

# International Settlements: A New Source of Systemic Risk?

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**T**HE VERY REAL SIGNIFICANT SOCIAL COSTS OF SYSTEMIC RISK HAVE LONG SERVED AS AN IMPORTANT RATIONALE FOR A FEDERAL PRESENCE IN THE DOMESTIC PAYMENTS SYSTEM.<sup>1</sup> RECENT MARKET DEVELOPMENTS HAVE HEIGHTENED CONCERNS ABOUT THE POTENTIAL FOR SYSTEMIC RISK IN THE PAYMENTS SYSTEM. FIRST, THE SHEER GROWTH IN LARGE-VOLUME PAYMENTS HAS RAISED THE POTENTIAL COSTS SHOULD A NUMBER OF INSTITUTIONS FAIL. SECOND, TECHNOLOGY AND TECHNOLOGICAL CHANGE SEEM TO BE REDEFINING THE KINDS OF TRANSACTIONS TAKING PLACE AS WELL AS INCREASING THE SPEED WITH WHICH THESE TRANSACTIONS CAN BE COMPLETED AND FUNDS TRANSFERRED. FOR EXAMPLE, BOTH COMPUTER AND OPTIONS PRICING TECHNOLOGIES NOW PERMIT THE UNBUNDLING, RESTRUCTURING, AND CREATION OF TRANSACTIONS (SUCH AS SWAPS AND DERIVATIVES) WHOSE RISKS, LEGAL STATUS, AND RELATED CHARACTERISTICS ARE JUST NOW BEGINNING TO BE UNDERSTOOD.

A third dynamic behind the increased concern about systemic risk in the payments system is the globalization of financial markets, which is tying economies and markets together in ways that introduce additional issues about the mechanisms by which traditional clearing (the notification and transfer of documents and orders to purchase and sell assets) and settlement (the transfer of final payment) take place. Finally, the fears about the supposed potential for systemic risk associated with

clearing and settlement loss have been given greater credence by the lack of internal controls within major institutions, which have been exposed by the actions of rogue traders in Kidder, Bankers Trust, and Barings (see Edwards 1996). As the problems in these institutions have been unwound, greater appreciation has emerged of just how complex and segmented the institutional arrangements for clearing and settling transactions have become.

Despite the fact that securities, futures and options, and derivatives are increasingly cleared under a variety of institutional arrangements, final settlement usually takes place in the interbank market. In general, clearing of transactions—be they securities, derivatives, or other assets—is almost exclusively done by the private sector while settlement can take place in the wholesale banking sector or through central banks (see BIS 1997b).<sup>2</sup> Markets have become tiered as more and more transactions are cleared through several layers of institutions before they are ultimately settled (see Corrigan 1990). Equally important, the introduction of new instruments, such as swaps, collateralized mortgage obligations, and off-exchange derivatives, and their associated methods for transferring cash flows and settlement relationships have resulted in seemingly unrelated markets and institutions being linked together in ways that both create and may de facto transfer risks from one market to another. Increasingly, these transactions and markets are assuming an international dimension that can also have significant domestic market implications (see BIS 1997b).

This article examines whether internationalization has changed the nature of and potential vulnerability of the financial system to systemic risks and looks at a method to mitigate them. The Lamfalussy Report, which examined and proposed standards for payments systems settlement and risk control features, indicates that system vulnerability is critically linked to the length of time that participants are exposed to credit and liquidity risks (see BIS 1993b). The analysis presented here suggests that regulatory and legal structures can also have systemic risk dimensions. As to the fundamental question of whether new risks are being introduced, the answer seems to be no. Moreover, recent institutional and regulatory developments may act to reduce the potential scope and the size of these risks and limit implicit taxpayer liabilities should these risks be realized.

### Risks in Payments

Regardless of the institutional arrangements, there are four generally accepted generic types of payments system risks that have been identified and have been the focus of much attention. These include operational, legal, credit, and liquidity risks (see Eisenbeis 1995 or BIS 1997b). While it is easy to differentiate these risks conceptually, in reality they tend to be interrelated. The realization of one can lead to occurrences of the others, and this dynamic has not changed with the evolution of the new instruments and markets just described. These interrelationships among risks can

be illustrated by considering credit risk, which arises when the purchaser of an asset defaults by failing to settle any or all of its obligations. Credit risk arises as a logical by-product of separating the clearing and settlement functions, which under current institutional arrangements nearly always involves an extension of temporary credit.

