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* The views expressed in this article are solely those of the author and should not be attributed to the Federal Reserve Bank of Dallas, or the Federal Reserve System.

Daylight Overdrafts: Who Really Bears the Risk?

The problem of payment system risk has been addressed by numerous government and private sector task forces over a period of years. New regulation of the large dollar transfer systems has reduced the level of risk, but the magnitude of the risk continues to be massive. The high level of daylight overdrafts, the basic source of payment system risk, is a direct result from the externality that the creator of the overdraft does not bear the full cost of the overdraft. Policy makers are concerned, however, that programs designed to limit the risk may interfere with the economy's ability to carry out transactions and reduce real economic growth. In attempting to balance these two issues, the externality and the ability to execute payments, most economists argue that the Federal Reserve needs to price daylight overdrafts to reduce the externality in creating these overdrafts and thereby to reduce payment system risk.

While there is payment system risk, the size of the risk is unknown. Current measures of the risk are inadequate and incomplete. Furthermore, the issue of who is actually bearing this risk is not usually explicitly considered in the analysis of

the risk problem. The cost of these daylight overdrafts is at least partially borne by the tax-paying public. Pricing the extension of intraday credit would be an excellent approach to limiting risk; however, a market determined price for this credit is more likely to properly allocate this risk than a government determined price. Federal Reserve pricing of daylight overdrafts would likely be an improvement over the current situation, but it would offer only a second-best solution.

This paper begins with a brief explanation of the mechanics of the payment system, the source and size of the risks, and a description of the current policies for reducing risk and their effectiveness. Following this introduction is an analysis of which parties would actually be exposed to loss in the event of a payment system failure. This analysis is followed by a discussion of some principles that would be useful as guides in reforming the payment system to reduce the existing risk. The paper will end with a brief summary of the conclusions.

1. Background and Mechanics of Large Dollar Payment Systems

Specialized payment systems for large dollar sums have developed in response to the demands of transactors. These specialized systems differ from normal check clearing payment systems in three ways: security, speed and finality. Because transactors value increased security when making extremely large payments, they use systems that include more safeguards against accidental loss or theft. Similarly, the value in increasing the speed of completing a payment is in proportion to

its size. The cost of float can be most effectively reduced by speeding the payment process and reducing or eliminating the float that might have occurred on the largest payments. Finally, transactors place greater value on finality when the payments are extremely large. Most large dollar payments systems provide either final payment at the time of the transaction or greatly reduce the time until the final transfer of funds is completed (Humphrey 1984).

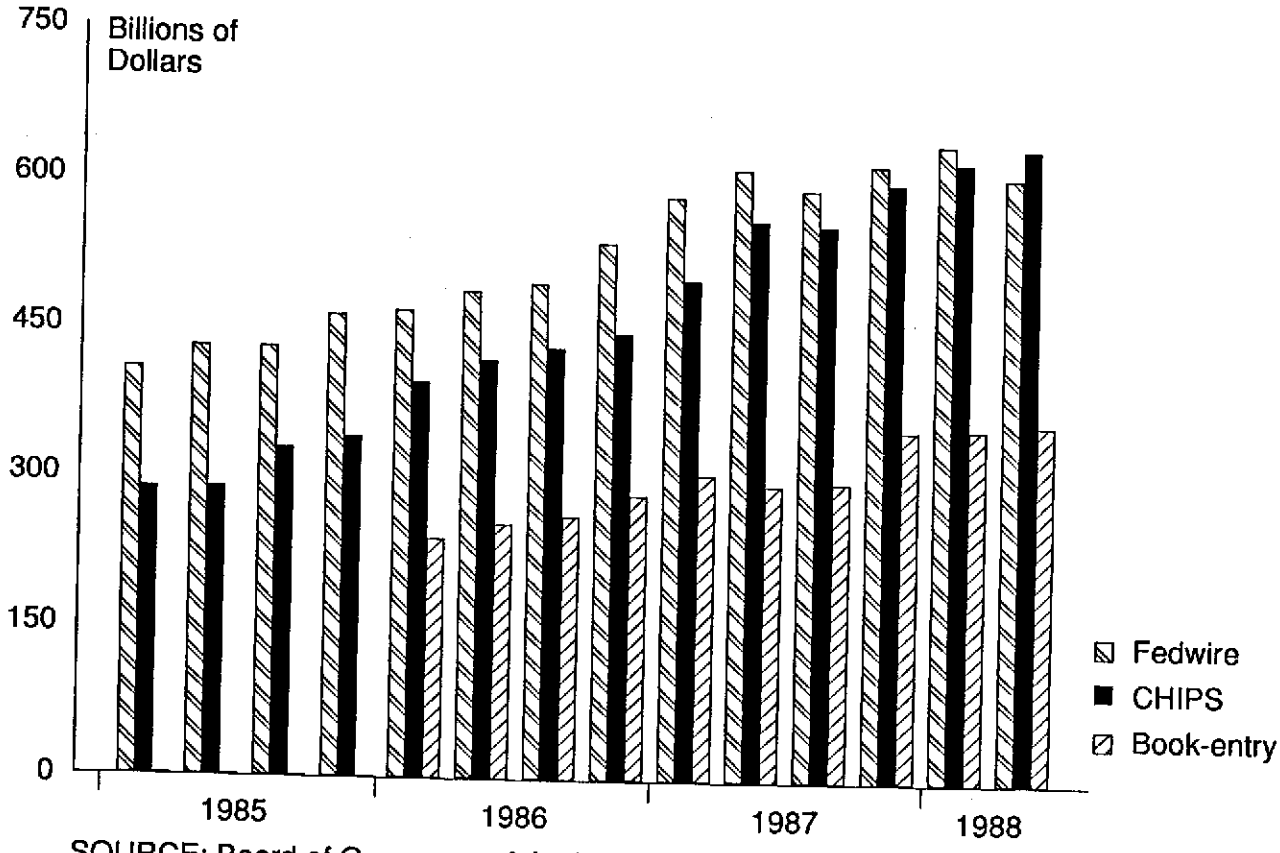
Large dollar payment systems act as a conduit to transfer funds between buyers and sellers. As many as five entities are involved in large dollar payments. The sender is the person or corporation that wishes to transfer funds to a receiver, another individual or corporation, usually in payment for goods, services, or securities received. The sender notifies its bank, known as the sending bank, to debit the sender's account and transfer the funds to the receiver. The sending bank notifies the transfer system to debit the sending bank's account, to credit the receiving bank's account, and to pass the payment information on to the receiving bank. The receiving bank then credits the receiver's account and notifies the receiver of the transfer. Thus, the five entities involved in the transfer are the sender, the sending bank, the transfer system, the receiving bank, and the receiver. Banks also transfer funds for their own purposes, often to other banks. In these transfers, the sender and the sending bank are one and the same as are the receiver and the receiving bank.

There are two important large dollar payment systems in the United States: Fedwire and Clearing House Interbank Payment

System. Fedwire is the transfer system operated by the Federal Reserve System and has existed in various forms since 1918. Fedwire transactions are split between funds transfers and book-entry securities. The average daily volume on Fedwire in the second quarter of 1988 was $605 billion in funds transfers and an additional $358 billion in book-entry securities transfers. Average daily payment volume is plotted in Chart 1. Fedwire conducts an average of 55 million transactions per year and serves 11,000 participating institutions. (Fedwire can be accessed by banks, saving and loan associations, and credit unions. To simplify the exposition, all participants will be referred to as banks.) Based upon a study by the Federal Reserve Bank of New York, transfers on Fedwire are concentrated in federal funds (33.5 percent of the total dollars transferred), securities transactions (27.8 percent of the total), and commercial and miscellaneous payments (17.0 percent of the total).

