dollar transfers.

Same-Day Settlement Finality of ACH Transactions

Risks in using an ACH arise from the time lag between payment instructions being issued and final settlement being made. For example, if a customer making an ACH payment through his or her bank fails to fund the payment on the settlement day, the originating institution could suffer a financial loss.

Some industry officials say that the period of risk could be shortened if the Federal Reserve adopted same-day settlement finality for its ACH processing. The Federal Reserve reserves the right to reverse credits to banks until some time in the night following provision of these credits to banks. A Federal Reserve official told us that there are several obstacles that would need to be overcome before same-day settlement finality could be achieved. For example, ACH transactions are provisional payments with the presumption, but no guarantee, that the originator of the transaction will fund its ACH obligations. If same-day finality were established for ACH transactions, then some sort of guarantee—such as collateral requirements—would need to be established to ensure that the depository institutions had sufficient funds to settle their ACH transactions.

Issue: New and Emerging Financial Products and Services

New and emerging financial products and services present many legal and regulatory challenges. Some areas of regulatory oversight, such as the Community Reinvestment Act (CRA) and credit access, are currently directed toward the geographical location of the bank, market, or product being supervised. And consumer protection laws and regulations have generally been written with the current, predominantly paper-based, processes in mind. With the growth of electronic commerce, such as electronic banking, electronic cash, and use of the Internet to purchase securities, regulators are likely to face increasing complications in applying existing laws and regulations to these new products and services. Several task forces are already under way to look at some of the consumer protection and compliance issues. In addition, the current regulatory structure is likely to be tested further as nonbanks increasingly offer these

Section 8: Issues

Issues Related to Payments, Clearance, and Settlement Systems

new services and products. Such developments, already under way, are likely to raise anew issues related to the extent to which there is a "level playing field" between banks and nonbanks.

Consumer Regulations

The Federal Reserve's Regulation E governs electronic funds transfers (EFT), among other things. Currently, Regulation E provides that consumers must be given a paper receipt at the conclusion of any electronic transaction conducted at an electronic terminal. For this reason, an ATM is to issue a receipt each time a customer uses it. This provision may be a problem for new financial products such as stored-value cards.

Geographical jurisdictional issues may arise in a number of areas. CRA requires a bank to delineate the territory it serves and take steps to meet the credit needs of that territory. Electronic access to banks and banking services, which provides consumers with opportunities to bank far from the communities in which they live, clearly complicates the task of delineating a community by geographical boundaries. Banks offering services over the Internet as one alternative to those offered at their traditional "bricks and mortar" branches may be able to continue to satisfy CRA requirements using these traditional branches. However, at least one bank is now offering its services exclusively over the Internet, soliciting customers nationwide. As Internet banks increase in number, regulators are likely to face a difficult challenge in defining the territory of service for these banks for CRA purposes. Another jurisdictional concern related to investor protection is raised by offerings of securities over the Internet.

The use of stored-value cards will likely raise additional issues related to legal and regulatory oversight. Currently, stored-value cards are being issued by banks and nonbanks. Questions have arisen about the applicability of deposit insurance to amounts contained on the cards issued by banks. Recently, FDIC issued an opinion having the effect that, with the types of cards anticipated to be most widely used, the funds paid for them will not be covered by deposit insurance. Only in cases in which the value is actually held in the cardholder's account at the financial institution until payment is authorized would deposit insurance for the cardholder be available. Consumers may not be aware of this and also may not be aware that, unlike similar-looking credit cards, stored-value cards generally offer no dollar limit against theft or loss.

When fully implemented, stored-value cards may be issued from a provider in any location to a consumer who uses the card in a completely different location. Because of these issues, some bankers have suggested that only banks be permitted to issue stored-value cards. However, these cards are already being issued by nonbanks.

Consumer Rights and Access Protection Versus Financial Innovation

At a U.S. Department of the Treasury conference on the role of government with regard to electronic money and banking,¹ several federal policymakers and representatives of the financial services industry emphasized that governments wishing to foster financial innovation must be careful not to impose rules that inhibit it. However, these conference speakers also acknowledged that governments should seek to ensure that effective risk management systems are in place in the private sector. Recognizing that transactions over the Internet ultimately create demands for universally accepted standards for protection of customers, one federal legislator suggested that private-sector interests may wish to join forces in developing an electronic commercial code of conduct and standards for such protection.

Escheatment

Most states have laws that allow them to "escheat," or take custody of abandoned property, such as bank accounts that have been inactive for some period. Given the potentially large sums involved, states with escheatment laws might not allow issuers of stored-value cards and electronic money to keep abandoned funds for their own accounts. But several issues must be resolved. For example, there is an issue of which state would have escheat jurisdiction, particularly if issuers of stored-value cards and electronic money do not keep records of purchases and customers' addresses.

Banks Versus Nonbanks

A broader question likely to receive increased attention because of the emergence of these new products and services is whether or not banks and nonbanks are operating, or should be made to operate, on a "level playing field"—that is, that they receive equal regulatory treatment. This question has been debated by bankers and other providers of financial services for some time; however, the entry into the market of so many new nonbank providers of such services as electronic banking, stored-value

¹Toward Electronic Money & Banking: The Role of Government, U.S. Department of the Treasury Conference, Sept. 19, 1996.

cards, and Internet-supplied financial transactions will likely serve to increase and sharpen the debate.

Brokerage houses provide deposit accounts similar to those of commercial banks. But they do not receive the same regulatory oversight as commercial banks do. Nor are they required to hold noninterest bearing reserve accounts at the Federal Reserve. In addition, bankers feel that other regulatory requirements imposed on depository institutions, such as CRA requirements, impose additional regulatory burdens on their institutions, which place them at a competitive disadvantage when competing against nonbanks.

On the other hand, banks have certain advantages that are derived from their bank charters. For example, the ability to offer deposit insurance to customers may give banks a competitive advantage over nonbank financial service providers. Furthermore, reserves enable banks to clear and settle obligations. And although undergoing safety-and-soundness examinations may impose regulatory burden on banks, it also allows banks to provide a measure of assurance to customers that their deposits are being well-handled.

However, industry observers believe that nonbanks could fall under applicable state regulations, for instance, those governing nonbank "money transmitters"—firms that issue "instruments for the transmission of money," such as traveler's checks or money orders.² The state laws generally provide a number of safeguards for users. Issuers typically must be licensed and bonded, are required to hold a minimum level of capital, may be required to hold reserves equal to 100 percent of outstanding value, and are also subject to periodic examinations and audits.

Issue: Security and Protection for New and Emerging Financial Products and Services

Electronic technologies now in place or under development, such as the use of the Internet for financial transactions, electronic cash, and stored-value cards, hold great promise for increasing consumer choice in payment methods. However, such technologies also provide additional means for abuse and illegal activity. Law enforcement officials have expressed concerns about the possibility of individuals using these new products and services for illegal purposes such as money laundering. Some fraudulent schemes involving securities transactions over the Internet have already been uncovered. Because of the newness of these

²According to the Federal Reserve, 44 states have enacted such laws, which industry representatives believe would apply, or will be amended to apply, to general-purpose stored-value cards.

products and services, approaches to making such products and services more secure and less vulnerable to illegal use are still under development.

