

IMF WORKING PAPER

© 1994 International Monetary Fund

This is a Working Paper and the author would welcome any comments on the present text. Citations should refer to a Working Paper of the International Monetary Fund, mentioning the author, and the date of issuance. The views expressed are those of the author and do not necessarily represent those of the Fund.

WP/94/133

INTERNATIONAL MONETARY FUND

Monetary and Exchange Affairs Department

The Payments System and its Effects on Monetary Operations:
Recent Experience in the Russian Federation

Prepared by Gabriel Sensenbrenner and V. Sundararajan 1/

November 1994

Abstract

Recent developments and reforms in the Russian payments system are discussed from the perspective of their impact on monetary policy. The large and highly variable payment float in the balance sheet of the Central Bank of Russia has complicated the conduct of monetary policy. However, reforms in late 1992 and early 1993 have been effective, as judged from their impact in reducing the level and variability of float, and have set the stage for medium-term reforms of the payments system. Rapid progress in the implementation of these reforms, and their appropriate coordination with monetary operations, remain critical to meet the emerging needs in money and foreign exchange markets, and to support the transition to indirect methods of monetary control.

JEL Classification Numbers:

E58; E52

1/ This is a revised version of the paper presented at the Central Banking Seminar in March 1994, organized by the Monetary and Exchange Affairs Department and the IMF Institute. The revisions take into account the comments received from the seminar participants, particularly Mrs. Paramonova, Acting Chairperson, CBR, and several colleagues from the European II and MAE Departments, particularly Adrienne Cheasty, Michael Marresse, and Delmar Harrison.

Contents

	<u>Page</u>
Summary	iv
I. Introduction	1
II. Payments Systems and Monetary Operations	2
1. Monetary effects of payment float	2
2. Implications for the design and mix of monetary operations	6
3. Monetary aspects of payments system design	10
III. Payment Float in Russia: Causes, Measurement, and Determinants	12
1. Institutional and operational aspects of the Russian payments system	12
2. Issues in the measurement of the payment float of the CBR	17
3. Determinants of CBR float--an analytical framework	19
4. Regression results and impact of reforms	23
IV. Concluding Remarks and Summary	25
Text Table	
1. Major Developments in the Domestic Payments System Operated by the CBR, 1992-94	14
Charts	
1. Daily Excess Reserves for a Sample of Moscow Banks	4a
2. Banks' Correspondent Accounts at CBR	4b
3. Monetary Impact of Payments System Shocks and Benefits of Alternative Monetary Instruments	6a
4. CBR Payment Float	18a
5. CBR Payment Float, Adjusted	20a
6. CBR Payment Float and Credit to Banks	22a
7. CBR Float and Net Credit to Government	22b
8. CBR Payment Float and Inflation	22c

Contents

	<u>Page</u>
Appendix. Institutions and Operations of the Russian Payments System--Recent Developments	27
1. The payments system in the former Soviet Union	27
2. Collapse and transition to post-Soviet system	28
a. Structural inadequacies of CBR payments system	29
b. Private sector responses	34
3. Emergency stabilization measures	37
a. Cash shortages	38
b. Inter-enterprise arrears	38
c. Interstate payment imbalances	39
d. Russia checks	40
e. Procedures for large value payments	41
f. Payment fraud	41
4. Medium-term reform strategy of the Russian payments system	42
a. Clearing system	45
b. Large value transfer system	45
c. Other areas of reform	46
Bibliography	48

Summary

Recent developments and reforms in the Russian payments system are discussed in this paper from the perspective of their impact on the conduct of monetary policy. The large and highly variable payment float in the balance sheet of the Central Bank of Russia (CBR) has contributed to large excess reserves of commercial banks, and has complicated both monetary management and the transition to indirect methods of monetary control. It is argued that well-coordinated and mutually supportive reforms of both monetary operations and the payments system are needed to deal with the monetary consequences of payments system deficiencies.