Fedwire is unique in providing gross settlement services in the United States. In a gross settlement system, each payment is a bilateral exchange between two participants where the funds are actually transfered between the two participants when the transfer message is sent. Within Fedwire, gross settlement requires the reserve accounts at the Federal Reserve Banks to be credited or debited at the time of the transfer, though the debiting can create a negative balance in a reserve account. This approach provides settlement finality to the participants, i.e., funds are irrevocable credits to receivers. Once the transfer is completed, the Fed has no recourse to the receiver to

Chart 1
Average Daily Payments Volume



SOURCE: Board of Governors of the Federal Reserve System

return the funds. The Fed's only recourse is with the sending bank.

The other major large dollar payment system is the New York Clearing House Association's Clearing House Interbank Payment System (CHIPS), which was formed in 1970. Originally, CHIPS was intended to handle international transactions, which still makes up the majority of its business, but it now also handles domestic transactions. CHIPS had an average daily volume of $635 billion in the second quarter of 1988 and served approximately 140 banks. (See Chart 1.) There is relatively little overlap between CHIPS and Fedwire. CHIPS is more heavily concentrated in international transactions, handling 99 percent of the foreign exchange market and 75 percent of the Eurodollar placement market. These two markets account for 82 percent of the total dollar volume transferred on CHIPS.

CHIPS utilizes net net settlement (Mengle 1985). Net net settlement differs from gross settlement in that the actual transfer of funds occurs only once per day. In addition, net net settlement greatly reduces the number of transfers of funds that must be made to complete payments. The single payment needed for settlement is calculated as the sum of all payments received, which represent credits, less the sum of all payments sent, which represent debits. If payments received exceed payments sent, then a participant is in a net credit position. Alternatively, if payments sent exceed payments received, then a participant is in a net debit position. At the end of the day, banks in a net debit position make a single payment through Fedwire to the CHIPS settlement account. After participants with net debit positions

have made their payments, funds are then transferred through the Fedwire to those CHIPS participants in a net credit position.

2. Risk within the Payment System

Payment system risk results from the extension of intraday credit. On Fedwire this intraday credit takes the form of daylight overdrafts. A daylight overdraft occurs whenever a sending bank sends more funds than it currently has in its reserve account, i.e. the sending bank's reserve account has a negative balance. This overdrafting is permitted under Regulation J. It treats the transfer of funds as final for the receiving bank and stipulates that the sending bank must have sufficient funds to cover its reserve accounts at the end of the day. The Fed does have the right to refuse to conduct a transfer if it has reason to believe that the transfer will create an overdraft. Under normal circumstances, however, the Fed does not exercise this right. If a bank with an overdraft were to fail during the day, the Fed would be another unsecured creditor and would likely face a loss.

The Federal Reserve permits daylight overdrafts because it believes intraday credit provides a more efficient payment mechanism. In its report, "Controlling Risk in the Payment System" the Task Force on Controlling Payment System Risk stated that intraday credit allows payments to be completed at a lower cost and faster than would occur if intraday credit was not permitted. The Task Force also recognized that extending intraday credit is costly, especially in terms of risk. It concluded that a careful analysis of the costs and benefits is

needed in order to determine the optimal quantity of intraday credit for the economy.[1]

The Federal Reserve treats overdrafts resulting from book-entry securities transactions quite differently than those occuring in funds transfers. The overdrafts created by book-entry security transactions are not controlled by the Fed's risk reduction programs. Two reasons are given for this different treatment. First, the Fed is concerned about any regulation of the government securities market that might interfere with its execution of monetary policy. The speed and low cost of transactions that result from permitting intraday credit are highly valued in the execution of open market operations to achieve monetary goals. Second, it is argued that these transaction are collateralized by the value of the government securities, and consequently the transactions are not risky. Essentially, the social gain of intraday credit is perceived to exceed by far the social costs in this case. Hereafter, references to Fedwire in this paper pertain only to the funds transfer component unless specifically noted.

Overdrafting is possible on a gross settlement system but not on a net settlement system. As mentioned previously, CHIPS is a net settlement system. Daylight overdrafts, in a strict sense, do not occur in the CHIPS system because the payment messages transferred by CHIPS represent payment information and an irrevoable obligation to transfer the required funds to settle the payment at the end of the day. Consequently, the receiving bank is a creditor of the sending bank during the day, i.e. it extends intraday credit to the sending bank. The risk in these

payments is exacerbated by the common practice of permitting receiving customers access to these provisional funds prior to the final settlement. If these funds are transferred out of the receiving bank before settlement, it would be difficult for the receiving bank to retrieve the funds from its customer if the sending bank failed to settle. If a CHIPS participant failed to make settlement, other participants who had received funds from the failed participant would have to attempt to retrieve the funds from their customers who were the receivers. In the short run before the retrieval might be accomplished, settlement would have to be accomplished. Each payment system determines its own rules for how a settlement failure would be resolved.

If an institution failed to make settlement on the CHIPS system, CHIPS would "unwind" the failing institution's transactions and recalculate settlement entries for all remaining participants. "Unwinding" implies that all transactions with the failed bank on that day would be separated from the day's transactions, and net settlement would be recalculated based on all remaining transactions. In the recalculation, some banks that had previously been able to settle might fail to make settlement if their successful settlement had been dependent on receiving funds from the failed bank. These affected banks may have been anticipating receiving funds from the failed bank, and after the recalculation of settlement these banks could move from a net credit into a net debit position, or the magnitude of their net debit position could rise. The change in their net settlement position could be larger than their capital, and these institutions would be bankrupt. In a less extreme situation if

their net debit position exceeds their balances in their reserve accounts, then these banks would not have sufficient liquidity to settle. If another participant were unable to settle, then CHIPS would again "unwind" transactions involving the newly insolvent banks and recalculate settlement. The unwinds and recalculations would continue until all remaining banks could settle their accounts.

The two most important risks in the payment system are settlement risk and systemic risk. Settlement risk is the risk that an institution will be unable to make its settlement, i.e., does not have sufficient funds to transfer to its creditors.[2] The bearer of the loss depends on the type of settlement of the payment system. In a payment system such as Fedwire, that uses gross settlement and permits overdrafts, the payment system itself bears the risk. The funds are final and irrevocable to the receiver. The payment system could lose the amount of the outstanding overdraft of the failed institution.[3] In a payment system that uses net settlement, the payment system has specific rules for dealing with a settlement failure. On CHIPS, transfers are irrevocable obligations of the sending bank. The transfers are considered provisional until settlement is made, however, even a settlement failure does not eliminate the obligation of the sending bank. In the event of a settlement failure on CHIPS, which has never occurred, there would be an "unwind" resulting in a number of transfers that are obligations that will not be able to be settled over CHIPS and that must be settled by the involved parties outside of the CHIPS system.