The Security of Internet Transactions

Through the Internet, customers now have access to credit card payment systems, electronic banking, and other financial services in a way that was never before possible. Such services bring to the consumer an array of new, convenient methods for doing financial transactions. However, because of the nature of the Internet—the fact that it is basically an unsecured means of transmitting information—customers, merchants, and other service providers have increasing concerns about the safety and security of their transactions. For example, if an intruder could successfully attack a credit card association, customers could lose access to their accounts, or in the worst case, the credit card payment system would grind to a halt.

Firewalls and other methods of filtering information coming from the Internet to computers can be used, in part, to increase the security of Internet transactions. A firewall is a method that attempts to block intruders by limiting the information that can pass to the merchant's or the financial institution's internal network. Use of encryption is another means by which the security of Internet transactions could be increased. However, neither firewalls nor encryption provides a guarantee of safety for Internet transactions. To the extent that financial transactions over the Internet remain vulnerable to intrusion or capture by unauthorized parties, consumers may be reluctant to dramatically increase their usage of the Internet for their financial business, and any major successful attacks would likely affect the public confidence in electronic commerce in general.

In addition to the issue of the basic security of the Internet, the Internet also provides a new means for criminal elements to perpetuate fraudulent schemes against consumers. Such schemes pose risks to consumers because the Internet provides relatively easy and cost-effective access to millions of individuals. Pennsylvania securities regulators we interviewed described several illegal schemes conducted over the Internet, including sales of nonexistent bonds. Law enforcement agencies are stepping up their efforts to identify and stop such schemes, but it remains to be seen whether these efforts can keep pace with the rapid growth of the use of electronic commerce and the Internet for such illicit purposes.

In addition, new technologies, such as the use of the Internet for financial transactions or stored-value cards, are likely to provide additional avenues for money laundering.³ Law enforcement officials are especially concerned with systems that allow person-to-person transfers, which would include stored-value cards and Internet transfers. Financial institutions offering accounts over the Internet are not limited to domestic U.S. institutions. Foreign, off-shore banks, which may not be regulated by U.S. bank supervisory agencies, are now offering U.S. customers accounts and financial services. In at least one case, an off-shore bank is advertising its services over the Internet as a tax haven for U.S. investors. Stored-value cards may enable individuals to move illegal money from a bank account onto a stored-value card, where it will be untraceable when used. However, because stored-value cards generally are designed for small-value purchases and many have low limits, such as \$500, for the amounts that can be stored on them, they may not be very efficient vehicles for laundering large amounts of cash.

Legal Status of Digital Signatures

To deter forgery, a person wishing to cash a check is usually required to provide a signature and some type of identification—such as a driver's license or passport—to verify that the signature is actually his or hers. A digital identification, or digital certificate, is the electronic counterpart of requiring a driver's license or passport. It enables a person to verify his or her identity for the electronic transfer of funds or some other transaction.

A digital identification allows individuals to sign, or "authenticate," digital transactions. For example, a person wishing to make an electronic money payment over the Internet could verify that the party requesting the payment was actually the generator of the request and not an impersonator.

If digital signatures are to substitute for handwritten signatures, they must have the same legal status as handwritten signatures—i.e., they must be legally binding. The legal status of digital signatures is not well defined. For example, banks are required to acquire a signature card for every customer, but none of the banking regulators has ruled on the validity of digital signatures.

Several efforts are under way to legislate the legality and use of digital signatures. In 1995, Utah became the first government entity to adopt a

³Money laundering is the disguising or concealing of illicit income to make it appear legitimate. Although precise figures are not available, federal law enforcement officials estimate that between \$100 billion and \$300 billion in U.S. currency is laundered each year.

comprehensive statute allowing electronic commerce using digital signatures. Similar legislation is under consideration in some other states.

Issue: Mitigation of Settlement Risks in Wholesale and Foreign Exchange Transactions

The emergence of the global marketplace has rapidly increased the speed and volume of wholesale financial transactions. With this growth has come the potential for increased risk and the call for new mitigation strategies. As explained in the section on foreign exchange transactions, Herstatt risk exists because the two sides of a contract are not settled simultaneously; therefore, if a participant defaulted after receiving its side of a contract but before making the payments due to the other party, all the payors could lose up to the full value of the contracts, which might be sizeable.⁴ Participants in the foreign exchange market might seek to diminish this gap between payment and receipt by delaying payments, but this could create gridlock; that is, if payments were delayed, the intended recipients—even though solvent—might be unable to make their own payments to others, thus spreading the same problems to still other participants. In addition, within the United States, the growth in wholesale transactions could place the Federal Reserve and the taxpayers at increased risk, in part because of the provision of daylight overdrafts.

A variety of proposals have been made for mitigating various risks in wholesale payments. Some of these address Herstatt and gridlock risks in foreign exchange transactions. These proposals include establishing simultaneous payment arrangements, known as payment-vs.-payment (PVP), and creating a clearing house as a counterparty. Other proposals are concerned with domestic wholesale payments in the United States. Some of these proposals include (1) increasing the fees banks are charged for incurring daylight overdrafts and (2) fully funding each Clearing House Interbank Payment System (CHIPS) transaction rather than allowing debit and credit positions to accumulate until end-of-day settlement.

Timing of Payment Release

A committee of major banks involved in foreign exchange trading has opposed delaying payments until late in the settlement day. Its "best-case" settlement assumption is for payments to be made at opening time on settlement day to ensure adequate liquidity for counterparties.⁵ We are not aware of any regulatory proposals for standards for payment release.

⁴Herstatt risk can exist within the same time zone, as long as settlement of one currency occurs before settlement of the other. Time zone differences obviously can increase the length of the time gap between the two settlements.

⁵The New York Foreign Exchange Committee, Reducing Foreign Exchange Settlement Risk, Oct. 1994.

Simultaneous Payment Process or PVP

Herstatt risk in foreign exchange transactions could be eliminated by procedures to make payment of each currency leg dependent on payment of the other; as mentioned earlier, the process for allowing simultaneous payment is called PVP. To enhance the potential for PVP in foreign exchange transactions, the Federal Reserve has announced plans to extend the opening hours of Fedwire in 1997. By the end of this year, Fedwire is to be open from Monday through Friday 12:30 a.m. to 6:30 p.m. ET, thus ensuring that it will be possible to process dollar final settlements during hours when payment systems in major foreign countries are also open. Expanded Fedwire hours should make simultaneous payments possible.

