

Brazil's Efficient Payment System

A Legacy of High Inflation

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Brazil has an impressive, efficient, highly automated payment system, driven at least in part by the need for rapid payment clearing and settlement in a high inflation environment. There is much of value to learn from the Brazilian system, but also room for improvement.



Summary findings

Brazil's efficient, highly automated payment system developed over many years in response to hyper-inflationary, or near-hyperinflationary, conditions. Listfield and Montes-Negret describe that system, its payment instruments, and its links to other networks (markets for money, foreign exchange, capital, futures, and commodities) and the government's payment (payroll, social security, and the like) and collection (taxes) operations. They examine factors that have affected the development of the system, innovations Brazil plans to introduce, and opportunities for improving the system.

The principal payment instruments used in Brazil are cash, checks, cobranças, and DOCs (Documentos de Credito). Cobranças — barcoded remittance documents used to pay bills — are handled much like European GIRO payments. DOCs are used to make interbank credit payments, intrabank transfers of funds between a client's different accounts, and client-to-client payments between parties with accounts at the same banking institution. Although a client can initiate a DOC on paper, all DOCs are electronic and processed only by banks.

Networks include direct deposit and direct debit services, automated teller machines, credit cards, and home banking services.

The system is highly automated, with separate systems for clearing and settling checks and credit payments (clearinghouses); government securities, private securities, state, local, and municipal securities; government payments; and foreign exchange.

Among the lessons from this review of Brazil's check-based payment system:

- Brazil's system shows that banks can cut costs by cooperating on check processing and transportation. The difficulty lies in structuring incentives and reaching agreements on how to allocate benefits fairly.
- A broad, inclusive approach should be taken to modernizing the payments system, taking into account the needs of all users, from individuals and participants in capital markets to enterprises and government.
- A wider menu of payment instruments should be offered than just checks. The use of cobranças and DOCs provides certainty of payment and gives those without checking accounts access to the payment system.

This paper — a product of the Financial Sector Development Department — is part of a larger effort in the department to examine factors constraining the development of countries' financial infrastructure. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Tomoko Ishibe, room G8-136, telephone 202-473-8968, fax 202-522-3199, Internet address fmontesnegret@worldbank.org. November 1996. (29 pages)

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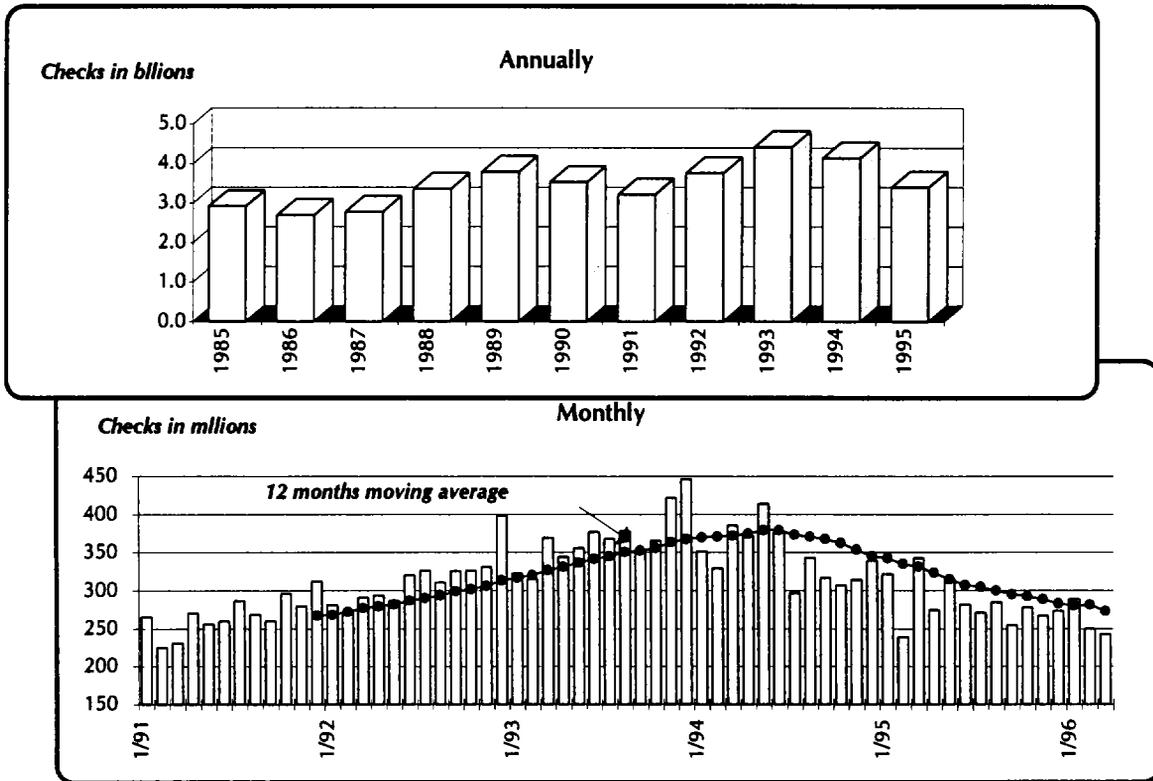
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Brazil has an impressive, highly automated and efficient payment system. At its peak operating level, in 1993, the system cleared an average of about 350 million checks per month, or about 4.2 billion checks a year, within three to six working days throughout the country (except in a few remote areas); checks drawn and presented in most larger urban centers were cleared within 24 hours. This is quite an accomplishment in a vast, and populous country (8,512,000 square kilometers and over 155 million people). Checks cleared in the first quarter of 1996 had an average value of about R\$280 billion a month.¹ In addition to checks, two increasingly important credit instruments, *cobranças* and DOCs, are processed either entirely in electronic form (DOCs) or truncated at their entry point (*cobranças*). Brazil has highly developed securities markets and automated systems for the book entry, custody, and transfer of securities against payment.

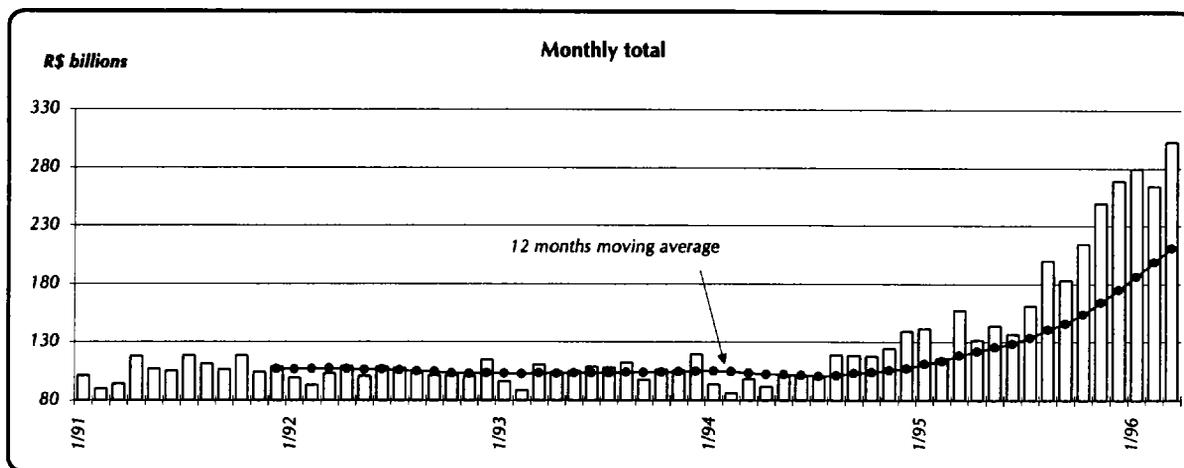
Investments in Brazil's sophisticated payment systems were necessary in an economy that experienced hyper or near hyperinflationary conditions for many years. As a result of the stabilization program initiated in July 1994, inflation is now running at about 20 percent a year, and the volume of payments and the velocity of money is beginning to decline, while the value of checks cleared has continuously increased until March 1996 but has since stabilized (Figures 1 and 2).

Figure 1: Volume of checks cleared
1985-1995 (annually), and January 1991-March 1996 (monthly)



¹ The unit of currency in Brazil is the real (plural is reais). The current exchange rate is about 1 real to U.S. dollar.

Figure 2: Value of checks cleared
January 1991 - March 1996



Source: Banco do Brasil SA

Until December 1992, nominal values adjusted by the inflation index (IGP-D) for January 1993, and then converted by the average URV in January 1993. From January 1993 to June 1994 nominal values adjusted by URV for the respective month (working days). Since July 1994 values are reais.

Reflecting the relatively high concentration of economic activity in the southern states, about two-thirds of checks by value and two-fifths of checks by volume are cleared in Sao Paulo.

The main objective of this paper is to describe the main characteristics of Brazil's payment system in terms of its payment instruments and organization; its links to other networks (the money market, foreign exchange market, capital market, futures and commodities markets); and its links to the government's payment (payroll, social security, and other payments) and collection (taxes) operations. We identify some possible gaps in the existing arrangements and briefly discuss the risks associated with each of the payment circuits. We also draw some important lessons for other countries that are considering or are in the process of modernizing and automating their national payment systems.

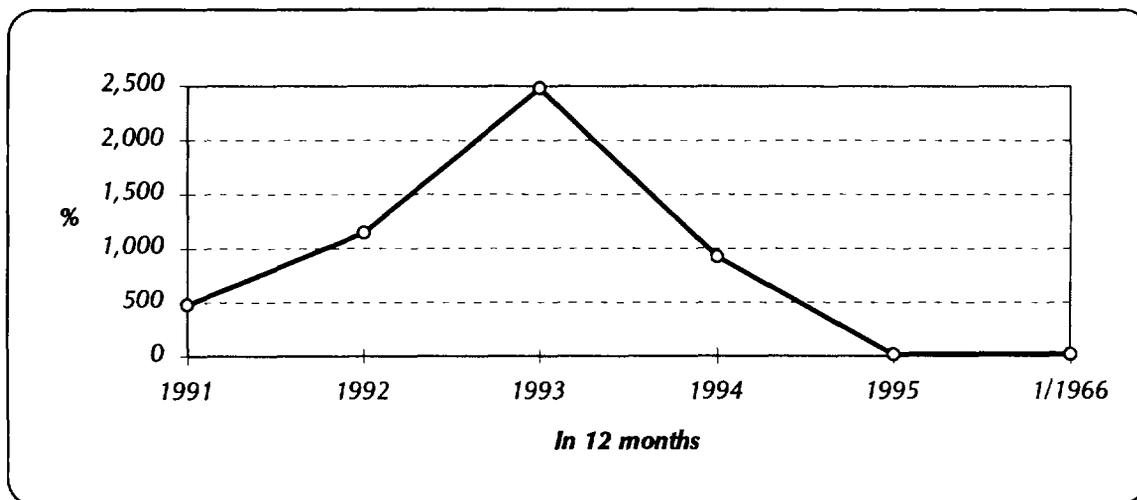
The report is organized into seven sections. **Section I** examines the main factors that have affected the development of the payment system in Brazil. **Section II** briefly describes the structure of the Brazilian financial sector. **Section III** describes the payment instruments used in Brazil, and **Section IV** describes the organization of the payment system. **Section V** describes some innovations in the payment system that Brazil plans to introduce this year. **Section VI** describes opportunities for improving the payment system, and **Section VII** identifies some lessons for other countries that can be drawn from studying Brazil's sophisticated national payment system.

