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Jeffery W. Gunther
Senior Economist and Policy Advisor

Linda M. Hooks
Assistant Professor
Washington and Lee University

Kenneth J. Robinson
Senior Economist and Policy Advisor

Mexican Payments System Reforms

Sujit "Bob" Chakravorti
Senior Economist

Financial Industry Studies

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Are Capital Requirements Effective? A Cautionary Tale from Pre-Depression Texas

Jeffery W. Gunther, Linda M. Hooks,
and Kenneth J. Robinson

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Capital requirements are now a primary ingredient in efforts to supervise and regulate the banking industry. Their main purpose is to protect the deposit insurance fund and to minimize taxpayer exposure should financial difficulties occur. Capital requirements are not new, however. Texas was one of the first states to institute formal capital requirements when it introduced a deposit insurance program early in the century. But this early attempt at capital regulation proved ineffective in preventing a complete breakdown of the deposit insurance system it was meant to protect. Using recently discovered examination data for Texas banks operating in the troubled 1920s, we show that the capital requirements were unsuccessful largely due to a reliance on book-value capital measures that overstated the true financial condition of banks. As some researchers have shown recently, the same types of problems confront current efforts to rely on measures of capital as the focus of banking supervision. This has led to recent proposals to restructure bank capital regulation, such as the pre-commitment approach.

Mexican Payments System Reforms

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This article investigates the ongoing payments system reforms begun by the Bank of Mexico in 1994. The goals of these reforms are to reduce the amount of uncollateralized intraday credit extended by the Bank of Mexico (previously unlimited), to promote a market-based allocation of intraday credit for interbank payments, and to move large-value paper-based payments to electronic form. The Bank of Mexico has been successful in achieving all of these goals to some extent. But despite this progress, like other central banks around the world, the Bank of Mexico still faces the possibility that government guarantees may weaken market discipline in the payments system.

Mexican Payments System Reforms

Sujit “Bob” Chakravorti
Senior Economist

Financial Industry Studies Department
Federal Reserve Bank of Dallas

As with the other major financial reforms initiated since the late 1980s, Mexico’s recent efforts to enhance the role of market-based decisions in the payments system represent a significant step in the right direction.

Since the late 1980s, Mexico has engaged in a series of far-reaching financial and economic reforms. These reforms include the privatization of its banks and other state-owned enterprises, interest rate deregulation, an easing of reserve requirements, reductions in restrictions on trade and foreign bank entry, and an overhaul of the payments systems.¹ This article investigates the ongoing payments system reforms that Mexico began in 1994.

The safe and efficient transfer of monetary value in exchange for goods, services, and financial assets is vital to any market economy. The apparatus used to transfer monetary value is the payments system. For the purpose of analysis, the payments system as a whole can be divided into large-value and small-value systems. Large-value, or wholesale, payments systems are primarily used to transfer funds between banks, and the average value of each transfer is relatively large. Folkerts-Landau, Garber, and Lane (1994) list the important functions of large-value systems: to provide the necessary infrastructure for the intermediation of household and business payments, to enable more efficient liquidity management by banks, to assist the development of security markets, and to allow for more effective implementation of monetary policy. The primary thrust of payments system reform in Mexico thus far has concentrated on large-value systems.

Small-value, or retail, payments systems process relatively small payments among consumers and businesses. Retail payment instruments include cash, checks, automated clearinghouse payments, credit and debit cards, and, more recently, electronic money.² Pingitzer and Summers (1994) state that “the efficient operation of a market economy depends on the availability of a smoothly functioning small-value transfer system that connects all economic agents.”

Although financial analysts agree that large-value payments systems should be safe and efficient, there is little consensus on their optimal design and operation. Major differences exist in the types of large-value payments systems employed in developed countries.³ As a result, developing countries seeking to enhance their integration with international capital markets face difficulty in identifying the most appropriate blueprint for strengthening their own large-value systems.⁴ Mexico provides an interesting example of the recent push to enhance the safety and efficiency of large-value payments systems in emerging financial markets.

In early 1994, the Bank of Mexico, the

Most of my understanding of the Mexican payments systems is based on interviews and written correspondence with the major players in the Mexican financial markets. I benefited from conversations with Juan Antonia, Gilberto Calvillo, Abdón Sánchez-Arroyo, and Francisco Solís at the Bank of Mexico, Héctor Pérez Galindo and Carlos H. Garza at INDEVAL, and individuals at other institutions that are major players in the payments systems described. In addition, I would like to thank Alton Gilbert, Jeff Gunther, Genie Short, Ed Stevens, Bruce Summers, and Jim Thomson for comments on previous drafts.

¹ For a discussion of Mexican financial system reforms, see Welch and Gruben (1993) and Gruben, Welch, and Gunther (1993).

² For a description of these systems, see Chakravorti (1997).

³ For a comparison of large-value payments systems, see Horii and Summers (1994) and Bank for International Settlements (1997).

⁴ For an overview of payments system issues in developing countries, see Listfield and Montes-Negret (1994) and Sato and Humphrey (1995).

central bank of Mexico, proposed reforming its payments system. The goals of these reforms are to decrease the amount of unsecured intraday credit it extends to banks over the large-value interbank payments system, to promote market discipline in the determination of credit exposures related to the payments system, and to move large-value transactions away from checks to electronic systems. The first two goals are designed to reduce payments system risk, while the last one is aimed at increasing efficiency.

