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PRICING DAYLIGHT OVERDRAFTS

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Introduction

The 12 Federal Reserve Banks extend about $115 billion of credit within a few hours on an average business day, only to take it back again before the close of business. Very large commercial banks extend an additional $45 billion of credit to other domestic and foreign banks each day, again, only to take it back again before the close of business.

This huge volume of daylight credit takes the form of temporary overdrafts of deposit accounts at Federal Reserve Banks and accumulated unsettled net payment positions between banks who participate in Clearing House Interbank Payment System (CHIPS).' In both cases, telecommunication of payments to other banks produces the daylight credit. Subsequent telecommunication of payments to overdrawn banks extinguishes the temporary credit. Daylight credit is not allocated by any market process. It is simply a by-product of the order in which a bank's payments and receipts occur.

Daylight credit created on Fedwire and CHIPS is free. Banks do pay a small fee to send telecommunicated payment messages, on both Fedwire and CHIPS, but there is no explicit or, as far as one can tell, implicit charge for the amount of daylight credit extended on either network. In fact, until regulatory limits were imposed in 1986, daylight credit had been in apparently unlimited supply from Federal Reserve Banks, although not necessarily between CHIPS participants.

Of course, a bank would have to pay for <u>overnight</u> financing if that were needed to cover an overdraft at the Fed or a net debit position on CHIPS at close of business. Neither network is intended to provide automatic overnight financing. It is the nature of the American banking system that overnight and

longer-maturity credit is scarce (with the degree of scarcity controlled in the aggregate by monetary policy) and must be paid for, but daylight credit is in virtually unlimited supply and is free.[2]

Using daylight credit is not a basic necessity for making payments. A bank could avoid any need for daylight credit at all, if it were willing to allocate a large enough portion of its assets to reserve deposit balances. Of course, that would be expensive, because reserve deposits are non-interest-bearing assets. Alternatively, modifying current transactions practices could reduce dependence on daylight credit. Banks or their customers could eliminate some payments (for example, by lengthening the maturity of liabilities), or adopt deliberate payment sequencing programs, or borrow other banks' idle balances for short periods during the day. However, the incentive to do any of these things has been lacking because daylight credit has been free.

Daylight credit may be free, but it is not without cost. Growing recognition of its costs has prompted proposals that both Fedwire and CHIPS reduce daylight credit by pricing.[3] Pricing daylight credit would then induce banks to economize on it. One proposal would encourage this simply by imposing a slight per-dollar fee on daylight overdrafts. Another would treat each daylight overdraft of a reserve account as an automatic overnight discount-window loan, booked at a penalty rate. A third would require banks to hold additional balances at a Federal Reserve Bank in proportion to their daylight overdrafts.

Evaluating these proposals requires an understanding of the costs of daylight credit, as well as of policy objectives being sought. An obvious cost of daylight credit is creditors' risk exposure, which is why this topic has become known as the payment system risk (PSR) problem. Risk-taking is a

normal feature of financial markets. To the extent that informed lenders assume risk in extending daylight credit, the cost of their exposure to daylight credit risk would not necessarily create a policy problem. However, current institutional arrangements for making large-dollar-value payments in the U.S. fully insure payor banks' access to daylight credit in making payments on the Federal Reserve electronic network.

Three problems are associated with daylight credit. First, institutional insurance creates a moral hazard problem. Second, extensions of daylight credit on the private CHIPS network create a systemic risk problem, and third, the attempt of private networks to compete with Fedwire suggests a competitive inequality problem. These three problems associated with daylight credit, plus concern about the application of old law to new technology, create the PSR policy problem, which is examined in Part I. Questions about possible policy objectives are raised in Part II, and Part III evaluates three recent reform proposals that would introduce pricing to resolve PSR problems. The conclusion reached in Part IV is that none of these pricing proposals would, in itself, resolve the problems. More basic decisions about technology and regulation must come first.

I. Daylight Credit and Payment System Risk

In a monetary economy, a payee must be concerned with the validity of the device used by the payor to transfer value. Finality characteristics of a payment specify circumstances under which the payee has irrevocable ownership of the amount transferred so that the payor's obligation is discharged. Settlement characteristics of a payment determine the risk that irrevocable ownership is not accompanied by access to good funds.

A. Finality and Risk. Cash--legal tender fiat money in the U.S.--is a riskless form of payment because receipt of cash gives the payee both ownership and funds. For checks, on the other hand, the payee has only provisional ownership until the payment is settled. The check must clear back to the paying bank, which then has an opportunity to reject it for reasons such as insufficient funds or a stop payment order. Settlement occurs when the payor's bank fails to take timely action to return the check, thereby accepting a debit to its account at the Federal Reserve or a correspondent bank. Until this settlement has been accomplished, however, the payment is not final. The payee's bank is extending credit to the payee if it allows proceeds of the check to be used, and is exposed to risk.

Fedwire payments provide receiver finality and immediate settlement, as specified by Federal Reserve Regulation J. Receipt of the payment message is the signal both that the payment is final and that good funds are available in the payee bank's reserve deposit account. This means that the Federal Reserve is extending credit to any payor bank having insufficient balances to cover its Fedwire payments. Hence, daylight overdrafts on Fedwire expose Federal Reserve Banks to credit risk.

CHIPS is a different matter, for which there is no "coherent framework" of law or regulation for finality.[4] Payment instructions are recorded among the 137 participating institutions during the day. At any moment during the day, banks that have made more payments than they have received are in a net debit position, representing credit granted by other participating banks. Positions are settled only at the close of the day through a settlement account at the Federal Reserve. Banks in a net debit position pay the net amounts due from them into the settlement account, enabling payments of net amounts due to banks in net credit positions. Settlement is complete only if

each of the net debit position banks actually makes the payment required to repay the credit it has received. CHIPS rules require that if a bank cannot make this settlement payment, and one or more lenders are unwilling to fund the net debit, then all of the day's transactions involving that bank are to be backed out, and a new set of net debit and credit positions calculated for the remaining participants. As currently constructed, therefore, payments made on CHIPS are based on interbank extensions of daylight credit. Whatever the legal outcome for finality, a net debit position bank's failure to settle means that other banks are deprived of good funds.

With no coherent framework for finality, it is not entirely clear who is exposed to credit risk (payor, payor bank, payee bank, payee) in the event of settlement failures. However, aside from this uncertainty, an important policy concern arises from the cost of settlement failure itself. Although a single bank may have extended credit directly to the bank that fails to cover its net debit at settlement, all banks are subject to uncertainty about the amount of good funds they will receive or need to pay at settlement as long as any bank can be backed out of the settlement.

A presumption has arisen that the federal safety net removes this uncertainty. CHIPS handles an enormous daily volume of payments, participants accumulate substantial net debit positions relative to their capital during the day, and the CHIPS network plays an integral role in the global money and foreign-exchange markets. The view is that, were a settlement failure to happen, regulators would be forced to do whatever was necessary to allow settlement to proceed by arranging a quick rescue package for the failed institution, or perhaps by providing financing to creditor banks in the amount of their unsettled bilateral credit positions with respect to the failed institution. The federal safety net, not CHIPS participants, is at risk.

There is an alternative structure for private payment networks, which CHIPS is soon expected to adopt. Settlement would be guaranteed by a risk-sharing agreement among participants, providing for settlement finality. In the event of a settlement failure, participants would provide funds to cover the credit represented by the failed banks' position, in accordance with an ex ante sharing agreement. The obvious difference between this and Fedwire is the creditworthiness of the entities underwriting payee banks' guarantee of good funds at settlement.

Evaluating the significance of PSR is difficult. Incidents of payor failures during a business day have been almost unknown. Bank failures typically are arranged to take place overnight, with the active involvement of regulatory authorities. A large constituency of foreign-based institutions in CHIPS may make unexpected failure during the day more likely, if foreign regulators were to act after the close of business in their time zone, but before close of business in the U.S. For Fedwire, a loss from the intraday failure of a bank to cover its daylight overdrafts would depend on terms worked out in a regulatory disposition of the failed bank.