I. Factors affecting the evolution of the payment system

In a highly inflationary economy the real value of nominal balances declines precipitously, reducing the real purchasing power of funds transferred. The annual rate of inflation in Brazil reached almost 2,500 percent in 1993, or almost 50 percent a month (Figure 3 and Table A-1) providing powerful incentives to accelerate the collection of payments. The high inflationary tax led to the development of a highly automated and efficient

mechanism for making payments and investing funds in very short-term paper. Without the incentives created by the hyperinflation the payment system probably would not be as automated and efficient as it is today.

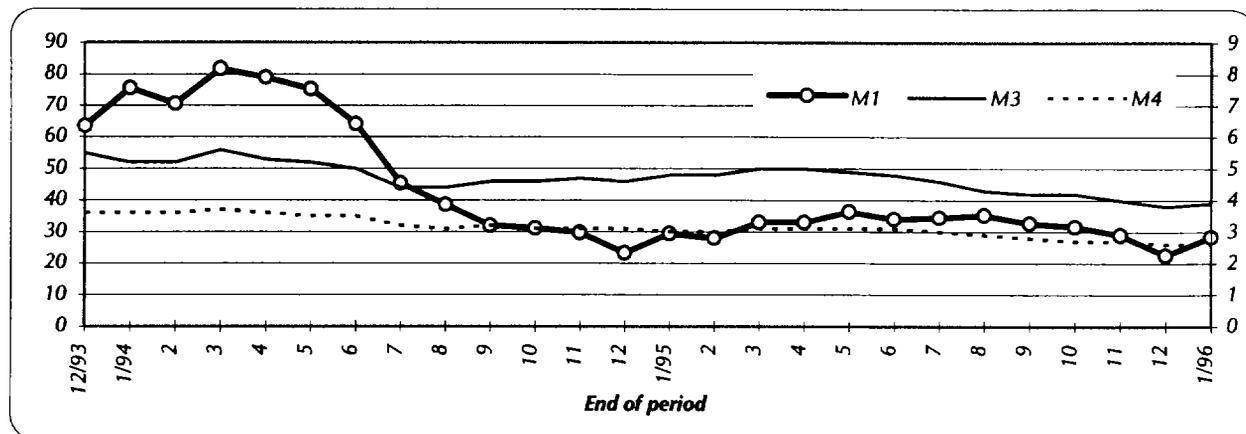
Figure 3: National consumer price index (percentage change over 12 months)



Source: Banco Central do Brasil

Because of the high rate of inflation in Brazil in the early 1990s, participants in financial markets had an incentive to keep monetary balances low by moving the existing stock of money rapidly. As a result, the income velocity of money—the number of times a monetary unit turns over during the year to finance a given product—rose very quickly as inflation rose. With the consolidation of the stabilization plan (Plan Real) and the currency reform that was introduced in mid-1994 the income velocity of money fell dramatically for all liquid financial assets, especially M1 (currency and demand deposits) from a peak of 82 in March 1994 to 29 in early 1996, and the economy returned to positive and significant rates of real economic growth (Figure 4 and Table A-1). As a result of the stabilization program real interest rates shot up, reaching more than 33 percent per year at the end of 1995 (Table A-2).

Figure 4: Income velocity of money*



Source: BCB, IBCE

M1 is on the lefthand scale; M3 and M4 are on the righthand scale.

* GDP/Mi (i= 1, 3, 4) ratio based on the end of period balance and on the GDP of the last 12 months at prices of the month indicated (deflator: 1GP-D1) based on sales published by the IBGE.

During periods of high inflation the banking system benefits by capturing part of the inflation tax given by the difference between the return derived from noninterest bearing sight deposits less the cost of keeping noninterest bearing reserve requirements at the central bank. These inflationary transfers captured by commercial banks have been estimated to have averaged almost 2 percent of GDP per year between 1947 and 1992.² Between 1990 and 1993 these potential transfers were as high as \$10 billion a year, split about equally among private, state-owned and federal government-owned commercial banks. These revenues were estimated to have more than covered personnel expenses at the banks, amounting to about three times the banks' net-after-tax income in the 1993-94 period. With the success of the stabilization plan this source of revenue for the banks has been drastically reduced, forcing them to increase their interest spreads and other fees.

Another characteristics of economies with a high inflation tax on nominal financial assets is the relative shallowness of financial markets. As a result the ratio of financial assets to GDP tended to be very low (28 percent in 1993, and 39 percent in 1995) compared to economies with stable prices (Table A-3). Comparable financial deepening ratios for countries in Asia show that M4/GDP can be as high as 150 percent of GDP and for several countries in Latin America, like Mexico and Chile the ratio of M2 to GDP reached 31 and 64 in 1995, respectively, compared to less than 20 percent for Brazil.

Other factors affecting payments include the following:

- The low proportion of consumers with checking accounts (estimated at less than 30 percent);
- A regulatory restriction that prohibits banks from holding correspondent accounts with other banks (with a technical exception for special purpose accounts with Banco do Brasil), which means that all interbank settlements are made through central bank reserves;
- An unreliable or slow mail system that is not generally used for the delivery of checks or other financial documents;

² Rubens P. Cysne, "O Sistema Financeiro Oficial e a Queda das Transferencias Inflacionarias," chapter II, [Reference—?].

- Highly developed securities markets;
- The large size of the country and the fact that many areas are remote and difficult to reach via ground or air transportation;
- Significant cooperation among payment system participants; and
- The large number of banks (241), which requires a highly developed interbank clearing and settlement system.

II. The structure of the financial sector

As of the end of 1995 there were 241 banks in Brazil, with over 32,300 outlets, of which over 17,000 were full bank branches. Many banks have close relationships with large companies, and as many as half of all branches are located within major corporations and government agencies. The largest two banks, Banco do Brasil and Caixa Economica Federal, are owned by the federal government, and state governments own another thirty banks, including some of the larger banks in Brazil. The banks play a major role in the collection and disbursement of government payments and in the collection of bills, and an estimated 30 percent of all banking transactions, are done on behalf of nonclients many of them payments related. Banks handle 40 million checking accounts (of which 90 percent are individual accounts) and 53 million savings accounts.

In spite of the rather large number of banks, the banking system is relatively concentrated and the largest 20 banks process about 80 percent of the volume of checks.

Table 1: Number of banking and nonbanking financial institutions (1964-1993)

<i>Year</i>	<i>Commercial banks</i>	<i>Multiple banks</i>	<i>Development banks</i>	<i>Savings banks (Caixas Economicas)</i>	<i>Banks total</i>	<i>Nonbank financial institutions</i>	<i>Total number of banks and NBFIs</i>
1964	336		2	26	364	134	498
1969	213		8	25	247	1,277	1,524
1974	109		14	6	129	1,235	1,364
1979	108		13	5	126	993	1,119
1984	110		13	5	128	960	1,088
1989	66	113	12	5	196	912	1,108
1993	37	206	8	2	253	821	1,074
1995	n.a.	n.a.	n.a.	n.a.	241	n.a.	n.a.

Table 2: Number of branches of banking and nonbanking financial institutions (1964-1993)

Year	Commercial banks	Multiple banks	Development banks	Savings banks (Caixas Economicas)	Banks total	Nonbank financial institutions	Total number of banks and NBFIs
1964	6,490				6,490	12	6,502
1969	7,886				7,886		7,886
1974	8,320		23	1,556	9,899	1,742	11,641
1979	10,613		2	1,497	12,112	1,471	13,583
1984	14,626		2	2,390	17,018	2,743	19,761
1989	7,174	8,842	16	2,341	18,373	143	20,316
1993	4,345	11,695	11	1,932	17,983	1,827	19,810
1995	3,984	14,189	11	2,991	21,175		

Source: Banco Central do Brasil

III. Payment instruments and networks

The principal payment instruments used in Brazil are cash, checks, *cobranças*, and DOCs. Networks include direct deposit and direct debit services, ATMs, credit cards, and home banking services.

A. Cash

As with many developing countries, cash remains a significant part of the payment system, particularly in the consumer sector. Because the central bank does not have an extensive branch network, the Banco do Brasil provides coin and currency delivery and collections for the country's banks. Settlement for coin and currency activities are made on a same-day basis through the reserves maintained at the central bank. The central bank does not verify the adequacy of reserves before currency shipments are made.

B. Checks

Checks are the most widely used payment instrument in Brazil, and are used as a means of making immediate payment and as a form of credit. Small value checks (less than R\$130) represent 85 percent of the total volume of checks cleared but only 15 percent of the value. All checks are MICR encoded using CMC7 MICR format. During the hyperinflation, savings were very limited. Consumers had incentive to consume rapidly before inflation raised the price of goods and services. Because of limited availability of consumer credit through the banking system, retail merchants would often let customers buy goods on time by letting them pay for items with a series of three to four checks, all but one of which were postdated. The merchant would submit each of the postdated checks for collection on the agreed upon date (usually monthly to coincide with receipt of the consumers payroll payment). This practice was not limited to high ticket items, but was used for purchases as small as R\$20.

Customers generally receive one block of 20 free checks each month and pay about R\$7 for additional blocks of 20 checks. Because of inefficiencies in the mail system and for security reasons, new checks are not mailed to the customer, but are available at the bank branch. Some banks have machines similar to ATMs that dispense checks 24 hours a day.

