Where Has All the Paper Gone? Book-Entry Delivery-Against-Payment Systems

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In the late 1960s the New York Stock Exchange reduced the number of days and hours of trading in an attempt to decrease the volume of stock trading. The reason was the "paper crisis": the trading firms could not manage to deliver and receive promptly the huge volume of securities traded each day. The highest daily volume of trade in 1968 was just over 21 million shares. In 1990 the highest daily volume of trade was 292 million shares. Yet this extraordinary increase in trading activity was accommodated without a crisis of any sort. What has allowed Wall Street to manage the huge increase in volume?

Many forms of automation contribute to the ability to settle the increased volume of trading in financial markets. Probably the most important consideration, however, is that today most securities listed on the New York Stock Exchange (and many others as well) never have to be moved at all. They are immobilized in a depository and therefore do not have to be delivered after a trade. Instead of the time-consuming and laborious task of delivering, examining, and counting the traded securities,

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a seller simply transfers ownership to the buyer by instructing the depository to debit its security account and to credit the account of the buyer. The "back office" where trades are settled has become, in an important sense, paperless.

The immobilization of securities in a depository has reduced the costs of settling trades and also has changed the risks that are always present in completing agreed-upon transactions. By combining the transfer of the security on the books of the depository with simultaneous transfer of payment for the security, the depositories have made it possible to eliminate the risk that the seller would lose its security after delivery but before payment was made. However, settling trades through a depository requires that the depository and its system for ensuring completion of trades be safe; otherwise the users of the depository would be at risk of losing expected settlement payments or securities.

Efficient and safe settlement of trades is important in lowering the costs of financing investment and in fostering ease of access to our economy's financial markets. Trading volume typically peaks at times of stress in financial markets as many people wish to trade securities. During the 1987 market break, for example, over 608 million shares changed hands on one day on the New York Stock Exchange. If the system of settlement were unable to manage such a large volume of trade, especially at such a critical time, investors might lose confidence in the safety and integrity of our financial markets. Such a belief could increase the costs of funds to our nation's firms and governments. In this article, we will examine the security depositories, their methods of completing trades, and their role in reducing the costs and risks of transacting securities.