PVP does not automatically follow from overlapping payment system hours; expanded Fedwire hours should make simultaneous payments possible, but realization will depend on private-sector actions. In that regard, a group of major banks in the industrial countries, calling themselves the Group of Twenty, have an objective of bringing about a private-sector PVP system by 1999.

A concern of market participants is that any risk-mitigation measures should not be so costly or cumbersome as to interfere with the ability of the markets to function effectively. To that end, proposals for clearing houses and PVP are being examined in terms of the amount of liquidity that may need to be tied up as collateral. The central banks' G-10 committee raises the question as to whether some proposed PVP schemes might heighten the potential for transmission of problems from one country to another by increasing links between them. Yet another consideration is the degree to which a proposed measure would allocate costs to those institutions that bring risk to the system, thus retaining incentives on each institution to manage risks prudently.

Clearing House Becomes Counterparty

One approach to reducing Herstatt risk in foreign exchange contracts involves the creation of a clearing house, which would become the counterparty—and thus guarantor—of all the trades among members. If such an institution had sufficient collateral or other backing available to be used in case of potential payment failures by one or more of its members, a clearing house could reduce credit risk. With reduced concerns over credit risk, there might be less incentive to withhold or delay payments, thus lessening the risk of gridlock. Exchange Clearing House (ECHO) is a clearing house based in London, which had 13 member banks as of May 1996. Multinet International Bank, once in operation, is to

be a clearing house that becomes counterparty to trades initially in U.S. and Canadian dollars among its members.

U.S. Treasury OFAC Powers Over Assets of Non-U.S. Companies

Under the Emergency Economic Powers Act, the President can prohibit or regulate transactions relating to the interests and assets of any foreign country or foreign national. Using this authority, the President can, among other things, prohibit (1) any transactions in foreign exchange; (2) transfers of credit or payments between, by, through, or to any banking institution, to the extent that the transfer or payment involves any interest of a foreign country or national thereof; and (3) the importing or exporting of currency or securities.⁶ Regulations implementing Presidential Orders under the act are promulgated by the Office of Foreign Assets Control (OFAC) within the Department of the Treasury. OFAC powers are exercised under laws intended to thwart terrorism or crime. OFAC powers are to be exercised on payments flowing across Fedwire or CHIPS, even if the payments are legal in the payor's country. Presently, all major players in global finance are heavily dependent on these two payments systems. Foreign financial institutions might want to divert their payments outside the United States. Some officials raise the concern that if international payments flows are pulled out of the U.S. payments systems, this action might affect the ability of the Federal Reserve to monitor financial flows and risks.

Pricing and Provision of Daylight Overdrafts

Some private-sector officials believe that the Federal Reserve is significantly underpricing daylight overdrafts. They argue that the rate charged for daylight overdrafts should be equal to the costs of providing those same funds to banks at the federal funds rate, which recently has been around 600 basis points. The Federal Reserve told us that they strongly disagree that daylight overdrafts are underpriced. Federal Reserve officials do not believe that daylight overdrafts fall within the meaning of a "new priced service" being offered under Monetary Control Act and, thus, Federal Reserve officials believe that cost recovery is not required. Instead, officials told us that the Federal Reserve's position is that charging fees for daylight overdrafts is a risk control mechanism as opposed to a charge for a priced service. Further, they argued that to raise

⁶50 U.S.C. §§ 1701-1706. The act authorizes such action in cases in which the President has declared a national emergency because of an "unusual and extraordinary threat" to the U.S. national security, foreign policy, or economy, "which has its source in whole or substantial part outside the United States." The President has used this power to issue "freeze" orders against the assets of Iraq (1990), Panama (1988), Libya (1986), Iran (1979), South Vietnam (1975); and other countries. See Rachel R. Gerstenhaber, Comment, *Freezer Burn: United States Extraterritorial Freeze Orders and the Case for Efficient Risk Allocation*, 140 U. Pa. L. Rev. 2333 (1992). See 31 C.F.R. §§ 575.101-575.901.

**Section 5: Issues
Issues Related to Payments, Clearance, and
Settlement Systems**

daylight overdraft fees precipitously would likely cause disruptions, e.g., causing a substantial volume of large-value payments to be shifted to less secure payments systems, thereby increasing payment system risk.

Regardless of the level of pricing of daylight overdrafts at the Federal Reserve, it is recognized that they pose credit risks to the Federal Reserve. If the bank receiving an overdraft fails before it repays the overdraft, there could potentially be a loss experienced by the Federal Reserve. However, the institutions at the highest risk of failure are not permitted to incur daylight overdrafts. In addition, virtually all daylight overdrafts that are attributable to Fedwire securities transfers, and by extension the majority of daylight overdrafts, are collateralized. In this regard, it is noteworthy that some major European central banks either do not provide uncollateralized daylight overdrafts or plan to require full collateralization for central bank, real-time gross settlement systems in the future. A Federal Reserve official said that provision of Federal Reserve intraday credit in the Federal Reserve's payment system was indispensable in maintaining the liquidity of the Treasury market, which underpinned the smooth functioning of other financial markets in this country and abroad as well.

**CHIPS End-of-Day
Settlement**

On an average day, over \$1.2 trillion of large-dollar payments are made among CHIPS' participants. These payments are netted among the members during the day, but the participants' net credit/debit positions are not settled until the end of the day. Individual participants could fail, at cost to their creditors; hypothetically, if enough participants were to fail, then end-of-day settlement would not occur; in the latter case, there would be systemic disruption to payments in this country and elsewhere.

Regulators and industry officials pointed out that the CHIPS system had rigorous controls over payments and debit positions and had access to collateral that would cover the largest failures. They added that the netting system helps maintain liquidity in the markets since the huge amount of daily payments that are sent over the system only require an average settlement amount of \$5 to \$10 billion each night.

Issue: Appropriate Role of the Federal Reserve in the Payments System

Several issues concern the role of the Federal Reserve in the payments system. Currently, the Federal Reserve serves as both a regulator and provider of certain payment system services and, as such, is in competition with private payment-service providers. The Monetary Control Act of 1980⁷ (MCA) required the Federal Reserve to price, on a basis comparable with private business firms, all the payment services it offered at the time the law was enacted and any other services it developed after that date. Private-sector providers and others have raised questions about the Federal Reserve's ability to fully adhere to this law; others see an inherent conflict in the Federal Reserve's dual role as regulator and service provider.

Potential Conflict Between Federal Reserve's Role as Both Service Provider and System Regulator

The Federal Reserve is currently the largest single provider of priced payments services—e.g., check clearing, ACH services, and wire funds transfer services—in the nation. Yet, the growth of private check clearing houses, such as the Chicago Clearing House Association (CCH), and the California Bankers Clearing House (CBCH), all of which directly compete with the Federal Reserve, has been a principal reason that the Federal Reserve's volume of checks cleared has declined in recent years. MCA placed the Federal Reserve in a unique position—competing actively with private-sector institutions in providing services, such as check clearing, on the basis of price and quality of service, even though it has supervisory authority over these competing institutions and has responsibility for ensuring that the nation's payment system functions properly.