After reviewing institutional and operational developments in the Russian payments system during 1989-94, an analytical framework is developed to measure and explain the behavior of the CBR payment float, which is viewed as an indicator of the efficiency and effectiveness of the payments system structure. An equation specifying the determinants of float is developed and estimated in order to assess the impact of initial payments system reforms. It is found that these reforms have contributed to stabilizing the initially turbulent situation and have improved the reliability and speed of payments. The empirical analysis also finds that the float has acted as an automatic stabilizer, offsetting the impact of net credit to government by the central bank. Nevertheless, this effect cannot be extrapolated and the level and variability of CBR float still remain high, contributing to a continued large demand for reserves. A factor that has also contributed to reducing the level and variability of CBR float is the rapid development of correspondent banking, on which data are not available.

Stabilization of the payments system has set the stage for medium-term reforms, whose design is progressing well. High priority is being attached to developing a large ruble interbank funds transfer system to provide real-time gross settlements. In addition, clearing houses have been licensed to improve clearing of bulk payments; progress is under way in developing new payment instruments, improving legal and regulatory framework, strengthening settlement procedures for government securities, and developing communications platforms, technical standards, and new automation architecture. Continued progress in the implementation of these reforms--including transitional steps based on readily available technology that could provide immediate benefits while implementing the medium-term structures--remains critical to support the emerging needs in money and foreign exchange markets and in monetary operations.

Payments system reforms, including the medium-term reforms now under way, need to be monitored closely in light of their strong potential to influence the demand for reserves. In particular, the implementation of a large value transfer system and the associated accounting reforms may reduce the demand for reserves, depending on the specifics of the design and its alignment with the monetary regime. This underscores the importance of proper coordination of payments system reforms with the ongoing reforms to develop indirect monetary instruments.

I. Introduction

The experience of countries undertaking the transition from direct controls on credit and interest rates to indirect instruments of monetary management shows that effective implementation of this transition process requires many parallel reforms in central banking and in the broader financial sector. 1/ In particular, successful transition is associated with, among other things, well-coordinated reforms of the monetary control system, consisting of:

- reforms of *monetary policy instruments and operations*, including *information systems* for policy design and implementation.
- reforms of *institutional arrangements for money and interbank markets*.
- reforms of *clearing and settlement system for payments*.

These reforms are technically interdependent and have to be pursued simultaneously, in a mutually reinforcing fashion. 2/ This interdependence derives from the fact that aspects of clearing and settlement systems--together with the characteristics of reserve requirements and refinance policies--affect the demand and supply of bank reserves, which are the ultimate means of noncash settlement for payments, and at the same time influence the structure of money markets, which are, among other things, a vehicle for obtaining and trading settlement balances. Similarly, the desired features of monetary operations and money markets could influence the design of payments system reforms.

In many economies in transition, significant reforms of clearing and settlement systems have been introduced early in the process of financial sector reform, in order to improve the reliability and security of payments as well as to ensure effective and smooth implementation of monetary policy through indirect instruments. The traditional reliance on gross settlements using paper-based and manual clearing arrangements, and a regulatory framework emphasizing control and account reconciliation have caused significant costs and risks, compromised the reliability and security of payments, and complicated the conduct of monetary policy. These problems have been tackled through several immediate reforms of the existing system with readily available technology in the short run, while redesigning the system based on modern telecommunications over the medium term. These reforms have major consequences for the design and operation of monetary policy, and for the evolving structure of money and interbank markets.

1/ See Leite and Sundararajan (1990).

2/ See V. Sundararajan (1992).

In most market economies, the effects of payments system changes on the money demand and money supply process and on the transmission mechanism of monetary policy are typically gradual, and are often dwarfed by the impact of other financial sector reforms. However, the large onetime changes in payments system arrangements in many economies in transition warrant close attention to the specific linkages between payments systems and monetary policy.