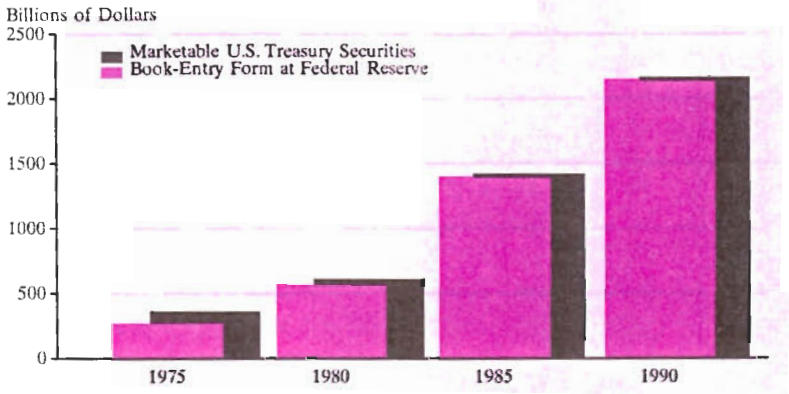
BOOK-ENTRY DEPOSITORIES

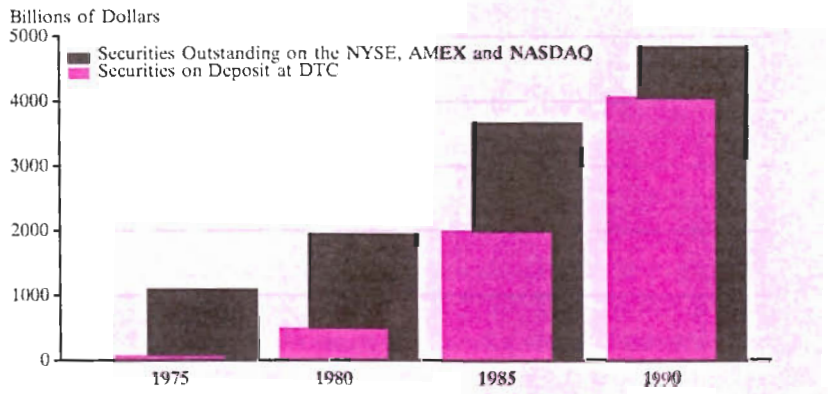
A book-entry depository is a specialized financial institution that accepts securities for safekeeping and maintains transferable accounts of those securities. Book-entry transactions can be completed more easily and at lower cost than transactions in which the securities are in paper form for two reasons. First, immobilizing the securities in one location is the least costly method of safekeeping securities, since it saves on the duplication of vault, security, and maintenance costs. Second, book-entry transfer of securities is quicker and cheaper than the physical transfer of securities. Book-entry transfer is accomplished by electronically debiting the account of the seller of securities and crediting the account of the buyer, while physical transfer requires that both the buyer and seller count the securities and verify that the right bundle of securities is delivered. Furthermore, physical transfer of securities requires expensive security and insurance arrangements to protect against theft, loss, and fire.

The growth in book-entry deposits of securities has been rapid. As shown in the figure on page 21, over 98 percent of U.S. Treasury securities are now in book-entry form at the Federal Reserve System. Indeed, all U.S. Treasury securities are now issued only in book-entry form; that is, there are no paper securities in the first place, and the securities exist only as entries in the Fed's computer system. Other U.S. government securities, such as those issued by government-sponsored enterprises and federal agencies, as well as the securities of many international organizations also are in book-entry form at the Federal Reserve System.

Many other securities, including corporate stocks and bonds, municipal bonds, and the mortgage-backed securities of the Government National Mortgage Association (GNMA, or Ginnie Mae) are on deposit in private depositories. (See *Book-Entry Depositories* on page 22.) For example, in 1990, 66 percent of the shares of all U.S. companies listed on the New York Stock Exchange were held in book-entry form at the Depository Trust Company, the largest private book-entry depository. Corporate stocks and

Book-Entry Deposits of Outstanding Securities





Note: All dollar figures are in billions.

Source: U.S. Bureau of the Public Debt; Federal Reserve Bank of New York; *NYSE Fact Book*, various years; *AMEX Fact Book*, various years; National Association of Securities Dealers; Depository Company *Annual Report*, various years.

bonds are often issued in paper form, then registered, immobilized, and transferred to a book-entry system.

That a depository can economize on the costs and risks of the physical movement of a commonly traded object is an old idea. In the 16th and 17th centuries, traders, who were paid in gold and silver coins, faced problems of cost and risk. In the great trading center of Amsterdam, hundreds of different types of coins of many countries circulated. Traders had to be able to identify the specific coin as well as to determine the amount of the precious metal in the coin. Each merchant would have to weigh the coins in order to assess their value—but who monitored the accuracy of the scales? Furthermore, the weight of the coins imposed costs on their movement, and the risks of loss and theft were significant. The solution to this increasingly clumsy means of payment was found in the creation of the Bank of Amsterdam—a depository of coins.

Adam Smith, in *Wealth of Nations*,[1] reports that "[i]n order to remedy these inconveniences, a bank was established in 1609 under the guarantee of the city. This bank received both foreign coin, and the light and worn coin of the country at its real intrinsic value in the good standard money of the country, deducting only so much as was necessary for defraying the expence [sic] of

[1]Adam Smith, *Wealth of Nations*, Book IV, Chapter III (The University of Chicago Press, 1976), pp. 504-05.

Book-Entry Depositories

The Federal Reserve, as fiscal agent for the U.S. Treasury, most federal agencies, and certain international organizations, issues, maintains, and transfers ownership of debt securities issued by these entities.