Actual exposure to loss--the enormous amount of daylight credit extended evaluated at an historically minuscule probability of loss--seems quite small relative to Treasury receipts and expenditures. It is taxpayers who are at risk. Any charge to Federal Reserve income, all else equal, would result in an equivalent decrease in Treasury revenue and, in the short run, an increase in Treasury debt issued to the public. In addition, of course, this does represent a roundabout open-market operation to create the reserves received by payees of the failed bank. However, any monetary impact could be offset by ordinary System open-market security sales.

B. Payment System Risk and Cost. The PSR problem in large-dollar payment networks is not so much the potential dollar loss to taxpayers or even to private network participants, but three derivative problems: moral hazard, systemic risk, and competitive inequality. In addition, there is some concern about how uncollateralized daylight credit resulting from modern telecommunication of payments fits into the 75-year old framework of the Federal Reserve Act.

1. Moral Hazard. The Federal Reserve creates moral hazard by insuring access to daylight credit for payor banks. Payee banks have no incentive to concern themselves with the creditworthiness of banks from whom they receive Fedwire messages, if that is the only relationship between them. Nor do payor banks have any incentive to concern themselves with market perceptions of their own creditworthiness as a means of assuring the willingness of other banks to accept payments from them. Uninsured creditors, as well as supervisors and regulators, of course, are concerned with the credit quality of banks, but, until the preparation and introduction of the Board's PSR policy in 1986, little or no attention was given to PSR--at least in part because there had been no way to document the extent to which daylight overdrafts existed.

Just as 100-percent automobile liability insurance may deter accident prevention, so too, 100-percent payment risk insurance surely has deterred payment risk prevention. Manifestations of moral hazard in the payments case may seem more obscure than nonchalance at the wheel in the automobile case. Nonetheless, they exist, and regulation has only recently begun to focus on them.

Identifying manifestations of moral hazard may be easier if the benefits of 100-percent payment risk insurance are clearly in view. The overriding benefit to consumers and businesses in the U.S. is that there is no real

impediment to receiving or making large (or small) value same-day payments through any pair of the thousands of banks with access to Fedwire. Those impediments otherwise would be the cost or unavailability of immediate, reliable information about the solvency and liquidity of any bank in the nation from which chance might bring a payment. Fedwire, by design of the Federal Reserve System early in this century, has provided a mechanism for encouraging a truly national payment system out of a fractionated private banking system.

The obverse of this original benefit in the modern world of telecommunications can be seen in the reliance of many banks on overnight borrowing for a significant portion of their financing, with attendent possibilities of rapid run-off of that financing. Lenders can decide anew each day whether to risk another overnight loan. The overnight borrower bank can return funds each morning and tailor borrowing to the needs of the new day, with the interval spent in daylight debt to the central bank. Similarly, a plethora of new markets in sophisticated financial instruments has grown up on a foundation of riskless private payments in which the quality of the payor's bank is largely irrelevant to trading decisions.

The moral hazard is to the public that provides the insurance. Any unexpected question about the credit quality of a bank can create an immediate liquidity crisis that necessarily must have an immediate resolution. That resolution will be to roll over the bank's daylight overdraft into either an overnight overdraft at the central bank or a discount-window loan from the central bank. As an operational matter, an overnight overdraft is automatic if a bank does not come to the discount window to borrow. Only a small subset of banks, including those under close supervisory watch, have all their Fedwire payments monitored in real time against agreed minimum balances during

the day. In the more normal cases, the central bank is not in a position to refuse overnight overdrafts because account balances are only monitored ex post. In effect, the insurer knows about reckless driving only after the accident.

2. Systemic Risk. Absence of payment insurance on a private payments network like CHIPS avoids the moral hazard problem of Fedwire. Payee banks themselves must recognize the possibility that a payor bank might fail to cover its daylight debt on the network. Evaluating the probability of loss, controlling daylight exposure with respect to each payor bank, and maintaining a capital cushion appropriate to these exposures would be the expected behavior of payee banks in the face of such direct daylight credit risk. However, systemic risk would remain for the most part unmanzged because it is not readily evaluated and is probably underestimated by network participants.

The concept of systemic risk reflects the interdependence of a payments network and the consequent potential for chain reactions of settlement failures. The triggering event would be failure of a network participant to repay net daylight credit extended by other network participants. Under the current CHIPS rule, backing out all of that day's payments from and to the failed bank will create new and unexpected net credit and debit positions for remaining banks. It is at this point that the systemic risk phenomenon might begin. If one or more banks were unable to fund their new and unexpected net debit positions, then their day's transactions would have to be backed out and yet another new settlement calculated. The chain reaction might continue if additional banks were unable to fund these newer and unexpected positions, and so forth.'

Granted that such a chain reaction might occur, it need not be of any unique concern to policymakers if network participants were able to evaluate

and manage their systemic risk exposure. But, as currently constituted, payment system arrangements probably prevent that, because systemic risk is likely to be underweighted in bank decisions to extend daylight credit. This reflects two informational deficiencies.

The first is a lack of information that would allow banks to evaluate conditional probabilities of settlement failure. While a bank may evaluate the probability of failure by each participant from which it directly accepts payments, it currently seems doubtful that there is a firm basis for judging the probability of a second-round failure of each participant, conditioned on prior failure of another, and further conditioned on failures at succeeding stages of the chain. Aside from computational complexity, these probabilities would depend on the bilateral credit-position of each bank with respect to each of the others, and the multilateral net position of each. Each of these positions may show regularities, but they are unknown to all but the directly concerned participants.

Another aspect of this problem involves a negative externality. Extension of daylight credit by any participant affects other participants because each extra dollar of credit extended increases the riskiness of each prior creditor's exposure. Social cost (in terms of risk) of extra daylight credit may be larger than the perceived private cost, leading to overlending.

The second informational deficiency is simply a general lack of knowledge of how the chain reaction of systemic failures would play itself out. The process is not a known quantity because it has not happened, or has not been allowed to happen. Three uncertainties illustrate this, involving the likelihood of private interbank lending, supervisory treatment of liquidity insolvencies, and the role of the lender of last resort.

A chain reaction would continue only if potential end-of-day lenders of

overnight funds (including the network participants with new and unexpected net credit positions) were unwilling to lend the funds required for settlement by those in new and unexpected net debit positions. After all, if the only unsound institution were the bank that triggered the potential chain reaction, why wouldn't potential private lenders recognize that next-round banks were merely illiquid, not insolvent? Even if the next-round banks had substantial loans outstanding to the triggering insolvent bank, the chances of those loans being a total loss in eventual liquidation, and of depleting the capital of the next-round banks, would seem remote.

Nonetheless, unwillingness of private institutions to lend does seem rational, and therefore plausible, under the combination of two quite likely conditions. One is that new and unexpected net debit positions of some banks can be quite large relative to their capital. Interbank overnight lending is unsecured, so that a borrower's capital cushion relative to the size of the needed credit is a significant indicator of the lender's risk, whether that lender acts alone or in some hastily arranged consortium of lenders.

The other condition is the haste with which such lending must be arranged. A settlement failure would become known, and unexpected net debit and credit positions calculated, only at, or close to, the end of a day's normal market activity. Lending would have to be completed before the opening of the next business day if market disruption were to be avoided. Within this short time frame, reliable information upon which to base credit decisions would be scarce, requiring hasty judgments about institutions and their assets and liabilities in an interdependent network of banks.

A second uncertainty concerns the reaction of supervisory authorities if second, third, and further-round banks were unable to finance new and unexpected net debit positions as the chain reaction proceeded. These banks

would show a net debit in the amount that forced them out of the settlement process, but with an offsetting net credit position with respect to one or more banks that already had been backed out of that, and previous, rounds of the settlement process. Except for the trigger bank, each bank in backed-out status might be solvent in the usual sense, but insolvent in the sense that it was unable to honor requests for payment--a liquidity insolvency.

Would supervisory authorities declare such banks insolvent and force them to close, or would they allow them to continue operating? Given time to sort out obligations free of a threat of imminent failure, such banks might resume normal operations once they had demonstrated their sound credit condition to lenders under more leisurely conditions and with full informztion disclosure. But such a reaction by supervisory authorities to permit this resolution of a chain reaction is uncertain.

