ARE NOW'S BEING USED AS SAVINGS ACCOUNTS?

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Recent years have witnessed a host of financial innovations, one of the most important of which has been the introduction of interest-bearing checking accounts. Currently, there are two types of interest-checking accounts available: NOW accounts, which have a 5¼ percent interest rate ceiling, and Super NOW accounts, which are ceiling-free. (A more complete description of the characteristics of these two accounts is found in the Box.) In this article "NOW accounts" refers to all interest-bearing checking accounts, including Super NOWs, unless otherwise noted.

Some observers have argued that consumers are using interest-bearing checking accounts for both savings and transactions purposes, causing a blurring of the formerly sharp distinction between "transactions accounts" and "savings accounts."[1] The likelihood of consumers using NOWs as savings accounts depends primarily on two factors : yield and liquidity. The rates paid on NOWs have been (and should remain) substantially lower than the rates paid on alternative savings vehicles (see Box), giving consumers an incentive to keep their savings in these other vehicles. Savings balances held in NOW accounts, however, are more easily accessed than balances held in alternative savings vehicles. (Although, as noted in the Box, there are savings alternatives that are very liquid.) This greater liquidity might induce some consumers to use NOWs as savings accounts even though they pay a lower yield." In general, this decision depends on each consumer's preference for yield versus liquidity and on the sacrifice in yield and the gain in liquidity from using a NOW instead of an alternative savings vehicle, To help determine if a substantial number of consumers are, in practice, using NOWs as savings accounts, this article presents some direct evidence on how consumers are using NOWs.

Whether consumers are using NOW accounts as savings accounts has important implications for monetary policy. Under current procedures the Federal Reserve sets annual target ranges for three different monetary aggregates-M1, M2, and M3. M1, which is intended to be a measure of the public's transactions balances, includes currency, travelers checks, balances in demand deposit accounts, and balances in NOWs. NOWs have been a significant portion of M1 since 1981 and comprised one-fourth of M1 as of the end of 1984. M2 and M3, the broader monetary aggregates, include M1 plus balances in various categories of savings vehicles. Historically, aggregate balances in these savings vehicles have grown more rapidly than aggregate balances in transactions accounts. For this reason the Federal Reserve has generally set the annual target ranges for M2 and M3 two to three percentage points higher than the target range for M1. The use of NOWs as both transactions and savings accounts could substantially alter the relationship between M1 and economic activity. Since balances in savings vehicles grow more rapidly than transactions balances, balances in NOW accounts used for both savings and transactions would grow at a faster rate than balances in transactions accounts.[3] As a result, the growth rate of M1 consistent with a given growth rate of economic activity would be higher than it was before the introduction of NOWs. In other words, the use of NOW accounts as savings accounts would raise

[1] See Hafer (1984) and Hetzel (1984).

[2] Also, some consumers might consolidate their transactions and savings balances in NOWs because of minimum balance requirements. For example, consider the case of an individual with insufficient savings balances to meet the minimum balance requirement on a money market deposit account, which is currently $1,000 but was $2,500 before January 1, 1985. This person, still saving in a passbook, might find it worthwhile to consolidate his savings and transactions balances in a NOW since the interest foregone on his savings balances would be negligible.

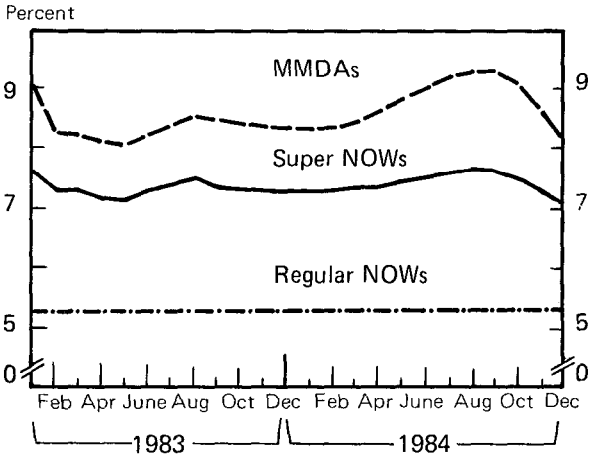
[3] Theoretically, savings balances should grow either more rapidly than or at the same rate as transactions balances. If savings balances grow at the same rate as transactions halances, it would not matter if consumers are saving in NOWs because saving in NOWs would not change the long-run relationship between the growth rates of M1 and GNP. Historically, however, aggregate balances in savings vehicles have grown more rapidly than aggregate balances in transactions accounts.

BOX

CHARACTERISTICS OF INTEREST-BEARING CHECKING ACCOUNTS

Interest-bearing checking accounts are available in two forms: NOW accounts and Super NOW accounts. These accounts can only be held by individuals and nonprofit organizations. NOW accounts were authorized nationwide as of the beginning of 1981 by the Depository Institutions Deregulation and Monetary Control Act of 1980; previously they were available only in New England. The interest rate on NOW accounts is limited by regulation to 5¼ percent and almost all financial institutions pay that rate. Super NOW accounts, which were authorized as of January 5, 1983, have no interest rate ceiling and the rates paid vary across financial institutions. Until 1985, Super NOWs were required by regulation to have a minimum balance of $2,500. At present the legal minimum is $1,000 although many institutions impose higher minimums. Similarly, although there is no legal minimum on NOW accounts, most institutions require minimum balances; a common requirement is $500.

RATES ON NOWs, SUPER NOWs, AND MMDAs



Source: Federal Reserve Statistical Release, H.6

As mentioned in the text, consumers consider two factors in deciding whether to use interest-bearing checking accounts as savings accounts: yield and liquidity. The savings vehicle which is closest to a checking account in terms of liquidity is the money market deposit account (MMDA), which pays an unregulated rate and is very liquid but has limited transactions capabilities.* As is shown in the accompanying chart, the rates paid on NOWs and Super NOWs have been well below the yields available on MMDAs. Most interest-checking accounts are regular NOWs, whose 5¼ percent ceiling rate was 3.6 percentage points less than the average MMDA rate in 1984. The rates on ceiling-free Super NOWs have also been well below those paid on MMDAs-averaging 1.4 percentage points less in 1984. Furthermore, it is likely that Super NOW rates will remain lower because a Super NOW is a costlier source of funds for a bank than is an MMDA. Since banks are required to hold 12 percent of Super NOW deposits as non-interest-bearing reserves, they would be expected to offer on Super NOW deposits no more than 88 percent of the rate they pay on MMDAs. In fact, the rate on Super NOWs in 1984 averaged only 84.1 percent of the rate on MMDAs, which is even lower than suggested by this rule-of-thumb. This even lower average rate on Super NOWs probably reflects the fact that banks have to recover the additional costs of providing checking services on Super NOW accounts.**

* MMDAs are allowed three checks and three telephone transfers per month, as well as an unlimited number of withdrawals in person or through automatic teller machines.

** Corcoran and Wachtenheim (1984) provide a detailed analysis of the relationship between the yields a bank would be willing to offer on MMDAs and Super NOWs.

the annual target for the growth rate of M1 compatible with any given growth rate of nominal GNP.

One approach to determining whether consumers are using NOWs as savings accounts is to look at the relationship between the growth rates of M1 and GNP. If consumers are using NOWs as savings accounts, then the growth rate of M1 should be permanently higher relative to the growth rate of GNP since the introduction of nationwide NOWs in 1981. Unfortunately, two data problems make it difficult to evaluate whether this has happened. First, only a short period has elapsed since the introduction of NOWs nationwide. Second, the relationship between M1 growth and GNP growth was temporarily distorted from 1981 through 1983 by consumers switching from regular checking accounts into NOW accounts.[4] As consumers switched into NOWs from regular checking accounts, they had to transfer funds from savings in order to meet the higher minimum balance requirements on NOWs and still have the same amount of funds available for transactions. These one-time shifts of funds from savings into NOWs temporarily boosted the growth rate of M1 relative to GNP growth but did not reflect the use of NOWs as savings accounts.[5]

Rather than looking at M1 and GNP growth rates, this study evaluates two types of direct evidence on how consumers are using NOWs. First, it examines survey responses by consumers on their holdings of different accounts. If consumers are using NOWs as both transactions and savings accounts these survey responses should indicate that consumers have consolidated their transactions and savings balances in NOW accounts. Second, it looks at a number of characteristics of NOWs, including (1) average balances, (2) transactions activity, and (3) seasonal behavior. If consumers are using NOWs as savings accounts, then these characteristics should partially resemble the characteristics of other savings accounts, such as money market deposit accounts and money market fund accounts. Alternatively, if consumers are using NOWs solely as transactions accounts, then these characteristics should resemble those of consumer demand deposit accounts. Overall these two types of direct evidence provide very little support for the view that consumers are using NOWs as savings accounts.

EVIDENCE ON CONSOLIDATION OF TRANSACTIONS AND SAVINGS ACCOUNTS

Perhaps the most direct way to determine if consumers are using NOWs for savings purposes is to see whether they have combined their regular checking accounts and savings accounts into NOWs. Evidence on the account combinations of consumers is available from the 1983 Survey of Consumer Finances, which collected detailed financial data on 3,824 randomly selected households nationwide.[6] Any consumer that had consolidated savings and transactions balances in a NOW would have shown up in the survey as having a NOW and no "savings account." Savings account is here defined to be either a regular savings account, a money market deposit account (MMDA), or a money market fund account (MMF).

While it is not necessarily true that all consumers without savings accounts are using their checking accounts for savings purposes, the percentage of survey respondents with NOWs but without savings accounts can be used as an initial estimate of the percentage of consumers that are using NOWs for savings purposes. To make this estimate, the survey results were classified into three groups on the basis of whether a household's main checking account was (1) a regular checking account, (2) a NOW, or (3) no checking account, and then each category was divided into households with and without savings accounts. The number of households in each group is reported in Table I. Seventy-nine percent of the households with NOWs also had savings accounts. Furthermore, the 21 percent of NOW holders without separate savings accounts was only 2.4 percent of the sample.[7] Therefore, even if one assumes that all NOW holders without savings accounts use their NOWs for savings purposes, the effect on aggregate M1 growth would be small.

[4] In addition, the sharp decline in interest rates in 1982 raised M1 growth relative to GNP growth in late 1982 and early 1983. Radecki and Wenninger (1983) and Judd (1983) provide discussions of this period.

[5] To account for the effects of these flows on M1 growth in 1981, the Federal Reserve "shift-adjusted" M1, thereby implicitly raising the M1 target range. The M1 target range for the current year reflects the view that the relationship between M1 and GNP has returned to a more normal and predictable pattern.

[6] Further detail on the survey is found in the Appendix.

[7] To check if the results were biased because the survey was stated in terms of households rather than individuals, subsamples of single person households and one-or-two-person households were examined. The percentages in the subsamples were very similar to those for the whole sample, leading to the conclusion that there was no bias. For example, the number of NOW holders without savings accounts was 2.8 percent *in* the single person household subsample and 3.0 percent in the one-or-two-person household subsample.