Started in 1971, the Fedwire book-entry safekeeping and transfer system now holds more than 98 percent of the marketable U.S. Treasury debt in book-entry form. The par value of the securities on the system exceeds $3 trillion, and about 47,000 transfers are processed on an average day. The system maintains accounts for approximately 8500 institutions that use these accounts to safekeep and clear transfers for themselves as well as for their customers.

For securities not on deposit at a Federal Reserve Bank, private cooperative depositories have been created, typically by market participants, to provide the benefits of book-entry deposit of securities. These depositories have grown increasingly sophisticated and provide a host of services too numerous to describe. All are members of the Federal Reserve system and so are examined and supervised by the Fed. All are registered clearing agents and therefore are regulated by the Securities and Exchange Commission.

The Depository Trust Corporation (DTC), begun in the late 1960s, is the largest private book-entry depository. It holds corporate debt and equity securities on deposit, as well as municipal debt securities. The market value of securities held by DTC at year-end 1990 was $4.1 trillion. This amount included 66 percent of all the shares of U.S. companies listed on the New York Stock Exchange, 41 percent of all the shares issued over the counter, and 43 percent of the shares listed on the American Stock Exchange. Some 87 percent of outstanding municipal bonds and 77 percent of the corporate debt listed on the New York Stock Exchange are held by DTC for its participants. DTC is owned by its participants.

The Philadelphia Depository Trust Company (PHILADEP) and the Midwest Securities Trust Company (MSTC), in Chicago, also safekeep corporate debt and equity and municipal debt. At year-end 1990, they held on deposit securities whose value was 3 percent of the value of securities on deposit at DTC. Both were created in the early 1970s. PHILADEP and MSTC are wholly owned subsidiaries of the Philadelphia Stock Exchange and the Midwest Stock Exchange, respectively.

The Participants Trust Company (PTC) was formed in 1989 to provide a book-entry depository for Government National Mortgage Association (GNMA) mortgage-backed securities. As of February 1992 it had more than $627 billion in par value of such securities on deposit--about 90 percent of the outstanding issues. It has operated on a same-day funds settlement system from its inception.

coinage, and the other necessary expence [sic] of management. For the value which remained, after this small deduction was made, it gave a credit in its books. This credit was called bank money... Bank money...has some other advantages. It is secure from fire, robbery, and other accidents: the city of Amsterdam is bound for it; it can be paid away by a simple transfer, without the trouble of counting, or the risk of transporting it from one place to another." Smith eloquently states the advantages of the book-entry system for coin. Modern security book-entry depositories have accomplished the task of taking a much traded item—a security—and, by immobilizing it and converting it to book-entry form, made transacting it as easy as writing a check.

Our discussion reflects that the cost of book-entry delivery of securities is less than the cost of physical delivery. One illustration of the lower cost is the decline in the *fail rate* since the introduction of book-entry depositories. A fail

is a failure by the seller to deliver the security at the time of settlement. It can occur for any number of reasons, such as an inability to find the security or slow movement of the security from the seller to the buyer. When a fail occurs, both the buyer and seller incur a cost of delay in receiving both funds and securities. In Ginnie Mae security trades, for example, the fail rate was estimated to be 25 percent as recently as 1985. Since 1989 most of these securities have been immobilized by Participants Trust Company. Today the fail rate in Ginnie Mae trades is about 6 percent.[2] Another illustration is the reduction in time required to complete a delivery electronically rather than physically. In a joint U.S. Treasury-Federal Reserve study on automating operations in government securities, it was found that "no more than two minutes elapsed time is required to complete an incoming telegraphic transfer as compared with nearly two hours when physical delivery is made."[3]

DELIVERY-AGAINST-PAYMENT

In addition to reducing the costs of transferring securities, book-entry deposit of securities can reduce the risks of default by one party in a trade because depositories can combine book-entry transfer of securities with transfer of money. With the ability to transfer both money and securities, the depository can match, simultaneously, a delivery of securities with the payment for those securities. This method, called delivery-against-payment, offers a way to complete or settle a previously agreed-upon transaction by making payment if, and only if, delivery of the security is made. Ordinary cash transactions, such as the purchase of groceries for cash, are made by delivery-against-payment.