Third, the reaction of the lender of last resort is uncertain, hinging in part on the outcome of the solvency issue. Discount-window loans may not be made to insolvent institutions, Loans to solvent institutions at any round of the chain reaction would bring an immediate end to the reaction by providing the funds needed to achieve a successful settlement. Acceptable collateral might be difficult to assemble, but the presence of a willing last-resort lender to banks other than the trigger bank would eliminate systemic risk to network participants.

Systemic risk may exist, but network participants are not in a position to evaluate the risk fully in making daylight credit judgments. This risk is probably underestimated by banks, because private risk costs understate social cost in extensions of private daylight credit, and because it seems reasonable to expect supervisory and lender-of-last-resort actions to prevent the chain reaction of settlement failure. For these reasons, controlling systemic risk

might involve active policy oversight of private network arrangements.

3. Competitive Inequality. Free daylight credit insurance gives Fedwire a competitive advantage. Fedwire is a money transfer system, with settlement on the books of the Federal Reserve. Other domestic money transfer systems have attempted to compete with Fedwire (CashWire and CHESS), but competition was difficult before the Monetary Control Act (MCA) required Fedwire to price transfers explicitly, rather than implicitly as part of the cost of membership in the Federal Reserve System. Since the MCA, price and service quality features of making payments have provided a basis for competition, but settlement has been a problem.

The Federal Reserve provides a settlement facility for private networks," illustrated by the CHIPS settlement process described above, but this is a net settlement, meaning that settlement risk exists throughout the day, until the net settlement process is successfully completed. Current PSR policy requires that each participant in a private network set a limit on the amount of credit it will extend to each other participant, and that the network impose a limit on the credit a single participant may obtain from all other participants combined, and that the total credit drawn by a single bank on private systems plus its daylight overdraft at the Federal Reserve not exceed a preset maximum at any time during a day. Private system credit risk still exists, although subject to these limits, such that each participant has some incentive to concern itself with the credit quality of each other network participant.

The upshot of these institutional arrangements is simply this: Fedwire provides receiver finality because the Federal Reserve extends daylight credit to payors, and at no charge. Net settlement systems offer settlement finality. Without binding assurance that the lender of last resort will

underwrite settlement, participants are exposed to direct and (probably underestimated) systemic risk, as on CHIPS, or at least to indirect risk as a result of some ex ante risk-sharing agreement among network participants. Managing risk imposes costs on participants in the form of monitoring the creditworthiness of other participants, managing bilateral credit limits, and maintaining a capital cushion against potential losses. On Fedwire, these costs are absent.

That CHIPS flourishes despite the competitive inequality of a public subsidy to Fedwire is usually attributed to its market niche in serving foreign participants, which Fedwire has not entered. But competition of other networks with Fedwire for domestic funds transfer traffic under current institutional arrangements would seem feasible only if private competitors were so much more efficient in processing payment messages that this cost advantage would offset their risk disadvantage. It may be that this competitive disadvantage was a factor in the demise of CashWire and CHESS, two networks that once competed for domestic payments business.[6] This suggests that there is no basis for a market test of the willingness of private agents to accept risk in making domestic payments, nor of the operating efficiency of Fedwire.

4. Law and Technology. Arguments that daylight overdrafts should be prohibited can take another form. The Federal Reserve, as the nation's central bank, is a unique governmental institution. Since the demise of the gold exchange standard, the System has had unlimited ability to create credit by issuing high-powered money in the form of currency and bank reserve deposits. The Federal Open Market Committee is charged with making the decisions that determine the aggregate amount of this fiat money in

existence. The Federal Reserve Act constrains System credit creation to two riskless activities. One is the purchase of U.S. government securities in the open market (not directly from the Treasury). The other is direct discount-window loans to eligible institutions at the prevailing discount rate, fully secured by eligible collateral.

Daylight overdrafts of reserve deposit accounts can be viewed as a third means of extending central bank credit, which was not contemplated in an Act drafted before the development of sophisticated telecommunication networks. Daylight overdrafts not only are free, but also are uncollateralized. That this third means of extending credit is not mentioned specificaliy as requiring collateral in the Federal Reserve Act probably reflects an historical understanding that such overdrafts would not take place. For example, the first operating letter of the Federal Reserve Bank of Cleveland governing transfers of funds, when adopted in 1939, said, "Collected funds on deposit -- are available for telegraphic or mail transfer ..."; "Telegraphic transfers ... of bank balances ..." would be processed, where "The term 'bank balances' shall be construed to mean an accumulation of funds comprising an established account maintained by a member bank ..." (emphasis added). [7]

When Subpart B of Regulation J was first adopted, August 1, 1977, however, the fact of daylight overdrafts was clearly recognized by providing that, if a bank did not have a sufficient "...balance of actually and finally collected funds" to cover transfers during a day, the Reserve Bank claimed a security interest in any or all of the bank's assets in the possession of, or held for the account of, the Reserve Bank. Notwithstanding that claim, the Reserve Bank also could refuse to act on a transfer request "...at any time when such Federal Reserve Bank has reason to believe that the balance maintained or used by such transfer is not sufficient to cover such item." Purists may be

forgiven for questioning whether the treatment of daylight overdrafts, even as protected by these regulatory provisions, is fully consonant with provisions of the Federal Reserve Act.

II. Objectives Underlying Payment System Risk Policy

Entering into PSR policy debate requires a clear notion of policy objectives. To date, Federal Reserve PSR policy has been fashioned with the explicit objective of reducing PSR, quantified as daylight overdraft exposure plus net daylight credit drawn on CHIPS.

Historical background suggests that existing PSR policy was a reaction to mushrooming PSR exposure associated with the telecommunications revolution in the payment mechanism (see appendix). For example, in 1947, reserve deposit balances represented 700 percent of (seven times) the value of daily debits (Fedwire, checks, etc.) to member bank reserve accounts; by 1983, balances were a minuscule 4 percent of daily debits.' That is, in 1947, the average bank could make all necessary payments for seven successive business days without ever receiving a single offsetting payment before exhausting its initial reserve deposit balance. By 1983, the average bank could meet demands for payment for only 20 minutes of a single eight-hour business day before it would have had to receive some offsetting payments, or go into overdraft. Over the course of 35 years, the Federal Reserve apparently moved from a cash-in-advance system, in which Fedwire payments involved no risk, to a largely automatic daylight credit system, in which the Federal Reserve is exposed to upwards of $50 billion of daily credit risk on Fedwire alone, plus another $60 billion on the book-entry system, while CHIPS participants extend about $45 billion.

It is understandable that policy discussion has emphasized daylight credit

reduction: having seen a horse escape from the corral into the fields, the first reaction is to close any holes in the fence around the fields so the horse can't go any further, and then begin the process of moving the horse back toward the corral. Without pushing this analogy too far, much of current PSR debate is about which combination of sugar cubes and whips should be used to get the daylight overdraft "horse" back closer to the old low-risk "corral," on the assumption that moving the horse in that direction--reducing Federal Reserve daylight overdrafts--is the appropriate objective.

Before investigating various policy proposals to reduce risk, it seems only prudent to recognize that reducing daylight overdrafts might not be the only, or best, objective for public policy today. Some other choices include doing nothing, achieving competitive equality, or restructuring institutional arrangements to allow private agents more choice between risky and safe payment devices.

Doing nothing, in the sense of delaying further policy action, may seem counterproductive even as a short-run policy objective. However, current policy has placed some limits around substantial further increases in PSR exposure. Delay might yield better decisions with a broader consensus for more effective future policy actions. Current PSR exposure appears to be an accident of history in the sense that it grew to substantial proportions before gaining widespread recognition. PSR reflects, in part, the revolutionary impact of technological change on payment practices. Perhaps the new technology is most useful when abetted by a substantial volume of daylight credit that is somehow worth the moral hazard and systemic risk cost. Reducing exposure may seem an agreeable objective, but how far should it be reduced? How can we determine whether the optimal quantity of daylight credit is substantially lower than current levels?