Table I

ACCOUNT COMBINATIONS HELD BY HOUSEHOLDS

Main Checking Account	Households with a Savings Account[1]	Households without a Savings Account
No Checking Account		
Number	322	485
Percent of category	39.8	60.1
Percent of total[2]	8.6	12.9
Regular Checking		
Number	1796	712
Percent of category	71.6	28.4
Percent of total	47.9	19.0
NOW		
Number	343	91
Percent of category	79.0	21.0
Percent of total	9.1	2.4

[1] Savings accounts include regular savings accounts, MMDAs, and MMFS.

[2] Total equals 3749. The table omits 75 households from the full sample: 44 that did not answer relevant questions and 31 whose main checking account was a type not included in M1.

source: Board of Governors, "Survey of Consumer Finances, 1983."

Table II

MEDIAN BALANCE IN MAIN CHECKING ACCOUNT BY TYPE OF ACCOUNT

Main Checking Account	Households with a Savings Account[1]	Households without a Savings Account
Regular checking	$ 500	$ 300
NOW	$ 900	$1250

[1] Savings accounts include regular savings accounts, MMDAs, and MMFs.

source: Board of Governors, "Survey of Consumer Finances, 1983."

Two other survey results cast doubt on the validity of the assumption that all NOW holders who do not have savings accounts use their NOWs for savings purposes. First, as shown in Table I, a substantial percentage of regular checking account holders held no funds in savings accounts. This indicates that many respondents either did not save at all or held all of their savings in financial assets not included in this study's definition of savings account. Second, one would expect consumers who had consolidated savings and transactions balances in NOWs to have significantly higher average balances than consumers who were using NOWs purely for transactions purposes. The survey, however, provided only weak evidence of such an effect. As Table II shows, the sample median of the balances in NOWs was only $350 higher for households with no savings accounts than households with some type of savings account.[8] This difference is fairly small, and indicates that only a small proportion of the households with NOWs but without savings accounts are using their NOWs for savings purposes. In sum, since only 2.4 percent of the households in the survey fell into the category of NOW holders without savings accounts and since only some of those households appear to be using their NOWs for savings purposes, it seems highly unlikely that a significant percentage of households are using NOWs for savings purposes.

EVIDENCE ON CHARACTERISTICS OF NOW ACCOUNTS

A second way to evaluate whether consumers are using NOWs as savings accounts is to compare the characteristics of NOWs with those of alternative transactions and savings accounts. Three characteristics for which data are available to make this comparison are average account size, transactions activity, and seasonal behavior.

Average Account Size

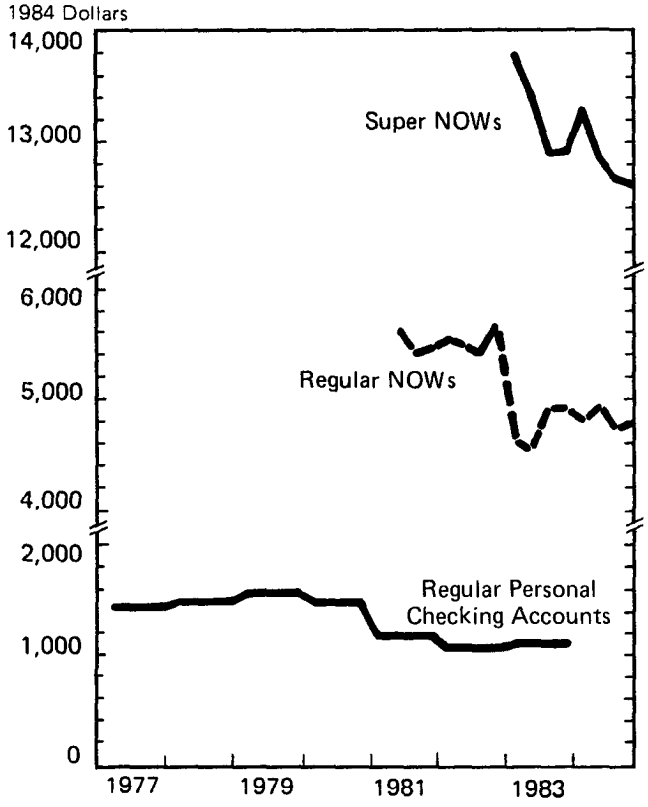
Chart 1 shows the size of the average balances held in Super NOW accounts, regular NOW accounts, and regular consumer checking accounts.[9] (Since average balance data are available for both Super NOWs and regular NOWs, this section discusses these accounts separately.) The average balance in Super NOWs is much higher than the average balance in regular NOWs, which is higher than the average balance in personal demand deposits (DDs). These differences might be used to argue that interest-checking accounts include a substantial amount of savings balances. There are a number of

[8] The survey estimates of account sizes appear to be biased downward, probably by the tendency of respondents to under-report dollar amounts. More reliable estimates of account sizes are presented below.

[9] Since the distribution of account balances is skewed to the right, the median is more representative of the typical balance than is the mean. Unfortunately, reliable estimates of median balances are not available.

Chart 1

AVERAGE BALANCES IN INTEREST-CHECKING ACCOUNTS AND REGULAR CHECKING ACCOUNTS

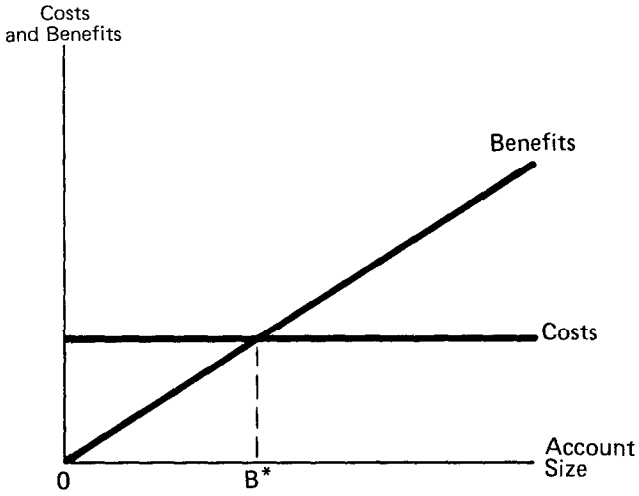


Sources. Board of Governors, Banking Section; and **Functional Cost Analysis.**

reasons, however, why interest-bearing checking accounts would be expected to have higher average balances *even if* they were solely composed of transactions balances. The most important reason is that, due to the high minimum balance requirements on interest-checking accounts, only persons with large average balances find it worthwhile to use them. The cost of switching to a NOW from a regular checking account is the interest foregone on savings-type deposits used to satisfy the higher minimum balance requirement, while the benefit is the higher yield earned on transactions balances. Since the cost of switching is unrelated to account size and the benefit increases with account size, only persons with high average transactions balances have the incentive to switch from a regular checking account to a NOW. This result is summarized in Figure 1. Only persons with regular checking account balances greater than B* profit by switching to NOWs. For this reason,

Figure 1

THE DECISION TO SWITCH FROM A REGULAR CHECKING ACCOUNT TO A NOW



one would expect the average balance to be higher in NOWs than DDs. Similarly, since Super NOWs have higher minimum balance requirements than regular NOWs (see Box), only holders of very large balances profit by switching to Super NOWs.[10]

The behavior of average account sizes following the introduction of NOW and Super NOW accounts illustrates the importance of segregation by account size as a determinant of average account size. The average balance in personal demand deposits fell by 21 percent in real terms (from $1,489 to $1,182 in 1984 dollars) following the introduction of nationwide NOWs, indicating that much of the higher average balance in regular NOWs was caused by persons with large transactions balances switching from DDs to NOWs. Similarly, the average balance in regular NOWs fell by 18 percent in real terms (from $5,701 to $4,662 in 1984 dollars) following the introduction of Super NOWs in January 1983, indicating that much of the higher average balance in Super NOWs is a result of regular NOW holders with large balances switching to Super NOWs.

In addition to causing this segregation by account size, the characteristics of interest-bearing checking accounts cause the *same* individual to hold a higher average balance in an interest-checking account than he would in a regular checking account. First, the higher minimum balance requirement on a NOW forces the individual to maintain a higher average

[10] For a more elaborate treatment of this effect, see Corcoran and Wachtenheim (1984).

balance in order to have the same amount of funds available for transactions. Second, because NOWs pay explicit interest, the marginal opportunity cost of holding NOW deposits is much lower than that of holding demand deposits. Hence, in general one would expect an individual to hold more transactions balances (above the minimum requirement) in a NOW than in a demand deposit. Similarly, he would hold an even higher balance in a Super NOW than he would in a regular NOW, since Super NOWs have higher required minimums and pay higher rates than regular NOWs.

While these factors explain why interest-bearing checking accounts would be expected to have a higher average account size than consumer demand deposits, they do not rule out the possibility that some of the higher average balance in interest-checking accounts results from some consumers using them as savings accounts. If consumers are holding savings in interest-checking accounts, however, the average interest-checking balance should be increasing faster over time than the average personal demand deposit balance. The reason is that, as discussed above, aggregate balances in savings vehicles have grown more rapidly than aggregate balances in transactions accounts. This difference in the behavior of aggregate balances probably reflects the tendency for individual savings balances to grow at a faster rate than individual transactions balances.[11] Therefore, if consumers are using NOWs partially as savings accounts, one would expect to see the average balance in NOWs increasing faster than the average balance in personal transactions accounts.

As shown in Chart 1, the average balance in personal demand deposits has been fairly stable except for the sharp drop following the authorization of regular NOWs nationwide in 1981, as persons with large checking account balances switched to regular NOW accounts. Similarly, the average balance in regular NOWs, although more variable, has been stable except for the sharp fall after the introduction of Super NOWs, as regular NOW holders with large balances switched to Super NOWs. Finally, the average balance in Super NOWs has been declining slightly since the first quarter of 1983.[12] In general, except during periods of regulatory change, the average balances in regular NOWs and Super NOWs have been stable or decreasing and the average balance in personal demand deposits has been very stable. This similarity in the movement in the average balances in interest-checking accounts and personal demand deposits suggests that interest-checking accounts are not being used extensively for savings purposes.

[11] Since the growth in aggregate transactions and savings balances reflects the behavior of both consumers and businesses, it is possible that the slower growth of aggregate transactions balances is solely a result of the behavior of businesses. In this case, the aggregate data would mask the fact that transactions and savings balances of consumers grow at roughly the same rate. If this were true, however, the use of NOWs as savings accounts by consumers would not alter the long-run relationship between the growth rates of M1 and GNP.

Transactions Activity

Turnover rate. A standard measure of the extent to which an account is being used for transactions purposes is the turnover rate of the account. The turnover rate is the dollar value of transactions made using an account in a year divided by the average dollar balance in the account. It can be thought of as the number of times per year an individual dollar flows through the account-the higher the turnover rate, the greater the transactions usage of the account. For this reason, this measure is an important determinant of the monetary aggregate in which an asset is included.