C. *Cobranças*

Cobranças are barcoded remittance documents used to make bill payments, and are handled much like European GIRO payments. A customer receiving a *cobrança* (bill for goods or services) takes the *cobrança* to a

bank and pays cash or writes a check to authorize payment through his/her account. Banks charge the payee an interbank fee of R\$0.94. The collecting bank captures the bar code information, key in the amount, and clear the item electronically. The physical item is then truncated at the collecting bank. In 1995 banks cleared 444 million *cobranças* with an average monthly value of R\$30 billion (equivalent to about 13.5 percent of the number of and 10 percent of the value of checks cleared per month).

D. DOCs

A Documento de Credito or DOC is used to make interbank credit payments; intrabank transfers of funds between different accounts of a client (usually in any city participating in a SIRC), and client to client payments when accounts are kept at the same banking institution by both parties to a transfer. All DOCs are electronic and are processed only by banks, although they can be initiated in paper form by a client.³ That is, in either case, they are truncated locally and cleared and settled electronically through the national clearinghouse (with a monthly average of about 1.7 millions). Currently, *cobranças* and DOCs collectively comprise about 20% of clearinghouse items by volume and 35% by value.

E. Direct deposit and direct debit services

Direct deposit and direct debit services exist in Brazil, although not on an interbank basis. Both the paying and receiving parties must have accounts at the same bank. To facilitate bill paying, utility companies often maintain accounts at several major banks.

F. ATMs, debit cards and electronic checks

Competition for ATM transactions is fierce in Brazil, and all of the major banks operate their own proprietary ATM networks, with as many as 600 ATMs not shared with other banks. Shared ATM networks do exist, but are used largely by the smaller banks participating in the network. The state-owned banks also have a network that is shared only by state owned banks. The reliance on proprietary ATM networks would appear to be expensive for the banks to maintain, and reduces the level of customer convenience. About 11,000 ATMs are available 24 hours, 55,000 cash dispensing machines at supermarkets and additional 53,000 serving machines are available at bank branches. A large percentage of banking services (as high as 50 percent for the larger banks) are provided on a self-service basis. Debit cards (with PIN) offer online or next-day electronic check services.

G. Credit cards

Credit card use in Brazil is low but growing. Because of the historically high levels of inflation, merchants received deep discounts on their credit card merchant deposits to allow for the float associated with the monthly billing cycle, and were thus reluctant to accept payment by credit card. With the reduction in inflation, credit card payments are becoming more acceptable. Debit cards (with PIN) offer online or next-day electronic check services.

Banks in Brazil may offer either Visa or MasterCard, but not both. Processing and settlement operations are conducted by Visa and MasterCard. Smart Cards are being tried on an experimental basis.

³ There are four types of DOCs. DOCs A and B are initiated by the payee bank as a request for payment for public utilities' services, taxes and other payments (rent, school fees, etc.). DOC C, the most widely used, is a credit instrument initiated by the payer and sent electronically by the bank. DOC C is also known as a national DOC because it can be sent to the electronic clearing in Sao Paulo to be cleared the same day with other credit instruments including *cobranças*. DOC D is identical to DOC C but is not subject to the turnover tax on financial transactions. The latter is used to make credit transfers among accounts owned by a single individual without incurring taxes repeatedly.

H. Home banking services

Brazil's major private banks are very sophisticated in their home banking service offerings. Many target the nation's affluent consumer class, recognizing that members of this class are often both technologically literate and concerned about managing their financial position. Several banks offer products such as home banking via a personal computer and the number of subscribers (580,000 clients) and the level of subscriber usage appear to be growing rapidly. Many banks are still test marketing such products, however, and do not currently attempt to recover the cost of the product through service charges. Payments initiated through home or telephone banking are processed electronically on an interbank basis (e.g., through a DOC). Phone banking is also widely used as 63 percent of bank branches offer this service to over 23 million clients.

IV. The organization of Brazil's payment system

Brazil's payment system includes several different systems and institutions. The system is highly automated, with separate systems for clearing and settling checks and credit payments (clearinghouses), government securities (SELIC), private securities, state, local and municipal securities (CETIP), government payments, and foreign exchange (Figure 2). Each part of the system is described in this section. A summary of the payment and settlement system is shown in Figure 5 and Table 3.

SIRC and CEL: The net settlement position for each clearinghouse is computed by Banco do Brasil, the operator of the local and integrated regional clearinghouses (SIRC) and the national clearinghouse in Sao Paulo. All net settlement data are transmitted to the national clearinghouse, which computes a single nationwide net settlement for transmission to the central bank for posting to the reserve accounts. Settlement for clearinghouse activity is made on a multilateral net basis through the reserves held at the central bank. Using the electronic clearing system (CEL) banks can forward to Banco do Brasil electronic files containing the clearing information, which is processed and retransmitted by electronic means (net position to each of the participants), and sent to the central bank for debiting/crediting of each banks' reserve account.

Banco do Brasil: Banco do Brasil maintains special temporary accounts for the sale of cash and bills to banks. Information on the net position is transmitted to the central bank at the end of the day, and affect the banks' reserve accounts.

SELIC: The Special System of Custody and Liquidation of Federal Securities (SELIC) is an electronic system controlled and operated by the central bank of Brazil to register transactions and maintain in book-entry form federal bonds and bills issued by the Treasury and the central bank. It also registers transactions in securities issued by state and local governments. SELIC settles on a same-day net basis through the central bank.

CETIP: Central Custody and Financial Clearing of Securities (CETIP), a private securities trading and transfer system, was launched in 1986. Its main objective is to offer a fast, reliable and safe system for dealing in private and public securities (similar to the services being offered by SELIC for Treasury and central bank papers). Nonbank participants are required to inform the bank account that will be used for clearing and settling transactions. At the close of trading the clearing bank is informed of the net debit/credit for confirmation. The net results for each clearing bank are sent to the central bank to update the bank's reserve accounts (effective the next day). CETIP is also used for settling stock and futures exchanges trading on a next-day net basis through the central bank.

SISBACEN: The information System of the Central Bank (SISBACEN) provides 24-hour a day access to a vast amount of information produced by the central bank. The system has about 60,000 authorized users, including all units of the central bank, 1,118 financial institutions, and 183 government agencies. The main subsystems include over 500 databases, including central bank directives, general information, exchange rates, interest

rates, and economic data. SISBACEN integrated to other domestic (including SELIC, CETIP, SIAFI, SERPRO, and SISCOMEX), and international (SWIFT) networks. SISBACEN is also used for foreign exchange trading.

Treasury: With the adoption in 1987 of a new integrated system of financial administration of the funds of the federal government (SIAFI) and the adoption of a single consolidated Treasury account at the central bank (at the end of 1988), the operations of the government were significantly centralized and streamlined. The accounting information flows through the SIAFI to over 5,000 administrative units of the government linked to a computer network through which the appropriations made by the Treasury to the ministries are allocated and sent. When these units need to make payments they issue “banking orders” through the agency of Banco do Brasil, where they keep their accounts. The consolidated information is transmitted by Banco do Brasil to the central bank, which debits the single Treasury account and credits the funds to Banco do Brasil, which transfers the money to the agency where the administrative unit making the payment has its account. The administrative units then make their payments. Taxes paid at bank branches are sent to the bank’s head office to be transferred to the central bank, which credits the Treasury account.

Figure 5: Payment system participants and transactions

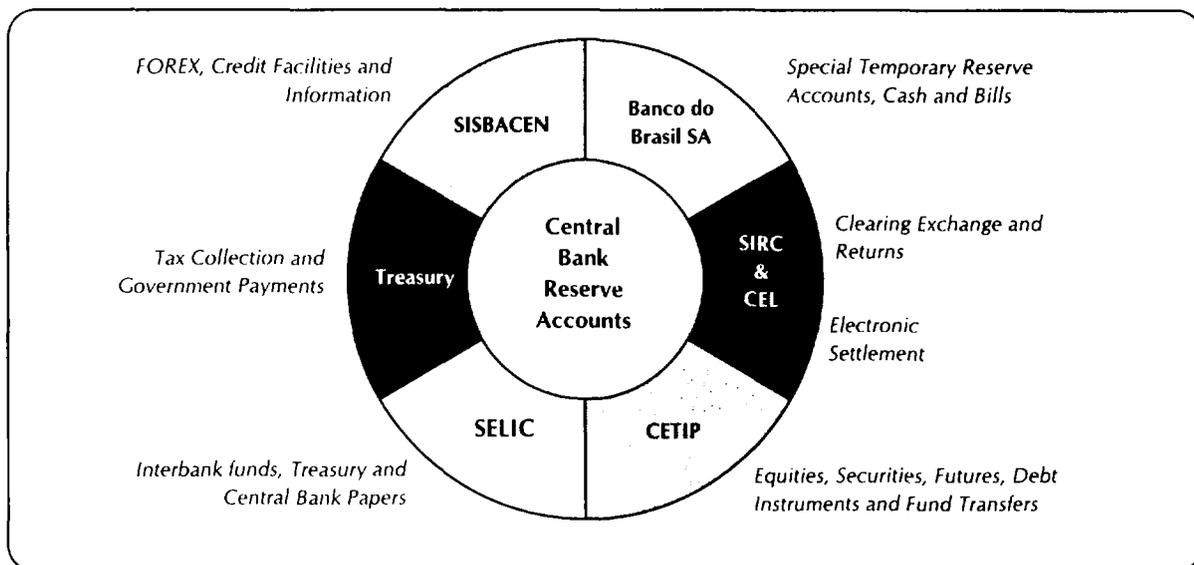


Table 3: Payment and settlement system summary

<i>Instrument</i>	<i>Clearing system</i>	<i>Settlement timing</i>	<i>Settlement mechanism</i>	<i>Physical item</i>	<i>Clearing agent</i>
Check	Clearinghouse	Next day	Net settlement	Exchanged	Banco do Brasil
Cobranca	Clearinghouse	Next day	Net settlement	Truncated	Banco do Brasil
DOC	Clearinghouse	Next day	Net settlement	All electronic	Banco do Brasil
Central bank paper	SELIC	Same day	End of day net	Book entry	Central bank
Treasury paper	SELIC	Same day	End of day net	Book entry	Central bank
State government paper	CETIP/SELIC	Next day	End of day net	Book entry	Private/central bank oversight and settlement
Municipal government paper	CETIP/SELIC	Next day	End of day net	Book entry	Private/central bank oversight and settlement
Corporate bonds	CETIP	Next day	End of day net	Book entry	Private/central bank oversight and settlement
Bank CDs	CETIP	Next day	End of day net	Book entry	Private/central bank oversight and settlement
Foreign exchange	SISBACEN (reais), Fedwire and CHIPS (US\$)	t+2	Gross		Central bank (reais), foreign correspondents
Equities	CETIP	t+4	Net	Dematerialized	Private/central bank oversight and settlement
Futures and derivatives	CETIP	t+4	Net	Dematerialized	Private/central bank oversight and settlement

A. The role of the central bank

The Banco Central do Brasil serves two principal functions in the payment system. By law, the central bank has regulatory authority over the payment system, and is responsible for all regulations and standards for payment systems. The central bank also provides interbank settlement services for all payment activity in the country, since, banks in Brazil are precluded by law from holding (correspondent) balances with each other. The central bank also sets the fees for electronic clearing and currency deliveries, and has the authority to approve other clearinghouse fees.