Competitive equality might be a more basic issue than risk. Deposit insurance and the lender of last resort may be capable of dealing with the costs of daylight credit risk exposure. The basic issue may be how to structure increasingly unnecessary public provision of payment service in such a way that private services are not precluded from operating in the same market. Modern telecommunication capabilities and nationwide banking may make obsolete the original basic rationale for government provision of service--assuring uniform nationwide access to the payment system. The MCA requires that Federal Reserve services pass a market test, but, so far, MCA implementation has not encompassed the possible inequity of tying Federal Reserve services to free central-bank risk underwriting.

Why not allow private agents to choose the risk exposure they want? The federal government has defined riskless cash-payment devices since 1792, but private agents have chosen to accept risk in making some payments, first by using private bank notes, and then checks, both with risky finality and settlement features. Electronic payments are now in the ascendency, due in part, no doubt, to free Federal Reserve settlement insurance. Perhaps the objective of PSR policy should be the creation of an institutional environment in which agents face a fair choice not only among risk-free, but also between risk-free and risky, electronic payments.

An obvious objection to this perspective is that, by allowing risky electronic payments, more risk may fall into the federal safety net. Other objections to this, or to delay, or to seeking competitive equity as policy objectives, are surely relevant. The point is, however, that evaluating proposals to reduce PSR should not obscure the view that risk reduction within the existing institutional environment may not be the best objective.

III. Three Policy Proposals

Recently, three different proposals for reforming PSR policy have drawn attention. All three aim at reducing Federal Reserve PSR exposure by making daylight credit costly, but they involve seemingly quite different institutional features. A brief sketch of each will set the stage for an evaluation of their differences, and of their potential impacts.

As an operational matter, the three proposals are alike in presuming no change in the regulatory and operational framework within which Fedwire operates. Banks would be able to control their daylight overdrafts by real-time monitoring of their account balances at the Fed. The Reserve Banks, however, would not incorporate the real-time monitor into Fedwire. Relying on the existing ex-post daylight overdraft monitoring system means that the Reserve Banks would not be in a position to delay or reject payment requests that would cause an overdraft, for example, by routing them instead to the discount window, or to a supplemental balance department, or to a limit-enforcing department under the respective proposals, before deciding whether to let a Fedwire payment proceed. Of course, Reserve Banks would police the balances of problem banks and certain special Fedwire users in real time against predetermined overdraft limits, just as they do now.

At the individual bank level, daylight overdrafts (DOD) arise when accumulated debits (Db) to the bank's reserve balance at some point during the day exceed the sum of its opening balance of required (RR) and excess (XR) reserves held overnight, plus accumulated credits (Cr) to the account:

$$DOD = (Db - RR - XR - Cr) > 0.$$

The nature of the daylight credit financing problem is that a bank requires funding only for a portion of a day--whether a few moments or a few hours--before incoming credits to its account offset the need. A full day

of 24 hours might include an 8-hour "daylight" period (10:00 a.m. to 6:00 p.m.) and a 16-hour "overnight" period (6:00 p.m. to 10:00 a.m. the next day). Daylight overdrafts and reserve balances borrowed in a daylight funds market, if one were to develop, would be drawn down and then repaid during one daylight period, without any need for overnight financing. A full 24-hour day loan of reserve balances would be drawn down at the beginning of one daylight period and repaid at the beginning of the next daylight period. Overnight loans of reserve balances would be drawn down at the end of one daylight period and repaid at the beginning of the next.

The penalty rate proposal, offered in several variants by Wayne Angell, member of the Board of Governors of the Federal Reserve System, would eliminate current quantitative restrictions on each bank's use of daylight credit. Instead, a bank would borrow the amount of any daylight overdraft as a collateralized loan from its Federal Reserve Bank discount window, ex post, at an above-market penalty rate. The Federal Reserve Banks would pay a (below market) rate of return on excess reserves, providing an offset to the costs of any extra reserve-account balances that banks might hold to avoid the penalty rate on overdraft loans. Thus, under normal circumstances, no bank would run a daylight overdraft and pay the penalty rate intentionally because the maximum cost to a bank of avoiding a daylight overdraft would be only the interest rate spread between its cost of financing extra excess reserves and the rate earned on those holdings.[9] In the aggregate, this extra demand for reserve balances would be matched by extra supply produced by open market purchases of Treasury securities for the System Open Market Account.

The supplemental balance proposal, described by staff of the Federal Reserve Bank of New York, also could eliminate current quantitative limits on each bank's use of daylight credit. Instead, a bank would be required to

maintain extra below-market, interest-bearing reserve deposits in a current period (the supplemental balance) equal to some fraction, $r < 1$, of daylight overdrafts of its regular reserve-deposit balance in a prior period. The maximum cost to a bank of a dollar's daylight overdraft today would be the fraction, r, of the expected next-period spread between the cost of financing a dollar's supplemental balance and the rate earned on the supplemental balance. The proposal envisions fixing both the fraction, r, and the spread; assuming that the spread is measured from a market rate reasonably close to the bank's cost of financing, the maximum cost of a daylight overdraft would be a constant, $a = r$ (spread). Again, in the aggregate, the extra supplemental balance demand for reserve balances would be matched by extra supply produced by the System Open Market Account.

The pricing proposal, suggested by the System's Large-Dollar Payments System Advisory Group, would retain (or perhaps reduce) current quantitative limits on each bank's use of daylight credit, but, within that limit, have the Federal Reserve charge a price for any bank's Fedwire overdrafts in excess of a base amount. The maximum cost to a bank of a dollar's daylight overdraft, within the two limits, would be the administered price, a.

A. Daylight Overdraft Reducing Mechanisms

In each proposal, a bank would pay a positive explicit or implicit price to prevent or cover a net debit in its reserve account. Federal Reserve daylight overdrafts would be expected to decline because this price would be higher than the current price of a daylight overdraft, which is zero. Banking operations would be expected to respond to the increased price through some combination of three adjustment mechanisms: increased holdings of excess reserve balances, redistribution of reserve balances through a daylight funds

market, and modified payment practices.

Extra overnight holdings of excess reserves would increase the initial balance from which debits could be absorbed. A private daylight credit market could redistribute existing reserve balances from banks having them and not needing them during the day, but only overnight, to banks not having them and needing them only during the day, but not overnight.[10] The Federal Reserve preempts such a market now by providing free daylight overdrafts, but if overdrafts were costly, and timely delivery of funds were reliable, borrowing in an interbank daylight funds market might be an inexpensive means of preventing net debits to a reserve account during a day.

Finally, modifying payment practices could change the relative amounts of debits and credits, or their sequence during the day. A bank might do this by lengthening the maturity of its liabilities or adopting a continuing contract for federal funds borrowing, with daily renegotiation of the rate but no daily repayment and re-receipt of funds. Or, a bank might induce pairs of institutional customers operating in securities markets to net their transactions obligations during a day, producing a single small obligation for daily payment, again reducing debits that might now precede credits. Or, groups of banks might join private payment networks, with only net settlement at the Federal Reserve.

Each of the three proposals might induce these adjustment mechanisms. Each has the common characteristic of increasing the cost to a bank of financing payments during a day, here called the marginal cost of preventing a net debit to its reserve account, MC_{Db}.

A cost-minimizing bank seeking to avoid a daylight overdraft might consider the adjustment mechanism of acquiring excess reserves in the federal funds market at a cost R_F. After meeting its temporary daylight need to

cover payments, the bank would then have these extra funds available to hold, or to loan out overnight, at a rate of return R_{ON}, if there were a private overnight market. The marginal cost of preventing a net debit in its reserve account would be the difference between the two rates: $MC_{Db}^{XR} = (R_F - R_{ON})$. Alternatively, the bank might turn to a daylight credit market, borrowing the funds and repaying before the close of business, at the rate R_{DC}. This rate would represent the marginal cost of preventing a net debit in its reserve account: $MC_{Db}^{DC} = R_{DC}$.

As a third alternative (and presumably adopted as a relatively permanent change by many banks and their customers over a longer period than a single day), it might modify some payment practices. This, too, would involve some cost, such as paying higher rates on longer-term liabilities or receiving lower prices or revenues for payments services when institutional customers engage in netting obligations, or by sharing the cost of a private payment network.[11] Assuming banks adopt the cheapest payment modifications first and then contemplate more expensive changes, the marginal cost of preventing successively larger net debits in reserve accounts by modifying payments practices, MC_{Db}^{MPP}, would increase, suggesting a rising marginal cost relationship with the volume of net debit avoided by this means.