Table III compares the turnover rates of several types of accounts. All the figures are actual values

[12] The sharp fall in the average Super NOW balance after the first quarter of 1984 seems to indicate that some consumers initially consolidated savings and transactions balances in Super NOWs but then transferred their savings balances into MMDAs or MMFs. This could have been caused by unusually high introductory rates on Super NOWs.

Table III

TURNOVER RATES

Type of Account	Number of times per year[1]
Consumer demand deposits	18-30
NOW accounts	15.8
Money market deposit accounts	3.5
Money market mutual funds	2.6[2]
Regular savings accounts	5.1

[1] Annual averages of monthly data for 1984, except the turnover rate of consumer demand deposits, which is an indirect estimate for the early 1970s from Pugash (1974).

[2] Excluding institutions-only funds; from Donoghue's Money Fund Report of Holliston, MA 01746.

Source: Federal Reserve statistical release G.6, February 12, 1985, except as noted.

for 1984 except the turnover rate of consumer demand deposits, which is an indirect estimate for the early 1970s from Pugash (1974).[13] (Data are not available to directly calculate the turnover rate of consumer DDs). The turnover rate of NOWs (including Super NOWs) is several times greater than the turnover rate of savings-type accounts, which implies that NOWs are used much more intensively for transactions purposes. The turnover rate of NOWs is somewhat lower, however, than the estimated turnover rate of consumer demand deposits.

The lower turnover rate of NOWs than DDs is not necessarily inconsistent with the view that NOWs are primarily being used for transactions purposes since an individual with a given amount of transactions would have a higher average balance if he. were using a NOW than if he were using a regular checking account. The two reasons for this were discussed above. First, he would have to have a higher average balance in order to satisfy the minimum balance requirement. Second, he would not manage his transactions balances as closely in a NOW as in a DD because the NOW pays explicit interest. Since the turnover rate is calculated as the dollar value of transactions divided by average account size, the individual's higher average balance in a NOW than in a DD (for the same amount of transactions) would cause his turnover rate to be lower. Therefore, the aggregate turnover rate of NOWs would be somewhat lower than the aggregate turnover rate of DDs even if NOWs were being used solely for transactions purposes.

It is difficult to estimate just how much the higher minimum balance and lower opportunity cost of NOWs would raise an individual's average balance relative to what it would be in a DD for the same volume of transactions. However, to illustrate the potential magnitude of these effects, assume that an individual's average balance is 20 percent higher in a NOW.[14] The turnover rate of NOWs adjusted for 20 percent higher average balances is 15.8 X 1.2 or 19.0, which is within the estimated range of the turnover rate of consumer demand deposits. All in all, the evidence on turnover rates is consistent with the view that NOWs are being used primarily for transactions purposes.

Number of withdrawals and deposits. Two other simple but direct measures of transactions activity are the average number of withdrawals from and deposits to an account. Although these measures cannot be used to determine if consumers have consolidated their savings and checking balances in NOWs, they can be used to determine if any NOW accounts are being used purely for savings purposes. Estimates of the average number of debits and deposits per account per month for personal checking accounts (DDs), NOWs, and regular savings accounts are shown in Table IV. These estimates indi-

[13] It is difficult to assess whether the turnover rate of consumer DDs has risen or fallen since this estimate was made. Technological innovations have reduced the cost of managing transactions balances. At the same time, however, real wages have risen, thereby increasing the opportunity cost of time spent managing balances. These two factors would have opposite effects on the turnover rate.

[14] This 20 percent figure is plausible based on 1984 average data. Average balances in regular NOWs and Super NOWs were $4,826 and $12,844,. respectively. Assuming that the minimum balance requirements were $500 and $2,500, respectively, then minimum balances alone caused a 11.6 percent higher average regular NOW account balance and a 24.2 percent higher Super NOW balance. Additionally, the marginal opportunity cost of holding transactions balances was 2.35 percentage points for Super NOWs, 4.51 percentage points for regular NOWs, and 9.76 percentage points for regular checking accounts, using the three-month Treasury bill as the alternative asset. Based on an interest elasticity of the demand for transactions balances of 10 percent, a representative individual would have held a 5.4 percent higher balance in a regular NOW and a 7.6 percent higher balance in a Super NOW than he would have held in a regular checking account. Combined! these two effects would have caused a 17.0 percent higher balance in a regular NOW and a 31.8 percent higher balance in a Super NOW than in a demand deposit for the same volume of transactions. Based on the relative amounts of regular NOW deposits and Super NOW deposits, total NOW deposits would have been 21.6 percent higher due to these factors.

Table IV

AVERAGE NUMBER OF DEBITS AND DEPOSITS PER ACCOUNT PER MONTH

	DEBITS		
	Personal DD	NOW	Regular Savings
1981	16.68	14.63	0.36
1982	14.96	16.93	0.37
1983	17.19	15.66	0.42
	DEPOSITS		
	Personal DD	NOW	Regular Savings
1981	2.99	2.99	0.44
1982	2.62	3.46	0.47
1983	3.03	3.25	0.53

Source: Functional Cost Analysis, 1981-1983.

cate that the average NOW is just as active as the average regular checking account and much more active than the average regular savings account.[15] They imply that there is not a significant number of NOWs being used purely as savings accounts.

Seasonal Behavior

It is evident from a comparison of the behavior of balances in regular checking accounts and passbook savings accounts that transaction balances and savings balances have very different seasonal patterns. This difference is illustrated in Chart 2, which shows the 1984 seasonal factors for demand deposits and passbook savings deposits.[16,17] Demand deposits increase strongly at times of seasonal transactions needs such as the April tax date and the period before Christmas. Savings deposits have a much weaker seasonal movement, although they tend to decline at the end of the year as people take funds out of their accounts to finance Christmas expenditures.

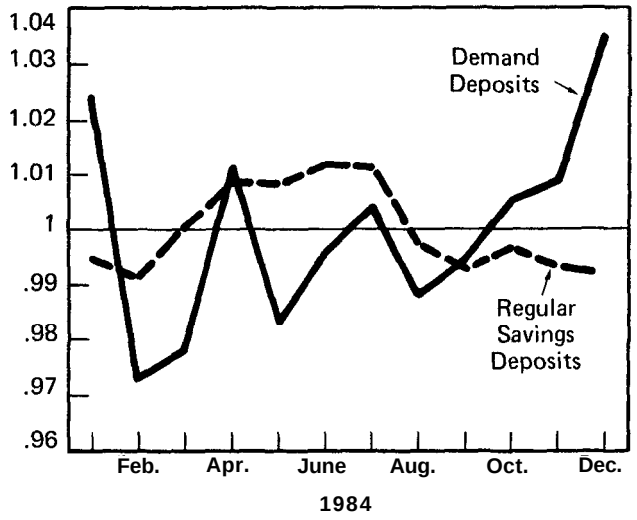
[15] The similarity in activity in NOWs and DDs is supported by the fact that banks' noninterest expense per account is nearly as high for NOWs as it is for personal DDs. See Taylor (1984).

[16] Despite financial innovation, the seasonal factors for passbook savings deposits have been stable for the last ten years.

[17] The Board of Governors has not constructed explicit seasonal factors for NOWs due to the data problems mentioned below.

Chart 2

SEASONAL FACTORS FOR DEMAND DEPOSITS AND REGULAR SAVINGS DEPOSITS



Source: Federal Reserve Statistical Release, H.6.

If NOW deposits are transactions balances, then their seasonal behavior should be similar to the seasonal behavior of consumer demand deposits. Unfortunately, there are two data problems in making this comparison. First, there is a shortage of data with which to evaluate the seasonal behavior of NOW balances. The seasonal pattern of NOW deposits was distorted by the introduction of nationwide NOWs in January 1981 and by the introduction of Super NOWs in January 1983. In addition, from 1981 through 1983 very strong growth in NOW deposits obscured the seasonal pattern. In 1984, however, there were no regulatory changes affecting the intra-yearly pattern of NOW deposit growth and the annual growth rate was only 11 percent. Hence, in 1984 it is possible to get a pretty good reading of the seasonal behavior of NOW deposits.

The second data problem is that while NOWs are held solely by consumers, demand deposits are held both by businesses and consumers. Unfortunately, there are no aggregate data available on consumer demand deposits to compare to the NOW deposit data. Until the end of 1978, however, the Federal Reserve collected monthly data on gross demand deposits at weekly reporting banks by type of holder. We know from these data that the seasonal patterns of consumer and business transactions deposits are somewhat different.[18] In particular, the buildup in demand deposits in the months before Christmas is greater for businesses than for consumers.

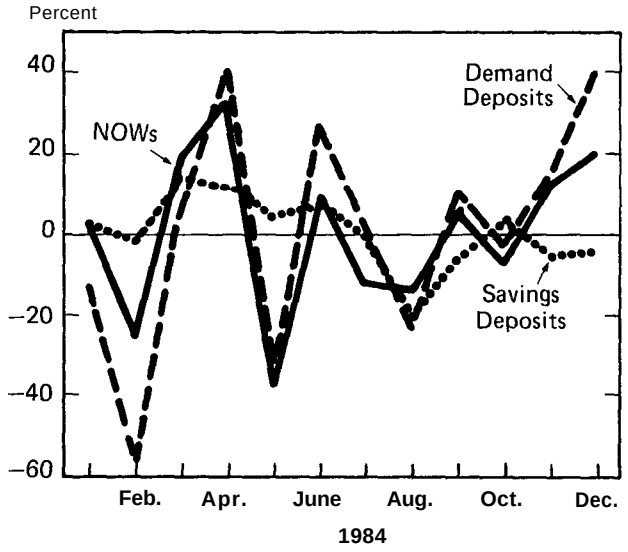
With these two problems in mind, Chart 3 compares the unadjusted monthly growth rates of NOW deposits in 1984 to the unadjusted growth rates of demand deposits and passbook savings deposits. The strong similarity between the seasonal patterns of demand deposits and NOW deposits-and the dissimilarity between the seasonal patterns of NOW deposits and savings deposits-provides additional evidence that NOW deposits are very heavily composed of transactions balances.

One noticeable difference in the seasonal behavior of NOW deposits and demand deposits occurs around Christmas, when the seasonal movement in NOW balances is smaller than that of DDs. This difference might be taken as evidence that NOW deposits have a significant savings component. It might, however, simply reflect the different mix of deposit holders for regular checking accounts versus NOWs. As noted above, the buildup in demand deposits in the months prior to Christmas-and the subsequent decline in the months after Christmas-is considerably greater for

[18] See Summers (1979).