Credit risk is a function of the potential loss exposure when a buyer initiates a transaction ordering its bank to transfer funds but then cannot make payment without going into an overdraft situation. The buyer's bank, which is attempting to settle on behalf of the buyer, is faced with essentially three alternatives. First, it can provide credit to the customer until funds are received. Second, the transaction can be canceled, or the bank can complete the transaction itself. If the buyer's bank takes the place of the customer and completes the transaction, it may then take possession of the goods or asset (or any other of the customer's available collateral) and proceed to unwind the transaction. Finally, in the extreme, the buyer's bank can default on its own obligation to settle if the time for settlement has not yet occurred.

If the buyer has good collateral and a sound credit rating, then extension of credit may be the best alternative. Canceling the transaction may not be an option, especially when delivery of the good or service has already taken place and there is no available collateral.

Settlement failure in this example could be controlled if the buyer's bank were to put a hold on the buyer's funds at the time payment is initiated, collateralizing the transaction. Organized futures markets effectively accomplish this control through the use of margins, mark-to-market accounting, and settlement requirements. For good customers, however, collateralization may not be necessary, practical, or efficient, especially if both the probability of default and the expected loss are small relative to the bank's resources. The lack of a hold or similar type of collateral policy illustrates that an institution's vulnerability and exposure to credit risk often results from the underlying conventions, practices, and

**Recent market developments have heightened concerns about the potential for systemic risk in the payments system. . . . As to the question of whether new risks are being introduced, the answer seems to be no.**

1. See Benston and Kaufman (1995) for a review of the evidence on fragility and systemic risk.

2. For a discussion of the risks and recent developments in exchange-traded derivatives markets, see BIS (1997a).

structures of the markets involved rather than from the realization of performance risks associated with the underlying projects and investments.

As markets have become increasingly global, differences in timing and clearing and settlement conventions and differences in bankruptcy laws can add important temporal and other dimensions to credit risks not always found in domestic markets. This consideration was clearly demonstrated in 1974 when Herstatt Bank failed and was closed by German authorities. Herstatt had entered into agreements to exchange deutsche marks for dol-

lars. The mark leg of the transaction was settled, but the dollar portion was not settled in New York at the time Herstatt was closed since the deadline on CHIPS (Clearinghouse Interbank Payments System) for final settlement was approximately 4:30 P.M. eastern standard time. This difference in settlement times for the two sides of the trans-

action left the counterparties to the foreign exchange transaction thinking that they had more funds than they did. When the dollar transactions failed to settle, the result was large losses to the U.S. counterparties. This temporal dimension to credit/systemic risk has come to be known as Herstatt risk and can be very large.<sup>3</sup>

A more recent example of this type of event is the closing of the Bank of Credit and Commerce International (BCCI) in 1991. The Industrial Bank of Japan had paid 44 billion yen into BCCI's branch in Tokyo, for which payment was to be received in New York from BCCI's New York branch. When BCCI was closed, the dollar portion of the transaction was never completed, and Industrial Bank of Japan became a creditor for \$30 million.

These examples may at first look like ordinary credit risk in that loss exposure resulted from the inability of Herstatt and BCCI to pay. But the incidence of the losses and ultimate position of the banks' creditors was determined by both home country laws and the intervention policies of their regulatory authorities, whose actions usually cannot be easily predicted or priced.<sup>4</sup> The losses to dollar counterparties in the Herstatt case were the consequence of the timing of the closure of the institution rather than the realization of estimable default risk. Had the German authorities waited until the U.S. dollar markets had settled, then the losses to those expecting

dollar transfers would not have occurred and the risks would not have been realized. Such exposure is better characterized as settlement uncertainty rather than settlement or credit risk since it is not possible to estimate reliably and cost out the implications associated with the vagaries of sometimes untested statutes governing transactions and of regulatory actions and policies. Note, too, that although the size of the losses may not have been affected by the closure timing, the distribution of the losses was significantly affected by legal structures and governmental action. At the same time, numerous initiatives by governmental bodies such as the Federal Reserve and the Bank for International Settlements (BIS) are continually seeking to identify and institute policies to limit these problems (see Bank of England 1994 and BIS 1989, 1990, 1993a-c, 1997a, b).