Delivery-Against-Payment Eliminates "Principal Risk." An ideal delivery-against-payment system eliminates an important source of risk in any transaction: if either payment or delivery takes place before the other side of the transaction is completed, the party that fulfilled its obligations might lose the entire sum (the principal amount) if the other party defaults and is unable to complete its side of the transaction.

An example is the risk to a store owner who accepts a check in exchange for some item, such as clothing. The store gives the clothing to the customer but will not receive payment until the check clears. If the check is not honored by the customer's bank because of insufficient funds, for example, it may be impossible to retrieve the clothing from the customer.

A more pertinent example is the risk of theft when paper securities had to be delivered (in advance of payment) before the advent of book-entry depositories. Brokerage firms would send the securities by messenger at the end of the day. It was common practice not to provide a guard unless the messenger was carrying over $1 billion worth of negotiable securities. Theft insurance rates were escalating quickly in 1969-1970, leading to an insurance crisis in 1971, when the largest insurer of securities announced that it would no longer offer the coverage. The securities industry, the Federal Reserve System, and other interested parties worked quickly to implement a book-entry system for U.S. Treasury securities in 1971 to alleviate the crisis.

Book-entry depositories can implement delivery-against-payment in two ways. One way is to transfer the money and the securities simultaneously. By doing so, neither side of the

[2]Reported in "Progress and Prospects: Depository Immobilization of Securities and Use of Book-Entry Systems," Division of Market Regulation, U.S. Securities and Exchange Commission, June 14, 1985, and by the Participants Trust Company.

[3]"Joint Treasury-Federal Reserve Study of the U.S. Government Securities Market," Staff Studies-Part 3, December 1973.

transaction is exposed to principal risk. This is essentially the way the Federal Reserve operates its book-entry system.

The other way is to transfer securities provisionally until payment is made later. Provisional transfer of a security means that the seller's securities account is debited even if the buyer does not have enough money to pay for the security at that moment. Later, perhaps at the end of the day, the buyer is expected to have sufficient funds to make payment. If payment is made, the securities transfer is final; if not, the securities transfer is reversed, and the seller keeps the security. Alternatively, rather than reversing the transfer, delivery can be provisional upon the buyer's posting sufficient collateral to ensure payment to the seller in the event that the buyer cannot pay cash at the end of the day. The private book-entry depositories transfer securities in one of these two ways.

"Principal Risk" With Physical Delivery. With physical transfer of securities, the seller has to deliver the security before payment because the buyer accepts the security subject to count and examination. So simultaneous transfer is not possible. If a third party, such as a clearinghouse, would perform the examination and count, the physical security transfer to the buyer could be made provisional on payment. But third parties are not always available, so settlement is often simply sequential. As a result, the seller is at risk that the buyer might default in the time after delivery but before payment.

Indiana Jones provides us with a dramatic example of the risks of sequential settlement. In the movie "Raiders of the Lost Ark," Indiana Jones and his South American guide, Satipo, are attempting to escape the many traps in the temple from which Indiana has taken a golden idol. Satipo crosses a chasm in their path, but in doing so, he breaks the rope used to swing across it. Indiana is on the wrong side of the chasm with the golden idol; Satipo is across the chasm with Indiana's famous whip. "Give me the whip!" demands Indiana. "Throw me the idol, I throw you the whip," replies Satipo. Indiana hesitates as a stone door descends to block their escape. "No time to argue!" insists Satipo. Indiana has no choice but to comply. He throws the idol, but Satipo defaults. He drops the whip with a sneering "Adios, Señor."

As luck would have it, Indiana Jones proved resourceful enough to manage his escape without Satipo's completing his end of the transaction, but the default in settling the sequential whip-for-idol trade illustrates the pitfalls of settling a trade without being able to count on the fact that both ends of the transaction will be completed. Indiana suffered principal risk in settlement with Satipo, and Satipo intentionally defaulted. Default, however, is a risk even when no one intends to default; rather, a firm may find itself illiquid or insolvent in the middle of the day after receiving securities but before having paid for them.