Progress has been made on each of these fronts. Except under certain circumstances, the Bank of Mexico no longer extends uncollateralized intraday credit to settle payments on its large-value payments system.⁵ Instead, to maintain adequate liquidity while imposing market discipline, the Bank of Mexico implemented a net large-value payments system, in which participants send payments based on intraday lines of credit they extend to one another. In addition, the Bank of Mexico has successfully promoted this system as an alternative to high-value checks. However, some challenges remain for the Bank of Mexico in implementing the desired market discipline in the intraday credit market.

Trade-offs in payments system design

The details of the recent payments system reforms in Mexico are best understood in the context of the policy alternatives facing payments system operators in general. To provide a framework for an analysis of Mexico's reforms, this section discusses some of the major issues associated with the operation of large-value payments systems.

A safe payments system minimizes the risks involved in the transfer of monetary value. From a public policy perspective, a safe payments system can prevent the costly disturbances that result from the stoppage of clearing and settlement caused by a failure of one or more participants to settle. An example of such a stoppage occurred in the Hong Kong futures market during October 1987, when the market was closed for four days to sort out its settlement problems. The Hong Kong government, along with leading banks and brokerage firms, helped the various parties meet their obligations by extending credit totaling HK\$2 billion (US\$256 million).⁶

The risks that safe payments systems attempt to minimize are often collectively referred to as payments system risk. Payments system risk includes liquidity risk, settlement

Clearing/Clearance "Clearing is the process of transmitting, reconciling and in some cases confirming payment orders or security transfer instructions prior to settlement, possibly including netting of instructions and the establishment of final positions for settlement" (Bank for International Settlements 1993).

Clearing House for Interbank Payments System (CHIPS) CHIPS is the primary electronic large-value funds transfer system for the dollar component of foreign exchange and cross-border transactions. CHIPS, established in 1970, is operated by the New York Clearing House Association.

Delivery Versus Payment (DVP) DVP describes transactions in which delivery of an asset occurs if and only if payment occurs. Participants need not deliver good funds but only a payment instrument with the underlying value.

Fedwire Fedwire, the U.S. large-value gross settlement system operated by the Federal Reserve, is used for the transfer of funds and government securities.

Liquidity Risk The risk that a participant does not have good funds at the time of settlement, but can provide them at a later time.

Settlement "An act that discharges obligations in respect of funds or securities transfers between two or more parties" (Bank for International Settlements 1993).

Settlement Risk The risk that one party to a transaction does not deliver the underlying asset in its entirety at the specified settlement time. This asset could be good funds, another financial asset, or a physical asset.

Sistema de Atención a Cuentahabientes de Banco de México (SIAC) SIAC is the large-value gross settlement system that transfers funds between reserve accounts at the Bank of Mexico.

Sistema de Información de Depósito de Valores (SIDV) SIDV is the large-value securities transfer system. SIDV is operated by the Instituto de Depósito de Valores (INDEVAL).

Sistema de Pagos Electrónico de Uso Ampliado (SPEUA) SPEUA is the large-value funds transfer system that nets payments and settles over SIAC. SPEUA is operated by the Bank of Mexico.

Systemic Risk "The risk that the inability of one institution to meet its obligations when due will cause other institutions to be unable to meet their obligations when due" (Bank for International Settlements 1992). This definition applies in the context of payments systems.

risk, and systemic risk. (See the box entitled "Glossary of Terms.") Liquidity risk is the risk that a participant does not have good funds at the time of settlement but can provide them at a later time. Settlement risk is the risk that one party to a transaction does not deliver the underlying asset in its entirety at the specified settlement time. This asset could be good funds, another financial asset, or a physical asset.⁷ Systemic risk, as defined by the Bank for International Settlements (1992), is "the risk that the inability of one institution to meet its obligations when due will cause other institutions to be unable to meet their obligations when due."⁸

However, safety is not the only factor influencing the economic benefits provided by a payments system. An efficient payments system also promotes an efficient allocation of financial resources. At the level of individual market participants, this efficiency results in lower transactions costs. For example, a comparison of the cost differentials between securities clearing and settlement systems used in emerging markets and the United States illus-

⁵ I discuss these circumstances below.

⁶ This conversion is based on the prevailing exchange rate of 7.81 HK dollar–U.S. dollar in October 1987. For a description of this event, see Folkerts-Landau et al. (1995).

⁷ When discussing large-value payments systems, good funds are usually reserves held at the central bank by financial institutions.

⁸ Bank for International Settlements (1992), A2–7. In the broader banking literature, systemic risk is often defined as the failure of a financial institution leading to the failure of one or more financial institutions, with adverse consequences to both the financial system and the economy as a whole.

trates the potential cost savings to participants. According to Stehm (1996), the average cost to process and settle a securities trade in emerging markets is probably between ten and one hundred times greater than in the United States.

When designing payments systems, operators can choose between gross settlement systems and net settlement systems. In gross settlement systems, each transaction is settled individually; in net settlement systems, participants settle the net of their incoming and outgoing payments at the end of a specified period of time, usually a day. (For a comparison of gross and net settlement systems, see the box entitled "Gross Versus Net Settlement.") Gross settlement offers participants the immediacy of using the underlying funds and reduced settlement risk because each transaction is settled with good funds.⁹ However, these systems are more expensive for participants to use than netting systems because of the need for greater quantities of good funds to settle. Operators of payments systems must weigh the safer gross settlement system against the more efficient net settlement system.