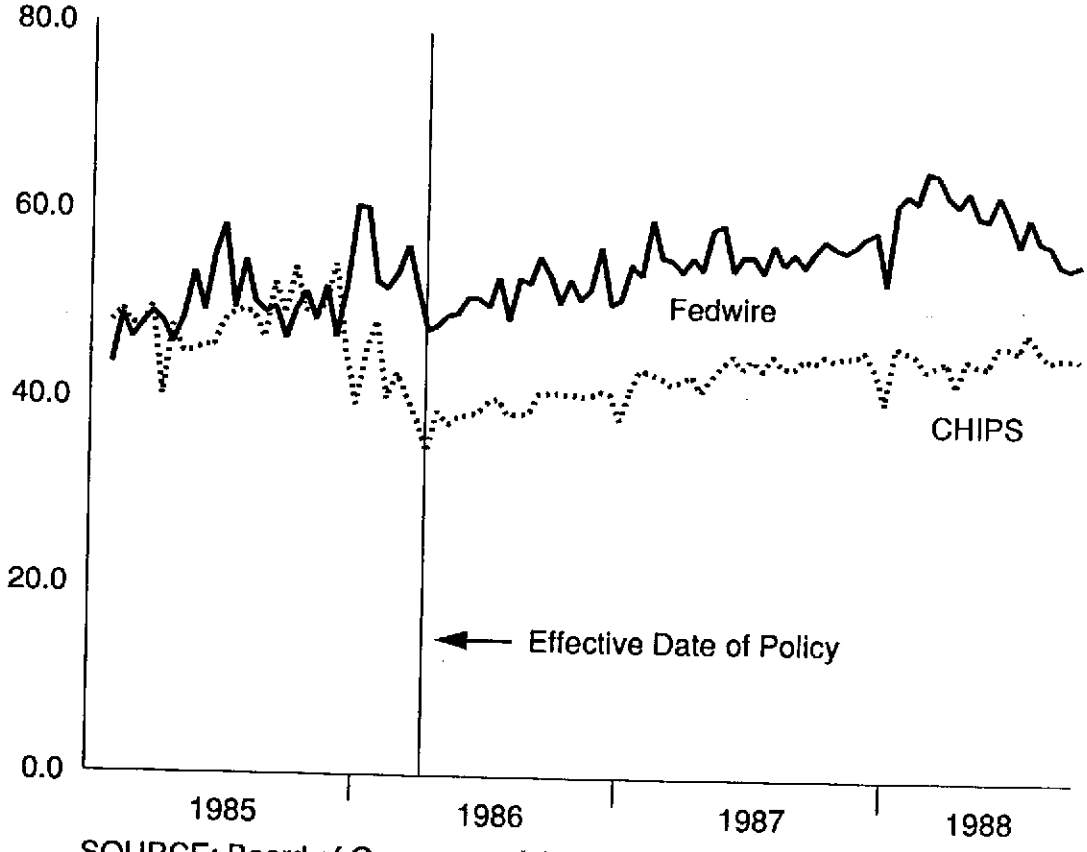
A settlement failure of one institution can result in the failure of other participants. The risk of multiple related failures is known as systemic risk. Systemic risk is not possible on Fedwire because the Federal Reserve bears the exposure to any loss. On CHIPS, however, a settlement failure could cause systemic failures. While there has never been a settlement failure on CHIPS, a simulation of a failure indicated that potentially one-third of all participants might fail in response to one settlement failure (Humphrey 1986).

Major concerns about payment system risk are that a settlement failure on a private transfer system could result in the systemic risk of multiple institutions failing or that a settlement risk could cause a substantial loss to the Federal Reserve. In the case of systemic risk and multiple failures, the shock to the payment system could be so severe that the ability to make large dollar payments is disrupted. In this event, the real growth rate of the economy could be reduced.

3. How Large Is the Risk?

The level of risk is dependent upon two factors: the size of the loss if a failure settlement were to occur and the probability of an unexpected failure of a participant. The absolute magnitude of the overdrafts and therefore the potential loss is staggering. The daily overdrafts on Fedwire and CHIPS are shown on Chart 2. Average daily daylight overdrafts on Fedwire in September 1988 were roughly $55 billion, and earlier in the year overdrafts had been as high as $65 billion. Net debit positions on the CHIPS system were $45 billion last

Chart 2
Overdrafts, By Transfer System



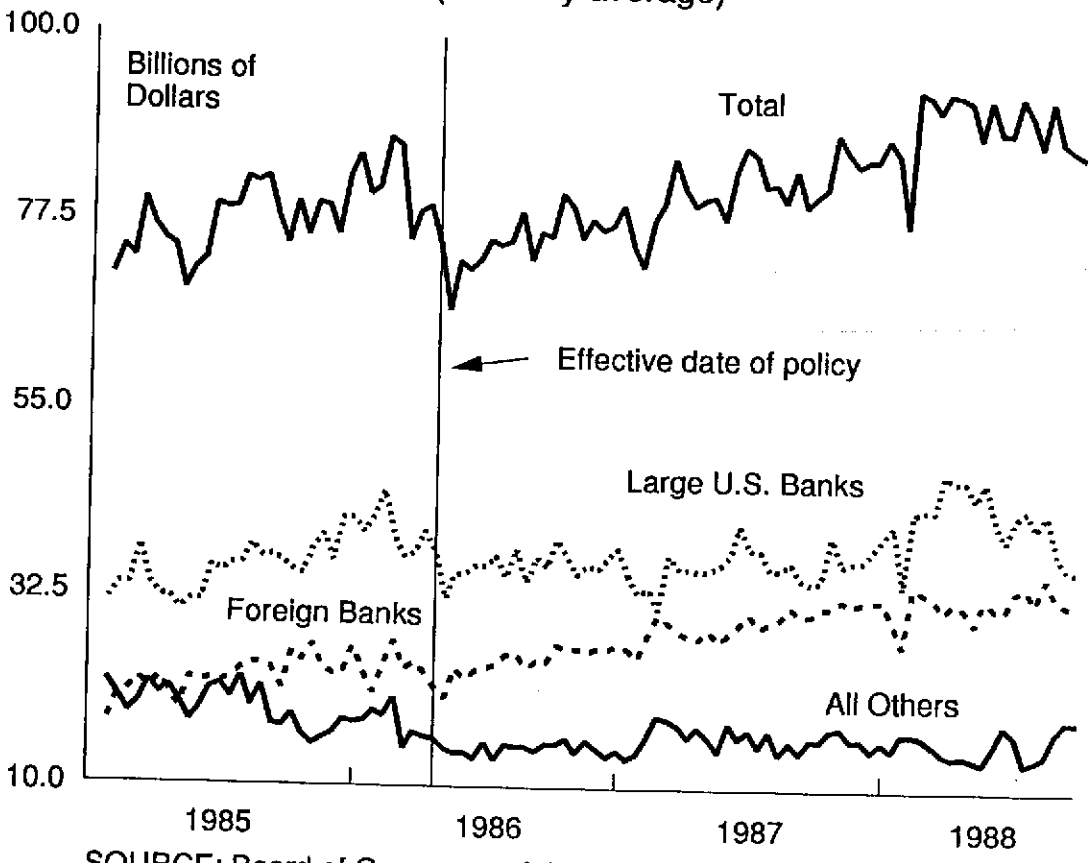
SOURCE: Board of Governors of the Federal Reserve System

September, relatively close to their high for the year of nearly $48 billion.

