

---

# The Reform of Wholesale Payment Systems

DAVID FOLKERTS-LANDAU, PETER GARBER, AND DIRK SCHOENMAKER

---

*Central and commercial banks in the major industrial countries are combining efforts to reduce the risks inherent in the world's wholesale payment systems. These reforms are beneficial, but could have an adverse impact on the liquidity of financial markets.*

---

**T**HE EXPLOSIVE growth in the volume of transactions in highly liquid national and international financial markets during the past 10 years has produced a corresponding increase in payment flows. These flows are facilitated by an interlocking network of wholesale payment systems that is at the core of the world's major financial systems. A disturbance in one of these payment systems—an operational mishap, the failure of one institution to pay another, a liquidity problem in one of the money markets—could have serious consequences for global trade and finance.

Payment systems are vulnerable because of the ubiquitous presence of unsecured and sometimes uncontrolled credit in settle-

ment systems. Because financial institutions make payments during a settlement period in anticipation of incoming payments, the failure of a major institution to settle its obligations could have a domino effect: banks that were counting on that institution's payments might be unable to meet their own obligations.

Reforms in the technically demanding and unglamorous area of payment systems have been implemented without the fanfare that has accompanied efforts to implement a regulatory capital structure based on value-at-risk models for the trading activities of global banks. Payment system reforms are, nevertheless, crucially important and should be regarded as a key component of ongoing efforts to create sound and efficient financial systems. By strengthening payment systems to reduce systemic risk, central banks have increased their degrees of freedom. Indeed, they may soon be able to strengthen market discipline by letting financial institutions fail, perhaps even those currently perceived as too big to fail, without threatening the stability of the entire financial system.

## Wholesale payment systems

Broadly, there are two types of wholesale payment systems: net periodic settlement systems and real-time gross settlement (RTGS) systems. Each is associated with particular risk control measures. A bank's exposure to settlement risk is eliminated once it receives payment in central bank

funds—so-called good funds. So, the crucial determinants of settlement risk are the size of a bank's exposure and the time lapse between sending a payment instruction and final settlement.

**Net periodic settlement.** In net periodic settlement systems, participants send payment instructions to each other over a given period of time, which are settled at the end of the period on a net basis. As there is no guarantee of their completion until settlement, payments become final only after settlement. Settlement is typically not achieved before the end of the day, although it may occur earlier through more frequent settlement.

Large-value netting schemes usually employ multilateral netting, in which the net amount of a bank vis-à-vis the clearing group as a whole is calculated. Netting significantly reduces the need for good funds, because transactors need only have a sufficient volume of the settlement medium—reserve balances at the central bank—to cover net amounts at the end of a settlement cycle. But netting arrangements expose the participants to risk as they extend large volumes of payment-related intraday credit to each other. This credit is the lubricant of the financial system: it represents the willingness of participants to accept payment messages on the assumption that the sender will cover any net debit obligation at settlement. The settlement of payments, by the delivery of reserves at periodic (usually daily) intervals, is

---

**David Folkerts-Landau,**  
*a German national, is Assistant Director in the IMF's Research Department.*

**Peter Garber,**  
*a US national, is Professor of Economics at Brown University.*

**Dirk Schoenmaker,**  
*a Dutch national, was Research Officer at the London School of Economics when this article was written and is currently working in the Bank of England's Regulatory and Supervisory Policy Division.*

## Settlement flows are huge and growing <sup>1</sup>

(billion dollars)