Some private-sector service providers have expressed the concern that the Federal Reserve faces a potential conflict of interest in being both a provider of services and a regulator of payment systems. These private sector providers fear that the Federal Reserve could be unfairly competing with them in two ways: first, by writing the regulatory rules so as to favor its own services; and second, by underpricing its services so as to retain a larger market share.

Federal Reserve officials told us that they have taken steps to ensure they are competing fairly with the private sector in providing payment services. For example, any proposed change in the Federal Reserve's operations must undergo an impact analysis to assess the impact of the proposed change on private-sector competition.

⁷Monetary Control Act of 1980, Pub. L. No. 96-221, Title I, 94 Stat. 132 (codified as amended in scattered sections of 12 U.S.C.).

Potential Conflict Between MCA and Federal Reserve's Future Check Clearing Role

The Federal Reserve, in providing its check clearing services, operates under two potentially conflicting requirements. First, under MCA, the Federal Reserve is required to recover all the costs of doing business that it would incur if it were a private business. The second requirement is that the Federal Reserve be the "clearer of last resort." This means that the Federal Reserve is required to provide check clearing services, regardless of the costs it incurs, to any financial institution that needs to use its services for this purpose.

The large private clearing houses have an advantage in that they, unlike the Federal Reserve, need not provide check clearing services to small and unprofitable depository institutions. For example, private check clearing houses often only cover certain geographical areas or handle only certain types of payments, such as those for large-dollar amounts. If the private clearing houses increasingly attract the most profitable business, leaving the most costly business for the Federal Reserve, the Federal Reserve may eventually be unable to meet its legal requirement to recover its costs of doing business. In addition, with the financial industry's move toward interstate banking, larger banks will be clearing checks within their own banks, and possibly exchanging checks among their organizations.

Possible Inefficiency in the U.S. Payment System

There are many estimates of the share of gross domestic product devoted to the U.S. payment system. For example, the Federal Reserve estimates this share to be below 0.5 percent of gross domestic product. One economist has estimated this share to be higher—between 1 percent and 1.5 percent, or in dollar terms, between \$72 billion and \$109 billion in 1995. Because electronic payments, such as ACH, credit cards, or stored-value cards, are estimated to cost only one-third to one-half that of payments by check, a shift from paper checks to these electronic systems could lower financial costs in the economy. In that regard, the usage of paper check payments in the United States is considerably higher than that in other industrial countries.⁸ The federal government should be making fewer check payments by 1999 under the Debt Collection Improvement Act of 1996. Nonetheless, because federal government checks only account for about 1.3 percent of all U.S. checks written, this decrease in check payments should have little impact on the total U.S. volume of check payments.

⁸In 1993, 80.4 percent of the volume of noncash payments in the United States was checks; among 9 other industrial countries, the share of checks in noncash payments averaged 25.6 percent, ranging from a low of 3.3 percent to high of 58.7 percent.

Comments From the Board of Governors of the Federal Reserve System

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



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

CLYDE H. FARNSWORTH, JR.
DIRECTOR
DIVISION OF
RESERVE BANK OPERATIONS
AND PAYMENT SYSTEMS

April 16, 1997

Ms. Jean Gleason Stromberg
Director, Financial Institutions
and Market Issues
General Government Division
United States General Accounting Office
Washington, D.C. 20548

Dear Ms. Stromberg:

We appreciate this opportunity to comment on the General Accounting Office's (GAO) draft report on Payments, Clearance, and Settlement Systems: An Information Guide to the Systems, Risks, and Issues. While the GAO has incorporated a number of the comments we had provided on earlier versions of the draft report, we are disappointed that many of our substantive comments have not been addressed and that technical and more substantive problems remain throughout the draft report. In particular, we do not believe that the GAO has developed a consistent framework for discussing the risks, legal environment, and characteristics of the various payment mechanisms. In addition, the draft report does not provide a balanced discussion of the differing perspectives on a number of the issues included in the report. Finally, the draft report contains a number of incorrect or misleading statements.

The draft GAO report does not categorize the risks associated with the various payments, clearance, and settlement mechanisms in a consistent or thorough manner, but rather uses a variety of approaches to discussing risk. Although the report's introduction purports to categorize risk into four general categories -- counterparty/credit risk, operational risk, risk of fraud, and security risk -- the draft report does not consistently follow this approach. Moreover, an important category of risk, liquidity risk, is not included in these categories, and two of these risk categories -- fraud risk and security risk -- describe substantially the same risks and are generally considered components of operational risk. More generally, the draft report describes selected risk controls without providing an overall context of how these controls work together in a complementary manner to mitigate key risks.

See comment 1.

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We also found the manner in which the draft report attempts to describe the legal environment in which the various payment mechanisms operate to be confusing. While the discussion with respect to some payment mechanisms focuses on the laws and regulations governing the various types of payment transactions (as in the discussion of Fedwire funds transfers and retail payments), the discussion of other mechanisms also addresses the supervisory regime for institutions that are parties to the transactions (as in the discussion of CHIPS) or for the market in which the transaction is made (as in the discussion of the various securities, futures, and options systems). We believe that greater consistency in the treatment of the legal environment would improve the clarity of the report.

Moreover, as a "primer" on payment and settlement systems, the draft GAO report does not discuss similar payment systems in a manner that provides for easy comparisons or assessment of differences. In other places, statistics are presented in a manner that makes comparison difficult. In other instances, the discussions are not placed in an appropriate context for the reader. For example, the discussion of clearance and settlement in the U.S. government securities market focuses on a portion of the market, namely the GSCC members and the securities clearing banks, which leaves the reader with the erroneous impression that these organizations represent the universe of clearance and settlement activity occurring over Fedwire. The discussion of *emerging payment products* fails to note that many of the issues mentioned are not unique to these types of payments and have been addressed in other contexts. Finally, some payment mechanisms, such as point-of-sale debit card systems, are not addressed in the report.

In addition, we believe that the discussion of many of the issues raised in the draft report is superficial and fails to give the reader an appreciation of the differing perspectives and associated considerations. The following illustrates our concerns with the draft report's discussion of payment issues in Section 5.

Use of ACH to Transmit Large-Dollar Payments. The draft report raises the issue of the use of the ACH to make large-dollar payments. The Federal Reserve believes that, as a general matter, it is preferable for large-dollar payments to be sent over systems, such as Fedwire or CHIPS, that permit the sending bank to control the risks associated with these payments more effectively. It is not clear, however, that large-dollar ACH transactions should be prohibited. For example, it is likely that if large-dollar ACH payments were prohibited, a portion of these payments would be made by check, which has risk characteristics similar to ACH transactions, and others may continue to flow through the ACH by splitting them into multiple smaller payments. It would also be useful for the GAO to note in its final report that the risk to a bank is based on the total value of transactions originated by a particular customer, not the value of any particular transaction.