Payments system operators often adopt policies to increase the efficiency of gross settlement systems or decrease the settlement risk of netting systems. To decrease cost to participants, gross settlement system operators may extend free intraday credit. To decrease settlement risk to participants, net settlement system operators may impose market-based debit caps and/or loss-sharing arrangements among participants. Market-based debit caps restrict the amount a participant can owe at any time during the day. Loss-sharing rules distribute the losses associated with the failure of one or more participants to settle among the remaining participants.

One area in which central banks' gross settlement systems differ is the quantity of intraday credit they extend. In this context, intraday credit is used to facilitate payment flows during the day. Payments system participants are expected to end the day with a zero balance. At one extreme is Swiss Interbank Clearing, where the Swiss National Bank, the central bank of Switzerland, extends no intraday credit.¹⁰ At the other extreme, until recently some central banks extended unlimited daylight credit. Until the mid-1980s, the Federal Reserve extended nearly unlimited daylight credit to Fedwire participants. Since then, the Federal Reserve has imposed limits on intraday credit and also charges fees based on the quantity of credit extended.¹¹ The Bank of Mexico also used to

extend unlimited and uncollateralized intraday credit to its banks to make payment over its large-value gross settlement system. As part of the recent reforms, however, the Bank of Mexico has replaced most unsecured intraday credit with fully collateralized credit.

Central banks are faced with a trade-off when deciding to extend intraday credit. By not providing intraday credit, they eliminate credit risks associated with direct intraday lending. However, such a policy may result in payment gridlock, especially in financial systems without well-developed interbank funds markets. Payment gridlock occurs when the flow of payments stops because participants are waiting to receive payments before sending them. By providing intraday credit, central banks increase intraday liquidity and prevent payment gridlock. A central bank's major concern about such a policy is the credit risk associated with intraday lending, especially if this credit is not properly priced. In addition, the reliance on central bank credit by payments system participants may distort the market allocation of intraday credit.

Another way to reduce payment gridlock that does not rely on central bank credit is to net payments instead of settling each payment individually. In net settlement systems, participants extend each other credit during the day and settle their positions with good funds at the end of the day. An example of such a system is the Clearing House Interbank Payments System (CHIPS), the large-value payments system used primarily to settle international dollar payments and dollar components of foreign exchange transactions.¹² However, such systems do not usually guarantee the immediacy of funds. In other words, good funds are not usually available until the end of the day for further transactions.

In its reform of the payments systems, the Bank of Mexico reduced its direct exposure to intraday credit risk, while maintaining sufficient liquidity. The Bank of Mexico implemented parallel gross and net settlement systems. The two net settlement systems settle over the gross settlement system at the end of the day. To decrease its exposure to credit risk, the Bank of Mexico eliminated the extension of daylight credit to banks except under certain limited circumstances. Although the Bank of Mexico eliminated direct unsecured intraday credit, it guaranteed payment of end-of-day net clearing balances arising from the two parallel netting systems. However, these guarantees may still expose the Bank of Mexico to undesired levels of credit risks.

⁹ Financial institutions usually do not earn interest on these reserves, so they attempt to minimize their reserve holdings.

¹⁰ For a description of Swiss Interbank Clearing, see Vital and Mengle (1988).

¹¹ For a discussion of these issues, see Hancock and Wilcox (1996) and Richards (1995).

¹² The risk and efficiency trade-offs of payments systems that net are modeled in Chakravorti (1996).

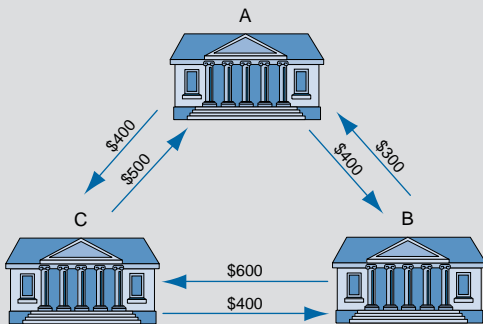
Gross Versus Net Settlement

To illustrate the difference between gross and net settlement systems, consider the following six individual payments between institutions A, B, and C:

A	→	B	\$400
A	→	C	\$400
B	→	A	\$300
B	→	C	\$600
C	→	A	\$500
C	→	B	\$400

In gross settlement systems, each institution settles each payment individually (*Chart 1*). If we assume that the central bank does not grant intraday credit, each participant would either have to wait until it is paid, borrow funds in the interbank funds market, or hold assets in the form of central bank reserves to make payment. If each bank waited until it was paid, there is a possibility that

Chart 1
Gross Settlement

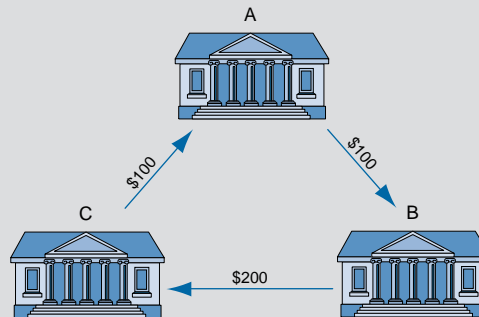


no one would send a payment, resulting in payment gridlock. Let us assume that institutions do not wait for incoming payments before sending an outgoing payment. In such a system, one cost of participation is the cost of holding or borrowing central bank reserves. For illustrative purposes, assume there is a 1 percent cost for holding or borrowing reserves. In this example, institution A uses \$800, institution B uses \$900, and institution C uses \$900. The cost for A would be \$8; for B, \$9; and for C, \$9.