Chart 3

UNADJUSTED GROWTH RATES OF NOWs, DEMAND DEPOSITS, AND SAVINGS ACCOUNTS



Note: Annualized growth rates of not seasonally adjusted data less the trend rates of growth from December 1983 to December 1984. NOW data includes demand deposits at thrifts (see Appendix).

Source: Federal Reserve Statistical Release, H.6

business demand deposits than for consumer demand deposits. Therefore, since only consumers hold NOWs, one would expect a smaller amplitude in the seasonal movement around Christmas of NOW deposits relative to that of total demand deposits.

Finally, even if NOWs are purely transactions accounts, there are reasons why the seasonal behavior of NOW deposits might be somewhat different from that of consumer demand deposits. First, NOW account holders are more likely to have money market deposit accounts (MMDAs) or money market fund accounts (MMFs), which have some transactions capabilities. In the 1983 Survey of Consumer Finances, discussed earlier, 24.6 percent of the respondents in the survey who had NOWs also had an MMDA or a MMF while only 14.5 percent of those with DDs had one of these accounts. In the aggregate, more NOW holders might use these alternative accounts for seasonal transactions needs, rather than building up balances in their NOWs.[19] Second, NOWs have higher minimum balances than consumer demand deposits. Both of these factors could lessen the percentage movement in NOW deposits around Christmas relative to that of consumer demand deposits.[20]

SUMMARY

This paper has examined two types of direct evidence on how consumers are using NOW accounts. First, the survey responses by consumers on their holdings of different types of accounts indicate that few households have consolidated savings and transactions accounts into NOWs. Second, the characteristics of NOWs resemble those of regular checking accounts and are very different from those of savings accounts. Overall, the evidence provides little indication that a significant number of consumers are using NOWs as savings accounts.

In conclusion, it appears that the introduction of NOWs has not, in practice, weakened the distinction between transactions accounts and savings accounts. Consequently, there is little reason to believe that the introduction of interest-bearing checking accounts has significantly altered the long-run relationship between M1 and economic activity or that M1 has deteriorated as a measure of the public's transactions balances.

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[19] A further implication of the relatively greater share of NOW account holders with MMDAs or MMFs is that total NOW balances might be more sensitive to changes in market rates than total DD balances.

[20] These two points raise the question of why the seasonal movement of NOW deposits around the April tax date in 1984 was roughly equal to that of demand deposits. This probably reflects the different mix of deposit holders for NOWs versus regular demand deposits. The seasonal movement in transactions deposits in April is largely due to the payment of nonwithheld federal in-ome taxes by individuals. Since only consumers hold NOWs, whereas both consumers and businesses hold regular demand deposits, one would expect greater strength in NOWs versus demand deposits in April compared to other times during the year when there is a seasonal demand for transactions deposits.

APPENDIX

DATA SOURCES

Functional Cost Analysis The Functional Cost Analysis (FCA) program is an annual survey by the Federal Reserve of banks' expenses and revenues. The analysis is primarily intended as a management tool for banks since it allocates costs and income among the various functions of the bank and allows the bank to compare its data to other banks. Participation is voluntary but substantial-608 banks in 1983. Average figures for all banks for each year are made available to the public by the Fed.

The FCA data reported in the text (average size of personal DDs; activity in NOWs, personal DDs, and regular savings accounts) are averages for all accounts of a given type in the survey. The personal checking account category included both NOWs and DDs, but figures for personal DDs could be isolated based on the method in Taylor (1984). The key assumption of this method is that the NOWs in the personal checking category have the same characteristics as the NOWs in the NOW category.

Survey of Consumer Finances, 1983 Between February and July 1983, 3,824 randomly selected families were interviewed by the Survey Research Center of the University of Michigan. The survey, sponsored by the Board of Governors of the Federal Reserve System and six other agencies, collected data on families' balance sheets. Information on the use of NOWs is found in the section of the survey on holdings of various types of assets. Detailed information on the survey construction and on obtaining copies of the results is found in Appendix A of "Survey of Consumer Finances, 1983" (1984).

NOW and Super NOW Account Size Four times a year the Federal Reserve System surveys a random sample of commercial banks stratified by size on the number and dollar volume of NOWs, Super NOWs, and MMDAs. The sample for NOW accounts excludes banks in New England, while the sample for Super NOWs and MMDAs is nationwide. The sample figures are used to calculate estimates of the number and dollar volume of these accounts at all commercial banks. The average account size is calculated as the aggregate dollar volume divided by the number of accounts. The estimates are available upon request from the Banking Section of the Board of Governors. In order to abstract from the effects of inflation, the estimates of average account size in the text are divided by the personal consumption expenditures deflator after first rebasing it so that 1984 equals 100.

Rates Paid As of the last Wednesday of each month, the Federal Reserve collects data from a nationwide random sample of about 550 banks stratified by size on rates paid on Super NOWs and MMDAs. Based on this survey, the Board estimates average rates on these accounts at all commercial banks. These estimates are published as part of a special supplementary table to the H.6 statistical release.

Turnover Rates The turnover rate is the ratio of debits to deposits for an account type. The data are reported in the *Federal Reserve Bulletin* and in the Board's G.6 release and, for MMFs, in Donoghue's ***Money Fund Report*** of Holliston, MA 01746.

Aggregate Deposits in NOWs As part of the H.6 statistical release, the Federal Reserve reports total Other Checkable Deposits (OCDs), which consists of deposits in NOWs (including Super NOWs) and demand deposits at thrifts. Since demand deposits at thrifts are less than 5 percent of total OCDs, the aggregate data for OCDs were used in the text as estimates of aggregate deposits in NOWs in order to examine the seasonal behavior of NOW deposits.

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DAYLIGHT OVERDRAFTS AND PAYMENTS SYSTEM RISKS

*David L. Mengle**

The last fifteen years have seen an almost incredible increase in the speed at which funds move through the economy. Central to this change has been the continual development of electronic funds transfer (EFT) networks. Although few would deny the benefits of the increasing facility with which transactions can take place, this progress has not come without cost. Specifically, there has been increasing concern with the risk exposure faced by participants in the payments system, particularly with regard to large dollar transfers that incur overdrafts.[1] Along with this concern have come proposals to deal with this exposure.

On an average day in 1984, over $640 billion was transferred by way of EFT networks. Given the interdependence that exists between participants in these networks, it is possible that losses in the event of the sudden failure of an institution could be huge. At the same time, however, such a failure is highly unlikely, and has not in fact occurred. Thus, it is possible for reasonable men to disagree on both the magnitude of the problem created by overdrafts and what to do about them.

The object of this article is to consider, in economic terms, the nature of risks on EFT networks and the desirability of specific measures proposed to deal with these risks. With regard to the former, a simple economic framework will be developed in Section II in order to analyze risks by EFT participants. With regard to the latter, Section III will describe and evaluate the various policy alternatives that have been advanced. The following questions will be implicit in the discussion of risk reduction measures:

- How will a risk reduction policy affect risk assignment?
- What incentives will the policy create among participants?
- Are the incentives created by the risk assignments likely to accomplish the policy's objective of reducing excessive risk taking ?

Particular attention will be given to pricing as a risk reduction policy and to the importance of the lender of last resort to the problem of risk on private networks. This discussion will be followed by a description of policies adopted by the Board of Governors in May 1985.

Since EFT systems are complex entities that are little known outside the banking industry, Section I will describe the major wholesale EFT networks and explain the nature of the overdraft problem. Readers who are familiar with EFT systems and daylight overdrafts may wish to skip the first section and go directly to the analytical material beginning with Section II.

I.

A PRIMER ON EFT NETWORKS AND DAYLIGHT OVERDRAFTS

Types of Networks

Generally, wholesale EFT systems are designed to transfer funds between banks[2] in order to permit a customer (the "sender") of the sending bank to make a payment to a customer (the "receiver") of the receiving bank, or else to be used for payments between banks. In contrast, retail systems, such as automated clearinghouses or automated teller machine networks, are primarily, but not exclusively, concerned with consumer payments. Wholesale wire transfer systems may simply take the form of communications networks that convey instructions to the receiving bank to debit the sending bank's correspondent account and to credit the receiver's account. If the two banks do not have a correspondent relationship, the sending bank may instruct a third bank

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[1] General overviews can be found in David B. Humphrey (1984), Richard L. Smoot (1985), and E. J. Stevens (1984).

[2] Throughout this article, "bank" will be used to refer to any depository institution authorized to use EFT services.

having a relationship with both the sending and receiving banks to debit the sending bank and credit the receiving bank for the amount of the transfer. These networks, of which BankWire and Society for Worldwide Interbank Financial Telecommunications (SWIFT) are examples, have in common the characteristic that they do not themselves provide settlement services, that is, they do not include any mechanisms for consolidating or centralizing transactions between participating banks in order to determine the banks' financial positions in relation to each other. As a result, wire transfers on nonsettling networks are essentially bilateral exchanges.

Adding settlement services to a network characterized by bilateral transfers yields a *gross settlement* mechanism, in which each transaction is settled when made. Because such a network uses a common set of accounts, such as reserve accounts, to determine relative financial positions, the receiving bank saves the costs associated with maintaining and posting entries to correspondent balances. In addition, since settlement occurs immediately, the receiver could have immediate access to "good" funds.

If all transactions between banks were conducted on a bilateral basis, however, increasing numbers of banks and customers in an economy would mean increasing costs due to the sheer increase in volume of transactions that must be handled separately. In order to reduce such costs, participants in payments systems have incentives to reduce costs by consolidating transactions into net debit and credit positions, thereby reducing the number of actual interbank transfers taking place. Specifically, *net settlement,* in which transactions taking place within a specified period are consolidated into net debits or credits for each settling institution, allows each participant to greatly reduce the number of payments and receipts it must make per period. This can in turn take two shapes : in its simplest form, net settlement means that each pair of institutions comprising a payments network would net final bilateral positions at the end of, say, a day, and then arrange payment. Although this would involve a payment or receipt each day between a bank and all others with which it deals, it does create economies by eliminating the necessity for funds to change hands with each separate customer transfer. Further economies may be gained by instituting "net-net" settlement, in which the settling organization maintains a central network account, and collects or distributes each institution's position vis-à-vis the settling organization at the end of each period. As a result, each participant makes only one payment or receipt per period. Because all existing net settlement EFT networks use the latter form, net settlement will be understood to mean net-net settlement in the remainder of this article.

Both gross and net settlement have their own unique advantages. On one hand, gross settlement provides immediate transfer and availability of funds. On the other hand, net settlement has the greater potential for cost reductions due to the consolidation of payments and receipts. It is possible, therefore, for both types of systems to exist side by side. When choosing between systems for a particular transfer, a bank would consider the importance of immediate availability relative to other cost savings.