Each bank maintains a single reserve account at the central bank head office in Brasilia, where about 240 such accounts are maintained. Reserve requirements are high (currently 83 percent of demand deposits and 20 percent on other deposits) as are penalties for reserve deficiencies⁴ so that reserve deficiencies are rare. The central bank operates ten branches in Brazil, which are used primarily for administrative and regulatory purposes. All reserve account maintenance and payment system functions are conducted out of the bank's head office in Brasilia. In certain cases banks are permitted to hold a voluntary account with Banco do Brasil.

⁴ Until July 1, 1995 prime SELIC rate plus 30 percent for reserve deficiencies and 45 percent over the SELIC rate for overnight overdrafts. Since then the 30-day Tasa Basica do Banco Central (TBC) plus 27 percent p.a. is charged on overdrafts. Notice that TBC < SELIC rate.

Funds in this account count toward reserve requirements, and can be used only for currency and coin transactions.

The central bank does not make the market for foreign exchange, nor is it involved in the settlement of the foreign currency leg (generally U.S. dollars). It does settle the domestic currency leg of foreign exchange transactions on behalf of Brazilian banks, and conducts foreign exchange transactions on its own behalf.

For interbank foreign exchange transactions among the 145 banks dealing in foreign exchange, both the seller and the buyer of reais notify the central bank of the trade via SISBACEN's on-line system. Information transmitted includes the values in local and foreign currency and the settlement date. The selling bank has one hour to confirm the trade. Settlement are at least two days after the notification to the central bank of the trade (t+2). Once the central bank confirms both sides of the trade, it sets up the necessary accounting entries on a gross (transaction by transaction) basis to the reserve accounts held in reais for the settlement of the trade. Banks can monitor their foreign exchange and reserve account positions on-line through SISBACEN. Daily turnover amounts to \$7-8 billion, with net transactions of about \$700 million.

To settle the foreign currency leg of the transaction, the Brazilian bank selling the foreign currency authorize its correspondent (usually a New York bank) via a SWIFT message to transfer dollars to the New York correspondent account of the Brazilian bank buying the foreign currency. The domestic and foreign legs of the transaction are thus settled separately and on a transaction by transaction basis. This creates a risk to the participants as they cannot be sure that the foreign currency leg of the transaction occurs on the same day as the domestic leg, if at all. Banks charge a premium on foreign exchange to compensate them for the risk of settlement failure.

B. The role of Banco do Brasil

Banco do Brasil, a state-owned commercial bank, is authorized by law to operate the clearinghouses, and thus serves as the primary operator of the nation's payment system. Since 1969 Banco do Brasil has been operating the Regional Integrated Clearing System for checks (SIRC). Over the years the bank has expanded the type of payment instruments cleared, expanding into *cobranças* and DOCs in the 1970s, fostered the integration of the check clearing system with the introduction of the National Clearing System (CNC) in 1983, and promoted increasing automation of the clearing operation with the Electronic Clearing (CEL) in 1988 and more recently with the electronic DOC. Because the central bank does not have an extensive branch network, Banco do Brasil provides coin and currency delivery and collecting to the country's banks. Settlement for coin and currency activity are made on a same-day basis through the reserves maintained at the central bank. The central bank does not verify the adequacy of reserves before currency shipments are made.

Commercial banks receive an interim report from Banco do Brasil with the partial result of the clearing, as well as a final report at the closing of the clearing cycle, informing them of changes in the balances of their reserve accounts at the central bank (which can be checked on line through SISBACEN). The aim is to achieve an automated closing of the clearing involving exchange of documents (FAC) as well as the electronic clearing being tried in Sao Paolo (FACEL) in order to increase the speed, simplify the process, avoid inconsistencies and mistakes. Banco do Brasil maintains a unique centralized reserve account at the central bank in Brasilia and sends the information for final posting of these accounts.

C. The role of the clearinghouses

Brazil's clearinghouse network is among the most sophisticated in the world. The system is made up of four types of clearinghouses, all of which are operated by the Banco do Brasil:⁵ (a) 345 local clearinghouses with "normal access," meaning that they can communicate with their respective state capitals within two days or less; (b) 157 local clearinghouses with "difficult access", or 4.3 percent of the municipalities in Brazil, meaning that they require more than 2 days to send their clearing documents to the state capital; (c) 84 integrated regional clearinghouses (SIRC), which centralize the processing of clearing documents of 3,289 other cities and towns; and (d) a national clearinghouse in Sao Paulo (with Rio de Janeiro as back up). All banks must be represented at the national clearinghouse either directly (in the case of the 46 largest banks by volume of documents cleared)⁶ or indirectly (represented by a participating bank or one of the four banking associations).⁷ Banco do Brasil is also represented at the national clearinghouse, for a total of 51 seats representing the 240 banks in the system. Settlement for clearinghouse activity is made on a multilateral net basis through the reserves held at the central bank. The national clearinghouse in Sao Paulo provides clearing and settlement services for all nonlocal/regional checks and for all *cobranças* and DOCs.

Both the regional (local and SIRC) and the national clearinghouses have two daily exchanges for clearing documents. The first session deals with the physical exchange of documents (listing number and amounts) and/or electronic information (for noncheck payment instruments) among participating banks; the second session deals with returned documents. The sending bank (*remetente*) is entirely responsible for the accuracy of the information delivered to the payer bank through the operator.

Checks for amounts in excess of R\$130 are cleared first and smaller checks, which represent 85 percent of volume but only 10% of the value, are processed later the same evening time permitting.⁸

The primary clearing operates between 5:30 p.m. and 11:00 p.m. for high value checks deposited that day. These items are settled on a net basis in next day funds (t+1). The second exchange occurs between about 11:00 a.m. and noon, and processes low value checks from the previous day. This settlement is made on a net basis in **same day funds with next day finality**. Returned items can be exchanged during either of the daily or evening exchanges. DOCs and *cobranças* are exchanged only during the night session.

The "clearing cycle" starts with the clearing session in the evening and the evening session for returned items. The combined result (partial clearing) amended by the daylight special clearing session (for checks under R\$130) and the daylight session for returned items completes the cycle, yielding the final clearing balance for each participant (DRC),⁹ which will affect its reserve account at Banco Central do Brasil.

Checks are exchanged and cleared locally when both the bank of first deposit and the paying bank have a branch within the local clearing area, regardless of the location of the branch of the paying bank on which the check is drawn. If both the depositing and the paying banks are in the same local clearing area, the checks are exchanged and settled on a net basis through the banks' reserve accounts. It is then the responsibility of the

⁵ In the event that the Banco do Brasil is unable to function (because of a strike, for example) another large bank will assume the operation.

⁶ Ranked annually on the basis of the monthly average of documents cleared.

⁷ The Brazilian Bankers' Federation (FEBRABAN), the Brazilian Association of State Commercial Banks (ASBACE), the Brazilian Association of Commercial Universal Banks (ABBC), and the Brazilian Association of International Banks (ABBI).

⁸ Banco do Brasil accepts the presentment of additional low-value checks in a special clearing session (*sessao especifica de troca*), which takes place between 7:00 a.m. and noon the following day. This session is concurrent with the session for returned items (for checks rejected at one of the 84 cities in which a SIRC is located).

⁹ Documento de Resultado da Compensação.

paying bank to get the check to the branch on which the check is drawn for signature verification purposes. The settlement for the item will be next day for all local items, but the returned item deadline—and hence the hold put on the depositing customer's funds—will depend on the distance between the point of deposit and the check writer's branch. The typical deadlines for returned items are next day for local items and three to six days for nonlocal items.

If the depositing and paying banks do not both have branches in the same local clearing area, the checks are sent to the nearest regional clearinghouse. If both banks have branches there, the checks are exchanged and settlement takes place the next day, as with local items. If the paying bank does not have an office in the regional clearing area (SIRC), the checks drawn on that bank are sent to the national clearinghouse in Sao Paulo. In Sao Paulo, all banks must participate in the clearing. Hence, for the Sao Paulo area, all checks are local and settled next day. As with locally cleared items, checks drawn on branches outside of Sao Paulo will have returned item deadlines and holds on customer accounts based upon the time it takes to return the check to the paying branch for signature verification (typically three to six days).

Because of the tiering of clearinghouse exchanges, all checks can be cleared upon reaching the national clearinghouse in Sao Paulo. The maximum time to clear a check is usually two to three days. Banks can, however, electronically transmit the full MICR line of high value checks directly to the national clearinghouse via a data transmission system called CR (Comunicacion de Recibimento) through CEL. Data transmitted checks are cleared electronically in one day, with the physical checks to follow. For all checks the clearing is done entirely electronically in the ten major SIRCs of Brazil (mandatory). In the remaining 74 SIRCs the electronic clearing of high-value checks is still voluntary. Thus, despite the size of the country, all checks can be cleared in 2-3 days, and all high value checks can receive next day funds.

Each clearinghouse computes its own net settlement and each settlement is transmitted to the national clearinghouse, which computes a single nationwide net settlement for transmission to the central bank for posting to the reserve accounts.