In equilibrium, cost-minimizing banks would adopt the unique combination of adjustment mechanisms with marginal costs equal to or less than the marginal cost of a daylight overdraft, $MC_{Db}^{XR} = MC_{Db}^{DC} = MC_{Db}^{MPP} \leq MC^{DOD}$. Banks would avoid one of these three mechanisms only if its marginal costs were fixed permanently above the others. It is within this cost-minimizing context that the effects of the three proposals on daylight overdrafts can be compared.

B. Effects on Daylight Overdrafts

The penalty rate proposal would set the marginal cost of a daylight overdraft at the above-market rate, R_P. No bank would choose to pay this price as long as a cheaper alternative were available. Except in the waning moments of the business day, when markets in reserve balances were closing or closed, banks would have cheaper alternatives because of the rate structure envisioned in the proposal. With $R_F < R_P$, and with $R_{ON} > 0$, a bank could hold excess reserves and avoid a net debit during the daylight period at a cost $(R_F - R_{ON})$. Market arbitrage would be expected to result, in equilibrium, in $R_{DC} = (R_F - R_{ON})$, so the alternative of borrowing in the daylight funds market would be just as attractive." And, with positive marginal costs for these reserve and funds market adjustments, banks would be expected to adopt modified payment practices with marginal costs less than or equal to $(R_F - R_{ON})$.

The supplemental balance proposal would create a marginal cost of daylight overdrafts of $rE_t(R_F - R_{SB})_{t+1}$. A dollar of daylight overdraft today would incur a cost equal to the fraction, r, of the expected net cost of financing the holding of a dollar supplemental balance in a future period. By design, this cost would be a constant amount, σ. Again, a daylight credit market might develop, but with an upper price limit of σ. The same upper limit would apply to the marginal cost of modifying payment practices. Note that excess reserves over and above any supplemental balances would not earn interest. This means that "plain vanilla" extra excess reserves would not be a cost-effective means of avoiding daylight overdrafts because the cost of financing them normally would be greater than σ, the cost of a daylight overdraft. This also means that the source of funds for a daylight credit market would be restricted to the required reserves of banks whose payments

needs for daylight balances were less than their need for required reserves.

The pricing proposal sets the marginal cost of a daylight overdraft at the administered price, π. Excess reserves would not be a cost-effective means of avoiding daylight overdrafts in this proposal, either. The cost of financing excess reserves normally would be higher than π. A limited daylight credit market could develop, redistributing the required reserves of those banks whose needs for daylight balances were less than their need for required reserve balances. Modifications in payment practices with marginal cost no greater than π would be the only other cost-effective means of avoiding daylight overdrafts in this proposal.

The three proposals, equivalently priced, would not necessarily produce equivalent reductions in Federal Reserve daylight overdraft risk exposure. This can be seen by standardizing the marginal cost of preventing a net debit at a common rate (CR): $CR = (R_F - R_{ON}) = \sigma = \pi$.[13] At this common rate, all three proposals would yield identical modifications in payment practices--namely, all those daylight-credit economizing modifications that produce a marginal cost of preventing a net debit less than or equal to CR. In addition, they should produce equivalent redistribution of required reserve balances through a private daylight credit market. Only if those two effects were sufficient to prevent all net debits would the three proposals have the same impact on Federal Reserve daylight overdrafts--by complete elimination. Otherwise, the remaining need to avoid or cover net debits would differ among the proposals.

In the penalty rate proposal, the remaining need would be met by excess reserves, supplied by the System Open Market Account as it sought to maintain a policy-desired (or determined) R_F. These extra reserve balances might be redistributed through the private daylight funds market to maintain

Roc = CR, the difference between R_F and the rate paid on overnight excess reserves. (Alternatively, if the System Open Market Account were directed to maintain a policy-desired stock of reserves, CR would be determined in the first instance by moving up the list of feasible, but increasingly costly, daylight-credit economizing modifications in payment practices. This bidding up of R_{DC} and R_F would continue until the unmet need for daylight credit at some level of CR were equal to the supply forthcoming through the private daylight credit market, given the rate paid on (and for) overnight reserve balances).

In the supplemental balance proposal, any remaining need for daylight credit would be available in unlimited supply as daylight overdrafts from the Federal Reserve at the rate CR, or from the daylight credit market augmented by holdings of supplemental balances by banks whose short-run payments needs had declined after the balance calculation period. In a long-run equilibrium, with unchanging payments needs at every bank, daylight overdraft exposure would decline for two reasons: the cost of supplemental balances would reduce daylight overdrafts directly, and the balances would provide collateral to offset some of the risk exposure represented by overdrafts.

In the pricing proposal, setting a direct charge of π = CR per dollar of daylight overdraft at the Federal Reserve would call for the same payment practice modifications and daylight-credit-market redistribution of required reserves common to the other two proposals. Any remaining need for daylight credit would be available in unlimited supply as Federal Reserve daylight overdrafts.

Standardizing the three proposals at a common marginal cost of preventing a net debit, CR, reveals their similarities and differences as strategies for reducing Federal Reserve daylight overdrafts and direct exposure to risk. The

three proposals would generate identical modifications in payment practices and in required-reserve-balance redistribution in a daylight credit market, with identical reductions in daylight overdrafts. In addition, the penalty rate proposal would eliminate virtually 100 percent of any remaining daylight overdrafts. The supplemental balance proposal would eliminate only some of any remaining overdrafts, but with some additional reduction in risk exposure from the collateral value of supplemental balances. The pricing proposal would not eliminate any remaining overdrafts.

These differences in daylight overdraft reduction in turn reflect differences in the volume of excess reserves associated with each proposal and the related potential volume of trading in a daylight credit market. Because all excess reserves earn interest in the penalty rate case, holding excess reserves overnight and using them directly for payments purposes, or indirectly by supplying them to a daylight credit market, allows complete elimination of daylight overdrafts without resorting to penalty rate borrowing at the discount window. Because excess reserves do not earn interest in the other two cases, and because a daylight overdraft involves no penalty relative to the cost of avoiding a daylight overdraft, excess reserves play no role, and the volume of trading in a private daylight credit market will be restricted to redistributing required reserve balances of banks not needing them for payment purposes.

It may seem curious that excess reserves play no role in the supplemental balance and pricing proposals. Why couldn't some banks hold excess reserves with the expectation at least of lending in both daylight and overnight funds markets, just as might happen in the penalty case? The answer is that anyone who did this repeatedly would be a sure loser: there can be no net demand for pure overnight funds as long as the aggregate supply of reserve balances is

more than sufficient to satisfy required reserve needs, even though it is insufficient to supply all payments needs. In these two proposals there are only two funds markets: one for balances that satisfy reserve requirements and one for funds that do not. The aggregate supply of the first kind of funds is established by monetary policy decisions (setting "the funds rate" or the supply of those reserves), while that of the second is established by payment system policy (setting σ or π), and there is no cost-effective way to arbitrage between the two kinds of funds markets. The penalty rate case is different because the earnings rate paid on excess reserves provides an effective basis for a third market, connecting the other two. An important implication is that variations in payments needs for balances can influence the monetary-policy-relevant funds rate in the penalty rate proposal, but not in the other two cases.

C. Eliminating Daylight Overdraft Exposure

So far, we have seen that, when equivalently priced, the three proposals could have markedly different implications for Federal Reserve daylight overdrafts. Another way to contrast the three proposals is to ask what difference in pricing would be required to achieve a common reduction in Federal Reserve daylight overdraft exposure. This requires examining the respective prices required to reduce daylight overdraft exposure to zero, because the penalty rate proposal is incapable of achieving less than virtually complete elimination of daylight overdrafts.[14] That is, as long as a net debit at any time during a day results automatically in a 24-hour discount window loan at a rate higher than the funds rate, no bank would choose to overdraw. Even if all other adjustment mechanisms failed to materialize, a bank could always borrow 24-hour funds to avoid a daylight net

debit, could hold interest-earning excess reserves, and would be better off than with an overdraft.