See comment 2.

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The draft report notes that the difference in the fees assessed for ACH transactions and Fedwire funds transfers provides an incentive for banks and their corporate customers to use the ACH for large-value transactions. The report, however, does not mention that differences in the time at which ACH and Fedwire transfers are posted to banks' accounts, which affects the amount of daylight credit incurred, may often offset the price incentive. A bank's marginal cost for intraday credit is \$0.42 per \$1 million for each hour the overdraft is incurred. While a bank is debited for ACH credit transactions at 8:30 a.m. Eastern Time on the settlement day, it is able to control the time at which Fedwire transfers are sent (and hence the time at which its account is debited) and, therefore, is able to manage its use of daylight credit more effectively.

Same Day Settlement Finality of ACH Transactions. Over the past several years, Federal Reserve and industry representatives have analyzed the costs and benefits of same-day settlement finality for ACH transactions. The final report would provide greater balance if it discussed the trade-off between credit risk and operational risk associated with the Federal Reserve's provision of same-day settlement finality for ACH credit transactions. If the Federal Reserve were to provide same-day finality for these transactions without the risk that transactions sent to a bank would be subsequently reversed, it would need to ensure that the originating bank had sufficient funds in its Federal Reserve account or that it was willing to extend credit to cover the payments at the time they were processed. Thus, the Federal Reserve would need to implement procedures similar to the procedures used to process Fedwire funds transfers. Such procedures would not be practical if the ACH service remained a value-dated system. If ACH value dating were eliminated, all ACH credit transactions would have to be processed within a fairly small time frame, which may pose operational risks that could lead to delayed payments.

The discussion in this section regarding the risk that ACH debit transactions will be returned should be deleted because this risk relates to the finality of the underlying payment, and not to the finality of the settlement of the transaction.

Issues Surrounding the Regulation of New and Emerging Financial Products and Services. The draft report suggests that the Federal Reserve's Regulation E receipt requirement may pose problems for new products, such as stored-value cards, due to privacy concerns. The Federal Reserve agrees that it may not be appropriate to require receipts for these transactions. Consequently, the Board proposed not to apply the receipt requirement to most types of stored-value cards in its April 1996 proposed amendments to Regulation E. (In Congressional testimony about emerging payment methods in 1995, former Vice Chairman Blinder also noted that it would make little sense to require receipts at

See comment 3.

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See comment 4.

vending machines, for example.) In addition, in March 1997 the Board issued a report to Congress on the application of the Electronic Fund Transfer Act to electronic stored-value products. This report provides a comprehensive analysis of the costs of applying Regulation E provisions to stored-value cards and discusses the considerable costs of applying the terminal receipt requirement to these transactions. It is not clear, however, why the draft report describes the problems associated with providing receipts for stored-value cards in the context of privacy concerns, when such concerns have not been raised with respect to debit or credit card transactions.

More generally, the discussion of issues related to emerging electronic payment products fails to note that many of the issues mentioned are not unique to these types of payments and have been addressed in other contexts. For example, the draft report notes that seignorage could decline if some U.S. currency is replaced by stored-value cards. It would be useful if the GAO put this issue in context by explaining that, to the extent that any noncash payment mechanism replaces cash transactions, seignorage may decline. The amount of currency in circulation today, and the associated seignorage, would certainly be higher if check payments, credit cards, and other electronic payments were not widely used. Any material effect of electronic money on seignorage would be very unlikely in the near to intermediate term. In addition, the draft report should recognize that the Federal Reserve Board has stated in Congressional testimony that it is highly unlikely that the introduction of stored-value cards will raise significant concerns with respect to the Federal Reserve's ability to formulate and implement monetary policy.

See comment 5.

Finally, the draft report is incorrect in its statement that brokerage firms and other nonbanks that provide accounts similar to demand deposits are subject to Federal Reserve reserve requirements. Reserve requirements are limited to transaction accounts held at depository institutions.

See comment 6.

Issues Surrounding Mitigation of Settlement Risks in Wholesale and Foreign Exchange Transactions. The draft report, which explains that Herstatt risk exists because the two sides of a foreign exchange contract settle in different countries, is misleading as it implies that Herstatt risk is only an intraday risk and results primarily from the different time zones of the settling currencies. This is not the case. Studies by the G-10 central banks and the New York Foreign Exchange Committee, a private-sector group, have shown that a bank's exposure may amount to the total value of its foreign exchange transactions over several days. The fact that foreign exchange settlement exposures span several days and not just one day was a key finding of the March 1996 BIS report entitled "Settlement Risk in Foreign Exchange Transactions."

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See comment 7.

Simultaneous Payment (payment-vs-payment PVP). If the GAO includes a discussion of the G-20 initiative in its final report, it should do so as part of its discussion of PVP, rather than in the "clearinghouse becomes counterparty" section, where it is referenced in the draft report. The objective of the G-20 continuous linked settlement initiative is to establish a mechanism to facilitate the simultaneous irrevocable final settlement of foreign exchange transactions.

Pricing and Provision of Daylight Overdrafts. The Federal Reserve's provision of daylight credit, like its overnight discount window lending, is not a priced service under the Monetary Control Act. In addition, the arguments cited in the report for pricing daylight overdrafts at the overnight federal funds rate are fundamentally flawed, in that they fail to distinguish between the cost of overnight funds and the cost of intraday funds. That is, the overnight interbank rate is not the appropriate benchmark for the cost of intraday credit, either for the Federal Reserve or private financial institutions.

Nevertheless, the Federal Reserve is not, as the draft report suggests, unwilling to consider appropriate adjustments to the daylight overdraft fee. In fact, in 1995 when it last increased the level of the fee, the Board stated its intention to evaluate the desirability of any further increases in the daylight overdraft fee in two years, based on the objectives of the payment system risk program.

See comment 8.

The Potential Conflict Between the Federal Reserve's Role as Service Provider and System Regulator. According to the draft report, some private-sector service providers fear that the Federal Reserve could be competing unfairly with them by writing regulations so as to favor its own services and by underpricing its services so that it retains market share. The report would be more balanced if the GAO discussed whether there has been any evidence of unfair competition by the Federal Reserve. We believe that the Board's regulatory actions as well as the Federal Reserve's priced-services cost recovery performance demonstrate that the Federal Reserve does not act as an unfair competitor. For example, the Board adopted Regulation CC's same-day settlement rule, which improved the legal presentment rights of banks that compete with the Reserve Banks in the collection of checks, even though it projected that the rule would result in significant Reserve Bank check volume declines. The Federal Reserve has also fully recovered the costs of providing its priced services over the long run, as required by the Monetary Control Act. During the past ten years, the Federal Reserve has recovered 100.7 percent of its total costs (including imputed costs and targeted return on equity); 1996 priced-services cost recovery was 103.5 percent.

See comment 9.