BOOK-ENTRY DEPOSITORIES AND THEIR DELIVERY-AGAINST-PAYMENT SYSTEMS

Several book-entry depositories exist: the Federal Reserve System for Treasury and agency securities and the four privately owned book-entry depositories for stocks, corporate and municipal bonds, and various other securities.[4]

The Fed's delivery-against-payment system is a real-time, gross settlement system. It is a real-time system because the transaction takes place at the time of day when the seller notifies the Fed of the transaction. For example, when a bank sells Treasury securities to another bank, it notifies the Fed on the settlement day to

[4]See Patrick Parkinson et al., "Clearance and Settlement in U.S. Securities Markets," Staff Study 163, The Board of Governors of the Federal Reserve System, for more information on the settlement systems for securities.

transfer the securities to the buyer against a payment. The Fed debits the buyer's reserve account and transfers the funds to the seller's reserve account; at the same time the Fed debits the seller's security account and credits the buyer's security account. The transfers occur within seconds. It is a gross settlement system because the gross amounts of both cash and securities for each of a bank's transactions are exchanged during the day. For example, it may be that the buyer and the seller change roles in a partially offsetting transaction later in the day. That transaction would be treated separately from the earlier transaction.

Unlike the Fed, the private depositories' delivery-against-payment systems employ payment netting systems. During the day the participant may buy and sell many securities. The depository keeps track of the transactions of its participants and at the end of the day it nets all transactions—each participant simply pays to or receives from the depository the difference between total sold and total bought. Even though the participant may have made thousands of trades during the day, it will either owe or be due only one amount of money. Since later transactions may partially offset earlier ones, netting can greatly reduce the total value of transfers that have to be made.[5] As a result, netting reduces the liquidity costs of settlement. It does so, however, at the expense of increasing certain risks that all transactions may be unable to settle because of the failure of one participant.

Private depositories employ one of two types of payment: next-day funds settlement or same-day funds settlement. (See *Same-Day Funds Settlement* on page 26.) In the former the payment at the end of the day is typically made by certified check (payable the next day), while in the latter, payment is made by wire transfer. These two systems ensure delivery-against-payment in different ways.

In the next-day funds settlement system, deliveries of securities are made throughout the day, but they are provisional until the final settlement payment is received at the end of the business day. If payment for a security is not made because a party is illiquid—it neither has the funds available to make payment nor can it borrow to make payment—then the security delivery is reversed. Since the security never left the depository, reversal is accomplished by a transfer from the defaulting party back to the original seller.

In the same-day funds settlement system, deliveries of securities are made throughout the day and are provisional upon the buyer's posting collateral of sufficient value to ensure the payment necessary for the securities. Rather than reverse security deliveries, the same-day systems use the collateral to effect payment in the event of a default. If the buyer defaults, the depository will seize the collateral and sell it. Since this will take time, the depository itself must have sufficient liquidity to make the payment due to the seller of the securities.

POTENTIAL RISKS AND CONTROLS IN DELIVERY-AGAINST-PAYMENT SYSTEMS

Although the development of properly designed delivery-against-payment systems has substantially reduced principal risk, we have seen that other risks arise in these systems. The depositories have established extensive control measures intended to protect the depository and its participants from these risks.

In the Federal Reserve book-entry system, the Fed extends intraday credit to those institu-

[5]See Brian Cody, "Reducing the Costs and Risks of Trading Foreign Exchange," this *Business Review*, November/December 1990; and R. Alton Gilbert, "Implications of Netting Arrangements for Bank Risk in Foreign Exchange Transactions," Federal Reserve Bank of St. Louis *Review*, January/February 1992, for discussions of netting arrangements. Netting also reduces bookkeeping costs in trades with many participants.

Same-Day Funds Settlement

Same-day funds settlement requires that the payment for a security be made by wire transfer rather than by certified check. Hence, same-day settlement means that funds are immediately available to the seller; payments made by check are not available until the next day (and are therefore subject to some small risk of overnight bank failure). U.S. securities markets are planning to move to same-day funds settlement for all securities transactions. Currently, only some securities in the U.S. are settled in same-day funds.