Against this background, the impact of payments system structure on the design and operations of monetary policy instruments is discussed in Section II, with special reference to the recent experience in the Russian Federation. It is argued that well-coordinated and mutually supportive reforms of both monetary operations and payments system practices are needed to deal with the monetary consequences of payments system deficiencies. Against this background, Section III provides a brief outline of recent developments and reforms in the Russian payments system--with details in the Appendix--and focuses on the measurement and analysis of payment float in the Central Bank of Russia (CBR) balance sheet; float is viewed as an indicator of the efficiency of the payments system structure. An equation specifying the determinants of float is developed and estimated in order to assess the impact of recent payments system reforms. This analysis revealed that initial reforms to improve the speed and reliability of the payments system during late 1992 and early 1993 were highly effective and set the stage for a systematic approach to the design and implementation of medium-term reforms. Continued progress in the implementation of these reforms--including transitional steps that could provide immediate benefits while implementing the medium-term structures--remains critical to support the emerging needs in money and foreign exchange markets and monetary operations procedures. Section IV contains concluding remarks.

II. Payments Systems and Monetary Operations

1. Monetary effects of payment float ^{1/}

In the Russian Federation, as in many transition economies, the large size and variability of payment float have proven to be a bottleneck in the shift toward indirect money management. The term "float" refers to amounts that have been debited (credited) from a payor's (payee's) account before the corresponding credit (debit) entry has been posted in a payee's (payor's) account. ^{2/} It reflects the difference in the timing of crediting and debiting of accounts arising from delays in the transmission of payment information and in the subsequent execution of accounting

^{1/} This section draws on material in Sundararajan and Sensenbrenner (1994).

^{2/} For a detailed discussion on float, see Young (1986), and Veale and Price (1994).

entries. Large and variable lags between the time of crediting and debiting bank accounts with the central bank (bank float), or of customer accounts with banks (customer float), could arise from a lack of operating standards in the processing of payments, inadequate rules and regulations on clearing procedures and settlement methods, poor enforcement ability, and unreliability of systems used (e.g., postal services) for the transport and delivery of payment information. 1/ Such factors have been present in various degrees during the recent evolution of the payments system in the Russian Federation, causing large and variable float. 2/

Both the size and variability of the float are major determinants of the demand for reserves (or demand for central bank overdrafts) and of the central bank's ability to implement monetary policy by managing reserve money. These two dimensions of the float have mutually reinforcing effects. A volatile float makes it difficult to manage liquidity both for the central bank and commercial banks, while a large float entails a commensurate settlement risk for the parties involved, which also tends to increase the demand for bank reserves at the central bank.

The volatility of bank reserves is illustrated in Chart 1 for a sample of Moscow banks during June 1992. These data, although taken from a month of particular instability in the central bank payments system, may be considered as representative of conditions that prevailed in the early period following the breakup of the former Soviet Union. Data from a broader sample of 21 banks in the same month suggest that banks held reserves in order to cover themselves against variations of up to two standard deviations in daily balances; this strategy appeared effective as only one bank resorted to a moderate two-day overdraft. The impact of float is also evident from the monthly changes in aggregate balances in the correspondent accounts of commercial banks at the CBR, which varied from 25 percent to 45 percent of total deposits during May 1992 to May 1994 (Chart 2).

If the bank float is quantitatively significant relative to bank reserves, its variability could be so large as to weaken control over the supply of bank reserves, complicating monetary management and hampering the development of the money and foreign exchange markets. For example, the debiting (crediting) of a bank settlement account before crediting (debiting) the receiving (sending) bank leads to a withdrawal (supply) of liquidity; variable lags in such debiting and crediting could result in large day-to-day variations in the size of reserves or of deposits, both in the aggregate and in individual banks. In the face of such large

1/ Even in well-functioning payments systems, a large float could develop owing to transportation delays and processing bottlenecks that lead to holdovers of payment documents, or errors in documents or in processing.

2/ Section III of this paper provides an algebraic framework for the analysis of central bank float in the Russian Federation.

variability, the central bank cannot forecast reasonably well the supply of reserves in order to act on its own initiative. 1/ As a result, in order to fund payment obligations, commercial banks hold large levels of correspondent account balances 2/ in the central bank, or rely on sizable central bank accommodation, insofar as many central banks have allowed liberal overdraft access--even if at a penalty rate--as a buffer against large shocks to the supply of reserves.