Large Dollar Wire Transfer Networks

Fedwire. The primary wholesale EFT network in the United States today is Fedwire, operated by the Federal Reserve System. This system, the first national settling network, has existed in various forms since 1918.[3] Settlement originally took place between the twelve regional banks by means of the Gold Settlement Account maintained at the Treasury, and today is accomplished through the Fed's Interdistrict Settlement Fund. Fedwire uses a gross settlement mechanism since, as will be shown, transfers between participants are essentially bilateral, making use of transfers between reserve accounts maintained at the regional Federal Reserve Banks by the participants.

A transaction on Fedwire may take place as follows. A sender, who may be an individual or a private or governmental organization, requests a bank to transfer funds to a receiver. The sending bank debits the sender's account, and requests its regional Federal Reserve Bank to send a transfer message to the Reserve Bank serving the receiver's bank. Banks may be directly connected "on line" by computer with the Fedwire system, or may use telephone or an ad hoc computer link to make contact with their Reserve Bank. The sending bank's Reserve Bank debits the sending bank's reserve account for the amount of the transfer, and credits the receiving bank's Reserve Bank for that same amount. The receiving Reserve Bank debits the sending Reserve Bank's account, and credits the receiving bank's reserve account for the transfer. Finally, the receiving bank notifies the recipient of the transfer, and the receiver is immediately free to use the funds.

This last point deserves emphasis. Fedwire transfers are *final* in that "irrevocable credit will promptly

[3] For a description of payments mechanisms that evolved before the Fed, see John R. Walter (1984).

be given [by receiving banks] to the accounts of customers receiving payments."[4] In other words, the receiver may assume he has "good" funds as soon as he is advised that a transfer has been made. Once made, a transaction cannot be revoked. Further, if the transfer takes place without sufficient funds being provided by the sender, the Fed assumes the risk. Thus, an attractive feature of Fedwire is the certainty it provides to receivers.[5]

Although Fedwire services were originally offered only to Federal Reserve member banks and were not charged for, the Depository Institutions Deregulation and Monetary Control Act of 1980 (DIDMCA) instituted pricing of transfers and gave nonmember banks direct access to Fedwire. The Fedwire system has the highest number of transactions of any wire transfer network. Because the Federal funds market works through Fedwire, and immediately good funds are desired in the money market, there is a continuing high demand for such a gross settlement network. In 1984, approximately 166,410 transfers took place on Fedwire on an average day, with an average transfer size of $2.2 million each. Average daily dollar volume was approximately $366 billion.

CHIPS. The second largest wholesale EFT system is the Clearing House Interbank Payments System (CHIPS), set up in 1970 by the New York Clearing House Association. The original purpose of the network was to clear international transactions of member banks, but it now accommodates domestic transactions as well. Settlement through CHIPS takes place on a net-net basis, and is conducted by a subset of participants known as settling banks. Approximately 138 banks participate in CHIPS, of which 21 are settling banks. Of the remainder, about two-thirds are branches of foreign banks.

A typical transaction may take place as follows. A transfer may be initiated between 7 a.m. and 4:30 p.m. (New York time), during which period payment information messages are sent from the sending bank, through the CHIPS computer, to the receiving bank. The computer in turn notifies the settling banks who have agreed to settle for the sending and receiving banks. This information is posted to the accounts of the participating banks, but no settlement takes place until after close of business. In other words, funds transfers are provisional until settlement at the end of the day.

After 4:30, the computer provides a list of net credit and debit positions of the settling banks vis-à-vis the CHIPS system and the position of the nonsettling banks against their settling banks. By 4:45, this information should be provided to participants. Once this becomes available, the settling banks may notify nonsettling banks of their net positions. As soon as all settling banks agree to settle, those in a net debit position with CHIPS send payment, through Fedwire, to the CHIPS account at the New York Fed. Then, assuming all net debtors have settled, payment is made to settling banks in a net credit position with CHIPS by 6:00. At this time, the CHIPS account should be back to a zero balance, and all that remains are payments between settling and nonsettling banks. Because Fedwire is used for settlement within the CHIPS system, all net transfers are final and there is certainty of the validity of the transfers on the part of participating banks.

Finality of payment does not exist on CHIPS in the same sense as it does on Fedwire. CHIPS transfers are irrevocable on the part of the sending bank, that is, once sent, a payment remains an obligation of the sending bank and cannot be cancelled. Unlike Fedwire, however, the receiver's account need not be credited until final settlement at the end of the day, although the receiving bank is allowed to give immediate credit if it so desires. Thus, transfers are provisional rather than final until settlement occurs.

CHIPS has a smaller number of transactions than does Fedwire, but a higher average transaction size. For example, in 1984, almost 23 million transactions took place at an average rate of over 91,000 transfers per day. Average daily dollar volume was approximately $276.5 billion, and mean transaction size was over $3 million.

CashWire. The third settlement network used in the United States is CashWire, which began full operations on April 1, 1952. This was developed as a settling network from BankWire which, as pointed out above, is a nonsettling network used to exchange payments information and to effect transfers of correspondent balances.

CashWire is a net-net settlement system, and a typical transaction occurs as follows. After a sender notifies his bank that he wishes to make a transfer, the bank transmits the payments information to the BankWire computer, and the information is passed through immediately to the receiving bank. At 4:30

[4] 49 Fed. Reg. 13190.

[5] Transfers are certain due to a combination for finality (Regulation J, Subpart B, 12 C.F.R. $210.36) and the provision that the Fed will have a security interest in the sending bank, not in the receiving bank or receiver, if an overdraft is not covered by the end of the day (12 C.F.R. § 210.31).

p.m. no more transactions are accepted, and a summary of net debit and credit positions is provided to the banks and to the New York Fed. Fedwire is then used by net debtor banks to send funds owed to the CashWire account at the New York Fed. After debit payments are received, Fedwire is again used to remit funds to banks in net credit positions, the CashWire account balance returns to zero, and payment is final.

CashWire has been characterized as providing finality of payment in that receiving banks, in the event of settlement failure, cannot take back funds that have been made available to receivers.[6] Actually, transfers are apparently provisional to receivers until net settlement, so finality on CashWire does not exist for receivers any more than it does on CHIPS. The closest CashWire comes to finality is its "receiver guarantee," according to which banks must make good the amount by which a failed sending bank is unable to meet its net debit position. Specifically, each of the failed bank's creditors is required to make up the shortfall by an amount proportional to its share of the sum of all net credits extended on CashWire to the failed sending bank. This shortfall could be made up from creditor banks' liquid assets, but nothing in the CashWire rules prohibits financing by revoking funds that had been provisionally granted to receivers. Thus, although finality may exist for receiving banks in that a settlement, once computed, will not be cancelled or unwound, it does not exist for receivers until final settlement.

Cash Wire volume is small compared to Fedwire and CHIPS, and daily volume as of August 1984 was only $500 million, consisting of 1,100 transactions per day on average.[7] Participation has also fallen short of expectations.[8] As of Summer 1984, out of 170 BankWire participants, only 22 were members of CashWire as well.

Other wholesale networks. In addition to the foregoing, the Chicago Clearing House Association operates the Clearing House Electronic Settlement System (CHESS), which is open to institutions in the Seventh (Chicago) Federal Reserve District. The most recent addition to the list of networks is the California Bankers' Clearing House Association's Twelfth District Electronic Settlement System (TESS) network for California banks in the San Francisco Federal Reserve District. In Canada, the Canadian Payments Association operates a system that uses net-net settlement through the Bank of Canada, while in England the Clearing House Automated Payments System (CHAPS) acts as a settling network for a set of United Kingdom clearing banks.

Daylight Overdrafts

The major controversy regarding EFT networks concerns the risk exposure of the payments system due to the existence of daylight overdrafts. These occur when payment is made during the course of a business day before the transaction is covered with "good" funds. In other words, at least one of the institutions involved extends free credit that will be repaid before the end of the day.

Daylight overdrafts on gross settlement networks are not identical to those on net settlement networks. On net settlement systems, overdrafts are of an ambiguous nature. Since participants on such systems do not settle until the end of the day, the only overdrafts (in the strict sense) that occur are, first, between a sender who has not yet provided funds to cover a transfer and a sending bank that allows that transfer to go ahead immediately ; and, second, between a receiver and a receiving bank that allows the receiver to use funds before settlement occurs. Both of these may be thought of as normal credit judgments which banks are called upon to make. One possible definition of a daylight overdraft on a net settlement network, then, is the extent to which receivers have been allowed to draw on provisional transfers. Another possible definition is the amount by which a bank's net debit position across all networks exceeds its reserve account balance with its Federal Reserve Bank.[9] In actual policy discussions, however, daylight overdrafts on the private networks are assumed to occur whenever a bank is in a net debit position, regardless of reserve account balance. Thus, by this definition, daylight overdrafts are an inescapable result of the nature of a net settlement system, in which at least one participant must be a net debtor.

On a gross settlement network such as Fedwire, a daylight overdraft has a more straightforward definition. Specifically, it refers to a transfer that has been made and becomes final even though the sending bank's reserve account did not contain sufficient

[6] See, for example, 49 Fed. Reg. 13190 and Stevens (1984), p. 6.

[7] American Banker, August 28, 1984.

[8] American Banker, August 9, 1984.

[9] The Canadian Payments Association uses a definition similar to this on its net settlement network. If an institution's net debit exceeds its clearing balance, it receives an advance from the Bank of Canada which must be paid back with interest.

funds for the transfer at the time it was made. Alternatively stated, the sending bank's reserve account balance has gone negative.

On Fedwire, daylight overdrafts occur due to the way in which Regulation J, Subpart B is written. One section states that payment is final once the receiving Reserve Bank sends it to the receiving bank or else notifies the receiver of the credit. In addition, this section makes it clear that finality means that the receiver has the right to immediate use of the funds.[10] Another section requires a sending bank to have sufficient funds in its reserve account *at the end of the day* to cover net debits for that day.[11] Thus, by granting immediate use of transferred funds while giving until the end of the day to cover debit positions, the opportunity for, as well as legality of, daylight overdrafts arises. Interestingly, the same section that gives the sending bank until the end of the day to provide cover also empowers a Reserve Bank to "refuse to act on" a transfer that "it has reason to believe" may incur an overdraft, so that overdrafts are apparently both permitted and frowned upon.[12]

It is not entirely clear how the regulation came to be written so as to permit daylight overdrafts. Such overdrafts probably occurred under the pre-1971 Fedwire system, which relied on manual accounting and teletype notification of transfers. Since Reserve Banks normally could not provide immediate information as to the current intraday status of a bank's reserve account, it is probable that wire transfers took place before it was known that a sending bank had sufficient covering funds in its reserve account. During this period, there were no systemwide regulations specifically covering wire transfers, and any rules that existed were contained in individual Reserve Bank operating circulars. Thus, it may be argued that Regulation J, when it was finally rewritten to include wire transfers, simply formalized what had already been taking place. However, when the Board of Governors first proposed that Regulation J be revised to cover wire transfers, the relevant section permitted transfers subject to the restriction that "each transferer shall maintain . . . a daily net balance sufficient to cover the transfers of funds debited to its account."[13] Given this language, it is not clear whether daylight overdrafts were to be permitted or not. This was changed to the present policy in the 1976 proposal, and the reason given was "to clarify the amount of the balance which a member bank must hold with its Federal Reserve Bank."[14] Indeed, given the technology in place at that time, daylight overdrafts most likely could not have been effectively controlled without major costly changes to the system. In addition, reserve balances at that time were higher than they have been since the Monetary Control Act of 1980 imposed universal, but lower, reserve requirements.