Same-day settlement requires greater monitoring than does next-day funds settlement to ensure adequate liquidity. If a participant in a next-day funds system experiences an unexpected shortfall in liquid balances at the end of the day, it has the opportunity to obtain liquidity the next day to fund its liability. However, a same-day funds system allows little time to obtain liquidity to fund a settlement shortfall. Therefore it is especially important for a same-day funds system to maintain sufficient liquidity to fund the settlement payments at day's end, should a participant default occur.

The greater difficulty of obtaining funds on a same-day basis makes reversing securities deliveries more problematic in the same-day funds settlement systems. When a security delivery is reversed, the seller of the security is placed under increased liquidity pressures. Since the seller anticipates payment at the end of the day, it may invest anticipated funds during the day, prior to settlement. However, if the buyer of the security defaults and the security delivery is reversed back to the seller, it must fund this addition to its portfolio. This is correspondingly more difficult when the cash to do this must be paid on the same day. As a result, systems using same-day funds rely more on full collateralization of security deliveries during the day (expecting to sell the defaulting party's securities later) rather than reversal of security deliveries. In its policy statement on the desirable features of same-day settlement systems, the Federal Reserve System actively discourages reversal of security transfers in the event of a default. Because selling the securities takes time, this requires that the same-day systems have greater liquidity on hand to fund the same-day payment of a defaulting participant.

Two private book-entry depositories have same-day funds settlement systems: the Participants Trust Company for GNMA securities and the Depository Trust Company for commercial paper and various other securities. Their procedures to ensure adequate liquidity are similar. Most important, these systems rely on full collateralization of any participant's net debit, debit caps that limit the risk exposure of the system due to any one participant, and committed lines of credit to the depository at least as large as the largest debit cap of any participant.

Full Collateralization. Full collateralization of a participant's net debit is achieved by marking to the previous day's closing price the securities the participant is due to receive. These securities themselves provide part of the participant's collateral, but they are valued at their market price minus a "haircut." This undervaluation is intended to cover expected movements in the price of the security in the next few days when the depository would liquidate the security in case of default. The rest of the collateral must consist of a participant's fund, at least part of which must be in cash, and the rest in short-term Treasury securities, a type of security that is easily sold.

Net Debit Caps. Net debit caps are imposed on each participant so that no one participant's default would imperil the ability of the system to effect settlement payments for all other participants. The cap is determined based on the liquidity resources of the participant.

Committed Line of Credit. The depositories that manage same-day funds settlement systems attempt to ensure final settlement. By paying for committed lines of credit that are at least as large as the largest net debit cap for any participant, the depository is able to complete settlement even in the event that the system's largest net debtor would default.

tions whose Fed accounts have insufficient funds to pay for incoming securities at the time of transfer. As a result, these participants incur daylight overdrafts in their Fed accounts. Should a participant fail during the time it has a large daylight overdraft with the Fed, then the Fed may lose the value of the overdraft. Because of this the Fed is exposed to *credit risk* from its participants. We will discuss the procedures the Fed has put in place to control this risk after considering the risks that arise in the private settlement systems.

Because they net money payments throughout the day and settle their transactions only at the end of the day, the private delivery-against-payment systems rely on participants that are net debtors to be able to make final settlement payment at the end of the day. The possibility that a net debtor (of money or securities) would be unable to settle at a designated time gives rise to *liquidity risk.*

Because all firms wish to earn a high return, each firm has an incentive to economize on cash holdings. Cash (transactions accounts at banks) yields low returns but is necessary to make payments. Firms constantly monitor their cash positions to maintain sufficient cash to make their payments, but not excess cash, which would lower their return. Because firms economize their cash holdings, the failure to receive an expected payment can easily cause a firm to be "illiquid" and unable to make the settlement payment on schedule. Hence all parties are subject to liquidity risk.