The level of total overdrafts is not necessarily the most accurate measure of the risk exposure of the payment system or of the Fed's likely loss in the event of a failure. If a single failure were to occur on Fedwire, the Fed's losses could be at most the size of the largest overdraft of any individual institution.[4] Unfortunately, the daylight overdrafts of individual institutions are not published. Overdrafts, however, are not evenly split among the 1,100 participants that typically incur an overdraft on a daily basis. As might be expected, the large U.S. banks account for a disproportionate share of the funds overdrafts on Fedwire and CHIPS. As shown in the Chart 3, large U.S. banks (total assets in excess of $10 billion) accounted for over 40 percent of overdrafts in September 1988. The average daily overdraft of a large institution was $911 million. Therefore, it is fully possible for the Fed to face a loss of $1 billion in the event of a single participant's failure.

The risk calculus of the payment system is dependent, not only upon the magnitude of the daylight overdrafts or the net debit positions, but also upon the risk of a bank failing to settle. The failure has to be unexpected for it to have an effect on settlement. Banks that are in a known danger of failing are monitored very closely by the Federal Reserve to prevent them from being in an overdraft or net-debit position. The deterioration of a bank's financial condition to the point of failure usually is a slow process taking weeks, months or even

Chart 3
Funds overdrafts
(biweekly average)



SOURCE: Board of Governors of the Federal Reserve System

years. It is hard to conceive of a set of circumstances that would result in a unexpected failure. One suggestion of such circumstances has been the sudden discovery of embezzlement or massive fraud, though a fraud of that magnitude is hard to imagine.[5]

The simulations of settlement failures offer strong evidence that if a settlement failure were to occur on CHIPS, the possibility of a systemic failure of other participants would be a likely outcome. Furthermore the magnitude of the number of participants and their dollar volume of electronic funds transfers would be so large as to create a serious problem. The very ability of the payment mechanism to carry out its function is questioned. If the settlement failure were to occur on Fedwire, then systemic risk is not an issue. Still, the Fed could incur a substantial loss.

4. Current Policies for Reducing Risks

The current policies for reducing risks in the payment system are based on several limits on the size of overdraft or net debit positions. These limits, often referred to as "caps," are placed on the overdraft or net debit position resulting from funds transfers, but do not apply to the daylight overdrafts that result from transactions on the Fedwire transfer system for book-entry securities for reasons described in section two above.

The Federal Reserve requires any private large dollar payment systems that utilizes the Fed's net settlement service to establish bilateral net credit limits and a network cap on the size of the net debit position. The bilateral net credit limits

refer to the maximum net credit position one specific participant will extend to each of the other participants. On CHIPS, this bilateral limit is set by each participant for every other participant. In addition, there is a network net debit cap that sets a maximum net debit position for each participant in the network.[6] In the event of a participant failing to settle, the net debit cap limits the magnitude of the loss that the payment system must absorb, and the bilateral net credit limits sets a maximum exposure to loss for each participant.

In addition to these limits on the private payment systems, the Federal Reserve has established a cross-system cap which is the cap on the net daylight debit position of each participant. It is essentially the sum of the net debit position on CHIPS and the daylight overdraft position on Fedwire. The cap is a multiple of the depository institution's capital position, and the multiple is based on a self-assessment by the institution of its ability to manage the payment system risk.

Finally, the Fed requires a cap on daylight overdrafts on the Fedwire system. This cap is essentially the same as the network net debit cap on the CHIPS system. The Fed calculates this cap as the cross-system cap less the net debit position on private payment systems.[7]

Thus, there are essentially four caps. There are two network net debit caps, one for Fedwire and one for CHIPS. These two caps limit the exposure of each of these payment systems to any one institution's use of intraday credit. There is also a cross system cap that limits the exposure of the combined payment systems to any one institution's use of intraday credit.

Finally, there are bilateral net credit limits designed to limit systemic risk by restricting the exposure of each individual institution to intraday credit use of other participants in the private payment system. This bilateral credit limit is not needed in the Fedwire system since there is no systemic risk in Fedwire since funds transfers are considered final at the time of transfer, i.e. gross settlement.

5. Enforcement of the Caps

The existence of the caps would be of little importance or effectiveness unless a system of enforcement was in place. In monitoring compliance, CHIPS currently is more advanced than Fedwire in limiting risk exposure. CHIPS monitors net debit positions on a real time basis. Any attempt to send a transfer through CHIPS that would violate either a net debit cap or a bilateral credit limit is rejected. Fedwire, by contrast, is monitored on a real time basis for some institutions and on an ex post basis for the majority of institutions.[8] Transfers that would result in exceeding the overdraft limit are not rejected for those institutions monitored on an ex post basis. It is only after the fact that the Fed counsels a participant on its excessive use of daylight overdrafts. The limitations of ex post monitoring are particularly troublesome given the premise that the greatest risk to the payment system would result from an unexpected failure of a participant. Ex post monitoring would provide no useful information on the day that an institution is building a large daylight overdraft and it unexpectedly failed.

Daylight overdrafts resulting from the transfer of securities on the Fedwire book-entry securities are not subject

to caps but have been restricted in other ways. The greatest risk that occurs is the transfer of book-entry securities to build a position. To fill a particular order, a dealer needs to deliver a large block of securities. The dealer acquires the securities throughout the day, and each transaction increases the dealer's daylight overdraft. At the end of the day, the dealer delivers the large block of securities and receives payment that covers its overdraft position. Prior to January 1988, it was not permitted to deliver a partial order, so dealers were required to build the entire position before the transfer to the final recipient and the covering of the overdraft could take place. To minimize the daylight overdraft, the Federal Reserve has restricted the maximum size of a transfer to $50 million, which effectively mandated partial delivery of the larger orders. As a result, the dealer can make several partial deliveries during the day and receive partial payments that reduces their daylight overdraft.[9]

6. How Effective Have These Risk Reduction Policies Been?

Before the effectiveness can be judged empirically, the date of the implementation of the caps on overdrafts and net debits needs to be determined. The effective date of the risk reduction policy implementation is not a clear issue. By March 1986, the Fed required all private networks utilizing the Fed's net settlement service to implement bilateral credit limits and network net debit caps (Belton 1987). In addition, the Fed implemented the cross system cap at this time.

In actuality, the private sector implemented the Federal Reserve's mandated risk reduction program prior to the time

mandated by the Federal Reserve. CHIPS established bilateral credit caps in October 1984. One year later, and five months before the Board required it, CHIPS implemented a network net debit cap.

A simple measure of effectiveness is the reduction in overdrafts that occurred following the implementation of the caps. The following table reports the average level of overdrafts on each transfer system before and after the date of implementation. The October 1985 date should only affect the CHIPS system.[10] There was a substantial reduction of $7.3 billion in overdrafts, a 15.4-percent decline, on the CHIPS network following the imposition of net debit caps. After March 1986, following the imposition of caps on the Fedwire system and cross system caps, daylight overdrafts did not decline on Fedwire. It appears that the use of caps has not had a substantial effect on reducing overdrafts on the Fedwire system, but it may have an effect on the CHIPS system. The implementation dates are sufficiently close to make it difficult to attribute the decline in CHIPS overdrafts to either the CHIPS implementation of net debit caps or the Fed implementation of overdraft caps and cross system caps. If the comparison is made between the level of overdrafts currently and prior to the Fed's implementation of caps, overdrafts have not been reduced on Fedwire. As shown in Table 1, overdrafts are $9.4 billion higher now than before the use of caps. A similar comparison for CHIPS shows that the overdrafts are less now than they were before March 1986, but they are growing.