Once daylight overdrafts are permitted on a gross settlement network, the distinction between a gross and net settlement system begins to break down. Although Fedwire's transfers are final when made while those on the other systems are not, sending banks incurring overdrafts on Fedwire are allowed to settle on a basis similar to that found on the private networks. The distinction would be even less significant if participants in the networks were to grant immediate irrevocable credit to their receivers.

II.

RISK AND WHOLESALE PAYMENTS NETWORKS

Risk Concepts

In order to gain some insights into the economic aspects of payments system risks, assume there exists a simple settlement network for banks in an economy which permits overdraft transfers subject to their being repaid by the end of the day, but does not guarantee that settlement will take place and does not provide for finality of payment. This network may use either gross or net settlement via a central set of accounts. Banks undertake transfers for the benefit of third parties (senders and receivers), and are compensated by fees net of operating costs.[15] Finally, all payments are risky, that is, it is uncertain whether or not an overdraft transfer will be covered. This uncertainty means that costs may be borne by participants in the payments system. Such costs, known as expected costs, are determined by multiplying the magnitude of loss and the probability of such a loss occurring.

Credit risk arises from uncertainty that funds credited will actually be received, and is faced as a

[10] 1.2 C.F.R. § 210.36.

[11] 12 C.F.R. § 210.31.

[12] Banks are not permitted to run overnight overdrafts, and violators are subject to a penalty rate. See Regulation D, 12 C.F.R. § 204.7 and various Reserve Bank operating circulars.

[13] 38 Fed. Reg. 32954 (1973).

[14] 41 Fed. Reg. 3098 (1976).

[15] For a model that emphasizes the jointness of both costs and benefits on payments systems, see William F. Baxter (1983).

private expected cost by the sending and receiving banks and the receiver. This may in turn be broken down into sender risk and receiver risk. In terms of the simple payments system described above, sender risk refers to the fact that a sending bank faces an expected loss whenever it extends overdraft credit to a sender. In other words, it is the risk that the sender will not provide covering funds and is by no means unique to EFT systems. At the other end of the transaction, the receiving bank faces receiver risk, which arises due to uncertainty whether or not a sending bank will settle.[16] In addition, if the receiving bank were to allow the receiver to draw on provisionally transferred funds, the receiver also faces expected costs due to the possibility that his bank may attempt to revoke his funds in the event of settlement failure.

Systemic risk refers to the expectation that failure of one bank to settle will cause another bank or banks to fail to settle as well. This would arise if, within a particular bank, ability to settle debit positions depends on receipt of credits. Default of a particularly large net credit (in relation to total liquid assets) may keep a bank from meeting its obligations to other banks against which it is in a net debit position. In turn, this failure could conceivably cause settlement failures at other banks who depend on credits from the receiving bank to meet their debit positions, and so on. Thus, systemic risk refers to expected costs that are not borne solely by the incurring bank but by other participants in a payments network as well. In other words, a receiving bank that accepts a transfer and allows a receiver to draw funds before settlement incurs not only private costs due to credit risk but also external costs that are borne as receiver risk by other banks in the system. These latter costs, known as externalities, may not be borne exclusively by the receiving bank's creditor banks, but also by banks to whom these creditors are in overdraft positions. Thus, in accepting a transfer, a receiving bank can be expected to take into account its private credit risks but not these additional social costs. The end result in the simplified payments system is an incentive for receiving banks to accept riskier transfers than would be the case if these banks were to bear all their costs privately.

The distinction between private and external costs is important for the following reason. Since receiver risk is borne privately by a receiving bank, this bank may be expected to have incentives to keep such costs to a minimum. Specifically, a bank may wish to control its exposure to sending banks it has reason to believe may default on credit positions. However, systemic risk is borne by other banks in the system, so that this same bank may not have incentives to limit risks to which it exposes other banks. In other words, there is little reason to expect this bank to place as much emphasis on controlling its net debit position against the rest of the system as it would place on controlling its exposure as a creditor to other banks.

In this simple system, it should make little difference for risk purposes whether a network uses net or gross settlement. Under the former, sender risk would exist until an overdraft is covered, while receiver risk would exist until final settlement. Under the latter, both sender and receiver risk would exist until the overdraft is covered. Assuming all such transactions under either system must be covered by the end of the day, potential risk on net settlement networks is the upper limit for that on gross settlement networks.

Risk Assignment Under Varying Institutional Structures

Both CHIPS and CashWire have some similarities to the hypothetical payments system described above. There is no finality for receivers, nor is there explicit guarantee of settlement to receiving banks. Thus, all the risks found in the hypothetical model are also found in the private networks. Sender risk exists for those banks sending transfers for customers who have not provided cover at the time of transfer. Receiver risk exists until final net settlement occurs at the end of the day. If the receiving bank allows a receiver to draw funds before settlement, it is exposed to risk even though the receiving bank may try to recover the funds from the receiver. In other words, there is no finality of payment to receivers until final net settlement. Thus, receiver risk is borne by both receiving bank and receiver. Less directly, the sender may also be at risk because, if a receiving bank successfully recovers funds from a receiver after failure of a sending bank, the receiver may have cause for action to recover payment from the sender. In turn, this sender may have already supplied funds to the failed bank.

Systemic risk is present on this simplified version of the private networks because a bank may depend on a credit from a failing bank to pay other banks against which it is in a net debit position. If a

[16] Stevens (1984) combines sender and receiver risk into settlement risk.

CHIPS member fails to settle, and no other bank will settle for that member, all debit and credit messages for this sender may be cancelled and a new settlement computed. Systemic risk arises here because of possible dependence of other banks on credits from the failed bank. The cancellation of the messages does not relieve the failing bank of obligation to ultimately settle because CHIPS transfers, once sent, are irreversible. However, this does not affect systemic risk since it is highly improbable that funds could be recovered during whatever remains of the day before settlement. On CashWire, as noted above, losses are apportioned among creditors. Although this does not by itself eliminate systemic risk, it does appear to localize problems.[17]

Adding finality of payment, under which immediate and irrevocable credit is granted to receivers, to the hypothetical system varies the risk assignment somewhat. Sender risk does not change, but receiver risk, which was previously shared by the receiver and the receiving bank, is narrowed to the receiving bank. One would expect this new risk assignment to lead to incentives on the part of receiving banks to monitor the soundness of sending banks from which they receive transfers. At the same time, receivers (and, as will be shown, senders), will have fewer incentives to monitor sending banks.

Adding guarantee of settlement to finality adds an additional party, the insurer, to the hypothetical payments system model, thereby approximating the risk assignment on Fedwire. Finality removes risk from the receiver, thereby confining receiver risk to the receiving bank. However, the Fed, as insurer, guarantees that settlement will occur, that is, that the overdraft will be covered. In the event of settlement failure, the Fed has recourse to the failing bank,[18] although the amount eventually recovered is uncertain. Thus, receiver risk is assumed by the Fed and consists of expected losses net of amounts expected to be recovered from the bank that failed to settle. Because any loss would reduce Fed net revenues available for transfer to the United States Treasury, the risk is ultimately borne by the public. Sender risk on Fedwire does exist, and may be borne by the sending bank and the Fed. However, since receiver risk is shifted from the receiving bank to the public, failure to settle is localized and will not affect the position of any other bank. Still, it is important to emphasize that no receiver risk has been eliminated; rather, it has simply been socialized.

The question of what happens to systemic risk is more complex. If banks no longer face receiver risk, they cannot face systemic risk so, at first blush, it appears that systemic risk has been eliminated. Certainly the externality has not been placed on the participating banks, since banks are not made to take these costs into account when choosing whether to accept a transfer. However, from the point of view of the insurer, that is, the Fed, systemic risk is someone's receiver risk. This is analogous to the fact that externalities are the sum of private costs borne by individuals other than those incurring them. For example, when a factory causes pollution, it inflicts costs on nearby landowners. The sum of these costs is the externality incurred by the polluter. If the factory owner is made to compensate the surrounding landowners for the pollution he has caused, all the pollution costs are turned into private costs to the polluter. Similarly, the total risk assumed by the insurer is the sum of receiver risks in the system, and in assuming all receiver risks the Fed has thereby assumed systemic risk as well.

Insurance of receiver risks in the Fedwire system means that, other things equal, costs faced by banks when exchanging payments messages are lower than they would otherwise be without insurance. As a result, supply of messages is increased. In other words, since banks need no longer concern themselves with receiver risk, they may tend to accept transfers from sending banks who may have been turned down if no insurance had been provided. Thus, the Fed provides a valuable service to each bank by assuming receiver risks. Since the Fed's insurance is provided at zero price, banks have little incentive to reduce exposure to overdraft transfers.

It may also be argued that the Fed also provides implicit insurance on the private networks through its role as lender of last resort. According to this line of reasoning, the Fed would never sit back and allow systemic failure, and would surely step in by lending to banks in net credit positions with a failed bank in order to contain the effects of any settlement failure. If this is indeed the case, then the final assignment of costs depends on what happens to the receiving banks affected by a sending bank's failure. Here, it is important to distinguish between illiquidity and insolvency.

If a receiving bank's problem is insufficient liquid assets to make up the sending bank's shortfall, discount window lending to the receiving bank in order

[17] Nothing in the CHIPS rules appears to preclude the New York Clearing House Committee from dealing with settlement failure in the same manner as that specified for CashWire.

[18] 12 C.F.R. §210.21.

to allow settlement to proceed would have the immediate effect of eliminating systemic risk. However, since the receiving bank would have to pay back the loan plus interest to the Fed, that bank would end up bearing the receiver risk net of any amounts eventually recovered from the failed sending bank. Further, the Fed will be compensated for the credit it has extended to prevent failure. Finally, the externality cost will be placed on the borrowing bank, since by averting failure due to illiquidity, the borrower is prevented from passing costs on to its creditor banks. Thus, if failure of one participant in a system causes liquidity problems for its creditors, discount window lending to the failed bank's creditors will both prevent systemic failure and assign costs to receiving banks and receivers. This in turn would increase incentives to monitor sending banks.

Insolvency presents a more complex set of circumstances. If a bank in a net debit position fails without warning before net settlement occurs, it is possible that one or more receiving banks may eventually become insolvent as a result. In this case, the assignment of costs will depend on to whom the Fed lends. If the Fed advances credit to the failing receiving banks in order to allow settlement to proceed, then the costs will ultimately be borne by the Federal Deposit Insurance Corporation fund and the public. In this case, the external costs are not placed on the failed banks, although the discount rate represents a price of the Fed's assuming the risk of having to bear these costs. If the Fed only advances credit to banks experiencing liquidity problems as a result of some receiving banks failing, then the assignment of costs is identical to that described in the previous paragraph.