Herstatt-type risk can also be involved solely in dollar clearing systems. In Asia the Chase Manhattan Bank operates a dollar clearing and settlement service through its Tokyo branch. The system provides a limited overdraft facility and promises finality of settlement guaranteed by Chase Manhattan. Participants are permitted to settle overdrafts in New York across the Tokyo/New York business day. Furthermore, Tokyo balances at the end of the day may be transferred to New York through the New York offices of Chase or Tokyo banks or through CHIPS. In this system any problems that may arise in this satellite settlement and clearing system quickly have the potential to transmit liquidity and credit risk from Asia to New York, and ultimately to the Federal Reserve, if it affects CHIPS, Chase, or significant New York correspondents. A failure to settle in New York on payments guaranteed in Japan by Chase creates a form of Herstatt risk that would end up having to be resolved in New York. At present, concern about such clearing and settlement systems stems from the sheer size of the potential losses rather than from a true understanding of well-articulated scenarios on how the risks would be played out.<sup>5</sup>

### Sources of Payments Uncertainty

Whenever clearing and settlement of financial assets are separated in the international arena, a given country's rules usually establish the exact point in time that a transaction has been completed and the obligation satisfied. The issue centers on transaction finality and the legal criteria for when debts are discharged and who bears the losses in the event of default. Finality usually occurs when the party selling the asset actually has "good funds" and the transaction is both irrevocable and unconditional. Importantly, since many central bank settlement systems can involve the extension of intraday credit, finality may or may not correspond to the time that the buyer actually settled. For example, because Fedwire provides finality as a matter of Federal Reserve policy, acceptance of a payment order

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carries with it the “guarantee” of good funds to the receiver and also discharges the debt, since the sender’s reserve account is debited and the receiver’s bank account is credited, even though the sender’s bank may default on the settlement of its reserve account with the Fed at the end of the day. When the settling institutions are located in two separate countries, the specifics of the transactions in terms of settlement, discharge of debt, and so forth may sometimes be governed by the laws of two separate countries and, if transactions involve clearinghouses, the laws where they are located as well.

The legal status of claims can quickly become very murky when the problems involved in settlement failures in cross-border bilateral and multilateral netting arrangements are examined, especially those transactions involving forward-dated contracts in foreign exchange, derivatives, and other cross-border markets (see BIS 1997b). Under netting systems, debt and credit orders are cumulated, and only the net difference is transferred at an agreed-upon time. This procedure contrasts with real-time gross settlement systems (RTGS), which continually process and settle transactions as the orders are received. Final disposition of the liability under netting systems depends critically on the legal rules governing the disposition of debts and transactions in the event of a default or bankruptcy.

As an example, if two institutions have entered into a bilateral netting arrangement, then completion of all the transactions subject to the arrangement is contingent on settlement of the net position. Should one of the parties fail to settle because of a bankruptcy, all the gross transactions subject to netting may have to be undone. The determining factor here depends upon the legal rules affecting the markets in which the transaction was settled. Since the legal rules may differ according to where settlement takes place, and this location may be beyond the receiver’s control, settlement uncertainty may exist.

The exact status of cross-border transactions, therefore, is determined by several sets of laws. These include

the laws governing bilateral netting arrangements and those governing the particular settlement market involved as well as the bankruptcy provisions and other related laws of the country of the failed institution (or the laws of the resident country if the transaction is recorded on the books of a branch of the failed bank). For example, netted transactions may or may not be regarded as discharged. The bankruptcy court with jurisdiction over the transactions may decide to unbundle netted transactions, demanding payment for debts owed and disavowing liabilities to creditors. In addition, country bankruptcy law may give creditors the right to offset their liabilities to a failed entity against their claims on that entity. Thus, debts owed on foreign exchange may be discharged with debts on securities, loans, or any other assets. Not only do the bankruptcy laws affect the size of the losses but also the way in which the losses may be apportioned across various creditors.