Alternatively, these participants could bilaterally net payments during the day and settle at the end of the day. By bilaterally netting, an institution nets payments between itself and each of the other institutions, resulting in only one transaction with each of the other participants (*Chart 2*). In such a system, institution A only needs \$100 of central bank reserves, reduced from \$800; institution B only needs \$200, reduced from \$900; and institution C only needs \$100, reduced from \$900. The cost for A is \$1, reduced from \$8; for B, \$2, reduced from \$9; and for C, \$1, reduced from \$9.

Multilateral netting would further reduce holdings of central bank reserves by the institutions

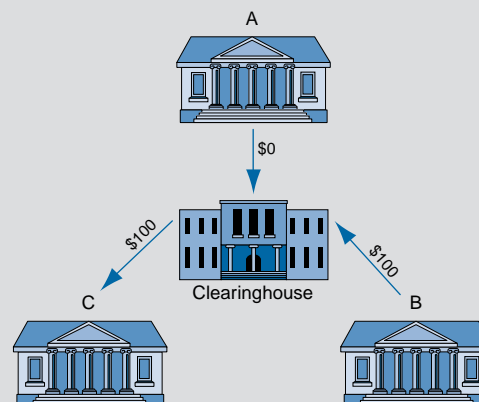
Chart 2
Bilateral Net Settlement



(*Chart 3*). In this case, institution A reduces its holdings of central bank reserves from \$100 in the bilateral netting system to \$0 in the multilateral netting system; institution B reduces its holdings of central bank reserves from \$200 to \$100; and institution C reduces its holdings of good funds from \$100 to \$0. The cost of holding reserves to A and C is zero and to B is \$1. Multilateral settlement systems require the least amount of central bank reserves to settle and are also the least costly to participants.

However, settlement of payments is not final in net settlement systems. Settlement only becomes final at the end of the day when good funds are transferred. One way to increase the efficiency of the payments system and to ensure settlement at the time of payment is for the central bank to extend free intraday credit and guarantee payment. In such systems, participants enjoy the benefits of netting, since they settle at the end of the day and also benefit from immediacy of funds due to the guarantee. But by extending free intraday credit, central banks are exposed to settlement risk, and the guarantee distorts the payments system participant's credit assessments of other participants.

Chart 3
Multilateral Net Settlement



The Mexican payments system reforms

Before the proposed reforms in 1994, the Bank of Mexico operated the Sistema de Atención a Cuentahabientes de Banco de México (SIAC-BANXICO, or SIAC), which was Mexico's only electronic large-value interbank payments system.¹³ SIAC was introduced in 1986, replacing the electronic system known as Sistema de Información Contable. Participants used SIAC to transfer Mexican pesos, U.S. dollars, and government securities. Each participant had three SIAC accounts: a peso account, a U.S. dollar account, and a securities account. The Bank of Mexico guaranteed every payment and granted free unlimited and unsecured daylight peso overdrafts to banks. However, the Bank of Mexico did charge penalty rates for overnight borrowing resulting from daylight overdraft positions.

As part of the reforms, the Bank of Mexico reorganized SIAC into three linked payments systems: a new SIAC, the Sistema de Pagos Electrónico de Uso Ampliado (SPEUA), and the Sistema de Información de Depósito de Valores (SIDV). SIAC, still operated by the Bank of Mexico, is now used primarily to settle positions from the other two systems. The Bank of Mexico replaced unlimited and unsecured overdrafts with 100 percent collateralized overdrafts. In addition, the Bank of Mexico placed limits on the size of the fully collateralized overdrafts based on bank size. SPEUA, also operated by the Bank of Mexico, is another electronic large-value funds transfer system. Unlike SIAC, SPEUA participants use uncollateralized intraday credit to make payment. However, participants face credit limits based on the credit lines they extend to one another. SIDV, operated by Instituto de Depósito de Valores (INDEVAL), a private firm, clears and settles government- and bank-issued securities and equities. Each of these systems is discussed in more detail below.

SIAC. Currently, SIAC participants hold only peso accounts at the Bank of Mexico, and payments are irrevocable. As mentioned above, most payments over SIAC must be collateralized or made with good funds, which limits the Bank of Mexico's exposure to unlimited and uncollateralized intraday credit. Most analysts agree that this policy has reduced the Bank of Mexico's risk because the value of unsecured intraday credit extended by the Bank of Mexico has decreased. SIAC's major function is to settle payments resulting from end-of-day positions from the other systems.¹⁴ These types of SIAC payments are called nonrejectable payments. In addition, some individual payments continue to

be processed over SIAC. Brokers, for example, send payments via SIAC since they are not allowed to participate in SPEUA directly.¹⁵

If a SIAC participant does not have adequate collateral for a payment and the payment is used to settle an end-of-day clearing obligation from another system, such as SPEUA, the Bank of Mexico will extend unsecured credit to the bank to allow the payment to be made. Although the Bank of Mexico thus extends unsecured credit, it charges penalty rates on such overdrafts and strongly encourages participants to avoid them. In addition to penalties for each unsecured overdraft, the Bank of Mexico imposes sanctions based on a participant's unsecured overdrafts during a given month. The Bank of Mexico may also increase collateral requirements for a participant that sends uncollateralized nonrejectable payments too often. Because the Bank of Mexico is willing to allow such payments, the receiving participant of a SPEUA payment bears no same-day liquidity risk. However, that participant does face credit risk based on its share of the loss-sharing arrangement should the sending participant be unable to meet its obligation after three days.¹⁶