1. Internal bank processing of deposited clearinghouse documents

Each branch of the depositing bank typically microfilms all checks received and sorts all checks into high and low value categories. If multiple branches of the depositing bank exist in the region, the checks are then sent to the bank's local operations center (or service bureau) for capture and sorting. Banks process their checks by sorting by receiving bank in the local clearing area, with separate runs for high and low value items. On us checks are cleared internally by the depositing bank, regardless of the location of the branch of the check writer.

High value items are exchanged during the night clearing (9:00 p.m. - 11:30 p.m. for next day funds). Low value checks are exchanged at about noon the following day for same day funds (day after deposit date). Full MICR line data (104 characters) are captured (by machine reading the preencoded data and keying in the amount) and the data are transmitted to each local bank (for local items). Nonlocal items are sent unsorted to the depositing bank's processing center at the regional (or national) clearing area. The checks themselves need not be amount encoded as the customer account posting and other future processing is done based on the electronically transmitted data and not on the physical checks. Payment data for *cobranças* and DOCs are also captured and these data are transmitted to the national clearinghouse. Checks sent from local to regional clearing centers or from regional centers to the national center are handled by the depositing bank's operations center the same way as locally originated items.

The MICR line data for high value nonlocal checks may be transmitted to the national clearinghouse for next day funds if received before 11:00 p.m. (subject to the depositing bank's internal limit based on cost-benefit analysis).

2. Local clearinghouse operations

Local clearinghouses are located in smaller cities that are not part of one of the 84 integrated regional clearing centers (SIRC). In a local clearing, each bank located in that city exchanges checks clearing notices (*fichas de compensação*), and other payment instruments with other banks located in that city. The exchange of checks is usually done at about 9:00 p.m. and occurs without regard to the location of the branch on which the check was drawn as long as the paying bank has a branch in that city. Checks are not separated by value. Checks drawn on banks without branches in the local city are sent unsorted to the sending bank's operations center (or service bureau) at the regional clearinghouse. The physical shipment of such checks is done on a shared ground transportation basis. All electronically transmitted checks, *cobranças* and DOCs receive next day funds regardless of the location of the paying bank, with an 11:00 p.m. cutoff at the national clearinghouse in Sao Paulo. The returned item deadline is next day for local items and three to six days (depending on the location of the paying branch) for nonlocal checks. Banks typically place a hold on the release of funds to the customer until expiration of the return item deadline, although good customers may receive use of the funds earlier. The vast majority of checks can be cleared locally, with only an estimated 5 to 10 percent of checks requiring shipment to the national clearinghouse.

3. Regional clearinghouse operations

Regional clearinghouses (SIRCs) are located in 84 larger cities, and typically include all cities within 180 kilometers and less than three hours of transport time of the seat of the SIRC. The SIRCs link 3,289 locations with over 90 percent of commercial bank branches in the country. Operations in the SIRCs are identical to local clearings except that: (a) there are two daily exchanges, one between 9:00 p.m. and 11:30 p.m. for high value checks which receive next day funds, and one for low value checks which are processed the next morning for same day funds for prior day's deposits; (b) all checks, not only local checks, are exchanged among banks provided the receiving bank is represented in the SIRC. Checks that cannot be cleared within the region are shipped unsorted to the bank's processing center (or service bureau) in Sao Paulo; and (c) all other payment instruments are exchanged independently of the receiving bank's representation in the SIRC, provided presentments are channeled through the electronic clearing (CEL) centralized in Sao Paulo.

4. National clearinghouse operations

The national clearinghouse was established in Sao Paulo in 1983 (a backup operation is located in Rio de Janeiro). It serves as the central national exchange for all checks that cannot be cleared within the bank of first deposit's (local or regional) clearinghouse, linking all 84 SIRCs, and as the regional clearinghouse for Sao Paulo. It also functions as the central processor for the clearing of all *cobranças*, DOCs, and electronically transmitted high value checks nationwide, and calculates the multilateral net position for all banks for all clearinghouse instruments and transmits the data to the central bank for settlement. About 40 percent of the volume of checks and almost 70 percent of the value of checks are cleared through the Sao Paulo clearinghouse. The Rio de Janeiro clearinghouse accounts for another 30 percent of volume and 13 percent of value.

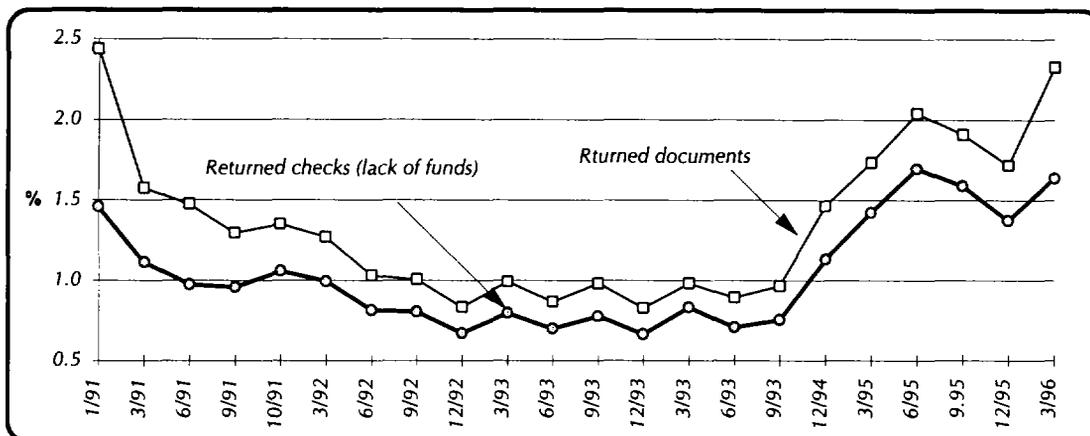
5. Handling of returned items

Returned items are processed through the clearinghouses in the same way as forward checks, but in the reverse direction. For large checks notification of return is made electronically¹⁰ through the CEL electronic network, with the physical item to follow. Typically a returned item is redeposited once for payment. If returned a second time, it is sent back to the depositing customer for collection. Returned items cleared locally and drawn on a local branch are returned in the next day's clearinghouse session, SIRC checks above the low-value ceiling are returned within 24 hours with low value checks returned within 48 hours. Nonlocal return items

¹⁰ *Comunicacion de Devolucion*

are generally returned within three to six days to allow for signature verification at the paying bank branch. The returned item deadlines are a function of the location of the paying and receiving branches. For example, returns going between Sao Paulo and a state capital region have a three-day deadline, returns between Sao Paulo and a small city take four days, and returns between two small cities outside of the same state might take six days. Returned checks to or from one of the 157 remote locations can take up to 20 days. These deadlines are much tighter today than they were before inflation soared in 1993.

Figure 6: Returned checks (lack of funds) and other returned documents
(Percentage over total number of instruments cleared; January 1991-March 1996)



Source: Banco do Brasil

The number and value of returned items has doubled since stabilization, and returned items comprise about 2.4 percent of checks by volume and about 4 percent of checks by value. Writing checks against insufficient funds is discouraged in several ways. Banks are charged R\$.35 for checks returned through the clearinghouse and typically charge customers a fee of R\$6-7 but it can be as high as R\$15 at certain banks. The central bank regulations require banks to close a customer's account after two checks are written against insufficient funds. This information is posted through SISBACEN (central database). Customers can be reinstated after repayment of bad checks or automatically after five years. Every time a check bounces it is registered in the SISBACEN database but customers loses the right to a checking account only after failing in the second clearing.

6. Clearinghouse fees

Clearinghouse fees are agreed upon by the operator (Banco do Brasil) and the four banking associations based on actual direct costs plus 10 percent. In some cases, such as for checks (MICR line capture) and cobranças, the depositing bank is compensated by the receiving bank for doing the work of data capture. The cost of such interchange fees are usually passed on to the receiving bank's customer.

The current clearinghouse fees, which went into effect August 14, 1995, are shown in table 4.

Table 4: Clearinghouse fees

<i>Item</i>	<i>Clearinghouse fee</i>	<i>Clearinghouse interchange fee (to compensate depositor for data capture)</i>
Checks exchanged	R\$.06 from the paying bank to the receiving bank	R\$.12 from the paying bank to the depositing bank
Electronic transactions (DOCs, <i>cobranças</i> , electronic checks)	R\$3.86 per 1,000 documents (paid to Banco do Brasil by the receiving bank)	R\$.63 from receiving bank to originating bank
Returned items	R\$.35	

Source: Banco do Brasil

Moving to the electronic check clearing system (CEL) lead to significant cost savings, as shown in table 5.

Table 5: Cost of check clearing under paper and electronic systems

<i>Item</i>	<i>Receiving bank</i>	<i>Sending bank</i>
Paper clearing	R\$.48	R\$.21
Electronic clearing	R\$.07	R\$.09

Source: FEBRABAN

These economies result from a better use by the receiving bank of the processing already done by the sending bank in preparing the checks to be sent. By economizing on one phase of the processing, the CEL reduces the cost to all participants.

7. Transportation costs

Transportation and related costs associated with sending items between local and regional clearinghouses and between regional and the national clearinghouse are arranged and paid for on a shared basis. The allocation of costs is based upon a formula that incorporates the number of banks (with a weight of 75 percent of total cost) and the number of branches in the region (with a weight of 25 percent of total cost). Transportation to and from a local and regional center is usually by ground; air transportation is usually used between the SIRC and the national clearinghouse in Sao Paolo. The cost of air transportation is allocated 50 percent by banks and 50 percent by member of branches.

8. Cooperative arrangements among participants in the payment system

One interesting feature of the Brazilian payment system is the high degree of cooperation among the commercial banks, the operator of the system (Banco do Brasil), and the central bank. Cooperative arrangements have been made in several areas in order to reach a consensus on technical issues (standards for checks, DOCs, *cobranças*, and communications); organization of the system (clearinghouse rules and transportation arrangements); and sharing of information (nationwide database on issuers of checks with insufficient funds; database with names, addresses, codes, and SIRCs, of all banking agencies; database with

information on regional holidays). As part of these cooperative arrangements several consultative bodies have been set up under the leadership of the operator. These groups are organized at the regional level in each SIRC (Evaluation and Performance Committee and Operations Committee, dealing mainly with the working of the shared transportation system) and at the central level (Consultative Group) in order to get advice and feedback from the participants in the system, to undertake specific studies, and to coordinate the actions of the participants to improve the clearing and settlement processes. Striking a balance between cooperation and competition is critical to achieving efficiency in national payment systems, and on this score the Brazilian payment system has done remarkably well.