The legal situation in multilateral netting arrangements introduces complexities several orders of magnitude greater than those affecting bilateral arrangements. There is considerable variation across countries in treatment of transactions, and thus uncertainty exists about how particular bankruptcies will be treated. The key point is that this legal uncertainty often can undermine the efficiency of bilateral and multilateral netting arrangements and creates the very real possibility that systemic risks could be heightened rather than reduced when the laws governing netting are not uniform across countries. Because these legal uncertainties complicate

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3. Notice, however, that it may be a misnomer to call this type of event risk, at least in the Frank Knight ([1921] 1971) tradition; see also Hu (1994). The incidence of loss resulted from the German governmental action, which seems almost impossible to assign a probability to, and hence may be better characterized as regulatory uncertainty. See BIS (1996) for a comprehensive discussion of risks in foreign exchange markets and efforts that both private- and public-sector entities have made to identify, monitor, and control these risks.
4. Bankruptcy statutes can clearly affect the distribution of claims as well. For example, some countries have what is known as a zero-hour rule, which means that transactions taking place after the time the institution is legally closed are regarded as invalid and will be unwound.
5. See, for example, General Accounting Office (1994). An exception is Edwards (1996), who describes the possible paths of a breakdown in derivatives markets. He describes a scenario in which an end-user fails to meet its obligations as a counterparty. This failure in turn brings down a major dealer, thereby spilling over to both other counterparties and dealers. These disruptions are then transmitted to other markets as uncertainty both raises contract prices and leads to reluctance to enter into contracts. There are then price breaks, credit disruptions, falling asset prices, and, ultimately, real effects. Edwards analyzes the likelihood that such a scenario would be realized and concludes that true dealer credit exposures are small and substantially smaller than their exposure on loans and other assets.

assessment of the likely outcome of a default scenario for many transactions, authorities have paid great attention to putting transactions on a common legal basis and, as discussed in the next section, some nations have moved to establish real-time gross settlement as the basis for clearing and settlement.

### Responses to Uncertainty

Both private- and public-sector entities have responded to the increased uncertainties, market risks, and evolving market technologies in many interesting ways. The responses affect contract design and the micromarket structure of exchanges and their rules governing transactions. They have given rise to proposals to change laws governing transactions and sug-

gestions to increase governmental cross-border cooperation in financial rules, regulation, and supervision as well as changes in the structural design of transfer systems.

Given the complexity of financial transactions and their interrelationships, measuring, monitoring, and pricing what institutions' true risk exposures to each other are and how

these risks flow directly and indirectly through relationships with related customer groups is difficult. For example, Customer X may have several relationships with its primary bank (Bank A). These might include a loan, a swap, a deposit account, and several foreign exchange transactions. Customer X may also have similar relationships and transactions outstanding with Bank B. In addition, Bank A may also have made loans in the form of advancing federal funds to Bank B. If Customer X fails, the entirety of its net position with Bank A across all the relationships and transactions represents its net direct risk exposure. Bank A may also be indirectly exposed through Bank B if the customer's default causes Bank B to default on its federal funds obligations to A's primary bank.

Measuring and monitoring these interrelated exposures across the world, across different markets and time zones, is a truly daunting modeling and monitoring problem. It is made even more so by the dynamic and continual evolution of new instruments and markets.

Central bank and market responses to these challenges have been to substitute rules and other mechanisms to control customer risk-taking incentives. A

number of control mechanisms have been designed to limit uncertainty and to provide incentives for member institutions to control their own risk exposures. These include maintenance of adequate capitalization, reliance upon contract design to allocate risk and losses, collateralization of transactions, use of outside guarantees and bonding, pricing, imposition of system membership requirements, and self-imposed (and system-mandated) caps and other limits on risk exposure to individual and related parties. For example, in the United States, the Federal Reserve imposed limits in 1986 on participating banks' net exposures across Fedwire and CHIPS as well as bilateral limits on exposures to individual participants. Collateralization of certain positions is also required, and the system charges for intraday credit that is extended.

Contracting activities also have focused on apportioning risks, defining performance, and allocating losses among participants in a payments system or exchange in the event that a default occurs. Because of the difficulties in continuously measuring and monitoring total risk exposure to individual system members, caps on the amount of exposure with any member have been imposed, and the system imposes a similar total cap across all system members. In the case of the U.S. CHIPS system (which is not a real-time gross settlement system), participants require same-day settlement, engage in real-time monitoring, have established limits on exposures, have required collateral to cover the largest two exposures, and have instituted a loss-sharing arrangement.<sup>6</sup> System members also impose various types of membership and participation requirements, such as the maintenance of minimum capital requirements.

It has also been recognized that accounting rules—such as mark-to-market requirements—can affect the ease of information transfer and reduce monitoring costs. Such rules have been especially widely used in the case of futures, options, and commodities exchanges.