After these changes were implemented in March 1995, SIAC participants learned to manage their SIAC accounts better and reduce their reliance on Bank of Mexico unsecured intraday and overnight credit. SIAC participants significantly reduced their reliance on Bank of Mexico unsecured credit after the first three months following the adoption of these policies. Of the penalties imposed for SIAC unsecured overdrafts in the first nine months after the adoption of these policies, 92 percent occurred in the first three months, whereas only 8 percent of the penalties occurred in the next six months.¹⁷ Thus, early indications suggest that the Bank of Mexico has been successful in reducing the amount of uncollateralized credit it grants to SIAC participants.¹⁸

SPEUA. SPEUA was developed to increase intraday liquidity and to decrease the risk absorbed by the Bank of Mexico. Unlike SIAC, SPEUA participants are limited to banks. In SPEUA, the participants determine the levels of intraday credit through bilateral credit lines that they extend to each other. Further, each bank has an aggregate credit limit that is the sum of the bilateral credit limits. Like SIAC payments, SPEUA payments are irrevocable, except if payments are queued.

For example, if a sending bank exceeds its credit limit, payment messages are placed in a

¹³ For a description of the Mexican payments systems prior to 1994, see Sánchez-Arroyo (1996).

¹⁴ In addition to SPEUA and SIDV end-of-day positions, SIAC also settles positions from the check clearinghouses.

¹⁵ The Bank of Mexico does not regulate or supervise brokers.

¹⁶ A bank that has defaulted on settlement has three days to meet its shortage of funds and faces penalties for the length of time it takes to settle. If the bank cannot settle at the end of three days, the loss-sharing arrangements are used. At this point, the banks that granted the defaulting bank credit share in the loss. This loss-sharing arrangement is described in the box entitled "SPEUA Loss-Sharing Arrangements." Failure to meet its overdraft within the three-day time frame is not sufficient for the Bank of Mexico to close the bank.

¹⁷ Diaz (1996).

¹⁸ A full assessment of the Bank of Mexico's success in reducing the level of intraday credit would require a comparison of the aggregate bilateral SPEUA credit granted as a percentage of the total value of payments to the aggregate overdrafts on SIAC as a percentage of total value of payments before the reforms.

SPEUA Loss-Sharing Arrangement

These loss-sharing arrangements are used after a bank has failed to settle its SPEUA obligations for three consecutive days. The additional settlement obligation (obligación adicional de liquidación—OAL) for institutions that grant credit to the defaulting institution is¹

$$(B.1) \quad OAL_{ij1} = C_{j1} \left[\frac{LER_{ij1}}{\sum_{k=1}^n LER_{kj1}} \right],$$

$$(B.2) \quad OAL_{ij2} = C_{j2} \left[\frac{LER_{ij2} - OAL_{ij1}}{\sum_{k=1}^n (LER_{kj2} - OAL_{kj1})} \right],$$

$$(B.3) \quad OAL_{ij3} = C_{j3} \left[\frac{LER_{ij3} - OAL_{ij2} - OAL_{ij1}}{\sum_{k=1}^n (LER_{kj3} - OAL_{kj2} - OAL_{kj1})} \right]$$

where:

- OAL_{ijt} = The additional settlement obligation of participant i as a result of the default of participant j on day t . Equation B.1 calculates the additional settlement obligation for day 1, equation B.2 for day 2, and equation B.3 for day 3.
- C_{jt} = The overdraft of defaulting bank j at day t . For days 2 and 3, C_{jt} measures the difference between the overdraft position on day t and the overdraft position from the preceding day, or day $t - 1$. If the difference is negative, the overdraft position for the preceding day will be recalculated.
- LER_{ijt} = The amount of the credit line extended to participant j by participant i at day t .
- LER_{kjt} = The amount of the credit line extended to participant j by participant k at day t .
- i = The bank for which the additional settlement obligation is being calculated.
- j = The overdraft bank.
- k = All banks except overdraft bank j .
- n = The total number of SPEUA participants.

In period 1, the additional settlement obligation of a participant is equal to the product of the participant's share of the total credit extended to the overdraft participant and the total amount of the overdraft.² In periods 2 and 3, the calculation of the additional settlement obligation is similar, except that it is based on any additional credit extended to the overdraft bank. The total additional settlement obligation of a participant is equal to the sum of the obligations in days 1 through 3. If there is a shortfall between the defaulting participant's overdraft and the sum of the additional settlement obligations of the remaining participants, the Bank of Mexico absorbs the loss.

¹ Bank of Mexico (1997). The description of loss-sharing arrangement did not appear in the original version but appeared as an update.

² Loss-sharing rules are often based on the credit line and not the actual credit extended. For example, CHIPS' loss-sharing arrangements are also based on credit lines extended (see New York Clearing House Association 1996).

queue. Payments that are queued can be canceled before they are sent. When the participant is again sufficiently below the credit limit, the queued payment message is sent if it has not previously been canceled. However, due to the high credit lines extended to participants, few payments are queued. In addition, participants usually stop sending payments when their credit limit is reached. The Bank of Mexico restricts them from reducing credit lines during the day.¹⁹ At the end of the day, each bank must meet any debit positions and send payments via SIAC. As part of the reforms, the Bank of Mexico also established loss-sharing rules to distribute losses in the event of the failure of a SPEUA participant. (For a description of this

arrangement, see the box entitled "SPEUA Loss-Sharing Arrangement.") According to these rules, SPEUA participants that grant intraday credit to a failed participant share in the loss based on a loss-sharing formula.²⁰ In addition, the Bank of Mexico plans to impose collateral requirements in the future.