Replacement-cost risk, or market risk, is a type of credit risk. For example, in the same-day settlement systems, if a participant defaults, its collateral is seized and later sold to pay for its obligations to the depository. Although the collateral is set to cover losses as large as can be expected in one to two days given the historical record of price volatility, there is a risk that the market value of the collateral could decline precipitously by the time it is sold.

In a netting system, the failure of one participant to make settlement payment imposes increased liquidity pressures on the depository and on other participants, since the defaulting party was a net debtor to them. For example, in a next-day settlement system, if a seller has a security delivery reversed back to it and does not receive its expected payment, it may become unable to fulfill its own obligations, since it then must fund a larger portfolio of securities than it had anticipated. The risk arises that one party after another will become illiquid and unable to settle, and the payment system itself will fail. This *systemic risk* would result in the failure of all the transactions to be settled that day. The participants would have to revert to bilateral settlement, and the benefits of the multilateral system would be lost, at least for a time.

Risk Control Measures in Book-Entry Depositories. Depositories have instituted several risk-control measures to reduce the chance of the failure of any individual settlement and, more important, to reduce the chance of any systemic failure of the settlement system.

Membership standards that restrict participation to firms with high levels of capital can reduce the risk of failure. Well-capitalized firms can better withstand unexpected shortfalls of funds, since they should be better able than thinly capitalized firms to quickly borrow to meet settlement payments and to absorb credit losses without becoming insolvent. Private depositories have explicit standards that participants must meet in order to join the system. For example, Participants Trust Company requires that its participants meet specific capital requirements.

All book-entry depositories *monitor* their participants for signs that the participant is subject to especially severe liquidity or solvency pressures or operational problems. Depositories study the financial statements and regulatory filings of participants to keep abreast of changes in participants' financial conditions.

All book-entry depositories impose *debit caps*,

or limits on the amount of the debit position a firm can build during the day, to limit the exposure the system has from any one participant. The debit cap is determined on the basis of the participant's liquidity resources and contributions to the participant fund. In the Fed's book-entry system, debit caps serve to limit daylight overdrafts.

The Fed has proposed *pricing daylight overdrafts* to restrain the incentive that a participant has to overuse daylight credit from the Fed. By charging a fee for each dollar of credit it extends to a participant for a daylight overdraft, the Fed expects that its participants will find ways to reduce their current reliance on this source of credit.[6]

All settlement systems require each participant to maintain a participant fund, or clearing fund. This fund partly collateralizes the participant's obligations to the organization and can serve as a liquidity backstop in the case of default of another participant. Typically, cash and short-term Treasury securities are acceptable for contributions to the participant fund. The level of required contributions to participant funds is not adjusted often.

In the same-day funds net settlement systems, participants are also required to post collateral (see *Same-Day Funds Settlement*). Collateral requirements are meant to fully cover the obligations that a participant has to the organization for all but the most extreme one-day changes in the value of the participant's collateral.[7] The collateral is adjusted (by marking the collateral to its market value) each time a trade is entered into the system. Some of the collateral must be in cash, while the bulk of it may be in the security to be delivered in the system.

The rules governing *loss sharing* among nondefaulting participants in the event of a default by a counterparty are part of the risk control system in net settlement arrangements. These rules vary by depository. An illustration of a loss-sharing rule is that once a participant defaults, the depository can seize the collateral of that participant and later sell it. In the meantime, the depository, using its liquidity, makes the payment that the defaulting participant failed to make. Any losses incurred in this operation may be recovered by first liquidating the defaulting party's clearing fund.[8] Next the depository can charge the loss to its own retained earnings; next it can charge losses to other participants' clearing funds.

If the depository charges losses to the settlement counterparties of the defaulting party, this action encourages bilateral monitoring by each participant of its counterparties. If the losses are charged equally to all participants, this action mutualizes risk and reduces the participants' incentives for monitoring settlement counterparties.