Possible Inefficiency in the United States Payments System. The draft report states that the share of GDP devoted to the payments system is estimated at 1.0 to 1.5 percent. This estimate overstates the payment system's component

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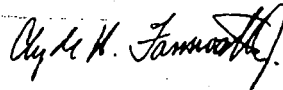
- 6 -

of GDP to the extent that costs included in total payment system costs (such as estimates of the time spent by consumers writing checks and maintaining their bank account records) are not costs reflected in the GDP. We estimate that the payment system's share of GDP is well below 0.5 percent.

As noted in the draft report, checks are the dominant form of noncash payments in the United States, although the total cost of a check transaction far exceeds that of most electronic payments. We believe it would be useful for the final report to describe some of the barriers to the widespread replacement of checks by electronic payments in this country. First, checks are familiar, very convenient to use, and accepted for most types of payments. Electronic payments, on the other hand, are not always easy to use and are not accepted for many types of payments. Second, many consumers do not wish to give up control of the payment process and, thus, have not embraced automated debit services through the ACH for bill payments. Third, no electronic payment products are currently widely available that permit individuals to pay other individuals. Fourth, businesses that shift from checks to electronic forms of payment often require investments in new accounts payable and receivable systems, which are costly to implement. While cost savings can be realized by businesses when they use electronic payments, the transition costs are high, which slows the rate of acceptance. Finally, electronic payment systems are more capital intensive than paper check processing systems, resulting in high unit processing costs until significant transaction volumes are realized. As a result, higher fees are often charged to users of electronic payment services than to users of checks, which negatively affect demand for electronic payments.

We hope that these comments, along with the additional technical comments we have provided under separate cover, are useful in the GAO's development of its final report.

Sincerely,



The following are GAO's comments on the Board of Governors of the Federal Reserve System's letter dated April 16, 1997.

GAO Comments

1. The Federal Reserve acknowledged that we had incorporated a number of the comments they provided on earlier versions of the draft report. However, they expressed disappointment that many of their substantive comments were not addressed.

While the Federal Reserve was reviewing our draft, we were in frequent contact with staff regarding technical comments. We incorporated their suggested changes where appropriate. In addition, officials responsible for operating many of these payment systems or developing new products, such as CHIPS, GSCC, and Mondex, reviewed sections of the report and commented on its accuracy. We made a number of changes to these sections based on their comments. Because our presentation of the issues did not include evaluation or conclusions, we did not incorporate the Federal Reserve's detailed comments on the issues if, in our judgment, their comments were evaluative in nature. However, their comments on the issues are presented in their entirety in the Board of Governors' letter.

2. The Federal Reserve stated that our discussion of the clearance and settlement in the U.S. government securities market only focuses on a portion of the market, the GSCC members and the securities clearing banks. The Federal Reserve believes this leaves the reader with the erroneous impression that these organizations represent all of the clearance and settlement activity that occurs over Fedwire.

We have added a footnote to our discussion of Treasuries stating that we focused only on GSCC's process, which is one mechanism for clearing and settling U.S. government securities. See page 58.

3. The Federal Reserve commented that our discussion regarding the risk that ACH debit transactions will be returned should be deleted because this risk relates to the finality of the underlying payment, not to the finality of the settlement of the transaction.

We have deleted our example of the ACH debit transaction in our discussion of same-day settlement finality of ACH transactions. See page 158.

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4. The Federal Reserve commented that it is not clear why the report discusses the problems associated with providing receipts for stored-value cards in the context of privacy concerns, when such concerns have not been raised with respect to debit or credit card transactions.

We deleted our discussion describing the problems associated with providing receipts for stored-value cards in the context of privacy. See page 159.

5. The Federal Reserve commented that our report was incorrect in stating that brokerage firms and other nonbanks that provide accounts similar to demand deposits are subject to Federal Reserve reserve requirements.

We have clarified our discussion of banks versus nonbanks to remove the mistaken impression that brokerage firms and other nonbanks that provide accounts similar to demand deposits are subject to Federal Reserve reserve requirements. See page 160.

6. The Federal Reserve stated that our report was misleading in that it implied Herstatt risk is only an intraday risk and results primarily from the different time zones of the settling currencies.

We state in the report that intraday risk could accumulate to the sum of 2 or 3 days' trading volume. See page 44. We have added language to the report recognizing that Herstatt risk can exist within the same time zone. See page 164.

7. The Federal Reserve commented that if GAO includes a discussion of the G-20 initiative, it should do so as part of its discussion of PVP, rather than in the "clearing house becomes counterparty" section.

We have moved the discussion of the G-20 initiative in foreign exchange transactions to the section discussing simultaneous PVP. See page 165.

8. The Federal Reserve believes that our discussion of the issues in the report fails to give the reader an appreciation of the differing perspectives and associated considerations. For example, with regard to the potential conflict between the Federal Reserve's role as service provider and system regulator, the Federal Reserve believes the report would be more balanced if it included a discussion of any actual evidence of unfair competition by the Federal Reserve. In addition, the Board provided information in its

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letter and in its discussion of other issues on efforts it has made to minimize the potential conflict between its two roles.

We raise the issues of the potential conflict in the Federal Reserve's dual role because many private-sector individuals and organizations expressed such concerns. We do not present any evidence that would either substantiate or refute the contention that the Federal Reserve is actually competing unfairly with its private-sector competitors. We have, however, incorporated where appropriate additional information the Board has given us about its efforts to minimize the potential conflict between its two roles. For example, we acknowledge that the Federal Reserve said that when it is considering any proposed change in its payment system operations, it conducts an analysis to assess the impact of the proposed change on private-sector competition. See page 168.

9. The Federal Reserve stated that our report overestimated the share of gross domestic product devoted to the payments system and offered an alternative estimate.

Recognizing that there are many different ways to measure possible inefficiencies in the U.S. payment system, we have included the Federal Reserve's estimate. See page 169.

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Glossary

ACH Operator/Processor	An ACH operator/processor is a central clearing facility that receives batches of ACH credit and debit transactions from originating depository institutions; edits, sorts, and distributes the transactions to receiving depository institutions; and facilitates the settlement among participants.
Authentication	Authentication is the process of verifying the identification of the true sender of a message and also that the text of the message itself has not been altered.
Back Office	The back office of a financial institution is made up of employees responsible for (1) recording and maintaining the official records of the financial institutions and (2) processing transactions entered into by the financial institutions or its customers.
Batch Processing	Batch processing is the transmission or processing of a group of payment orders and/or securities transfer instructions.
Bond	A bond is a debt security representing a loan by the buyer to the corporation or government issuing the bond; it may pay interest, or it may be discounted in price from the value at maturity.
Book-Entry System	A book-entry system is an accounting system that permits the transfer of assets (e.g., securities) without the physical movement of paper documents or certificates.
Browser	A browser is a computer program that facilitates locating and displaying information on the World Wide Web (e.g., Netscape Navigator or Microsoft Explorer). The browser could work on the Internet or through internal information management systems called Intranets.
Call Option	A call option is a contract that gives one the right, but not the obligation, to buy a specified amount of an underlying asset, such as stocks or currency, at a specified price by a certain date.
Cash Letter	A cash letter is a group of checks, accompanied by a listing of the checks, which is sent to a clearing house, a correspondent bank, or the Federal Reserve for collection.
Check	A check is a written order from one party (the payor) to another party (the payee) requiring the payor to pay a specified sum on demand to the payee or to a third party specified by the payee.