In reforming its payments systems, the Bank of Mexico also wanted to move high-value payments away from checks to electronic form. Several studies have shown that electronic alternatives are significantly less costly to process and use than checks.²¹ This savings increases the efficiency of a country's payments system. To provide an incentive to use SPEUA instead of checks, the Bank of Mexico changed the value

¹⁹ The Bank of Mexico has considered allowing participants to decrease their credit lines during the day. However, such a change would further complicate the loss-sharing rules. The Bank of Mexico is considering the adoption of less complex loss-sharing arrangements in conjunction with the introduction of collateral requirements. If such changes are adopted, the Bank of Mexico may consider allowing participants to decrease their credit lines.

²⁰ The effectiveness of the loss-sharing provision is critically dependent on how the Bank of Mexico settles insolvent banks. If banks are not allowed to fail, or if interbank placements are not subject to loss even in the event of failure, SPEUA participants extending credit would discount the costs associated with the loss-sharing provision in their interbank lending decisions.

²¹ See Robinson and Flatraaker (1995) and Humphrey and Berger (1990) for cost comparisons of electronic forms and checks or paper giros. Giro payments are credit transfers between the payor and the payee that may be used for recurring or nonrecurring payments. The payor instructs the Giro, an organizational structure that receives and makes payment, to debit his or her account and credit the payee's account. Giro payments are a dominant form of payment in many European countries. Giro payments can be either electronic or paper based.

date on checks to next day from same day in January 1996. The Bank of Mexico also reduced the minimum value for SPEUA transactions from 500,000 pesos to 150,000 pesos in December 1995.²² The Bank of Mexico believes that these policies were responsible for the reduction of the average daily value of checks from 55 billion pesos in 1995 to 6 billion pesos in 1996.²³ Although the value of check transactions decreased significantly, the number of checks processed did not decrease significantly because the number of checks with values of 150,000 pesos and above was and continues to be fairly small. The average daily number of checks decreased from 782,000 in 1995 to 684,000 in 1996.

Most Mexican peso components of large-value foreign exchange transactions are settled via SPEUA. Most foreign exchange peso transactions are for U.S. dollars, and the dollar components of each transaction are settled primarily via New York-based CHIPS. In most cases, if a nondollar–peso foreign exchange transaction is requested by a client, the trader would first make a dollar trade and then trade dollars for the desired currency. Herstatt risk exists for peso–dollar transactions using SPEUA and CHIPS, since the settlement of the dollar and peso components of the transaction may not occur simultaneously, even though SPEUA and CHIPS operate roughly during the same time.²⁴ For large-bank–to–large-bank transactions, the peso and dollar transactions are not settled in any specific order. However, for transactions involving a small participant and a large bank, the large bank will often require the delivery of one currency before releasing the other.

SIDV. Operated by INDEVAL, SIDV is used to clear and settle bank and government securities, and equities.²⁵ SIDV participants are required to have two types of SIDV accounts—a funds account and a securities account. All SIDV transactions follow the Bank for International Settlements' Delivery Versus Payment (DVP) model 2.²⁶ In a DVP transaction, the underlying security and the payment for that security are exchanged at the same time, thereby reducing settlement risk.²⁷ In October 1994, DVP was implemented for bank securities transactions. In July 1996, the DVP process was extended to government securities, and in April 1997, the DVP process was extended to equities.

For a DVP SIDV settlement to occur, the buyer must have a positive balance in its SIDV funds account or have access to overdraft facilities, and the seller must have the security in its securities account. Once INDEVAL has con-

firmed the seller's possession of the security and that the buyer has adequate funds or overdraft facilities, the transaction cannot be reversed. If the seller does not have the underlying security or the buyer does not have the funds or sufficient overdraft facilities, the transaction is placed in a queue and settled when each party has the necessary funds and securities to settle. If the queued transaction involves government or bank securities, the trade can be canceled. However, if the transaction is an equity transaction, it cannot be canceled while in the queue because of stock exchange rules regarding trades.²⁸

The buyer's overdraft facility is the lesser of the fully collateralized credit line or buyer's bank credit line. Collateral can be in the form of bank or government securities. When used for collateral, government securities receive a lesser discount than bank securities.

In addition to the collateralized credit lines, participants are granted credit lines that are a component of their overdraft facility from banks. Every morning, the Bank of Mexico extends credit lines to banks for the purpose of making SIDV payments. In turn, banks allocate these credit lines to SIDV participants. Although there is not a set policy for the amount of credit each bank is granted by the Bank of Mexico, in most cases banks receive credit lines of around 60 percent of their aggregate SPEUA credit line to allocate to SIDV participants. In addition to the collateralized and bank credit lines, buyers can transfer funds from SPEUA or SIAC to use for payment.²⁹ However, participants use the overdraft facility most of the time.

SIDV is linked to SPEUA and SIAC. These links enable participants to transfer funds in real time between these systems either directly, if they are banks, or through their correspondent bank. A participant, for example, can sell a security using SIDV and transfer the funds to SIAC and then use the funds to offset some other obligation, all within minutes.