Table 1.
Average Overdrafts
billions of dollars

	CHIPS	Fedwire (funds only)
Implementation Date		
October 1985		
3 quarters before	47.3	46.8
3 quarters after	40.0	49.5
Change	-7.3	2.7
March 1986		
3 quarters before	47.7	48.5
3 quarters after	39.5	49.1
Change	-8.2	.6
Last 3 quarters	44.7	57.9
Change from average for three quarters before march 1986	-3.0	9.4

Source: Board of Governors of the Federal Reserve System

The imposition of caps has had relatively little effect on the level of overdrafts because the current caps are too high to be a constraint on most participants. The aggregate cap usage rate is reported in Table 2. This rate is defined as the total of overdrafts on CHIPS and Fedwire (funds only) as a percent of the total permissible overdraft, i.e. the cross system cap, as of the two weeks ending September 21, 1988. Small domestic banks used relatively little of their caps, only 19.6 percent, and large domestic banks with over $10 billion in assets utilized only 40.5 percent of their caps. If the cap is not a binding constraint, the marginal cost of incurring additional overdrafts is near zero. It is no wonder that overdrafts did not decline on Fedwire. Moreover, these cap usage rates are based on current caps that are lower than those imposed in March 1986. Caps were reduced on January 14, 1988 and May 19, 1988.

Table 2.
Distribution of Aggregate Funds Overdrafts and Cap Usage Rates 1/

Type of institution	Number of institutions	Percent of total funds overdrafts	Aggregate cap usage rate2/ (percent)
Domestic, by asset size (billions of dollars)			
less than 1	2,066	6.5	19.6
1-5	189	6.2	17.3
5-10	49	7.0	22.5
more than 10	41	43.6	40.5
Foreign3/	94	36.7	10.4
All	2,439	100.0	17.8

1/ For the two weeks ending September 21, 1988, total funds overdraft capacity was $481.5 billion and actual funds overdrafts were $85.7 billion. The table excludes institutions with negative adjusted primary capital or zero or no caps on file. Such institutions accounted for about 0.1 percent of cross-system overdrafts.

2/ The cap usage rate is the ratio of total cross-system funds overdrafts as percent of total cross-system caps. The rates reported here are aggregated for all banks in each category.

3/ U.S. agencies and branches of foreign banks. The cross-system overdraft capacity of these institutions is based on worldwide capital. However, their uncollateralized Fedwire capacity is based on the smaller measure of 5 percent of their U.S. third party liabilities.

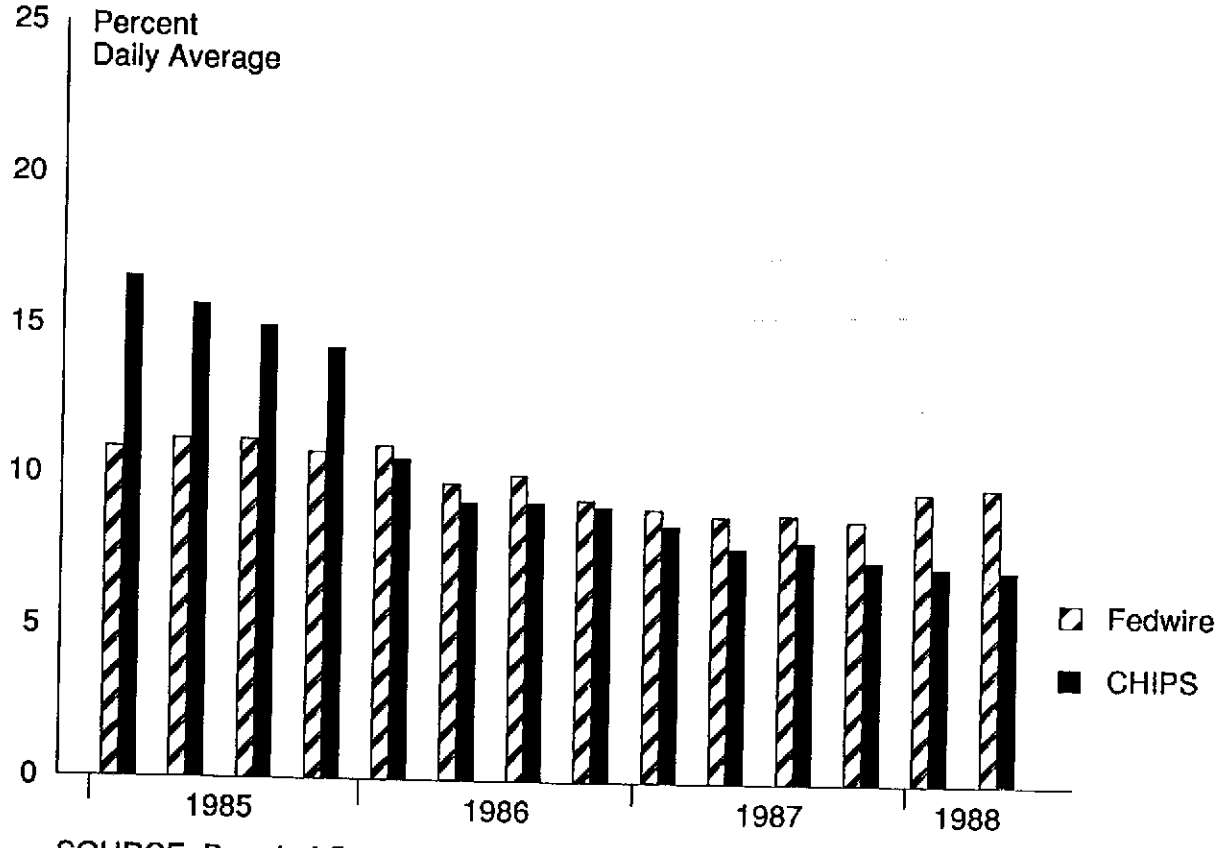
CHIPS caps may have been more effective in reducing daylight overdrafts than Fedwire caps. Similar data for CHIPS are not published, but CHIPS caps are much smaller than cross system caps. Consequently, CHIPS caps may have been binding for many participants and may have had an effect on reducing overdrafts on CHIPS. It is possible that the binding constraint of CHIPS caps may have encouraged growth of payments over the Fedwire where caps were not binding.

The gross level of overdrafts may be rising but it does appear that the growth rate of overdrafts slowed relative to the growth rate of payments. The level of overdrafts per dollar volume of payments has declined for both Fedwire and CHIPS. In 1985, overdrafts on Fedwire were 11 percent of the total payments. In the last four quarters of data, from the third quarter of 1987 through the second quarter of 1988, overdrafts were 9.2 percent of payments. The improvement on CHIPS has been even greater. The overdrafts as a percent of payments has declined from 15.4 percent to 7.4 percent over the same time period. (See Chart 4.)

It is possible that the risk reduction policies have had an important effect in slowing the growth rate of risk exposure. While the original goal to reduce overall risk might not have been achieved, the level of exposure is likely less than it would have been without the caps. One reason for the reduction in overdrafts relative to payments is that the imposition of caps, even if nonbinding, may have focused attention on the problem. The ratio of overdrafts to payments, however, is not a measure of risk exposure.