D. The role of SELIC

The Special System of Custody and Liquidation of Federal Securities (SELIC) is an electronic system controlled and operated by the central bank of Brazil to register transactions and maintain in book-entry form federal bonds and bills issued by the national Treasury and the central bank.¹¹ It also registers transactions in securities issued by state and local governments and major municipalities. The electronic system keeps the record of purchases and sales and the inventory of securities under the name of each of the 240 banks and 1,000 non-bank financial institutions linked to the system and enables same day settlement of transactions through the reserve accounts of the central bank. Since intermediaries have on average 10 to 15 accounts, SELIC handles over 4,500 customer accounts. All securities were dematerialized in 1977, when SELIC recalled all paper-based securities, reissuing them in electronic form.

The SELIC system operates from 9:00 a.m. to 6:30 p.m. daily, recording about 10,000 transactions, worth about R\$70 billion, each day. SELIC also keeps track of interest and redemption payments and public offerings, and updates the respective reserve accounts of the participating financial institutions at the end of the day. A significant concentration of transaction volume occurs at the end of the day. Settlement for SELIC transactions is made on a net basis at the end of the day. Only banks can participate in the settlement; nonbank direct participants must settle through a bank.

SELIC has three subsystems: the free movement subsystem, the special movement subsystem, and the financial liquidation subsystem. Under the free movement subsystem normal transactions (buying, selling, and borrowing or lending of securities) are processed and the title to the securities transacted is updated on-line by the system. The special movement subsystem handles securities that are immobilized as a result of liens or guarantees offered pursuant to a legal or regulatory requirement, and includes securities kept as part of the banks' legal reserve requirements. These reserves are modified based on the liquidation by the central bank of the different reserve requirements calculated over a variety of deposits and loans collected or granted by banks at the end of each reserve period. The financial liquidation subsystem handles the transfer of funds among the banks' reserve accounts at the central bank resulting from the operations in the other two subsystems.

At the end of each day SELIC determines and reports to participants the net daily balance of the operations and the new starting position of each institution (Final Financial Position Report). SELIC also reports to each institution the record of transactions of the custodian bank (the net securities position, reflecting the algebraic sum of operations processed on their own account), as well as the account of transactions processed on behalf of clients and subcustodian banks. SELIC charges a basic fee of R\$1,700 per month (up to 150 transactions) and it goes up to a maximum of R\$6,500 per month for over 2,400 transactions. Members of ANDIMA (National Association of Open Market Institutions) receive a 50 percent discount. SELIC does not have intraday overdraft monitoring and control capabilities.

¹¹ Include Central Bank Bonds, Central Bank Special Notes (yield linked to fluctuations in the exchange rate in the free market) and Central Bank Bills. Treasury securities include National treasury Bills, Notes and Financing Bills. State Securities and City Financing Bills are included as well.

In 1993, the central bank authorized commercial banks, multiple service banks with commercial portfolios, and savings banks to register through SELIC interbank transactions affecting their reserve positions at the central bank with same day settlement (next day finality), without a corresponding movement in their securities position (although most interbank transactions are collateralized). These money market operations are known as interbank deposits. The minimum term for such deposits is 1 day on preset operations and ninety days on postset operations.

SELIC users include primary issuers of securities (the national Treasury, the central bank and state and local governments) and all participants in the secondary market (the central bank; commercial, multiple service, investment, development, and savings banks; credit, finance, and investment institutions; leasing companies; mortgage companies and mutual funds; and any other entities authorized by the central bank to operate in the market).

Although SELIC transactions are not encrypted, the system is considered very safe for participants because it requires both institutions party to a securities transaction to positively confirm each operation, and includes other security procedures, including passwords for each video terminal linked to the system (which are changed weekly); the capability for SELIC to block any terminal (totally or partially), custody balance checks after each operation in order to guarantee that the selling institution holds enough securities¹² (if securities are not in the seller's account) the system keeps the operation pending until the securities are placed in the seller's account; individual and unique entry numbers for each operation; control of the custodian's video terminal authority to undertake an operation; individualized access to its own records and to those of its subcustodians; and a "no break system" that prevents any interruption of service and data recording in magnetic tapes and microfiches, with copies kept in different locations. In the event of technical failure SELIC can use CETIP as a backup (for capacity reasons SELIC cannot backup CETIP).

E. The role of CETIP

The Central Custody and Financial Clearing of Securities (CETIP), a private securities transfer and trading system, was launched in Rio de Janeiro in March 1986. The system is operated as a nonprofit organization by its 747 owners, which include most banking and nonbanking financial institutions in Brazil.¹³ It is subject to supervision by the central bank. The system handles transactions of more than 1,200 participants, processing about 20,000 transactions worth about R\$53 billion a day. It also handles more than 120,000 requests for information daily.

CETIP centers around three integrated modules: custody (in electronic book-entry form), trading (with buyers and sellers keying their operations into the system for crosschecking and confirmation purposes) and financial clearing (through a clearing bank designated by each participant).

Membership in the CETIP is open to all financial institutions authorized by the central bank. In addition to the Rio head office CETIP has three other branches (Sao Paulo, Belo Horizonte and Porto Alegre). Its hours of operation are from 8:30 a.m. to 8:00 p.m., with the clearing information sent to the central bank in electronic form at 11:00 p.m. to debit/credit banks' next day reserves. In case of failure by one of the participants there is an unwinding procedure for transactions undertaken on the participant's own account (transactions on behalf of customers are final). Delivery versus payment (DVP) is achieved in (t+1) when final settlement takes place. Securities lending is not allowed (i.e., no free transfer of securities). As in SELIC's case, CETIP does not have intraday monitoring and control capabilities.

¹² Apparently SELIC does not check its inventory to ensure that the bond to be transferred is actually owned by the transferring bank (check).

¹³ Brokerage houses, dealers, commercial banks, multiple and investment banks are required to buy CETIP shares (unless they deal exclusively with inter-financing deposits). Insurance companies, pension funds, etc. pay an account opening fee.

CETIP is used to buy and sell state and municipal debt, corporate bonds, and bank certificates of deposits (CDs), gold transactions, posting of debentures, foreign exchange transactions, mortgages, and to transfer reserves in next day funds for the settlement of stock exchange and commodities and futures exchange transactions. All CETIP securities are held in book-entry form and require confirmation of the transaction from both the buyer and the seller.

By centralizing many securities transactions within CETIP and SELIC, the central bank can monitor large financial transaction flows for monetary policy purposes. For this reason the transfer of same day funds is not allowed. Tax authorities can also monitor transaction flow to detect tax fraud or money laundering activities.

1. Stock exchanges

Brazil has nine regional stock exchanges. The largest, with an estimated 90 percent of the market, is BOVESPA (Bolsa de Valores do Sao Paulo). The Rio de Janeiro stock exchange accounts for an estimated 7 percent of the national stock exchange trading market.

BOVESPA operates with 78 members, about 550 listed companies, more than 1,000 stocks, and a total market capitalization of listed companies that exceeds R\$170 billion. Trading volume in 1996 has averaged about 9,000 trades a day, for a daily value of R\$300 million. Seats on the BOVESPA exchange cost R\$4.2 million, and funds from the sale of seats are used, in part, to provide cover in the event of a settlement failure by one of the members.

Financial settlement for BOVESPA trades takes place on a net basis, with BOVESPA serving as the counterparty for all exchange members. At the end of each trading day, BOVESPA calculates the net position of each exchange member. On the third day following the trade, BOVESPA initiates a CETIP credit from the bank of each stock exchange member in a net debit position into BOVESPA's bank and a credit from BOVESPA's bank to the bank of each member in a net credit position. The CETIP entries are delayed until the third day to allow time for the buyer to issue a check to his or her broker and for the check to clear. Financial settlement for BOVESPA stock trades takes place on the fourth business day following the transaction, and security ownership is released to the buyer on the morning of the fifth day. All stocks traded through BOVESPA are held in book entry form. Member-to-member financial settlement are handled through CETIP. For dividend purposes, the ownership of a traded security is deemed to be transferred on the second day following the trade. However, because the financial part of the trade has not been settled, the ownership of the security is blocked and the buyer cannot trade the purchased security until finality on (t + 5).

Table 6 shows the key steps and timing of the settlement of stock trades through BOVESPA

Table 6: BOVESPA clearance and settlement of securities

<i>Activity</i>	<i>Timing</i>
Trade executed	t+0
Security deposited with buyer, but blocked from transfer	t+2
BOVESPA initiates net debit to buyer broker and net credit to seller broker through CETIP	t+3 @9:00 a.m.
Selling and buying broker confirms net debit and credit through CETIP	t+3 @12:00 noon
Buyer issues check (or DOC) to buyer broker and selling broker issues check (or DOC) to seller	t+3 @noon to 6:00 p.m.
CETIP net settlement sent to Banco Central for posting	t+4 @2:00 p.m.
Net settlement through CETIP posted to buyer/seller broker banks settled through reserve accounts	t+4 @6:00 p.m.
Buyer and seller broker's checks (or DOCs) settled	t+4 @6:00 p.m.
Security ownership unblocked and transfer finalized	t+5 @9:00 a.m.

In the event of a failure to settle, BOVESPA's capital is used to underwrite the settlement, and BOVESPA takes possession of securities traded by the failed member as collateral. Certain precautions, including the establishment of member net debit limits and the on-line monitoring of member positions against those limits, are taken to ensure against a settlement failure.

2. *Commodities and futures exchanges*

The Sao Paulo Commodities and Futures Exchange (CMF) was founded in 1985 as a private nonprofit company owned by its 71 members. Based upon the Chicago Mercantile Exchange model, CMF is the third largest derivative exchange in the world, trailing only the Chicago Board of Trade and the Chicago Mercantile Exchange. The CMF handles about \$150 million in derivatives annually. About 90 percent of the exchange's total trading value is in derivatives

Settlement for exchange activity is similar to the process used by BOVESPA. Each clearing member must have an account with a major bank and an agreement authorizing the bank to provide settlement services on its behalf. The interbank transfer of funds for settlement purposes goes through CETIP. Customers are required to pay for purchases at t+1. Settlement, which takes place on a net basis, is handled through CETIP to take place at t+3. The CMF serves as the counterparty for all transactions and guarantees the settlement. CMF has several guarantee and assistance funds to ensure settlement. The guarantee assistance funds and capital position of the exchange represent about ten times the maximum daily net debit settlement position of any of its members.