The Group of Thirty in 1989 made recommendations for the clearance and settlement of securities.³⁰ (See the box entitled "Group of Thirty Recommendations for Securities Clearing and Settlement" for a complete list.) These recommendations have been accepted as a standard that securities markets around the world should strive to meet, and, in 1992, the Group of Thirty produced status reports on various countries, including Mexico. At that time, Mexico did not satisfy two of the recommendations. First, Mexico did not satisfy recom-

²² In May 1996, the Bank of Mexico further reduced the minimum value per transaction to 100,000 pesos. However, there was no significant change in the value or volume of check payments.

²³ The figures for check value and volume are from Diaz (1996) and correspondence with Bank of Mexico staff.

²⁴ Named after the German bank that was closed in 1974 before it could make payment on its dollar obligations, Herstatt risk is the risk in a foreign exchange transaction that one party delivers one currency but the counterparty does not deliver the other. In the case of Herstatt, the time zone difference between Germany and New York was largely to blame for the dollar defaults. Although this type of settlement risk is named Herstatt risk, it is not necessarily eliminated if there is little or no time zone difference between the currencies being settled. The difference in settlement times of the two underlying currencies in a foreign exchange transaction leads to Herstatt risk. For a discussion of foreign exchange settlement risk, see Chakravorti (1995) and Bank for International Settlements (1996).

²⁵ For a general overview of clearance and settlement of securities in emerging markets, see Stehm (1996).

²⁶ Based on a survey of various DVP systems, the Bank for International Settlements (1992) categorized DVP systems into three models. Model 2 DVP systems settle the securities part of the transaction on a gross basis during the day and settle the funds side on a net basis at the end of the day. Model 1 DVP systems settle both the securities and funds side on a gross basis. Although model 1 systems have less settlement risk than model 2 systems, such systems require greater amounts of good funds to settle and as a result are more expensive for participants to use. Model 3 DVP systems settle both the securities and funds side on a net basis.

²⁷ The adoption of delivery-versus-payment arrangements does not eliminate payments system risk completely. There could still be a failure to settle the payment. In non-DVP transactions, there is the potential for one party to never deliver its asset after receiving the counterparty's asset.

²⁸ Most stock transactions occur on the stock exchange because of tax benefits associated with exchange traded stocks.

²⁹ For SIAC transfers, nonbank participants may transfer funds themselves if they are SIAC participants. However, for SPEUA transfers, nonbank SIDV participants must have correspondent relationships with a SPEUA participant.

Group of Thirty Recommendations for Securities Clearing and Settlement

mentation 5, which states that each country should use DVP to settle all securities transactions. Today, all transactions cleared and settled by INDEVAL use DVP.

Second, Mexico did not meet recommendation 9, which states that each country should adopt the international message standard developed by the International Organisation for Standardisation (ISO Standard 7775). Use of one standard for numbering and identifying securities facilitates greater ease in cross-border transactions. In 1993, INDEVAL implemented the International Securities Identification Number (ISIN) code.³¹

Some market participants are concerned about the funds-netting component of SIDV's DVP system, especially if participants are allowed in the future to sell securities short or act as market makers. They fear that the risk of open positions taken by participants may affect end-of-day settlement. In a netting system, the default of one participant may affect others, even if they did not deal directly with the defaulting participant. However, other participants argue that, by allowing participants to make the market or sell short, the liquidity of these markets should improve. Greater liquidity in the market should enable participants to have greater ease in buying and selling securities, thereby reducing the settlement risk associated with open positions in general.

Remaining challenges

As part of its payments system reforms, the Bank of Mexico attempted to implement a market-based allocation of intraday credit. By eliminating unsecured daylight overdrafts on SIAC and simultaneously developing SPEUA, the Bank of Mexico attempted to shift most of the credit risk associated with the extension of intraday credit from itself to payments system participants. Furthermore, by implementing explicit loss-sharing rules for SPEUA settlement failures, the Bank of Mexico attempted to increase market discipline by imposing losses on creditors.

However, concerned about maintaining adequate liquidity to avoid payment gridlock and keeping the cost to participants relatively low, the Bank of Mexico has implemented policies that may have the unintended effect of distorting the market-based allocation of intraday credit. For example, the Bank of Mexico's restriction on participants' decreasing their credit lines during the day may also increase the availability of interbank funds to troubled participants, which, in turn, could increase the risk

The recommendations made by the Group of Thirty (1989) are:

Recommendation 1: Trade Comparison

By 1990, all comparisons of trades between direct market participants (that is, brokers, broker/dealers, and other exchange members) should be accomplished by T + 1.

Recommendation 2: Trade Affirmation

Indirect market participants (such as institutional investors, or any trading counterparties which are not broker/dealers) should, by 1992, be members of a trade comparison system which achieves positive affirmation of trade details.

Recommendation 3: Central Securities Depository

Each country should have an effective and fully developed central securities depository, organized and managed to encourage the broadest possible industry participation (directly and indirectly), in place by 1992.

Recommendation 4: Trade Netting System

Each country should study its market volumes and participation to determine whether a trade netting system would be beneficial in terms of reducing risk and promoting efficiency. If a netting system would be appropriate, it should be implemented by 1992.

Recommendation 5: Delivery Versus Payment

Delivery versus payment (DVP) should be employed as the method for settling all securities transactions. A DVP system should be in place by 1992.