	1988	1990	1992
<b>France</b>			
Paris clearing house	77.2	94.1	97.0
SAGITTAIRE	8.7	26.0	44.7
Banque de France credit transfer system	20.9	27.2	32.1
<b>Germany</b>			
EAF (daily electronic clearing)	--	61.9	212.9
Daily local clearing	171.7	213.3	142.0
EIL-ZV (intercity credit transfer system)	10.0	20.7	34.9
Local credit transfer system	15.3	20.8	21.6
<b>Italy</b>			
SIPS	--	18.8	38.9
Electronic Memoranda	--	17.2	33.9
BISS <sup>2</sup>	4.0	5.5	9.3
<b>Japan</b>			
Bill and check clearing systems	124.6	132.4	112.6
Zengin	39.8	51.6	54.5
FEYCS	117.2	200.4	196.1
BOJ-NET	692.8	1,017.9	1,133.8
<b>Switzerland</b>			
SIC	69.0	87.5	95.1
<b>United Kingdom</b>			
Town clearing	54.8	34.1	9.8
CHAPS	80.4	134.9	147.9
<b>United States</b>			
Fedwire (funds)	640.0	796.4	796.8
Fedwire (securities)	367.6	399.6	558.8
CHIPS	661.6	888.4	953.2

Source: Bank for International Settlements, 1993, *Payment Systems in the Group of Ten Countries*, Basle.

Note: EAF: Elektronische Abrechnung mit Filetransfer; EIL-ZV: Eiliger Zahlungsverkehr; SIPS: Sistema Interbancari di Pagamenti; BISS: Banca d'Italia continuous Settlement System; Zengin: Zengin data telecommunications system; FEYCS: Foreign Exchange Yen Clearing System; BOJ-NET: Bank of Japan Financial Network System; SIC: Swiss Interbank Clearing System; CHAPS: Clearing House Automated Payment System; CHIPS: Clearing House Interbank Payment System.

<sup>1</sup> Daily payment flows.

<sup>2</sup> This system also handles payments between banks and the Banca d'Italia or the Treasury, which are settled across centralized accounts held at the Banca d'Italia.

therefore a key test of the solvency and liquidity of the participants.

The most serious risk in netting systems is the risk that the failure to settle by one participant will lead to a system crash. Recognizing the risk, the central banks of the G-10 countries have formulated minimum standards for netting schemes. These so-called Lamfalussy standards stress the legal basis of netting. In addition, netting schemes should include adequate procedures for the management of credit and liquidity risks. One way to contain such risks is to set limits on the size of each participant's net debit position. In addition, netting schemes should have a reserve fund to complete settlement if a large participant does not meet its obligations.

**Real-time gross settlement.** In RTGS systems, each payment is immediately settled on a gross basis. Settlement in all major wholesale payment systems occurs on the books of central banks. The direct finality of gross settlement prevents settlement failures, with their potential systemic consequences. In some RTGS sys-

tems, the central bank grants daylight overdrafts to the participating banks by guaranteeing all outgoing payment instructions, thereby preserving the liquidity and the processing efficiency of net settlement systems. Participants can make payments throughout the day and have to square their positions or erase their overdrafts only at the end of the day.

In the absence of collateral for such daylight overdrafts, however, the central bank assumes credit risk until the overdrafts are eliminated. Collateral requirements, or even the more stringent prohibition of overdrafts, minimize credit risk, but they also may significantly reduce the liquidity of the system. If good funds or acceptable collateral are not available, payments could be rejected or at least delayed until cover is obtained.

Some RTGS systems have, or are planning to add, queuing facilities. Payment messages, for which no cover is available, enter a queue to be processed when sufficient funds have been delivered to cover incoming payments. Heavy reliance on

queuing may generate significant settlement risks and thus undermine the essence of real-time gross settlement. But, in practice, only a small proportion of payments may be queued for a short time.

**Which approach?** In most of the major industrial countries discrete-time payment systems with end-of-day net settlement predominate. In 1992, more daily payment flows went through these systems than through other types of payment systems in all but two of seven major industrial countries (see table). The exceptions were the United States, where a little more than half of fund transfers were settled on a net basis, and Switzerland, where all large-value payments were settled on a net basis. In Japan, the main system, BOJ-NET, allows for net and gross settlement, but the vast majority of payments were, and still are, settled on a net basis.

In 1996, the United Kingdom switched all wholesale payments to RTGS. While the Banque de France is planning to introduce an RTGS system in 1997, the commercial banks will establish a parallel electronic netting system, for less time-critical payments, to save on the required collateral. Germany improved its main netting system in 1995; this now allows for 20-minute settlement cycles. The Bundesbank plans to merge the revamped netting system with its own gross settlement system in five years. Finally, Italy is currently overhauling its RTGS system to make it more attractive for participating banks, and the current netting schemes will be phased out.