A better measure of risk exposure would be to compare the level of overdrafts relative to the ability of other participants to absorb losses in the event of a settlement failure. Analyzing such a measure would indicate whether the imposition of caps has reduced risk. For the Fed, such a measure would be size of the daylight overdraft relative to the Fed's ability to absorb the loss either out of its revenues or capital account. The risk exposure of a CHIPS participant would be the sum of transfers

Chart 4
Overdrafts as Share of Payments



SOURCE: Board of Governors of the Federal Reserve System

received during the day, to which it has granted its customers immediate access, relative to its capital. Unfortunately neither of these measures are reported.

An alternative method to test whether the imposition of caps has reduced risk would be to replicate the simulations of settlement failure conducted by Humphrey (1986) using data after the implementation of caps. His simulation takes into account the capital position of the remaining participants. No more straightforward measure of systemic risk could be devised.

7. Moral Hazard and Payment System Risk: Who really bears the Risk?

The current payment system continues to operate with a substantial amount of risk. Overdraft levels are high and rising. Current caps are not effectively controlling the level of risk. All of this raises the issue of who is bearing this risk? In the event of a settlement failure, where would the losses be borne? The answer to this question depends on which transfer system has the failure and how the Federal Reserve responds to the failure.

Consider first a settlement failure occurring on Fedwire. One possibility would be for the Fed to absorb the loss directly. Possible policy responses are presented in Table 3. The Fed initially loses an amount of money equal to the institution's overdraft position. The institution is then declared insolvent and the FDIC or another federal deposit insurance agency must deal with the failure. The Fed would be treated as any other unsecured creditor. Given the loss, the Fed's income would be reduced. The Fed returns the vast majority of its net income to

the U.S. Treasury through interest payments on Federal Reserve notes. Consequently, any reduction to Fed income will likely reduce the payment to the Treasury and reduce government receipts.[11] This implies that the tax-paying public would have to make up the short fall in Treasury receipts, either through new taxes or by repaying additional bonds floated by the government. The final result is that the public would indirectly bear the cost.[12]

A different scenario for a settlement failure on Fedwire begins with the Federal Reserve extending a discount window loan to an institution that is unable to make settlement. Since discount window credit is extended on a secured basis, the Fed has changed its status from an unsecured to a secured creditor of the troubled institution. With these funds, settlement could take place. Following settlement, the Fed could call its note and the institution could be declared insolvent. The FDIC or other federal deposit insurer would then have to deal with the failed institution. Typically in these cases, the FDIC wants to find a buyer for the failed institution. The FDIC pays off the Federal Reserve's note in order to gain control of the collateral so that it has clear ownership of the assets to be sold to the buyer. In this scenario, the Fed would not sustain a loss. Even if the FDIC would not pay off the Fed's note, the Fed would control assets that could be sold to repay the note.

Table 3.

Distribution of Losses Resulting from a Payment System Failure on Fedwire or CHIPS

	Fedwire	
Does the Federal Reserve make a discount window loan to the failing bank?	no	yes
Initial loss borne by:	Federal Reserve	FDIC
Cost of the loss is passed to:	Public	Banks
If the loss is larger than the FDIC can absorb, it is passed to:		Public

	CHIPS	
Federal Reserve make a discount window loan to the failing bank	no	yes
Initial loss borne by:	CHIPS partic-ipants	FDIC
If the loss is larger than the FDIC or the CHIPS can absorb, then it results in:	FDIC and poten-tially the public	Public bears the costs

The loss in this second scenario is borne primarily by the FDIC. This could be viewed in two ways. One view is that the loss will be small enough for the insurer to absorb the loss out of the insurance fund and the fund will be replenished by insurance premiums paid by banks. If the loss were too large to be absorbed by the insurer alone, the insurer might require

additional Congressional funds. If this were the case, then the loss would be borne by the tax-paying public.[13]

If a settlement failure were to occur on CHIPS, the Fed's exposure to a loss is largely dependent on whether it acts as a lender of last resort to the failing CHIPS participant or to CHIPS participants facing some difficulty in settling or whether the CHIPS settlement failure would cause settlement failure on Fedwire. If the Fed extends a discount window loan to the institution failing to make settlement, then, as described above, the loss would likely fall upon the FDIC initially and possibly the tax-paying public. Lending to the failing institution would avoid a settlement failure and the systemic risk inherent in such a failure.

If the Fed does not provide a discount window loan to the failing institution, CHIPS will incur a settlement failure. Previous simulations suggest that a substantial number of additional institutions will also be unable to settle. A large number of banks might close, and the losses would be borne by bank stockholders, unsecured creditors, other CHIPS participants, FDIC and, in all likelihood, the tax-paying public. Furthermore, all of the institutions that were unable to settle on CHIPS would be unable to settle their Fedwire accounts. It is likely that the Fed would be exposed to losses equal to the sum of the overdraft positions of the failed institutions. These Fed losses would in all likelihood be indirectly absorbed by the tax-paying public.

After reviewing all these scenarios about possible settlement failures, it becomes clear that the tax-paying public

is bearing a great deal of the payment system risk indirectly. It is possible for the loss to be borne by the Fed or for the Fed to shift the cost to the FDIC, other federal depositor insurer, or other participants of the payment system. If the Fed bears the initial loss, it will result in lower government receipts at the U.S. Treasury. If the FDIC or other insurer bears the loss, it is very possible that Congressional funding will be needed to replenish the deposit insurance funds. In either case, directly or indirectly, the tax-paying public may be incurring the loss.

The major problem with the risk being borne by the public is that the public has the least control over the level of payment system risk. Generally, a free market assigns risks to those best able to control risk, or if that is not possible, the risk is usually assigned to either those best able to diversify the risk or absorb the loss. In the case of the tax-paying public, only the last case may be true. A moral hazard exists because the participants have relatively little incentive to control their risk exposures, especially on Fedwire. The public is dependent on the Federal Reserve to act as its agent to control the level of risk.

The participants do not do enough to control their risk. There are two explanations for the excessive risk taking. The first explanation is that there are externalities in the extension of intraday credit. When a participant increases the amount on intraday credit it extends to another participant, it shares the increased risk of failure of that institution with all other participants that have extended intraday credit to the same borrower. Furthermore, by extending this credit, the

participant has increased the risk to its own creditors. These increases in risk represent costs that are not priced in the extension of intraday credit.[14] These externalities, however, apply to all extensions of credit whether they are intraday, overnight or term loans. In most interday extensions of credit, the lender restricts how much additional credit the borrower can obtain. These restrictions are typically referred to as loan covenants, and the violation of a loan covenant permits the lender to either renegotiate or withdraw the loan. In the case of increased risk borne by the creditors of a payment system participant that extends additional credit, the creditors could act to control the risk taking of the participant. A simple approach would be for a bank to set a bilateral net credit limit for other participants and to establish covenants whose violation would change the bilateral limit. The covenants might be a limit on the total net debit position of the intraday borrower. Essentially, rules that exist on CHIPS may reflect an attempt to deal with the above externality.

The second explanation for why participants in the wire transfer system do not control their risk exposure is their expectation that the Fed will prevent any settlement failure and, consequently, any systemic failures. Since they expect the Fed to absorb the risk, they do not factor it into their willingness to extend intraday credit. In the current world of regulated banking, these creditors often abdicate their role of monitoring risk and rely on regulatory agencies or deposit insurers to control the risk-taking behavior of payment system participants. The regulatory agencies or the insurer typically limit the risk

through regulation and examination to insure that regulations are followed. This is analogous to uninsured depositors of large banks expecting the federal deposit insurer to handle any failure with a purchase and assumption transaction that will leave them whole. Consequently, these depositors are not motivated to control their risk.