The supplemental balance approach could achieve the same result in either of two ways. First, if the balance ratio, r, were set equal to 1, supplemental balances would equal daylight overdrafts, eliminating Federal Reserve risk exposure in equilibrium with constant payments needs at each bank. This result is independent of the rate spread, $E_t(R_F - R_{SB})_{t+1}$, and depends only on the balance ratio, r, being equal to 1. Just as in the penalty rate case, complete elimination of Federal Reserve daylight overdraft exposure can be achieved at more or less cost to banks, depending on the size of the rate spread, $(R_F - R_{SB})$.

The second way to eliminate daylight overdraft exposure would be to set a very high rate spread, $(R_F - R_{SB})$. Holding R_F at a level desired for monetary policy purposes, and with r set at a positive fraction less than 1, the only way to do this is through the setting of R_{SB}, the earnings rate on supplemental balances. Lowering the value of R_{SB} raises the cost of daylight overdrafts toward the basic money market rate of interest, R_F. As the cost rises, more extensive and expensive modifications in payment practices become an economical means of reducing the need for daylight credit. If the marginal cost of modifications in payment practices were reasonably elastic, all daylight credit needs might be eliminated at some positive, albeit low, earnings rate on supplemental balances. On the other hand, if that marginal cost were quite inelastic, the earnings rate on supplemental balances could go as low as $((r-1)/r)R_F$ (that is, a negative earnings rate and a marginal cost of preventing a net debit equal to R_F) before all daylight overdrafts were eliminated. That they would be eliminated at this or any marginal cost higher than R_F is assured because at such a

high cost, banks would find 24-hour holdings of extra non-interest-earning excess reserves a cheaper means of avoiding the cost of preventing a net debit, and monetary policy operation would supply the extra excess reserves to maintain a desired funds rate while satisfying the extra demand for reserves. The markets for required reserve balances and payments balances would become one.

The pricing case is similar. Complete elimination of Federal Reserve daylight overdraft exposure could be assured if the price, π, were less than R_F, but high enough to elicit payment practice modifications eliminating all unmet needs for daylight credit. If that did not work, then setting π above R_F would, as in the supplemental balance case, merge the reserve requirement and payments markets for reserves, and excess reserves would become a more economical means of avoiding a net debit than paying the price of daylight overdrafts. The result with $\pi > R_F$ would be much the same as an outright prohibition on daylight overdrafts, sternly enforced.

In summary, all three of the proposals considered would reduce Federal Reserve daylight overdraft exposure. Moreover, all exposure could be eliminated if the marginal cost of modifications in payments practices and redistribution of daylight-surplus required reserve balances were sufficiently elastic. If this were not the case, then significant differences would be observed among the three proposals:

- the penalty rate regime would eliminate all remaining daylight overdrafts by expanded holdings of excess reserves and their redistribution in a daylight credit market;
- the supplemental balance regime would eliminate some of the remaining daylight overdrafts by expanded holdings of excess reserves in the form of supplemental balances and their redistribution in a daylight credit market;

- the pricing regime would eliminate none of the remaining daylight overdrafts.

D. Reducing the Cost of Payment System Risk

Implementing one or another of the daylight-overdraft-reducing proposals has been shown to trigger a variety of adjustment mechanisms. If a proposal will reduce what we have called the costs of PSR, it must be because those adjustment mechanisms will reduce moral hazard, systemic risk, or competitive inequality. Of course, none of the three proposals deals with private net settlement networks like CHIPS, or with overdrafts arising from payments for book-entry government securities. Therefore, no matter how effective a proposal might be in reducing PSR costs, it would not represent complete PSR reform.

Two conclusions emerge from tracing the effects of adjustment mechanisms on PSR costs. One is simply that the three proposals could differ substantially in their effectiveness in ameliorating the costs of PSR. The other is that no firm conclusions are likely to be drawn about these three (or any other) reform proposals until the Federal Reserve makes lasting decisions about some institutional details of its own operating and regulatory structure.

1. Moral Hazard. Moral hazard arises from an informational asymmetry that prevents those at risk from controlling their exposure effectively. The existing PSR program, while setting limits on permissible overdrafts based on each bank's assessment of its own credit quality, is thought to be ineffective because the limits are, in many cases, not binding, and in any event not strictly enforceable. (Reckless driving is discovered only after the accident.) The three proposals would either replace or supplement existing

limits by making daylight overdrafts costly.

Modified payment practices could reduce moral hazard. It is true that such devices as long-maturity bank liabilities, customer netting of obligations, and new private payment networks will transfer exposure to private market participants. However, even if these adjustments were merely part of a zero-sum risk game, moral hazard could decline. Whereas payee banks now have no reason, and existing Federal Reserve limits are not adequate, to enforce credit quality standards on users of daylight credit on Fedwire, replacement creditors introduced by modified payment practices might have a direct incentive to base credit extensions on credit judgments about payor banks. A similar conclusion would hold to the extent that payor banks would need market financing of excess reserve or supplemental balances. Market financing would require passing a market test of the kind that is lacking in today's daylight overdrafts.

The same argument has been made about a private daylight credit market: payor banks borrowing daylight funds to avoid daylight overdrafts will not escape careful credit judgments of lenders. Unfortunately, Dr. Seuss' "If such a thing could be, it certainly would be" is not necessarily true.[15] Replacing daylight overdrafts with some of these alternatives could, but need not, reduce moral hazard. The matter is in doubt because the outcome depends on some unspecified institutional details of daylight credit, of private net settlement systems, and of the reformed daylight overdraft facilities introduced by the proposals.

A private interbank daylight credit market would reduce moral hazard only if daylight lenders knew themselves to be at risk and had information necessary to control their exposure. Both conditions are questionahle.

Would lenders in a private daylight credit market face a risk of

nonpayment? The problem is that, while any of the proposals might lead banks to borrow daylight credit in the private market under normal circumstances, none of the proposals would prevent a bank from overdrawing during the day and overnight under abnormal circumstances, which is what risk is about. Would a debtor bank, unexpectedly in trouble, suspend payments by defaulting on a daylight loan rather than overdraw its deposit account at a Federal Reserve Bank? A bank unexpectedly in extremis should have no difficulty in repaying its daylight creditors on Fedwire even if it had insufficient funds because overdraft monitoring at Federal Reserve Banks is only ex post. None of the current proposals suggests moving to real-time balance monitoring. Such payments carry receiver finality, and none of the current proposals has so much as hinted at altering the irrevocable nature of Fedwire payments.

The only banks subject to real-time monitoring are those the authorities already know to be in trouble. Would the authorities allow banks under their continuous scrutiny to become further overextended through daylight borrowing and then prevent the troubled banks from repaying?

Answers to these two questions can be only conjecture, but there seems to be a fair chance that daylight loans would be considered riskless by daylight lenders, and in fact would be riskless to them because the exposure would remain with the Federal Reserve, either as operator of Fedwire or as supervisor of troubled banks. Moral hazard would remain intact even to the extent that Federal Reserve daylight overdrafts were replaced by daylight loans in a private interbank market.

A similar argument applies if the proposals result in the development of private payment network's in competition with Fedwire, comparable to CHIPS. As long as there is no coherent framework of payments finality on such systems, banks extending daylight credit may not perceive the extent of the

credit risk they assume, and therefore may fail fully to manage risk. Unlike the daylight credit market case, however, risk exposure would not remain with the Federal Reserve.

Informational deficiencies arising from externalities in private daylight credit arrangements might diminish the reduction in moral hazard even if private lenders were (and knew they were) exposed to credit risk. How could daylight lenders judge credit quality of banks who could borrow additional amounts from other lenders in the daylight credit market, or how could a creditor in a private payment network set an appropriate bilateral net credit limit for a payor bank in ignorance of bilateral credits provided to the same payor bank by other network participants?

This is not a problem unique to daylight credit: recent leveraged buyouts of industrial firms have highlighted this "event risk" problem in corporate bond markets, but in that case new issues have begun to include bond covenants protecting the lender from takeover-re1ated increases in debt-equity ratios.[16] Daylight credit arrangements may not be amenable to comparable covenants, but protections might still be possible in standard legal agreements underlying daylight loans, or by making the rate paid depend on total daylight borrowing which itself became a matter of public record via brokers' screens. Similarly, on private payment networks, bilateral limits and amounts drawn, and network debit caps and amounts drawn, all might become information provided on a continuously updated basis throughout the daylight hours for the use of potential daylight lenders.