Advances in domestic payment systems are frequently accompanied by efforts to improve settlement in money markets. By adopting electronic book-entry systems for most government and short-term money market securities, most countries have reduced the cost of trading. These countries realize that electronic book-entry systems are crucial for establishing a flexible and cost-effective means of pledging collateral in the newly planned RTGS systems.

## System reforms

Reforms in the major industrial countries are motivated by a greater awareness of the systemic risk inherent in discrete-time net settlement arrangements and, in particular, the recognition that a central bank would be obliged to intervene to avoid systemic disruption should a serious failure occur. Reforms are also driven by the growing credit-risk exposure of central banks in RTGS systems. These reforms aim to improve the safety features of domestic wholesale payment systems and to force

banks to internalize the cost of third-party risk.

**Reforms in the United States.** To control risk on the Clearing House Interbank Payment System (CHIPS)—the major international net payment system for settlement of the US dollar leg of foreign exchange transactions—the New York Clearing House imposed a system of net debit caps in 1986 and a loss-sharing arrangement backed up by collateral in 1990. The net debit cap is the sum of the bilateral credit limits granted to a bank by all other banks. The loss-sharing rules specify that each surviving bank's share in the losses should be proportional to its share in the sum of bilateral limits that were granted to the bank that failed to settle. Banks thus have an incentive to monitor the creditworthiness of other banks and to intervene by reducing their bilateral limits. But the US Federal Reserve System, in its role of lender of last resort, may still have to provide liquidity to prevent a systemic crisis.

To control risk on Fedwire (an RTGS system), in 1994 the Federal Reserve began a program to impose charges for overdrafts beyond a permissible allowance. The initial charge was 10 basis points (one tenth of 1 percent) at an annualized rate on average overdrafts during the day, beyond the allowance. Peak overdrafts—the highest level of banks' overdrafts during the day—immediately fell from nearly \$125 billion to approximately \$70 billion. A subsequent rise in the fee to 15 basis points in April 1995 had little marginal impact.

**Reforms in Europe.** The major EU countries, in the context of discussing the future monetary system in Europe, have declared their strong support for RTGS systems for wholesale payments. Three factors have led to this support. The first is the fast-growing volume of payments that has resulted in massive intraday credit exposures between banks. Rather than reducing settlement risk by net debit caps and loss sharing as in CHIPS, some European central banks would like to go further by removing interbank payments-related credit from the payment system altogether. The second factor is the doubtful legal status of netting in some countries. The third factor underlying support for RTGS systems is the opportunity that they offer for real-time delivery-versus-payment (DVP) settlement for securities transactions. Most European countries have introduced, or are on the brink of introducing, real-time book-entry systems for the transfer of securities.

Recently, the European Monetary Institute, the precursor of the future European Central Bank, published a blueprint for the new payment system for the single currency to be introduced on January 1, 1999. The new system, called TARGET (Trans-European Automated Real Time Gross Settlement Express Transfer), will build upon national RTGS systems and provide an interlinking mechanism. Each prospective member country will have to implement an RTGS system before it can join the EMU.

### **Intraday liquidity**

A common principle underlying the introduction of RTGS in Europe is that there should be no extension of uncovered daylight credit to the participating banks. These banks must have settlement funds, in the form of reserves or collateral at the central bank, before they can make payments. Otherwise, settlement delays could occur, thereby defeating the purpose of introducing RTGS—namely, ensuring the direct finality of payments. In short, a certain amount of intraday liquidity is crucial for the smooth running of the system. Two sources of intraday liquidity are reserves and daylight overdrafts. In Europe, daylight overdrafts extended by central banks will be subject to collateralization.