In the case of either externalities or expectations of a government bailout, participants do too little to control their risk because the marginal cost to society of an additional dollar of intraday credit is much higher than the expected marginal cost faced by the participant extending the credit. It appears that many participants treat the marginal cost as near zero if their overdraft cap is not binding. Even the cost of exceeding a cap may be too low if the marginal cost is being "counseled" by the Fed. As discussed earlier, the current caps are typically not binding for most participants. The caps set an upper limit for risk exposure but do little to reduce risk below this upper limit.

8. Reforming the Payment System

The key to reducing payment system risk is to restructure the current payment system in a way that shifts the costs of the risks to those participants that are best able to reduce the level of risk. The Fed is currently exploring policies that will raise the marginal cost of the risk to the participant to a level closer to the marginal social cost of the actual risk. The Fed has explored the possibility of imposing a cost on the extension of intraday credit and has discussed the theoretically optimal level of such credit. Pricing daylight overdrafts could have

substantial effects on reducing risk because there are numerous institutional changes that are relatively easy to adopt that would lower risks. Among these are extending maturities on federal funds borrowing to several days, utilizing continuing contracts or rollover contracts on federal funds, and netting by novation.[15] The Fed has estimated that if these institutional changes were adopted, daylight overdrafts could be nearly eliminated.

Pricing daylight overdrafts is intuitively appealing, especially for economists who believe that once an appropriate price is set, agents will behave in an optimizing manner. I suggest that the Fed's price for daylight overdrafts will be unlikely to achieve an optimal solution in the case of payment system risk. There is an implicit assumption that the Fed will be able to set a price that appropriately equates the marginal social cost with the perceived private marginal cost. Any deviation between these two costs will result in either too high or too low a level of daylight overdrafts.

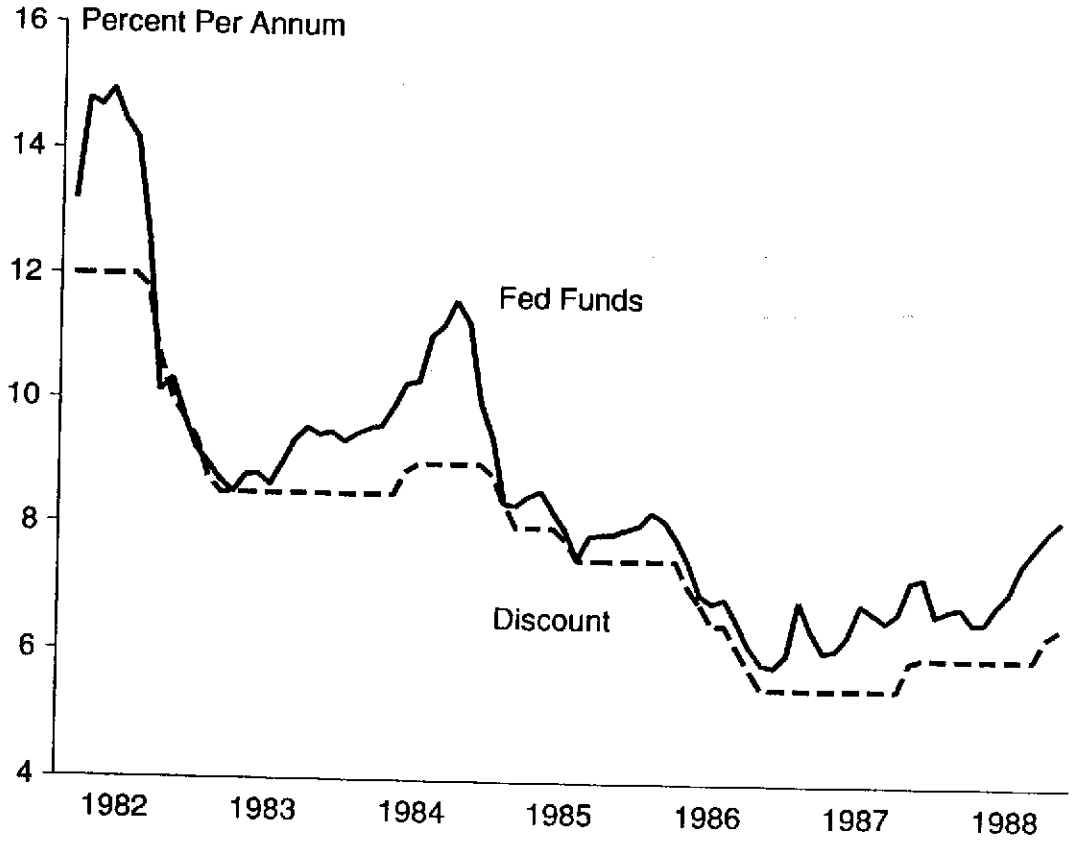
Several suggestions for pricing daylight overdrafts have been made. One was to price daylight overdrafts at the same price as intraday credit extended by banks to security dealers. This is appealing because it is a market set price for intraday credit. An alternative suggestion was to price daylight overdrafts at the same rate as federal funds adjusted for the duration of the overdraft position. While this would be more technically difficult, it would act to discourage both the size and the duration of overdrafts. One key advantage of both these pricing schemes is that both attempt to tie the price for

daylight overdrafts to a price determined in the marketplace. Both of these pricing schemes, however, have their flaws.[16]

Setting the correct price for daylight overdrafts would be nearly impossible for the Federal Reserve. The above suggestions are reasonable first attempts to set an average price that might be relatively close to correct, but these suggested pricing schemes offer nothing to determine the risk premium that ought to be assigned to each individual institution. Furthermore, it is possible that the price charged for intraday credit to security dealers and, to a lessor extent, the interest rate on federal funds, are affected by the current structure of the payment system. Determining the appropriate price for daylight overdrafts is an extremely complex problem for a government entity. Numerous examples can be cited of errors in pricing that occur in centrally planned economies. These errors regularly create either gluts or shortages for goods that are far less complex in nature and theoretically easier to price than daylight overdrafts.

Even if an appropriate price might be determined, the Fed has a history of not charging a market clearing price on the extension of credit, not responding to changes in the price of credit determined in the marketplace, and preferring to ration credit by means other than price. Discount window lending is the interday equivalent of intraday credit extensions. The federal funds market offers an excellent reference by which discount window credits could be priced. As shown in Chart 5, the divergence of these two rates is at times substantial and hardly constant. Because the discount rate is typically below the

Chart 5
Short-Term Interest Rates



federal funds rate, extensions of credit through the discount window are rationed by non-price means and the quoted rate is not a market-clearing rate. Is there any reason to believe that the Fed would do a better job of pricing intraday credit than it currently does for pricing interday credit?