Clearly, the three reform proposals would have identical, if quite uncertain, implications for reducing moral hazard in that, equivalently priced, they would induce identical modifications in payment practices and redistribution of daylight-surplus required reserves. Beyond that, however,

their implications differ. The penalty rate proposal relies heavily on excess reserves, and therefore on market scrutiny of a bank's creditworthiness in traditional markets for bank liabilities, both insured and uninsured. Thus, a moral hazard problem of Federal Reserve daylight overdrafts is transformed into a moral hazard problem of deposit insurance. In part, the same is true of the supplemental balance proposal, but is not true at all of the pricing proposal. By the same token, the pricing proposal would simply retain the existing daylight overdraft facility and, with a flat-rate price unrelated to risk, retain moral hazard. The supplemental balance proposal does the same, although on a smaller scale.

At a more basic level, all three proposals might retain a substantial moral hazard. None of the proposals envisions pricing based on the actuarial or judgmental probability of a bank's inability to repay daylight credit, and none removes the simple mechanism by which the Federal Reserve now insures all but problem banks against a shortage of daylight credit. Pricing still assures any bank that is unexpectedly in extremis of unlimited daylight credit; the supplemental balance proposal retains the same assurance; even the penalty rate proposal, while requiring collateral for discount window loans to cover daylight overdrafts, nonetheless has no means of preventing overdrafts in excess of collateral. Only a real-time balance monitor, with the capability of rejecting or at least pending-for-approval at risk-based limits, could remove this ultimate moral hazard: that the existence of an assured source of daylight credit will invite practices that increase the probability of its use.

2. Systemic Risk. Issues of systemic risk are not addressed directly by any of the three proposals; none is specifically directed at the CHIPS network, or

at similar networks that might develop in competition with Fedwire when Federal Reserve daylight credit becomes more expensive. To the extent that private networks provide a substitute for Federal Reserve daylight credit, systemic risk might become a more costly problem, offsetting gains from reduced moral hazard. For this reason, the proposals cannot be considered in isolation, but must be incorporated into an integrated view of Federal Reserve PSR policy, whether that policy be implicit or explicit.

The cost of systemic risk is the possibility of a chain of liquidity insolvencies for banks left empty-handed at the end of a day because other banks are unable to make settlement, and the market disruptions brought on by uncertainty about who paid whom on that day and about opening balances on succeeding days. If private networks are to carry a larger share of large-dollar payments, then there is a need to assure a coherent framework in law, regulation, or network rules that either removes serious threat of systemic risk, or makes that risk manageable by network participants. Otherwise, the lender of last resort and other banking authorities face a moral hazard--that the existence of a safety net invites disregard of systemic risk by banks.

Controlling systemic risk is not a settled matter. One issue is whether the framework for private network settlement requires attention to both finality and settlement, or simply to settlement. That is, can systemic risk be controlled only by a credible guarantee of finality, so that all payments made by the offending bank are final despite its inability to settle, or is a credible guarantee of settlement sufficient, with finality only provisional so that payments can be reversed later, if necessary? The distinction could be important. A guarantor of finality might have recourse for repayment only to the (presumably) failed bank. A guarantor of settlement only, however, might

have recourse to unfailed parties whose payments were not final, leaving all parties with a healthy concern for credit risk in making payments. A settlement guarantee would seem sufficient to preclude systemic risk of liquidity insolvencies in a private network, but whether a network without a finality guarantee could be competitive with Fedwire is not clear.

A second issue is the appropriate role of the Federal Reserve in controlling systemic risk on private networks, other than a concern that there be a coherent framework for finality and settlement. The System might have difficulty guaranteeing finality because it would seem to imply guaranteed access to the discount window for insolvent banks. Less troublesome might be a settlement guarantee implemented, for example, by assuring access to the discount window for otherwise solvent banks caught short of good funds by failure of one or a series of other network members to make end-of-day settlement payments.

The point is simply that adopting PSR policy proposals to reduce daylight overdrafts that induce banks to develop private payment networks may be premature until a coherent framework for controlling systemic risk can be developed.

3. Competitive Inequality. Making daylight credit more expensive when using Fedwire for payments reduces the apparent competitive advantage of Fedwire in the payment system. The extent of this reduction would depend on both the level of the "price" set under any one of the three proposals and the nature of the framework for finality and settlement on private payment networks.

It is one thing to observe that offering receiver finality and immediate settlement at no charge on Fedwire precludes significant private competition with Fedwire. It is quite another thing to define the price for daylight

credit, or private network rules for finality and settlement, that would define competitive equality between Federal Reserve payment services and private networks. The Federal Reserve must always have a competitive edge in ensuring access to credit because it alone can manufacture unlimited credit, and there is no sound basis for incorporating that advantage in pricing.[17] Product differentiation must be the basis for competition between the Federal Reserve and private payment networks. Regulatory oversight may call for internal network rules about setting and monitoring participant risk, to assure that moral hazard is minimized. Some form of settlement guarantee may be required to minimize systemic risk. In combination, these requirements mean that Fedwire would be differentiated from private networks on the basis of the risk exposure of payees who become net creditors on a private network.

Imposing a price for Federal Reserve daylight credit introduces a problem of adverse selection: the higher the Federal Reserve price, the lower the likely quality of the average bank remaining on Fedwire, and the riskier the pool of credit extended by the Federal Reserve in making payments. Even with the penalty rate proposal, there may be banks who find the administered penalty rate on overdrafts more attractive than the risk-augmented market terms they might face to meet credit requirements on a competing private network. Ultimately, if policy intent were to allow competition without allowing adverse selection, an outright prohibition of Federal Reserve daylight credit, enforced with a real-time monitor, might be the only effective solution.

IV. Conclusion

The fundamental concern--that uncollateralized Federal Reserve credit, even though limited to daylight maturities, may be inconsistent with the

Federal Reserve Act--would provide the clearest direction for PSR policy. Alternatively, any of the three proposals examined here could be employed to eliminate daylight overdrafts. But the world has changed since Fedwire payments involved no daylight credit. Returning to that cash-in-advance system in a world of telecommunications and trillion-dollar transaction days would require integrating the chosen proposal into a broader policy reform focused on moral hazard, systemic risk, and terms on which private payment networks would operate. This surely would require a real-time monitor to enforce.

The more pragmatic concern about Federal Reserve risk exposure from daylight overdrafts could be addressed by the three proposals in slightly different ways. The pricing proposal to set a fee per dollar of daylight overdraft is simple and direct. Setting the price "low" initially and raising the price periodically thereafter has the advantage of testing a frequently voiced judgment that most daylight overdrafts could be eliminated cheaply by simple changes in payments practices. If that did not turn out to be the case, then the supplemental balance proposal could achieve a larger reduction in overdrafts simply by the larger balances from which transactions are made. The penalty rate proposal would go further, assuring virtually complete elimination of daylight overdrafts.

Implementing any of these proposals, however, does not deal effectively with the underlying costs of moral hazard, systemic risk, and competitive inequality that characterize the payment system risk problem. Indiscriminate provision of daylight credit, even at a positive price, retains moral hazard. Inducing the development of a private daylight credit market need not reduce moral hazard either, if no real-time monitor is in place to enforce assignment of credit risk to private lenders. Inducing the development of private

payment networks leaves risk assignment muddy if finality and settlement rules are inexact, and increases the presumption of rescue by the federal safety net if systemic risk is not managed. Nor could private networks be relied upon without assuring terms on which they might compete successfully with Fedwire without creating an adverse selection problem.

In short, none of the three proposals brings a satisfactory resolution to the payment system risk problem. Resolution requires their integration into a more encompassing policy reform.

Footnotes

CHIPS is a private interbank telecommunication payment network operated by the New York Clearing House. This paper deals only with CHIPS and with Fedwire, the Federal Reserve's electronic funds transfer system. A third system, for transfers of book-entry Treasury securities against reserve deposit balances, contributes $60 billion of the $115 billion average sum of the maximum daily daylight credit on Fedwire. This system is not considered here because of its specialized business and because its relevance is concentrated at only a handful of banks.