**Reserves.** Although some central banks consider reserves important, reserve requirements—expressed as a percentage of banks' eligible liabilities—are rapidly declining while payment flows are increasing. Non-interest-bearing reserve requirements are increasingly difficult to enforce in today's global financial markets, as banks tend to find ways around them. In an environment with low or zero reserve requirements, reserves are not enough to provide the intraday liquidity needed for a smoothly functioning RTGS system. Central bank overdrafts, whether collateralized or not, are then necessary to achieve adequate intraday liquidity.

**Collateral.** As a second source of intraday liquidity in the newly designed European RTGS systems, central banks will provide collateralized daylight money. This will effectively convert collateral pledged by commercial banks into central bank money that can be used for settlement during the day. A crucial issue centers on which securities can be used as collateral. Not surprisingly, because of the creditworthiness of the issuer, government securities appear prominently on the lists of eligible securities. Pledging collateral is expensive. In the United Kingdom, for example, it is

estimated that the opportunity cost of pledging collateral to guarantee timely settlement could be as high as 25 basis points on an annual basis.

Electronic book-entry securities settlement systems, in conjunction with securities depositories, are crucial for flexible and cost-efficient pledging of collateral at central banks. The United Kingdom and France already have well-functioning book-entry systems, which allow for the transfer of securities in real time. The recently introduced Italian system for real-time transfer of government securities is not yet widely used, while the German system is not capable of transferring securities in real time.

### **Impact on market liquidity**

The United States and various European countries use two different methods for reducing the risk faced by central banks in RTGS systems. The Federal Reserve allows uncollateralized overdrafts, but it charges for daylight overdrafts. By contrast, various European central banks allow overdrafts that are collateralized by eligible paper, but they do not levy a finance charge. Both methods give users incentives to avoid tapping daylight credit from central banks, but they differ in two important respects: namely, central banks' credit risk and pricing of money market instruments.

**Credit risk.** Under the Federal Reserve's system, the Fed continues to bear credit risk but is partially compensated by overdraft receipts. Fees are not based on credit risk calculations but are designed to provide an incentive to reduce overdrafts. Nevertheless, the evidence suggests that the overall risk from overdraft default may have been reduced very little by the overdraft charges. Large losses most likely will be incurred when a large bank fails or during a liquidity crisis, when payment traffic is abnormally high and imbalances are unusually large. Under such conditions, the charges are not a disincentive for a failing bank to fire out payments.

By contrast, various European central banks allow collateralized overdrafts, but do not levy a finance charge. Thus, these central banks eliminate their day-to-day credit risk from the RTGS systems, but they forgo revenue from overdrafts. In a severe situation, however, there may be insufficient collateral to manage payment traffic. Collateral may have to be delivered to the central bank in overnight discount operations, and uncovered payment traffic may surge. In this case, there must be an escape mechanism, whereby the central bank provides uncovered credit rather than

allow the payment system to seize up. In such a situation, weak institutions would likely collapse, leaving the central bank with an uncovered loss. To prepare for this eventuality, it may be desirable to charge interest on daylight overdrafts to establish a loss reserve.

**Pricing of securities.** The two methods also have different impacts on the pricing of money market instruments. The Federal Reserve method tends to increase yields on treasury securities relative to those on non-treasury securities, while the European method tends to reduce yields on treasury and other eligible securities relative to those on non-treasury securities.

Looking at the United States, treasury securities typically are the most liquid securities and therefore carry a liquidity premium that is reflected in relatively low yields and narrow bid-ask spreads. Liquidity is provided by a massive trading and dealer financing operation, which means that treasury securities generate a large share of the overdrafts in payment systems. Alternatively stated, the existence—until very recently—of unpriced overdraft facilities is one of the underpinnings of treasury security liquidity.

Charging for overdrafts amounts to a charge on the most liquid securities, for these generate the bulk of total payment volume. Banks will pass this charge on to dealers, who must respond by widening spreads to cover the added costs. This makes treasury securities less liquid—and less attractive—so their yields must rise to compensate the ultimate holder for this erosion in quality. Other, less liquid securities—non-treasuries and off-the-run treasuries—will, on average, attract a far smaller pass-through of overdraft charges, because trading in them is less frequent. Thus, their yields should rise less than the yields on liquid securities, such as treasuries. In sum, a charge on payment services more strongly affects securities that generate extensive payment flows.