F. **The role of the Treasury**

In part because most Brazilians do not have checking accounts, banks are often used to collect and disburse government payments to and from consumers. To facilitate the settlement of government payments and collections, the Treasury maintains an account at the central bank. Treasury payments and collections are not made directly from and to the central bank, however, but are generally handled by Banco do Brasil, which serves as the disbursing and collecting bank.

With the adoption in 1987 of a new integrated system of financial administration of the funds of the federal government (SIAFI) and the adoption of a single consolidated Treasury account at the central bank (at the end of 1988), the operations of the government were significantly centralized and streamlined. The accounting information flows through the SIAFI to more than 5,000 administrative units of the government linked to a computer network through which the appropriations made by the Treasury to the ministries are allocated and sent. When these units need to make payments they issue banking orders through the agency of Banco do Brasil, where they keep their accounts. The consolidated information is passed by Banco do Brasil to the central bank. The central bank debits the single Treasury account and credits the funds to Banco do Brasil, which transfers the money to the agency where the administrative unit making the payment has its account. The administrative units then make their payments.

1. Treasury collections and disbursements

One of the major Treasury payment applications is the collection of tax payments, which are collected through the banking system. Taxpayers deposit their taxes along with a remittance form to a bank branch of their choice. Bank branches are generally connected online to the bank's main office, which collects the receipt data for each of its branches. The bank may hold the funds for one day and keep the float, or it may hold the funds for two days and pay interest to the Treasury before remitting the collected funds electronically to the central bank and forwarding the collection information to the Treasury's data-processing subsidiary, SERPRO. Upon receipt of the funds on day 2, the central bank notifies SERPRO for reconciliation purposes. All Treasury payments are disbursed out of accounts held on behalf of the Treasury at the Banco do Brasil.

2. Social security collections and disbursements

All companies are required to deposit their social security withholdings into the bank of their choice by the fifth working day of each month. The withholding rate is based upon a percentage of each workers' salary, and represents approximately 12 percent of a company's payroll. The collecting bank remits the deposited funds electronically (via SELIC) to the INSS account at the Banco do Brasil. This process of collection takes place during the first few days of each month. The collecting banks are compensated for their efforts by keeping the interest earned on the funds between the time they collect the funds and the time they transfer the funds to Banco do Brasil. Funds collected are used to pay social security recipients on a one-for-one basis, and are generally not transferred into investment accounts, but are maintained in liquid accounts at the Banco do Brasil.

For a bank to serve as a collector of social security funds it must also disburse funds to recipients. Sixty-four banks participate as social security collectors and disbursers handling 15.9 million payments worth R\$2.9 billion each month.

Upon reaching eligibility (30 years of work for men, 25 years for women), social security recipients sign up for benefits at one of 900 local social security branch offices and receive their payments at a bank branch near their home. DATAPREV, a government-owned computer processing company, processes the information on behalf of the INSS for all non-state employees, sending banks information on individual payments in magnetic form. Public employees' benefits are processed by different public service companies and funds are disbursed through federal and state banks. Each social security recipient is assigned a date of the month by which the benefits will be available at the bank branch (payments are made during the first ten days of each month). All recipients receive a plastic card authorizing them to withdraw social security funds deposited in their name at the assigned branch. Some banks have the capability to permit recipients to withdraw from any branch of that bank, although most banks require withdrawal at the assigned branch. Some private commercial banks have issued a magnetic card to allow beneficiaries to withdraw funds gradually throughout the month.

Based upon social security instructions, the Banco do Brasil electronically transfers funds to each disbursing bank according to the expected amount of benefits that social security recipients assigned to that bank will collect on a particular day. Social security also provides a magnetic tape to each bank detailing the payments

due to each recipient by branch. It is up to each bank to ensure that the funds are allocated to the appropriate branches. Funds transferred to a branch but not collected are transferred back to Banco do Brasil on behalf of the INSS. In the event of underpayment by social security (as a result of disbursement estimation errors), Banco do Brasil disburses the shorted funds.

V. Planned initiatives

Several significant initiatives are planned for 1996.

A. Truncating low value checks

During 1996 Brazil plans to move to truncation of low value checks within the city of first deposit, with all clearing and settlement done electronically. The separation of high value and low value checks and the capture of full MICR line check data will facilitate the full truncation of low value checks. Because checks are posted to customer accounts via the MICR line data and are not returned to the customer, the only reason to move the physical check through the clearing system is to verify signature. Most Brazilian banks do not verify all signatures, but only those above an established bank threshold, which is usually, higher than the low value threshold of R\$130.

B. Reducing risk in foreign exchange settlement

Current foreign exchange transactions bear a risk because the foreign currency leg and the real leg are settled separately and independently. The central bank is currently developing plans to unify the settlements for U.S. dollar foreign exchange transactions, which constitute the bulk of Brazilian foreign exchange transactions by value.¹⁴ Under this plan two banks conducting foreign exchange transactions would negotiate the trade and notify the central bank as it is currently done at $t+0$. However, rather than the bank selling U.S. dollars, arranging a CHIPS or Fedwire transfer at $t+2$ for each trade, each bank would be notified of its **net** U.S. dollar transactions on day $t+1$, and the central bank would debit the reserve accounts of banks with a net position buying in U.S. dollars. Banks in a net selling position in U.S. dollars would authorize a CHIPS, Fedwire, or book transfer of the dollars owed into the U.S. account of the central bank (if both the debit bank and central bank had accounts at the same U.S. bank). Once all dollars had been received on day $t+1$, the central bank would instruct its New York correspondent bank to initiate outgoing wires (or book transfers) to the banks that were in a net credit position in dollars. Assuming that all dollar transfers are received and adequate reserves existed to cover the real leg, the central bank would authorize the transfer of dollars to the New York correspondent of the banks with a net buying position in U.S. dollars.

The system will close at 7:00 p.m. but parties will continue to have one hour to confirm trades. After 8:00 p.m. banks will be able to know their net position. Each bank will receive information from the central bank requesting payment (for net U.S. dollar buyers) one day before settlement date. Net selling banks in U.S. dollars will need to confirm the deposit of the funds at the central bank's New York account before 2:00 p.m. of the next day for the central bank to invest the U.S. dollars overnight. To compensate for the float to net buyers and sellers of receiving transfers one day early ($t+1$), the banks would be paid interest at the rate of overnight investment received by the central bank. The use of netting will reduce the number of Fedwire/CHIPS transactions from about 1,300 a day to a maximum of 145 (one per participating bank). In the event of a settlement failure (inadequate real reserves or U.S. dollars), the central bank would unwind the unmatched transactions on a last in first out basis until sufficient dollars and reais were available. Banks will have to sign an agreement to accept the Sistema Nacional de Cambio (SNC) rules. Upon approval by the U.S. Federal Reserve System, the new foreign exchange settlement system will start operating.

¹⁴ *Non-U.S. dollar transactions will continue to be made through the existing mechanism (see section IV.A).*

At a future date SELIC could be linked to the foreign exchange trading module of SISBACEN (SNC) to allow participants to collateralize to the central bank the “domestic leg” of a foreign exchange transaction.

C. Other initiatives

There are a number of other initiatives under discussion dealing with the payment system directly (e.g., the introduction of a large value transfer system via CETIP, direct debiting of *cobranças*, continuous clearing of checks) or dealing with a simplification of the regulatory framework (e.g., simplifying reserve requirements, reducing the taxation of financial transactions, creating a more leveled playing field between private and public banks) which would increase the general efficiency and competition in the banking sector.

VI. Opportunities for improvement

Brazil’s payment system is highly efficient in terms of speed, reliability, and customer convenience. There are questions, however, about whether the system, which was developed in response to the hyperinflation, remains cost effective in a lower inflation environment.

There are also questions about whether the risk control measures, particularly credit risk control in the settlement process, are adequate given the high volumes and values of funds transferred through the payment and securities systems. This section examines some issues that need to be considered in fine tuning the system.

A. Creating an intraday customer to customer funds transfer system

Despite the sophistication of its payment system, Brazil lacks a system that facilitates the intraday movement of funds between bank customers. SELIC operates in a same day settlement mode but is not a pure funds transfer system, as security ownership must be transferred along with the funds. SELIC is also used to lend money in the interbank market. Under certain circumstances CETIP will allow a pure funds transfer system, but CETIP transfers next day funds with two day finality, and DOCs, *cobranças*, and checks are all settled in next day funds (although banks may arrange for same day credit for good customers).

Although this lack of an intraday funds transfer system would appear to be a deficiency in the nation’s payment system, neither the central bank nor the bankers interviewed appear to want such a system. Indeed, many of the settlement and other payment systems are tailored around a t+1 settlement to coincide with what is often a check settlement leg of the underlying transaction.

The absence of an online real time funds transfer system would appear to delay the settlement of certain systems (such as BOVESPA) by at least one day, thereby increasing somewhat the risk of settlement failure.

B. Reducing settlement risk for the central bank

All payment systems in Brazil are settled through reserve accounts held at the central bank. The five principal settlements are **SELIC** (end of day net settlement in same day funds, with next day finality); **CETIP** (end of day net settlement in next day funds, with two day finality); **clearinghouse night exchange** (net settlement in next day funds, with end of next day finality); **clearinghouse morning exchange** (net settlement in same day funds, with next day finality); and **the domestic leg of foreign exchange transactions** (gross settlement at end of t+2).

In the case of each system relying on net settlement, it is unclear exactly what would happen in the event that a participant failed to settle. Three different alternatives were mentioned by bankers.

Under the first scenario, the securities associated with the trades (for SELIC and CETIP) would be seized and liquidated to provide cover for the failing bank. This assumes that the systems could quickly identify the

underlying transactions of the failed bank, take legal ownership of the securities, and liquidate the securities quickly at the traded value. It is not clear that all of these conditions would hold.

Under the second scenario, all of the day's transactions with the failed bank would be unwound. It was not clear that the systems had the ability (legally and operationally) to unwind. Moreover, even if an unwind could be done, it is not clear that systemic risk would be avoided.