2. Two forces are now at work to limit supply. Members of CHIPS can and do set dollar limits on their net credit positions with respect to other members during a day in real time. Federal Reserve rules since 1986 have set an upper limit on any bank's cross system net debit, although the limits do not appear to have been a constraint on most banks and are not administered in real time.

3. These proposals are described in Van Hoose (1988), the Angell proposal of a penalty rate; Hamdani and Wenninger (1988), supplemental balances; and Large-Dollar Payments System Advisory Group (1988), pricing.

4. The phrase is from Mengle (1988), who provides a useful discussion of finality issues.

5. Humphrey (1986) provides simulations of such chain reactions.

6. See Milano (1988).

7. Federal Reserve Bank of Cleveland, Operating Letter #9, August 1, 1939.

8. Annual Report, Board of Governors of the Federal Reserve System, 1947; 1983.

9. This argument is different from that in Van Hoose (1988), where neither a bank nor its Federal Reserve Bank knows about a daylight overdraft until after the fact. While the Federal Reserve has no immediate program to integrate real-time monitoring into Fedwire operations, banks should be able to monitor their positions in real time both from their own information and by using the Federal Reserve real-time Automated Balance Monitoring System.

10. Simmons (1987) contains an extensive discussion of daylight funds market possibilities.

11. Humphrey (1987) and Large-Dollar Payments System Advisory Group (1988) contain detailed explanations of a number of such potential modifications.

12. The arbitraged relationship is explained in Van Hoose (1988).

13. David Humphrey has pointed out that, at this common rate, the stated price for a daylight overdraft in the pricing proposal would have to be about 40 percent higher than σ and $(R_F - R_{ON})$ if T is to equal CR. The reason is that interest rates apply to a 365-day year, but the price charged for a daylight overdraft applies only to about 255 business days.

14. Two situations might give rise to overdrafts. One is closed markets, mentioned previously. The other would arise if variations in the funds rate brought it up to the level of the discount rate, removing its penalty feature. With the penalty removed, banks would be indifferent between daylight overdraft loans and purchases of 24-hour funds. Either would fund a potential net debit and earn interest at the overnight rate.

15. The aphorism is from McElligot's Pool, in which a boy fishes in a mud puddle, fantasizing that it has a hidden connection to the seven seas.

16. International Financing Review, Issue 751, November 19, 1988, p. 3774.

17. Neither is it possible to use a pure private market solution as a paradigm for public provision, as some have tried to do (Van Hoose [1988]; Task Force on Controlling Payments System Risk [1988]). The fact is that the U.S. payment system is based on fiat money produced by the Federal Reserve. One question is of the terms (the Federal Reserve price for daylight credit) on which that fiat money should be supplied through Federal Reserve credit during a day, in addition to the monetary policy specification of the terms on which it should be supplied from day to day. The other question is of the terms on which private institutions should be allowed to provide competing private credit during the day. The two questions are obviously related, and their answers will determine the mix of public and private credit used to facilitate payments. The appropriate mix cannot be determined by reference to the terms on which a single element of the mix would be provided in a world without the other.

Appendix

Confronting the payment system risk problem of daylight credit became unavoidable in the late 1970s under the pressures of technological change and of the demand for same-day net settlement service for private large-value payment networks. Originally, starting in 1918, telegraph, telephone, or mail messages to the Federal Reserve were the only mechanisms for transferring ownership of reserve deposit balances between banks with same-day finality. Other devices were official checks and an early version of CHIPS, requiring at least a one-day period for clearing and finality, or interbank messages that simply instructed a bank to use Fedwire to transfer funds.

Development of new computer-to-computer telecommunications technology for Fedwire and CHIPS payments, and for interbank message systems, suggested a new possibility. Private net settlement systems like CHIPS and Bankwire's then-proposed Cashwire might clear payment messages among a set of participants during the day and present a balanced set of net debit and credit positions to the Fed for settlement at the end of the same day, achieving same-day settlement finality. This offered the dual advantages of reducing the costly overnight float financing of banks in net debit position by those in net credit position, and of shortening the length of time during which bilateral credit positions exposed banks to credit risk. (The Canadian banking system went a different route, continuing to use paper checks even for securities market transactions, but eliminating overnight float by making ex post adjustments of prior-day balances at the Bank of Canada for settlement; duration of risk exposure in clock time was not reduced, however.)

Operating details of telecommunication devices, accounting system modifications, backup facilities, and daily time schedules were laid out quickly, but the enterprise foundered on the "unpostable debit"--that is, what to do if one of the participants did not have sufficient funds in its reserve account to cover its net debit on a private network at settlement hour. Some found this an operational inconvenience that should be ignored: from an operations perspective, it was no problem as long as the accounting system was designed to accept negative numbers. After all, Fedwire did not check to see whether a bank had sufficient funds to cover a wire transfer request, so why should a net settlement message be treated any differently? Others found it scandalous, or at least troubling, to design a system in which the central bank automatically would guarantee a private settlement by accepting an unpostable debit as an offset to irrevocable credits. The issue remained unresolved for several years, but two developments forced some action.

One of these developments was the increased incidence of overnight overdrafts of reserve accounts and adoption of the current Federal Reserve overnight overdraft policy. High interest rates, mushrooming wire transfer traffic, and declining reserve requirements were making reserve deposit accounts a less and less effective buffer stock in banks' daily reserve management. With no overnight overdraft policy other than Regulation D (that banks maintain an average required balance over a reserve maintenance period), concern was mounting that banks might abuse the Federal Reserve by running overnight overdrafts when especially profitable opportunities arose. (An egregious example was an occasion on which the Open Market Desk did a large late-in-the-day matched sale/purchase transaction to drain reserves only to find that the counterparty bank "happened" to run an equivalent overnight overdraft.)

The second development was a carefully constructed survey that revealed the extent of daylight overdrafts. Developing an overnight overdraft policy led to more widespread realization within the Federal Reserve that daylight overdrafts were a fact of life. There was no way to prevent daylight overdrafts, but neither was there a way to know how widespread the practice was. The survey served as a factual foundation for debating and developing the current PSR policy: self-set limits on cross system net debit positions, bilateral credit limits and multilateral debit limits on private systems, with a stated Federal Reserve intention to ratchet-down the debit limits over time.

References

1. Board of Governors of the Federal Reserve System. "Controlling Risk in the Payments System." Report of the Task Force on Controlling Payments System Risk to the Payments System Policy Committee of the Federal Reserve System, Board of Governors of the Federal Reserve System, Washington, D.C., August 1988.

2. _____. "A Strategic Plan for Managing Risk in the Payments System." Report of the Large-Dollar Payments System Advisory Group to the Payments System Policy Committee of the Federal Reserve System, Board of Governors of the Federal Reserve System, Washington, D.C., August 1988.

3. Hamdani, Kausar, and John A. Wenninger. "The Macroeconomics of Supplemental Balances, Appendix C," Controlling Risk in the Payments System, August 1988.

4. Humphrey, David B. "Payments Finality and Risk of Settlement Failure," in Technology and Regulation of Financial Markets, Anthony Saunders and Lawrence J. White, eds., Lexington Books, Lexington, Mass., 1986.

5. Humphrey, David B. "Payments System Risk, Market Failure, and Public Policy," in Electronic Funds Transfers and Payments: The Public Policy Issues, Elinor Harris Solomon, ed., Kluwer-Nijhoff Publishing, 1987.

6. Mengle, David L. "Legal and Regulatory Reform in Electronic Payments: An Evaluation of Finality of Payment Rules," Federal Reserve Bank of Richmond, Working Paper 88-2, May 1988.

7. Milano, Gerard F. "Payments System Risk: A Private Sector View," mimeo of remarks, Cato Institute, November 2, 1988.

8. Simmons, Richard D. "Would Banks Buy Daytime Fed Funds?" Economic Perspectives, Federal Reserve Bank of Chicago, May/June, 1987.

9. Van Hoose, David. "The Angell Proposal: An Overview," mimeo, June 6, 1988.