Next, consider the effects of imposing 100 percent collateralization on overdrafts on RTGS systems, like those that prevail in various European countries. Though some private paper will be eligible as collateral, here we concentrate on government securities, because they probably comprise the bulk of eligible paper. We assume that the increased usefulness of such paper in allowing overdrafts will increase banks' demand for it—that is, the collateral constraint is binding. The cost of pledging collateral is analytically similar to charging a fee for daylight overdrafts. Again, the yield

on nongovernment securities—that is, “ineligible” paper—will rise because of this cost, but not that much, as such paper typically trades little and makes relatively rare use of overdrafts. For government securities, the story is different. On the one hand, their liquidity is reduced by the new collateral cost, resulting in higher yields. On the other hand, demand for such securities by banks must increase because of the need for government securities to collateralize overdraft positions. For this reason, the yield on government securities must fall. The net impact is not clear. What is clear, however, is that the European method of collateralization favors government securities and other eligible securities over private securities.

## Conclusion

The growth in the volume of national and cross-border financial transactions during the 1980s and the corresponding increase in the size of the flows through the world's principal wholesale payment systems—domestic and international—have led the major central banks to focus on the risks inherent in current wholesale payment arrangements. By now, it is well recognized that any interruption in wholesale payments carries with it the threat of a payment gridlock that ultimately could have serious consequences for the real economy. This threat has provided the urgency for the ongoing reform of wholesale payment systems.

In evaluating the success of current efforts to strengthen the world's wholesale payment systems, two related issues must be taken into consideration. The first issue is that reductions in systemic risk come at a price. In particular, a reduction in payment-related credit reduces liquidity in financial markets—that is, it increases bid-ask spreads for financial instruments roughly in relation to the share of daylight overdrafts that arise as a result of trading in these instruments. Payment patterns can be altered to lower overdrafts, but trading patterns in securities markets cannot easily be rearranged. Yet separating the timing of payments would only increase settlement risk.

In any event, intraday credit has economic value; therefore, intraday credit markets are likely to develop: payments made early in the day may command a discount, while payments made late in the day may command a premium. A quantitative analysis of the relation between the size of payment-related overdrafts and liquidity in financial markets has proved elusive thus

far, but once data from ongoing experiments become available, such an analysis will be both possible and beneficial.

The second issue that must be taken into account in evaluating reforms is that they may lead to private sub-netting systems. Such systems may be established as low-cost alternatives to RTGS systems, where the cost of daylight credit has been increased through collateralization or interest charges on overdrafts. Thus, determined efforts to reduce daylight credit in central banks' wholesale payment systems may only shift it into private netting systems, and doing so might distort payment patterns. Managing risk in an environment where it can be clearly observed may be preferable.

The main cost of reducing payment-related credit is its negative impact on market liquidity. The main benefit of reducing such credit is that a financial disturbance would no longer pose the threat of payment gridlock in a large part of the financial system. Once this threat is minimized, central banks will no longer need to stand ready to rescue a large number of institutions that are perceived as too big to fail. Payment system reforms thus hold the promise of strengthening the market mechanism in banking and finance and of reducing the extent of the financial safety net.

While payment system reforms have been largely successful, a host of technical issues have yet to be addressed. Some of these arise in the context of continued growth in international cross-border payments and securities transactions. This growth will require linking the major RTGS systems (for example, linking Europe's national RTGS systems under TARGET) and linking RTGS systems with securities settlement systems to put transactions on a delivery-versus-payment basis.

Another set of issues arise in the context of the increase in national RTGS systems. At the moment, only a few commercial banks are members of more than one system, but the number of such banks will likely increase. With the globalization of securities markets, banks will need to keep collateral balances in European-type systems. Yet doing so will be highly inefficient for global institutions, as these balances could remain idle most of the time. Thus, arrangements for a global collateral pool may have to be explored. The successful resolution of all these issues will require continued cooperative efforts among the major central banks. F&D