It is important to emphasize that the preceding analysis depends on the assumption that the Fed lends to receiving banks in net credit positions with the failing bank. If, on the other hand, discount window advances were made to the failing bank simply to allow settlement to proceed, costs would, as in the case of insolvency, be shifted to the FDIC and public and not to the receiving banks. In this case, as with Fedwire, receiving banks would have little incentive to monitor sending banks. Thus, banks' incentives to control risk exposures may be related to their perceptions of to whom the Fed is likely to lend in the event of settlement failure.

To sum up, the crucial difference between risk assignment on Fedwire and that on the private networks stems from the manner in which transfers are guaranteed. On Fedwire, losses due to failure to settle are borne by the public free of charge. Therefore, since sending banks are not made to take account of external costs involved in making transfers, there is an oversupply of transfers. On the private networks, however, risks are placed on receiving banks because banks will have to repay the lender of last resort the amounts borrowed to cover a sending bank's failure to settle. Since interest is charged for this lending, the externality should be passed back to the banking system, and should be faced as a cost by banks when accepting transfers from each other.

III.

POLICY RESPONSES

The complexity of payments systems institutions, to say nothing of the overdraft problem itself, makes it critical that any policies instituted to control risk be selected thoughtfully and deliberately. Using the framework developed above, this section will analyze five policy alternatives. Two of these, pricing and an intraday funds market, explicitly rely on the price system to reduce risks. Two others, banning daylight overdrafts and placing restrictions on overdrafts, explicitly reject price incentives. The fifth, finality of payments, creates an assignment of liabilities among parties to a transfer in order to provide incentives to monitor risks. All five will be looked at in terms of how they affect risk assignment, what incentives they will create, and whether they may be reasonably expected to attain their stated objectives. Following this discussion, recent policy initiatives from the Board of Governors will be described.

Analysis of Policy Alternatives

Ban daylight overdrafts. As was pointed out in the first section, daylight overdrafts on net settlement systems actually refer to net debit positions. Since if one or more parties on a net settlement network are net creditors, then at least one other party must be a net debtor. It follows that banning daylight overdrafts on private networks would mean that a bank could incur a debit only if it were receiving an offsetting credit in return. Such a ban would, in all likelihood, be so costly as to eliminate net settlement systems entirely.

Daylight overdrafts could be banned on a gross settlement network. If daylight overdrafts on Fedwire were totally forbidden, so that transfers could only be made if banks had sufficient funds in their reserve accounts to cover them, sender risk would still exist to the extent that sending banks extend

overdraft credit to their sending customers. However, receiver risk to the public would be eliminated. Thus, from a risk reduction standpoint, banning overdrafts would be the most effective course of action, at least as far as Fedwire is concerned. Unfortunately, such a policy would be fraught with difficulties.

Forbidding Fedwire overdrafts would be costly to the banking system and its customers because transfers would have to be held until covering funds were provided, thus depriving institutions of flexibility in making transfers. The results would be the intraday analogue of forbidding short-term credit by which businesses bridge gaps between payments and receipts. Of course, this is not to argue that the current level of overdrafts is somehow optimal, but rather that some overdrafts may be justified on efficiency grounds.[19] If daylight overdrafts are permitted, however, there is no reason why they should be given away as free credit.

From an operational standpoint, banning daylight overdrafts would be costly if one were to insist on "real time" (second-to-second) monitoring of Fedwire transfers in order to stop overdrafts before they occurred. A less costly approach would be to monitor transfers ex post and then to levy heavy penalties in order to deter would-be violators. Finally, a strict ban on daylight overdrafts on Fedwire could easily be evaded by shifting transfers to one of the private networks.

Establishment of an intraday credit market. Daylight overdrafts could eventually be banned if an intraday Fed funds credit market were to evolve. There, credit would be available for periods of less than 24 hours, possibly by lending for four-hour increments. If such a market existed, a sending bank could make the decision whether to borrow in order to send immediately or else to wait until covering funds were on hand. This would preserve the flexibility of the present system, but would shift risk to intraday lenders rather than to the Fed. Further, since risk would be borne by lenders only for a price, the costs described above would be placed back on those banks that incur them.[20] Most importantly, since intraday credit would no longer be unpriced, borrowers would have incentives to economize on risks they incur. Since effects of such a system on resource allocation are similar to pricing, further discussion will be suspended until the following section.

Pricing. An alternative perspective on the overdraft problem can be obtained from the economics of information and uncertainty.[21] Microeconomic theory asserts that, given a choice between, say, receipt of $200 for certain and a fifty percent chance of $1000, a rational person may prefer the certain $200. In other words, even if this person could expect to win $500 in such a gamble on average, he may be willing to give up some expected winnings in order to reduce uncertainty. This behavior is referred to as risk aversion, and one of its implications is that risk-averse individuals are willing to pay to have uncertainty reduced, that is, they are willing to buy insurance at some price.

Assuming that the stockholders of banks participating in a payments network are risk-averse, it follows that they would be willing to pay a positive amount to have receiver risk reduced. In other words, insurance of receiver risk is a valuable service to banks. Thus, the Fed's nonpriced guarantee of Fedwire overdraft transfers is in effect a subsidy to the stockholders and customers of participating banks. The amount of the subsidy is not the actual amount of overdrafts, but rather the premium that bank owners would be willing to pay to have receiver risk assumed by the insurer. If this insurance were explicitly priced, not only would the subsidy be recovered but banks would have incentives to take account of the risks they place on the payments system. Thus, although credit risk would still be assumed by the public, it would not be assumed for free.

One advantage of pricing Fedwire overdrafts is that it acknowledges that a certain amount of overdrafting may be optimal insofar as it helps maintain an "efficient" payments system that avoids a gridlock in which the whole system becomes jammed due to delayed transfers. Overdrafts could be monitored on an ex post basis and then charged for, say, at the end of the month. Banks would, as a result, be made

[19] For example, it has been argued that banks in unit banking states must depend on daylight overdrafts more heavily than do banks in other states. (Chicago Clearing House (1984), Appendix A) In addition, many overdrafts are apparently the result of current practices of banks buying and selling federal funds. To the extent that these practices simply reflect institutional practices that evolved as the result of permitting overdrafts, they do not affect the arguments presented here.

[20] Cf. Kenneth J. Arrow's (1969) characterization of the externality problem as "a special case of a more general phenomenon, the failure of markets to exist."

[21] See, for example, John D. Hey (1979).

aware that they impose costs on the system, and thus would have incentives to delay at least some transfers until covering funds become available. In addition, charges made on the basis of percentage of overdrafts would bear some relation to risk exposure, certainly a closer relationship than that found in the current practice of charging a flat fee for wire transfers regardless of overdraft position.

Pricing of overdrafts on Fedwire may also be desirable from the standpoint of public policy regarding competition between payments service providers. Since Congress passed the Monetary Control Act of 1980, the Federal Reserve System has been placed in the somewhat awkward position of both regulator and competitor of private banks. Although the Act contains no specific mention of "fair" competition with the private sector, the legislative history of the Act shows that Congress clearly was concerned with this subject. In fact, some have recommended that the Federal Reserve Act be amended to make such competition an explicit objective of Fed policy.[22] Despite the ambiguity of current law, however, the Board of Governors has expressed its "fundamental commitment to competitive fairness" and stated as a matter of policy that "Federal Reserve actions are . . . implemented in a manner that insures fairness to other providers of payments services."[23] Thus, since guarantee of settlement in the form of free intraday credit constitutes a competitive advantage of Fedwire over the private networks, pricing may help to stimulate competition in the provision of payment services.[24]

The major obstacle to implementing a pricing scheme on Fedwire is that it is not obvious what the appropriate price for either insurance or intraday credit is. Risk premia most certainly exist in a world of risk-averse individuals, but measuring such premia would require data that are typically not available, such as how much risk bank stockholders are willing to tolerate and the probability of settlement failure occurring. A market price for intraday credit does exist in the form of the broker call rate charged brokers for day loans, which are made so that a broker can certify a check used to pay for securities. This rate tends to float about 100 basis points above the Fed funds rate, and the loans are repaid by the end of the day.[25] The main problem with this form of pricing is that it charges a one-day rate whether the actual loan lasts a few hours or the whole day. There is no reason, however, why the rate could not be computed for shorter periods. An alternative means of pricing is to use the tax-adjusted difference between the rates on go-day bank certificates of deposit and Treasury bills as an approximation of the price of default risk.[26] The problem with this approach is that this difference fluctuates widely, and disentangling default risk from tax effects is likely to be a formidable task.[27] As another alternative, overdrafts could be charged the Fed funds rate extrapolated backwards to periods of less than 24 hours. If such a rate is too high, then it is likely that an intraday credit market would develop. If it is too low, at least it will provide incentives in the desired direction, that is, toward fewer overdrafts. Finally, a price for overdrafts could be computed from the discount rate. Since this rate is typically lower than the Fed funds rate, it is less likely to lead to an intraday funds market.

While pricing daylight overdrafts may be desirable on Fedwire, it does not necessarily follow that net debits on the private networks should be explicitly priced as well. As pointed out above, if the Fed stands ready to lend through the discount window in order to prevent systemic failure due to illiquidity of receiving banks, the costs incurred by the failed bank will most likely be borne by the banks in net credit positions against the failed bank. Since these costs represent expected costs to participants in net settlement networks, banks should take them into consideration when deciding on risk exposures. Thus, although explicit pricing of risks does not exist on the private networks, there is implicit pricing so long as banks expect the Fed to lend to net creditor banks experiencing liquidity problems due to the failure of a net debtor to settle. In addition, although the public may bear some losses if one or more of the receiving banks fails and is unable to repay borrowed funds, the Fed is compensated for taking this risk because interest is charged on discount window credit. The main problem for policymakers is to ensure that sufficient collateral is on hand to facilitate discount

[22] See Raymond Natter, "Legislative Intent Regarding Pricing of Services by the Federal Reserve Board" in U. S. Congress, House of Representatives (1984), pp. 81-91; for the recommendation, see p. 8.

[23] Board of Governors of the Federal Reserve System (1984), pp. 710, 712.

[24] The Department of Justice has also expressed its concern with such an advantage, and has suggested consideration of pricing. See U. S. Department of Justice (1984), pp. 7, 34-5.

[25] For a discussion of day loans, see Gardiner B. Van Ness III (1975), pp. 143-52.

[26] Humphrey (1984), pp. 100-l.