Recommendation 6: Same Day Funds

Payments associated with the settlement of securities transactions and the servicing of securities portfolios should be made consistent across all instruments and markets by adopting the "same day" funds convention.

Recommendation 7: T + 3 Settlement

A "Rolling Settlement" system should be adopted by all markets. Final settlement should occur on T + 3 by 1992. As an interim target, final settlement should occur on T + 5 by 1990 at the latest, except where it hinders the achievement of T + 3 by 1992.

Recommendation 8: Securities Lending

Securities lending and borrowing should be encouraged as a method of expediting the settlement of securities transactions. Existing regulatory and taxation barriers that inhibit the practice of lending securities should be removed by 1990.

Recommendation 9: Common Message Standard

Each country should adopt the standard for securities messages developed by the International Organisation for Standardisation [ISO Standard 7775]. In particular, countries should adopt the ISIN [International Securities Identification Number] numbering system for securities issues as defined in the ISO Standard 6166, at least for cross-border transactions. These standards should be universally applied by 1992.

of financial loss from a settlement default. In addition, the previously mentioned practice of granting immediacy of payment for SIAC transactions used to meet end-of-day settlement may distort the credit assessments made among interbank participants.

Banks evaluate their daily credit line extensions knowing that the Bank of Mexico will make payment at the end of the day. As long as the Bank of Mexico allows non-rejectable payments to exist on SIAC, market-based risk assessments may be distorted by the guaranteed end-of-day extension of liquidity by the central bank. Although the SPEUA loss-sharing rules can allocate losses to SPEUA creditors, even if the defaulting bank is not

³⁰ The Group of Thirty, established in 1978, is a private-sector nonprofit organization concerned with the working of international financial markets. In 1989, the Group of Thirty published its recommendations to reduce risk and improve efficiency of securities markets around the world.

³¹ S. D. INDEVAL (1995).

declared failed, other considerations might make the Bank of Mexico reluctant to impose these loss-sharing rules as a first step. To the extent that banks feel that the Bank of Mexico will deal with insolvent banks without creditors absorbing losses, its efforts to induce participants to monitor risk and allocate their exposures based on the establishment of interbank SPEUA credit lines with loss-sharing provisions will not impose the degree of market discipline that would exist if market participants anticipated the potential for interbank losses.

In this regard, the Bank of Mexico has revised its policies governing the liquidation of failed banks, with the purpose of promoting market discipline. In 1995, the Bank of Mexico established—through an amendment to Fondo Bancario de Protección al Ahorro (FOBAPROA)³²—explicit rules identifying categories of bank liabilities that it will not guarantee. The 1995 FOBAPROA amendment states that

FOBAPROA shall guarantee all liabilities contracted by participating financial institutions, as long as said liabilities stem from their normal business operations, excluding:

- 1) subordinated debentures they might issue,
- 2) liabilities resulting from illicit or anomalous acts or acts of bad faith, and
- 3) liabilities stemming from credit contracted between banks in order to guarantee liabilities payable in favor of the Bank of Mexico, provided the said banks participate in the fund transfer systems administered by the central bank.³³

Exception three of this amendment specifically addresses SPEUA credit lines. However, this amendment applies only when the bank is in the process of being liquidated. To date, none of these exclusions has been imposed.

Conclusion

The 1994 large-value payments system reforms implemented by the Bank of Mexico, including the introduction of parallel intraday large-value payments systems for funds and securities, have reduced payments system risk while keeping transaction costs relatively low. By eliminating free and unsecured daylight overdrafts, the Bank of Mexico has reduced its credit risk associated with direct intraday lend-

ing. In addition, with the implementation of DVP for all securities transactions and 100 percent collateral requirements for the funds component of securities transactions, credit risk in securities transactions has been significantly reduced. However, to maintain adequate liquidity at a relatively low cost for participants, the Bank of Mexico established the large-value interbank funds payments system, SPEUA, and the securities clearing and settlement system, SIDV. Participants do not use good funds to settle each SPEUA or SIDV transaction but must settle their net positions at the end of the day. In addition, the Bank of Mexico extends unsecured credit to allow banks lacking reserves to settle over SIAC their end-of-day clearing balances from the other systems, although the Bank of Mexico strongly discourages banks from relying on such credit.

Payments system reforms are still being implemented, and further changes may be necessary for the Bank of Mexico to meet its stated objectives. Market participants seem generally pleased with the payments system reforms implemented to date. However, the Bank of Mexico may find that some of the policies designed to increase liquidity in the payments system, such as the inability of SPEUA participants to decrease their credit lines during the day and the guarantee of payment for non-rejectable SIAC payments, unintentionally work against the goal of promoting market-based intraday credit decisions. The need for some of these policies in Mexico may diminish over time with renewed strength in the banking system and a continued deepening of financial markets.

Finally, the SPEUA loss-sharing rules designed to help promote market discipline in the payments system will not be fully effective if participants feel that the Bank of Mexico will resolve insolvent banks without imposing losses. However, this struggle to offset the possibility that government guarantees may weaken market discipline in the payments system is not unique to Mexico; it is, in fact, common to developing countries in general and even to developed countries. As with the other major financial reforms initiated since the late 1980s, Mexico's recent efforts to enhance the role of market-based decisions in the payments system represent a significant step in the right direction.

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³² FOBAPROA is the Mexican deposit insurance fund.

³³ Bank of Mexico (1996).

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