Finally, systems are evolving toward real-time gross settlement despite the supposed efficiency advantages of netting arrangements. Real-time gross settlement systems require those engaging in payments activities to collateralize payments fully as they are initiated. The benefits of doing so are weighed against the costs of uncertainty and credit risks. Such systems contain inherent incentives for institutions engaged in offering payments services to price and monitor their exposures. Furthermore, real-time gross settlement reduces risk exposure by limiting the duration of both credit and liquidity risk.

The first real-time gross settlement system was the Federal Reserve's Fedwire (see BIS 1997b). By the end of the 1980s, six of the Group of 10 countries had instituted RTGS systems. As the European Union proceeds, Lamfalussy Standards (BIS 1993b) specify that RTGS systems must be in place, and the union's umbrella set-

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**TABLE 1**  
**Features of Selected Funds Transfer Systems**

Country	System (Planned)	Type	Date	Central Bank Daylight Credit
Belgium	ELLIPS	RTGS	1996	Yes
Canada	IIPS	Net	1976	
	(LVTS)	Net	1997	
France	SAGITTAIRE	Net	1984	
	(TBF)	RTGS	1997	Yes
Germany	EIL-ZV	RTGS	1987	Yes
	EAF2	Net	1996	
Italy	BISS	RTGS	1989	
	(BI-REAL)	RTGS	1997	Yes
	ME	Net	1989	
	SIPS	Net	1989	
Japan	BOJ-NET	Net+RTGS	1988	No
	FEYCS	Net	1989	
Netherlands	FA	RTGS+Net	1985	
	(TOP)	(RTGS)	1997	Yes
Sweden	RIX	RTGS	1986	Yes
Switzerland	SIC	RTGS	1987	No
United Kingdom	CHAPS	RTGS	1984	Yes
United States	CHIPS	Net	1970	No
	Fedwire	RTGS	1918	Yes

Source: BIS (1997b).

tlement system, Target, which will link settlement systems within the union, is also designed as a real-time gross settlement system. The progress of the European Union and the European Monetary Union have also contributed to the conversion of netting systems such as the U.K. CHAPS system to real-time gross settlement even though the United Kingdom is not projected to join the European Monetary Union initially. Table 1 briefly summarizes some of the salient characteristics of settlement systems in selected developed countries and illustrates the extent to which they are evolving toward real-time gross settlement.

### Conclusions and Implications

**T**he present path on which payments systems are moving involves a seeming contradiction. On the one hand, markets are becoming more integrated

and global in scope. At the same time they are becoming more segmented in the sense that there is a growing separation evolving between the clearing and settlement of transactions. This increasing separation raises the prospect that there may be a need to invoke the safety net and introduces a possible distortion into the international payments system. As a consequence, both public-sector and private markets have given great attention to attempting to identify and control risk exposures. Perhaps one of the more interesting developments in this evolution of regional and globalized payments markets in both the public and private sectors has been the push toward real-time gross settlement systems with collateralization. Nowhere are these efforts more apparent than in Europe, where the struggle to create a single financial marketplace has focused attention and generated analyses of the underlying issues, with the Bank for

6. Real-time gross settlement may also improve risk management. In the case of derivatives clearinghouses, real-time gross settlement facilitates the use of intraday margin calls and the receipt of final funds before the end of the day.

International Settlements, the Group of Ten, and central banks spearheading much of this work.

Casual empiricism suggests several reasons why the systems are evolving in this direction despite considerable analysis suggesting that netting arrangements are more operationally efficient. The first reason is that systems, instruments, and markets are evolving faster than the political entities can bring their various rules and regulations into harmony despite the many initiatives that have been undertaken. Second, harmonizing systems to control effectively the systemic risks (such as Herstatt risk) inherent in nonsynchronized clearing and settlement systems, such as foreign exchange markets, even if all the legal rules are in place requires extensive interna-

tional coordination and cooperation. Third, central banks realize that, regardless of the explicit rules governing exchanges and settlement arrangements, they still may be thrust into the role of the lender of last resort should major participants get into financial difficulties that threaten to bring down settlement and clearing systems. In the United States, the decline in member bank reserve balances reduces payments system participants' liquidity positions and increases the likelihood that intraday credit may have to be extended. Finally, the movement toward expanding the overlapping hours that exchanges are open will increasingly make the operation of net settlement systems more difficult.

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