As an alternative solution, it is not clear that the Fed needs to provide extensions of intraday credit. As easily as the Fed permits overdrafts, the Fed could eliminate overdrafts by mandate. While it might be technically difficult, it would be possible for the Fed to establish a system of real time monitoring, and the Fed could refuse any transaction that would create an overdraft. The CHIPS system already has this capability. This approach would create a market for intraday federal funds. As a result of such an approach, the public would no longer bear the risk of loss resulting from a settlement failure because there would always be sufficient funds for settlement since overdrafts would not be permitted. Since there would likely be extensions of credit through the intraday federal funds market, participants in the payment system would have as much incentive to monitor their risk as they currently do in the federal funds market.[17]

One concern about such a mandate would be the effect on monetary policy of the tremendous increase in demand for reserves. While an increase in reserves might be needed, the mandate for zero overdrafts could be phased in by lowering the caps slowly over time until they are zero. Furthermore, such a managed shock to the demand for reserves is likely to be far more predictable than the shock to the financial system in the event

of a settlement failure, especially if it were to result in systemic failures.

9. Summary and Conclusions

Risk within the payment system is perceived to be a serious problem; however, there is a lack of hard empirical evidence to measure the actual risk exposure. There has never been a settlement failure. While large banks have failed, none of these failures have been so completely unexpected as to have occurred in a single day preventing regulators from controlling their risk-taking in the payment system. Currently, overdrafts are measured either absolutely or relative to the volume of payments. In actuality, it would be better to measure the overdrafts relative to the capital available to absorb the risk. Finally, the likelihood of systemic failure following a settlement failure has not been measured since the imposition of bilateral credit caps, net debit caps, and cross system caps.

The imposition of caps appears to have had some effect but is not solving the problem. Currently, caps are too high to have a binding effect on the majority of participants in the payment systems. Since caps were imposed, overdrafts have grown at a slower rate than have total transactions, suggesting that caps are having some effect. Total overdrafts have continued to rise, however.

Assuming that there is a large risk in the payment system, the current structure places a great deal of the risk on the general public which has the least ability to control the level of risk. In the event of a settlement or systemic failure, the loss will be at least partially borne by either the Federal

Reserve or the Federal Deposit Insurance Corporation. In either case, a large loss will affect either the Treasury's receipts in the case of the Federal Reserve or require an expenditure of funds in the case of the FDIC. Consequently, tax payers are bearing at least part of the risk. The exposure of the public shows that there is a negative externality in the extension of intraday credit.

The most direct way to compensate for the externality is to price it. Currently intraday extensions of credit are not priced. The Federal Reserve has considered pricing daylight overdrafts in order to encourage the reduction of these overdrafts. History has shown that the Federal Reserve is not likely to price the overdrafts at a rate that eliminates the public's exposure. As an example, discount window loans are usually priced below market rates. The Federal Reserve could pursue an alternative approach. First, the Fed could lower the current caps slowly over time to zero, effectively no longer permitting daylight overdrafts. This approach would require a substantial injection of reserves and would encourage the development of an intraday federal funds market.[18] It would require the Fed to improve its current computer system to provide real time accounting for all participants. It would shift the risk back to the banking institutions. These institutions would then have the proper incentives to control their risks.[19] Finally it would encourage the development of a private market for intraday credit rather than a government entity pricing such credit.

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1. Optimal in this case refers to the quantity of intraday credit where the marginal social benefit of the last dollar of intraday credit exactly equals the marginal social cost. See Board of Governors of the Federal Reserve System, Controlling Risk in the Payment System, Report of the Task Force on Controlling Payment System Risk to the Payment System Policy Committee of the Federal Reserve System (August 1988) p. 26-7.

2. Settlement risk is also referred to as credit risk by some authors.

3. It is possible that the loss would be less if liquidation of the failed institution provides funds for a partial payment, or the FDIC, as guarantor of the failed institution's liabilities, reimburses the Fed.

4. This implicitly assumes that the failure occurs on the Fedwire system. If the failure occurred on the CHIPS system, there is the real possibility of multiple failures resulting from the "unwind."

5.Failure to settle due to technical reasons is not discussed though it has nearly occurred. Usually these problems results from computer failures, and in the past it has been dealt with by extending credit through the discount window to permit the institution to settle.

6. The Federal Reserve System does not specify how this net debit cap should be set. CHIPS sets its net debit cap as five to six percent of the sum of all bialteral net credit caps granted to a participant by other participants. See New York Clearing House Association, Constitution of the New york Clearing House Association, Article VI, Section 3(H) and "Rules Governing the Clearing House Interbank Payments System," amended January 27, 1988.

7. If an institution is in a net credit position on the private transfer network, this would not increase its net debit cap on the Fedwire system to greater than the cross system cap.

8. Initially, the institutions that are monitored on a real time basis on the Fedwire are finanically troubled institutions or the U.S. branches and agencies of foreign banks. The former are included because they are judged to be of a higher risk of failure and the later are included because the Federal Reserve may face a more difficult time in monitoring the behavior of the parent company. The Federal Reserve is expanding its ability to monitor institutions on a real time basis, and it is now monitoring the larger users of Fedwire services regardless of their financial condition.

9. The concern about overdrafts resulting from book-entry security transfers may be misplaced since it has been argued that the securities themselves create a collateral backing the transaction. The resolution of this issue in the literature is not clear.

10. If there was any effect on the Fedwire system, it would have likely been to increase the level of overdrafts. Once CHIPS implemented a cap, institutions that reached a cap could avoid the CHIPS limitation by sending transfers on the Fedwire system. There is some limit to this because Fedwire imposed similar caps only 5 months after CHIPS.

11. In 1987 the Federal Reserve made a payment to the Treasury of $17.7 billion. Board of governors of the Federal Reserve System, 74th Annual Report, 1987 (1988) p. 201.

12. An alternative approach would be for the Federal Reserve to treat the loss as a cost of providing wire transfer services. In this case the Fed would need to recoup the loss through higher prices on future wire transfers. The Fed, however, has never attempted to price its wire transfer services in a manner to recover any of the cost of the risk exsposure. Furthermore, to recoup a $1 billion loss in the year that it occurred would require raising the basic price of a Fedwire transfer from $.50 to $18.68. Pricing after the fact would be ineffective since the Fed would simply lose business to competing wire transfer systems.

13. Any belief that this would not occur, has been eliminated by the Bush administration's plan to rescue the Federal Savings and Loan Insurance Corporation.

14. For a complete discussion of this idea see Board of Governors of the Federal Reserve System, Controlling Risk in the Payment System, Report of the Task Force on Controlling Payment System Risk to the Payment System Policy Committee of the Federal Reserve System (August 1988) p. 27.

15. Netting by novation is a technique where gross bilateral transfers between two institutions are replaced by a new contractual obligation for transferring only the net amount.

16. It has been suggested that even a price that does not exactly equate marginal social costs with marginal private costs would still be helpful in reducing payment system risk. I would not argue against this suggestion as a second best solution. Any price for daylight overdrafts would reflect at least some of the cost of the risk exposure and would likely reduce the payment system risk.

17. It might be argued that the existence of the safety nets of deposit insurance and discount window loans reduces the incentive to monitor risk. While this is likely the case, it is an problem outside the scope of this paper.

18. Any arguments that the injection of reserves would make the control of monetary policy more difficult would be countered by the argument that the shock of a systemic failure in the payment system is likely to produce a much larger and much less manageable shock.

19. One possible hindrance to this solution is the moral hazard created by the existence of the federal safety nets of deposit insurance and discount window loans. Insuring deposits may eliminate or reduce risk premiums on deposits and encourage depository institutions to take on excessive risk. This issue and suggested reforms have been discussed extensively in the literature.

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