Check Clearing	Check clearing is the movement of a check from the depository institution at which it was deposited back to the institution on which it was written. The funds move in the opposite direction, with a corresponding credit and debit to the involved accounts.
Check Truncation	Check truncation is the practice of holding a paper check at the bank at which it was deposited (or at an intermediary bank) and electronically forwarding the essential information on the check to the bank on which it was written. A truncated check is not returned to the writer.
Class of Options	A class of options consists of options that are of the same type and style and cover the same underlying asset.
Clearance	Clearance is the process of transmitting, reconciling, and in some cases, confirming payment orders or security transfer instructions prior to settlement, possibly including the netting of instructions and the establishment of final positions for settlement. In the context of securities markets, this process is often referred to as clearance.
Clearing Agent Banks	Clearing agent banks are Fedwire participants that are regularly engaged in the business of providing clearing services in eligible securities for members and GSCC.
Clearing House	A clearing house is a voluntary association of depository institutions that facilitates the exchange of payment transactions such as checks, automated clearing house transactions, and large-value funds transfers and the settlement of participants' net debit or credit positions.
Clearing Members	Clearing members are firms that are determined by OCC to be qualified to interact with OCC on behalf of market participants.
Commercial/Merchant Server	A commercial/merchant server is a computer and/or computer program that provides information in response to requests by other computer programs. Some servers are capable of sending and receiving secure messages.
Commercial Online Service	A commercial online service is an integrated package of services providing news, e-mail, a special-interest forum, information resources, shopping, and other services accessed by consumer and business computer users using proprietary software and a modem (examples include America Online, Microsoft Network, CompuServe, etc.).

Glossary

Comparison Members	Comparison members are primarily government securities broker-dealers and clearing agent banks that are capable of interacting with GSCC operations.
Corporate Payments	Corporate payments are payments that are used by businesses to pay other businesses for goods or services.
Correspondent Bank	A correspondent bank is a bank that—by arrangement—holds the deposits of another bank and provides payments and other services for that bank.
Credit Card Company	A credit card company is a company that owns the trademark of a particular credit card and may also provide a number of marketing, processing, or other services to the members using the card services.
Credit Line	A credit line is the maximum amount of credit available in an open-ended credit arrangement, such as a bank credit card, which the lender may change at any time. The credit line is disclosed in the credit card agreement.
Currency Option	Currency options are options that represent the right to buy or sell foreign currency at a particular price within a specified period.
CUSIP	CUSIP stands for the Committee on Uniform Securities Identification Procedures. Each type and issue of security will have its own unique CUSIP number.
Daylight Overdraft	A daylight overdraft is an intraday loan that occurs when a bank transfers funds in excess of its reserve account.
Depository Bank	A depository bank is the bank at which a check is first deposited.
Direct Participants	Direct participants are financial institutions that are permitted to transact with the clearing organization, and all customers come to the clearing organization through them. The term usually refers to institutions that interact with NSCC.
Dual Trading	Dual trading occurs when an individual (or representative of a firm) trades on behalf of customers and also trades for his or her own or the firm's proprietary account.
Decryption	Decryption is the restoration of encrypted data to their original text.

DVP System	A delivery vs. payment (DVP) system is a system that ensures that the final transfer of one asset will occur if, and only if, the final transfer of another asset (or other assets) occurs.
Electronic Banking	Electronic banking is a banking activity accessed by electronic means.
Electronic Funds Transfer (EFT)	EFT is any transfer of funds between accounts using an electronic terminal, telephone, computer, or magnetic tape and that does not use checks or other paper.
Electronic Data Capture (EDC)	EDC is a point-of-sale terminal that reads the information encoded in the magnetic stripe of bank cards. These terminals electronically authorize and capture transaction data, eliminating the need for a paper deposit.
Encryption	Encryption is the process of disguising a message (using mathematical formulas called algorithms) in such a way as to hide its substance, a process of creating secret writing.
Equity Index Option	An equity index option is an options contract that covers the price of a diversified stock portfolio that matches a designated stock-index (a statistical indicator used to measure changes in stock groupings).
Equity/Stock	Equity or stock is a financial instrument that represents ownership in a company.
Exchange	An exchange is an organized market with transactions concentrated in a physical facility with participants entering two-sided quotations (bid and ask) on a continuous basis.
Exercise	Exercise means to make use of the "rights" in a contract. For instance, a buyer of a call option may exercise the right to buy the underlying asset at a particular price agreed upon when the contract was purchased.
Federal Funds Rate	The federal funds rate is the rate charged by a depository institution on an overnight sale of federal funds to another depository institution. The rate may vary from day to day and from bank to bank.
Federal Reserve Account	A federal reserve account is a noninterest-earning account that a depository institution maintains with a Federal Reserve Bank. The balance in this account is maintained for purposes of (1) satisfying the Federal Reserve's reserve requirements and/or (2) settling payments cleared

through the Federal Reserve. The balances in these accounts play a central role in the exchange of funds between depository institutions.

File	A file is a group of entries transmitted by originating institutions or to receiving institutions by ACH operators. A file may contain one or more batches of entries.
Finality	Finality is an irrevocable and unconditional transfer of payment.
Float	Float is checkbook money that appears on the books of both the check writer (the payor) and the check receiver (the payee) while a check is being processed.
Floor Broker	A floor broker executes trades for customers and may also execute trades for their personal or employer accounts.
Floor Trader	A floor trader executes trades only for their personal accounts. A floor trader is also referred to as a "local."
Futures Commission Merchant (FCM)	An FCM is a firm that buys or sells futures contracts and accepts payment from or extends credit to those whose orders it accepts.
Hedging	Hedging is engaging in financial transactions to protect against potential adverse changes in the values of assets, liabilities, or off-balance-sheet activities.
The Internet	The Internet is an open, worldwide communication infrastructure consisting of interconnected computer networks that allow access to remote information and the exchange of information between computers.
Liquidity	Liquidity is a quality that makes an asset easily convertible into cash with relatively little loss of value in the conversion process.
Locked-in Trades	Locked-in trades are transactions that are matched by a computer, usually at the place of the trade, before being sent to a clearing organization.
Market Maker	Market maker is a dealer that makes bids and offers at which he/she will trade.
MICR-Line Information	MICR-line information refers to the data characters at the bottom of a check. The magnetic ink character recognition (MICR) line at the bottom of