The depositories themselves typically maintain committed *bank lines of credit* to provide liquidity in the event of a participant's default. Closing out a participant's position takes time, and the depository, to prevent further liquidity pressures on the system, must have access to liquid funds. The two leading private depositories, Participants Trust Company and the

[6]See David B. Humphrey, "Market Responses to Pricing Daylight Overdrafts," *Economic Review*, Federal Reserve Bank of Richmond, May/June 1989.

[7]Because of the greater liquidity pressures in the same-day funds systems, the Federal Reserve discourages reversal of security deliveries in these systems.

[8]In the next-day funds systems, reversal of security transactions may not always be possible. For example, a counterparty to a defaulting firm may be at its debit limit; a reversal would not be permitted under the existing debit caps. In this case, the depository may then decide to close out the defaulting party's position (possibly incurring a loss), in which case the loss-sharing rules become applicable.

Depository Trust Company, retain committed bank lines of credit in an amount in excess of the largest net debit allowed for any one participant.

Finally, *operational safeguards* are an important part of depositories' risk control system. Security of the data transmitted through the system, adequacy of the system's size, alternative sources of power and communication networks, and backup of the automated facilities are all important components of ensuring access to the system, even in the case of loss of power or some other major disruption to the facilities. Off-site backup facilities are a minimum requirement for major delivery-against-payment systems.

PUBLIC POLICY TOWARD PRIVATE DELIVERY-AGAINST-PAYMENT SYSTEMS

Public policy has supported the development of book-entry depositories, with the Fed and the Treasury actively involved in creating the book-entry system for U.S. Treasury and agency securities. The Securities and Exchange Commission (SEC) has sponsored workshops for the securities industry to share ideas for managing the book-entry systems. While the SEC supports the immobilization of securities, it believes that the individual investor should be able to obtain a certificate if she so desires.[9]

The Working Committee of the Group of 30 Clearance and Settlement Project has adopted a set of recommendations concerning settlement of trades.[10] One important goal of this group is to harmonize the methods of settlement internationally as a greater flow of capital across countries occurs and more firms are listed on both domestic and foreign stock markets. Included among the group's recommendations are the following:

> Each country should have an effective and fully developed central securities depository, organized and managed to encourage the broadest possible industry participation (directly and indirectly)...
>
> Delivery versus payment should be employed as the method for settling all securities transactions.
>
> Payments associated with the settlement of securities transactions and the servicing of securities portfolios should be made consistent across all instruments and markets by adopting the "same day" funds convention.[11]

The Board of Governors of the Federal Reserve System has issued a policy statement regarding private delivery-against-payment systems that settle, directly or indirectly, over Fedwire.[12] The Board provides guidance regarding issues of intraday credit risks and payment risk management arising from such systems. It outlines liquidity, credit, and op-

[9]See "Progress and Prospects: Depository Immobilization of Securities and Use of Book-Entry Systems," Division of Market Regulation, U.S. Securities and Exchange Commission, June 14, 1985.

[10]The Group of 30 is an independent, nonpartisan, nonprofit international organization, composed of senior financial industry participants and researchers with interests in economic policy issues. In 1988, the Group of 30 began a project to improve the world's clearance and settlement systems. The Working Committee of the Group of 30 Clearance and Settlement Project was formed to further develop the recommendations of the Group of 30.

[11]Group of 30 Clearance and Settlement Project, "Year-End Status Report 1990," Group of 30, 1990 M Street, N.W., Suite 450, Washington, D.C.

[12]This policy statement was issued on June 15, 1989, and is reprinted in Parkinson et al. (See footnote 4.)

erational issues that should be considered in a same-day funds settlement system.

CONCLUSION

Book-entry deposits of securities, along with the delivery-against-payment system book entry makes possible, have become an important feature of the securities market in the U.S. In these systems, the computerized technology that makes this cost- and time-saving method of safekeeping and transferring securities possible must be complemented by carefully crafted control measures that limit the credit and liquidity risks that inevitably remain in any payment system. The primary regulators of the securities industry and the industry itself have identified further immobilization of securities and the movement to same-day funds settlement as important developments to pursue in the future.