Under the third scenario, the central bank would intervene and in essence underwrite the settlement. This last scenario appears to be the one that many bankers believe is most likely to occur, especially given the large proportion of banking assets that are controlled by government-owned (federal or state) banks to avoid systemic risk and a run on government-owned banks. To avoid systemic risk and a run on government-owned banks the central bank could be forced to guarantee a settlement in the event of the failure of a settling participant. The central bank currently has no way to monitor the intraday positions of the banks across all systems, and no intraday limits are established on these various payment and settlement systems, suggesting that the central bank and banking industry do not have an effective mechanism for monitoring and controlling intraday risk exposure.

Given the high value and volume of funds transferred in Brazil and the fragile financial condition of some of the banks after the stabilization program, the potential settlement risks across all payment systems should be better monitored and controlled.

C. Facilitating interbank direct deposit/direct debit

Direct deposit and direct debit exists and are available in Brazil only when both the payer and the payee have transaction accounts at the same bank. Given the level of electronic processing capabilities at the banks and clearinghouses, it would seem that the creation of an automated interbank clearinghouse capability would not be difficult. Such a capability could reduce the amount of in-branch traffic for tax payments, *cobranças*, and DOCs, and would offer greater customer convenience by not requiring employees to maintain accounts at their employers' bank to receive direct deposit.

Although such a capability may not be needed now, a growing middle class and the concomitant increase in checking accounts may justify establishing such capability in the near term.

D. Broadening shared ATM networks

For a country in which banking institutions have cooperated closely in building a very sophisticated payment and ground transportation system, it is surprising that a nationwide shared ATM capability does not exist. Such sharing would reduce the cost of building national ATM coverage and would lay the foundation for a POS debit capability.

E. Consolidating banking institutions

The loss of the inflationary transfers captured by commercial banks, as well as the adjustment of the enterprise sector to the new low-inflation environment, is likely to require adjustments, including consolidations and mergers. A process of consolidation in the financial industry that may result in the failure of banking and nonbanking financial institutions need not pose risks to the operation of the payment system if proper risk control measures and contingency plans are implemented.

F. Reducing the level of returned items

Since the stabilization program, the percentage of checks written against insufficient funds has roughly doubled – to 2.5 percent by volume and 4 percent by value. This level would seem to be high for a country with such a high level of dependency on checks.

It may be that with lower levels of inflation, the payment system would be better served by greater use of credit cards (for true consumer debt purchases) and debit cards (for the convenience of check users). Increased use of credit cards could reduce the volume of returned items and end the practice of writing multiple checks for a single purchase at the point of sale.

G. Reconsidering whether the system may be unnecessarily costly given recent rates of inflation

Much of the Brazilian payment system was set up in response to extremely high levels of inflation. With the severe drop in the time value of funds that has occurred since 1994, some bankers are questioning the level of expense needed to support the system. The cost of processing payment documents at night to receive next day funds is high, for example, because of the 35 percent differential for night shift employees' salaries. The cost of transporting virtually all checks on a next day basis may also be high relative to the time value of funds. Each bank should examine its internal operations, deadlines, and service levels to determine if they still make sense given the new economic environment. Banks are discussing the option of slowing down the clearing system by a day.

H. Introducing fees for payment-related services to noncustomers

Banks frequently provide payment-related services, such as collecting taxes and disbursing social security payments, to noncustomers. One large bank has estimated that 30 percent of its branch transactions are on behalf of noncustomers.

Banks have historically received compensation for these services by being able to keep a day or two of float with the transactions. When inflation was high, banks were well compensated for their services. With the decline in inflation, however, payment by float is no longer as attractive, particularly since the value of many of these transactions for nonbank customers is low. Assuming that inflation remains at historically low levels, banks may have to begin explicitly charging for some services previously offered for free. The use of explicit charges would not only compensate banks for services rendered, but would also discourage over-use of certain payment instruments and branch services.

I. Ownership of the payment systems operator

Banco do Brasil is a federal government-owned commercial bank, competing in its banking business with other state and private commercial banks. The present ownership structure raises the issue of the feasibility of privatizing the operation of the payment system establishing, for example, a new entity owned jointly by the banks to be the operator of the systems, always under the supervision of the central bank. This issue deserves some consideration in the future.

J. Strengthening the legal framework

To the extent that banking transactions and participants' needs have changed dramatically in the last few years, Brazil, like most countries in the region need to plan reforms to the legal foundations governing electronic payments. This is particularly important if a large-value credit transfer system is planned.

K. Encryption

SELIC and CETIP are not encrypted. While they have security procedures encryption should be introduced.

VII. Lessons

Several general observations emerge from the check-based payment systems in Brazil, and our prior review of the cases of Colombia and El Salvador.¹⁵

- **Banks can achieve significant cost reductions by cooperating.** As the case of Brazil's shows, banks can reduce costs by cooperating on check processing and transportation. Cooperation is not a zero-sum game but a means of reducing processing costs throughout the system, benefiting customers and the economy. The difficult part is structuring incentives and reaching agreements on allocating these benefits fairly.
- **Economies of scale can be achieved through specialization.** The use of service bureaus for processing checks and other payment instruments is likely to improve the efficiency of the system and reduce costs, as it allows for smaller banks to take advantage of modern technology on a shared basis with other smaller banks.
- **Planning for the future is critical.** By developing a vision of the future and the steps required to improve the payment system, the central bank and/or the operator of the payment system can promote discussion, consensus, and coordinated action among the participants, which can be very important in reducing wasteful investments. One good example is offered by Brazil where there are announced plans to move in a certain direction (electronic clearing, truncation, etc.)
- **Leadership in modernizing the payment system is necessary.** Leadership is needed to forge agreement on technical standards and their enforcement in order to improve the efficiency and security of the payment system.
- **Good communication among payment system participants is vital.** Participants in the payment system need to know the rules of the system and be familiar with the emergency procedures in place. For these reasons preparing clear documentation is very important. Banco do Brasil has made a very good job in preparing and disseminating important information for users.
- **A broad and inclusive approach to payment systems development should be taken.** Modernization of the payment system must take into account users' needs. In most countries the government is among the largest users of payment services. The automation and simplification of procedures for collecting revenues from the public (individuals and enterprises) and making payments can contribute significantly to raise the efficiency of government, improving the control of public funds. Other major users include participants in the capital market and in other markets requiring the use of payment services. In modernizing payments services the needs of these major users should receive priority.
- **A wider menu of payment instruments should be offered.** In addition to the check, the use of *cobranças* and DOCs (credit instruments) provide payment certainty (no return items) and allows payment system access to those without checking accounts.
- **Automation is critical.** Automation is a key component of payment system modernization. Cost reductions and tremendous increases in speed and capacity will continue to affect the way banks and clients do business and demand faster and better payment systems. The value of modern telecommunications may, however, be a function of country size, level of sophistication and geographic accessibility.
- **The importance of constant rethinking of the existing operating structure of the payment systems and of receiving feedback.** The establishment of advisory groups including major participants and users of

¹⁵ See R. Listfield and F. Montes-Negret, *Payment Systems in Latin America, A Tale of Two Countries: Colombia and El Salvador*, Policy Research Working Paper No. 1519, The World Bank, Washington, D.C., October 1995.

payment services provide a useful forum and focal point for continuous discussion of issues (with risks and security high in the agenda) and the study of improvements to continuously upgrade payment services, as well as solving outstanding issues in a cooperative form.

- ***The importance of a modern and efficient securities clearance and settlement system to support the development and liquidity of primary and secondary markets.*** With the spread of privatization and the increasing sophistication of financial markets, in which the intermediation of funds by non-bank financial institutions becomes increasingly important, it is essential to pay more attention at the linkages between clearance and settlement of securities and the risks involved.

Table A.1 - Brazil: Economic indicators 1987-1995
(percentage change over a 12-month period)

Year	Inflation measured by		Real GDP growth
	the consumer price index (a)	the wholesale price index (b)	
1987	367.1	400.7	
1988	891.7	1,055.4	
1989	1,635.9	1,732.4	3.2
1990	1,639.1	1,425.3	-4.3
1991	458.6	471.9	0.3
1992	1,129.5	1,160.9	-0.8
1993	2,491.0	2,635.7	4.2
1994	941.3	1,031.4	5.8
1995	23.2	6.6	4.2

Source: *Boletim do Banco Central do Brasil (BCB)*, Vol. 32, No. 3, March 1996

(a) IPC-Fipe

(b) Total wholesale price index

Table A.2 - Brazil: Income velocity of money and real interest rates (1993-95)

Year	Velocity of				Real interest rate	
	M1	M2	M3	M4	Government paper (OTC/SELIC)	Certificates of deposit
1993	63.6	7.9	5.5	3.6	7.1	0.8
1994	23.3	7.4	4.6	3.1	24.8	26.5
June	64.2	7.3	5.0	3.5	10.6	11.9
July	45.4	6.9	4.4	3.1	13.2	-
1995	22.6	6.1	3.8	2.6	33.1	31.7

Source: *Boletim do Banco Central do Brasil (BCB)*, Vol 32, No. 3, March 1996

M1 = (currency + demand deposits); M2 = (M1 + special deposits and financial investment funds + short-term government paper);

M3 = (M2 + savings deposits); M4 = (M3 + private securities)

Table A.3 - Brazil: Financial deepening (1993-95)

<i>Year</i>	<i>M1/GDP</i>	<i>M2/GDP</i>	<i>M3/GDP</i>	<i>M4/GDP</i>
1993	1.6	12.6	18.3	27.5
1994	4.3	13.6	22.0	32.7
1995	4.4	16.8	26.5	39.0

Source: Boletim do Banco Central do Brasil (BCB), vol. 32, No. 3, March 1996

Table A.4 - Brazil: Inflationary transfers received by commercial banks
(US\$ billions and percentages of total inflationary transfers)

<i>Year</i>	<i>Private banks</i>	<i>Percent of total inflationary transfers</i>	<i>State banks</i>	<i>Percent of total inflationary transfers</i>	<i>Federal banks</i>	<i>Percent of total inflationary transfers</i>	<i>Total</i>
1990	4.0	38.2	3.6	33.9	2.9	27.9	10.5
1991	3.4	37.9	2.9	32.0	2.7	30.2	8.9
1992	3.1	38.2	2.6	32.1	2.4	29.7	8.1
1993	3.8	39.3	3.0	30.9	2.8	29.8	9.5
1994*	2.0	41.2	1.5	30.9	1.3	27.9	4.8

Source: Cysne, 1995

* First five months of the year

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