	a check includes the routing number of the payor bank, the amount of the check, the number of the check, and the account number of the customer.
Mortgage-Backed Securities	MBS are securities that are backed by mortgages in which investors receive payments out of the interest and principal payments made on the underlying mortgages.
Multilateral Netting	Multilateral netting is an arrangement among three or more parties to net their obligations, which may arise from financial contracts, transfers of funds, or both. This type of netting normally takes place in the context of a multilateral net settlement system.
Net Debit Cap	A net debit cap is the quantitative limit placed on the debit position that participants in a funds or securities transfer system can incur during the business day. Under the Federal Reserve's policy, institutions are subject to two caps—a daily cap and a 2-week cap.
Net Settlement	Net settlement is the settlement of a number of obligations or transfers between or among counterparties on a net basis.
Netting	Netting is an agreed upon offsetting of positions or obligations by trading partners that can reduce a large number of individual obligations or positions to a smaller number.
Netting Members	Netting members are primarily government securities broker-dealers and banks that are capable of participating in the netting services through GSCC.
Novation	Novation is an agreement to replace one party to a contract with a new party. The novation transfers both rights and duties and requires the consent of both the original and the new party.
Offsetting	Offsetting is liquidating a purchase of contracts (e.g., futures contracts) by the sale of an equal number of contracts with the same delivery month, thus closing out a position.
On-Us Check	An "on-us check" is a check payable from funds on deposit at the same bank where it is presented for collection.
Open Outcry	Open outcry is a form of trading whereby buyers and sellers trade by shouting their orders and using hand signals.

Glossary

Opportunity Costs	Opportunity costs refer to the present value of income that could be earned (or saved) by investing in the most attractive alternative to the one being considered.
Options on Futures	An option on a futures contract gives an investor the right but not the obligation, in exchange for a price (called a premium), to buy or sell a specified futures contract at a specific price (called the exercise price) within a specified period.
Order-Book Official	An order-book official is an exchange official who accepts and executes limit orders from customers—orders to buy or sell when the market reaches a certain price.
Originating Depository Institution	An originating depository institution is a depository institution that initiates and warrants electronic payments processed through the ACH network on behalf of its customers.
Originator	An originator is the person or organization that initiates an ACH entry.
Paying Bank	A paying bank is the bank at which a check is payable and to which it is sent for payment or collection.
Payment Processor or Credit Card Association	A payment processor is an association dedicated to the settlement and clearance of transactions using credit cards. Examples of such associations are VISA and MasterCard.
Payments System	Payments system is a collective term for mechanisms (both paper-backed and electronic) for moving funds, payments, and money among financial institutions throughout the nation. The Federal Reserve plays a major role in the nation's payments system through distribution of currency and coin, processing of checks, electronic transfer of funds, and the operation of automated clearing houses that transfer funds electronically among depository institutions; various private organizations also perform payments system functions.
Premium	A premium is the amount that the buyer of an option pays the writer or seller of the option.
Presentment Fee	A presentment fee is a fee that a bank receiving a check may impose on the bank that presents the check for payment.

Glossary

Proprietary Trading	Proprietary trading is the buying and selling for the trading institution's own account, in contrast to the trading the institution does on behalf of its customers.
Put Option	A put option is a contract that gives one the right, but not the obligation, to sell a specified amount of an underlying asset, such as stocks or currency, at a specified price by a certain date.
Real-Time Gross Settlement	Real-time gross settlement is a system that processes each transaction as it is initiated rather than processing it in a batch. Gross settlement means that the system settles each transaction individually.
Receiver	A receiver is the individual or organization that has authorized an originator to initiate an ACH credit or debit transaction entry to the receiver's account with the receiving depository institution.
Registered Options Trader	A trader that trades on the exchange floor but has an obligation to make markets similar to that of specialists.
Repurchase Agreement	A repurchase agreement is an agreement between a buyer and seller (usually) of U.S. government securities, whereby the seller agrees to repurchase the securities at an agreed-upon price and, usually, at a stated time.
Respondent Bank	A respondent bank is a bank that regularly buys check processing and other services from a correspondent bank.
Return Item	A return item is a transaction that has been returned by a receiving depository institution because it cannot be posted.
Securities	Securities refer to a financial instrument that represents a share of ownership in a corporation—a stock; a loan to a corporation, government, or governmental body—a bond; or conditional rights to ownership, e.g., an option.
Self-Regulatory Organizations	Self-regulatory organizations are industry organizations and associations responsible for enforcement and practices in their market.
Series of Options	Series of options are all options of the same class that also have the same unit of trade, strike price, and expiration date.

Server	A server is a computer that stores information that is retrieved by other computers.
Settlement	In banking, settlement refers to the process of recording the debit and credit positions of two parties in a transfer of funds. Also, it is the delivery of securities by a seller and the payment by the buyer.
Settlement Banks	Settlement banks are banks that maintain the settlement accounts for clearing members whereby payments and deposits are made.
Specialist	A specialist is a member designated by an exchange to be the sole market maker for a particular stock.
Speculation	Speculation is the assumption of risk in anticipation of gain but recognizing a higher than average possibility of loss. The term speculation implies that a business or investment risk can be analyzed and measured, and its distinction from the term investment is one of degree of risk.
Stock/Equity Option	A stock option gives one the right to purchase or sell a certain number of shares of stock at a particular price within a specified period.
Stored-Value Card	A stored-value card is a credit-card-sized device, implanted with a computer chip, with stored money value. A reloadable stored-value card can be reused by transferring value to it from an automated teller machine or other device. A disposable card cannot be reloaded.
S.W.I.F.T.	The Society for Worldwide Interbank Financial Telecommunication is an international financial payment cooperative organization that operates a network that facilitates the exchange of payment and other financial messages between financial institutions throughout the world.
Systemic Risk	Systemic risk refers to the risk that the failure of one participant in a transfer system (or financial markets generally) to meet its required obligations will cause other participants or financial institutions to be unable to meet their obligations when due.
Trade Comparison	Trade comparison is the receipt, validation, and matching of data on the long (buy) and short (sell) side of a transaction and the reporting of such match.
Treasury Security	A Treasury security is a negotiable debt obligation of the U.S. government, backed by its full faith and credit, and issued with various maturities.

Glossary

UCC	The Uniform Commercial Code (UCC) is a set of model laws governing commercial and financial transactions.
Value Added Networks	Value added networks refer to a third-party service provider that manages data communications networks for businesses that exchange electronic data with other businesses.
Verification	Verification is the ability to positively identify and authenticate a particular encrypted communication.
Writer (Option)	An options seller is called a writer of options, a "covered" writer if owning the underlying asset and a "naked" writer if not. The writer of an option is obligated to sell, in the case of a call option, or buy, in the case of a put option, a specified amount of the underlying asset at a predetermined price when the buyer or holder exercises the option. The writer earns a premium paid by the buyer.

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