[27] See Timothy Q. Cook and Thomas A. Lawler (1983).

window lending should systemic failure be threatened.[28]

The existence of implicit pricing on the private networks calls into question the assertion that certain intervention by the lender of last resort creates a "moral hazard," that is to say, leads network participants to devote fewer resources to monitoring the riskiness of sending banks than would otherwise have been the case, thereby increasing the probability of settlement failure.[29] For moral hazard to exist, however, it would be necessary for banks to be able to shift the costs of their failure to monitor to other banks. At least in the case of temporary illiquidity of receiving banks, it is difficult to see how such cost shifting could occur, since borrowers must pay back, with interest, funds advanced by the Fed. Thus, if banks are not observed to engage in extensive risk monitoring, it may be due not to moral hazard but rather to their perception of a very low probability of settlement failure.

Finality of Payment. As mentioned above, finality exists on Fedwire but not on CHIPS or CashWire. In essence, finality of payment establishes a strict liability rule under which a receiving bank is made liable for all payments it accepts. Regardless of whether or not the receiving bank could have foreseen the failure of a sending bank, the receiving bank would have no recourse to the receiver. The rationale for such a condition is that overall costs would be minimized by focusing them on the party to the transaction who can reduce risks at lowest cost.[30] In other words, the receiving bank is made to bear the costs of a settlement failure because it is believed that this party is in the best position to monitor and avoid such costs. Although finality would not by itself reduce risks, it has been justified as a means of risk concentration that would in turn induce banks to take risk reduction measures, thereby minimizing costs to all parties.[31]

It is possible, however, that the receiving bank may not necessarily be in the best position to monitor sending banks, since it would require each bank to perform a credit evaluation of each participant in the system. Although rating firms exist to evaluate creditworthiness, it may be costly to obtain continually updated ratings. Thus, it may be preferable to place some liability on senders and receivers as well. There would be at least two advantages to such an assignment. First, customers using large dollar transfer networks to send funds are likely to possess the sophistication to monitor the banks with whom they deal. Second, they would, as customers, probably have fewer banks to monitor than would banks participating in a funds transfer network.

If a sending bank fails before net settlement on a network with no finality, a receiving bank that had allowed a receiver to use funds before they were finally received may now attempt to take back those funds. If the attempt is successful, the receiver now has reason to take action against the sender to recover a payment. This exposes the sender to liability. This is especially severe since that sender may have actually provided funds to the failed sending bank. If he had, then he must both attempt to recover from the failed bank and also will be subject to action by the receiver demanding payment. Thus, the sender will have incentives to monitor the riskiness of the sending bank he selects. At the same time, due to the uncertainty of recovery from the receiver by the receiving bank, there still will be incentive for this bank to monitor the riskiness of sending banks.

Finality of payment, then, is justified only if it can be shown to be the cost-minimizing assignment of liabilities. If monitoring of sending banks is costly, then it may be preferable to spread liability in order to give other parties incentives to monitor. The benefits of finality become even more dubious when one considers that lack of recourse to transferred funds may increase the probability of settlement failure for a receiving bank, and thereby increase systemic risk as well. Although finality may "insulate the nonbank sector from the effects of a settlement failure,"[32] it is not at all clear that it creates the incentives that would minimize risks from a social standpoint.

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[28] Institutions that do not have access to the discount window could be required to collateralize all daylight overdrafts, or else these institutions could be forbidden overdrafts.

[29] Stevens (1984), p. 11.

[30] This corresponds to the "cheapest cost avoider" in Guido Calabresi (1970), pp. 135-40.

[31] See Stevens (1984), pp. 10-11. Stevens also suggests that a "hands-off" policy by the Fed toward settlement failure would create incentives similar to those claimed for finality.

[32] 49 Fed. Reg. 13190.

Nonprice rationing of overdrafts. Approaches to payments system risk that ration daylight overdrafts seek to control either a bank's exposure to risk from sending banks or else the amount of risk one bank creates for the rest of the payments system. Indeed, such measures have been recommended by private sector studies.[33]

Net bilateral credit limits are drawn up by a receiving bank and specify the maximum net transfer the bank will receive from a particular sending bank.[34] By limiting the size of a net transfer, exposure of a receiving bank to a sending bank is kept within bounds. Since failure of a sending bank would inflict costs on a receiving bank, it is likely that, if bilateral limits were an effective risk reduction measure, banks would institute them. Further, if finality of payment were imposed on a system, receivers may have greater incentives to establish bilateral limits. Indeed, all private payments systems now have such limits in place.[35] However, such a measure is not without problems.

The most serious problem with bilateral credit limits is, as in the case of finality, the cost of making judgments about individual banks in order to set actual limits. Judgments would include determining for which banks to set limits, gathering information, analyzing information, and updating the limits as conditions change. Since many banks would be faced with large numbers of judgments to make, some sort of categorization may be necessary in order to obviate a separate study for each sending bank. However, this would involve a loss of detailed information, which would in turn make the resulting bilateral limits less useful.

A second problem with net credit limits is that they, like most nonprice rationing schemes, tend to be inflexible and therefore costly. Suppose a receiver is expecting a payment over a private network, but that the payment exceeds the receiving bank's net credit limit. If limits were rigid and could not be easily modified, they would preclude the bank from accepting the payment, even if there were no doubt as to the sending bank's solvency.[36] In actual practice, however, limits can be lifted to cover such situations, The result is that flexibility is preserved but the value of the limits as a risk reduction tool may be called into question.

The third problem with bilateral limits is intimately related to the second. If limits are set at relatively low levels, they may reduce risks but may also send business over to Fedwire, where no such limits exist. This problem would be even more acute if finality were imposed on private networks. Thus, the problem of competitive equity between public and private networks again rears its head.

Net debit caps attempt to control the risk a bank poses to the banking system by limiting the amount by which a bank may be "in the red" on a network or across networks.[37] Such a measure should be effective for reducing both receiver risk and systemic risk. Unfortunately, such caps have the same disadvantages of inflexibility as do net credit limits, although they do not involve as costly a set of information requirements to implement. In addition, since net debit caps would control costs external to individual banks, it is unlikely that these banks have strong incentives to establish binding caps that are likely to limit risks to acceptable levels, Thus, such caps, if adopted, would probably have to be developed by a collective effort of banks or, failing that, imposed by regulatory fiat.

Net bilateral credit limits and net debit caps may be characterized as measures which limit risks by limiting the choices of banks without altering the underlying incentive structure. In other words, neither may be expected to affect risk assignments among network participants, but rather to control the amount of risk assumed. Because both may prevent some transfers from taking place, they are likely to reduce risks in the short run. Over the long run, net bilateral credit limits are likely to prove useful to banks as means of controlling exposure to other banks in the system. However, it may be in some institutions' interests to find ways to circumvent such restrictions as net debit caps, thereby short-circuiting risk control policies. For that reason, it may be necessary in the future to institute additional policies that more directly affect the incentives of payments network participants.

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[33] See, for example, Association of Reserve City Bankers (1983), pp. 23-25.

[34] 49 Fed. Reg. 13189.

[35] CHIPS was the last system to institute bilateral net credit limits. American Banker, December 5, 1984.

[36] A likely response is to divide the payment between two networks.

[37] 49 Fed. Reg. 13188. CashWire has net debit caps of 50 percent of capital, while CHIPS is experimenting with a more complex system of caps.

Recent Policy Initiatives

As mentioned above, all private networks now have bilateral net credit limits in place. In October 1984, the Association of Reserve City Bankers (ARCB) Risk Control Task Force issued a report outlining a procedure for setting up a voluntary system of net debit caps.[38]

The caps would work as follows. Financial institutions would evaluate themselves in the areas of creditworthiness, operational controls and procedures, and credit controls. The ratings in these three areas will then be combined in order to give an overall rating-exceptional, satisfactory, or less than satisfactory. The rating would determine whether a bank would be permitted to overdraft across systems up to 2.5, 2, or 1.5 times capital, respectively. However, the limit would not apply to individual overdrafts but rather to the average maximum overdraft over a two-week reserve period. Finally, the caps would be applied across: all wholesale EFT networks, including Fedwire.

In May 1985, the Board of Governors met to discuss risk reduction measures. Generally, they agreed with the ARCB recommendations, but instituted two major changes to the net debit cap system.[39] First, in addition to a cap on average maximum overdrafts, banks will be asked to set higher caps on maximum daily overdrafts. Controls will be applied by banks to both average overdraft size and how much these overdrafts will be allowed to vary from the average. Second, average caps were reduced by fifty percent of capital for each rating category, so that a bank rating itself in the highest range could not overdraft more than twice its capital. The Board also added a fourth, lowest category, the members of which could not overdraft at all.

The regulators' role in this self-regulatory mechanism would be for examiners to review the self-evaluations and to point out areas of disagreement. Such a role is actually compatible with a results-oriented approach to regulation, in which specific objectives are established by regulators but implementation is left to the regulated industry. The older, alternative approach would be for the regulator to require specific actions to accomplish the objectives. This latter approach would only be brought into play if the former approach fails.

[38] Association of Reserve City Bankers (1984).

[39] 50 Fed. Reg. 21120 (1985). In addition, networks requesting net settlement services from the Fed will be required to institute bilateral net credit limits.

IV.

CONCLUDING COMMENTS

On its surface, the risk reduction problem has all the earmarks of the economic problem of collective action, that is, actions that are in the interest of depository institutions as a whole are not necessarily in their interests as individuals. If this accurately describes the situation with regard to systemic risk, then the current "voluntary action in lieu of regulation" solution is warranted. Because the alternative to voluntary action is more stringent imposed regulatory solution, the banking industry may well have incentives to attempt to reduce overdrafts by means of a self-regulatory mechanism.

However, this article has attempted to demonstrate that while the problem is complex, the solution need not be. On Fedwire, risk is being assumed by the public because intraday credit is granted free of charge to participating depository institutions. Thus, some sort of pricing of overdrafts or an intraday funds market may be called for. Even with pricing, Fedwire would continue to be in demand because it, unlike the private networks, provides immediate transfer of funds, On the private networks, however, pricing is not called for because risks are borne by participating banks. If the Fed lends to receiving banks through the discount window in order to prevent a systemic failure, the borrowing institutions will bear the cost, and may be expected to take this cost into account in their credit decisions. Further, even without finality of payment, it appears that costs due to settlement failure are assigned to parties that have incentives to monitor, should they perceive the potential for losses to be significant. All that is required is a commitment by the lender of last resort to supply net creditor banks the necessary liquidity to prevent a settlement failure from becoming a systemic failure, and the proper collateralization to insure that lending can proceed.

Recently, the Board of Governors has established a risk reduction policy for large dollar transfer networks. Although this policy relies largely on non-price risk control measures, the Board made it clear that it intends as a matter of long-term policy "to reduce further the volume and incidence of daylight overdrafts and other uses of intraday credit."[40] As experience is gained with risk control policies, it may be desirable in the future to consider measures that provide additional economic incentives for banks to take account of risks they create.

[40] Ibid., p. 21121.

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