Large shocks to the supply of reserves limit the scope of short-term liquidity management by the central bank, thereby influencing the choice of operating targets and the design of monetary policy instruments. Insofar as the authorities wish to target a reserve aggregate as part of a stabilization package, the specific choice of the aggregate could be influenced by the size and variability of float. For example, the conventionally defined net domestic assets (NDA) of the central bank--reserve money minus net foreign assets--may be subject to large variations owing to fluctuations in the interbank float, and this could affect the predictability and controllability of the variable and warrant a switch to an alternative operating target. In the presence of large shocks to the supply of reserves, currency plus required reserves, or a measure of net-free reserves could be more predictable than total reserves. In general, the choice of an appropriate operating target will depend upon the instrument mix used by the authorities and on the type of shocks affecting the monetary system, the latter influencing the degree of correlation between operating and intermediate targets. 3/ The behavior of float could influence this correlation as well as the instrument mix (as discussed further below), thereby affecting the choice of operating target. 4/

Several other monetary consequences of float are noted below. 5/ A large and highly variable bank float can complicate the measurement and interpretation of monetary statistics. 6/ Moreover, specific accounting procedures for payments in many transition economies make it difficult to

1/ By contrast, a large but predictable float may not create problems for monetary management.

2/ Correspondent account balances are reserve money balances in excess of the required reserves. The required reserves are held in separate accounts at the Central Bank of Russia; balances are blocked for the duration of the requirement period. Therefore, the terms *correspondent account balances* and *excess reserves* will be used interchangeably. Excess reserves include both desired reserves--balances held voluntarily to fund anticipated payment obligations--and surplus reserves--involuntary balances in excess of desired reserves.

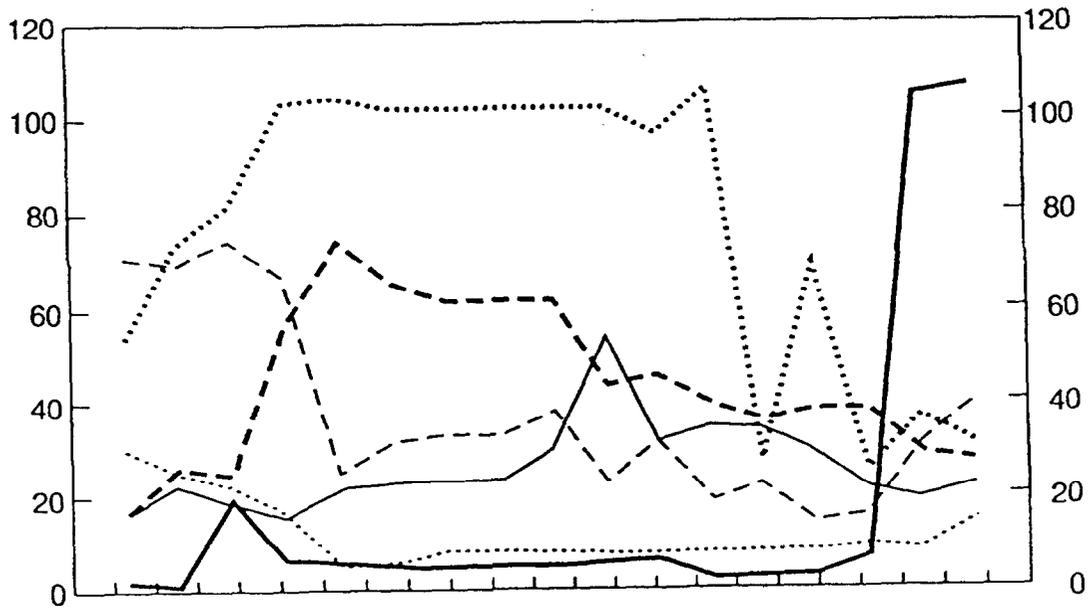
3/ See, for instance, McCallum (1990) and Friedman (1988).

4/ This choice is thus an empirical matter, which is beyond the scope of analysis of the present paper.

5/ For details, see Sundararajan and Sensenbrenner (1994).

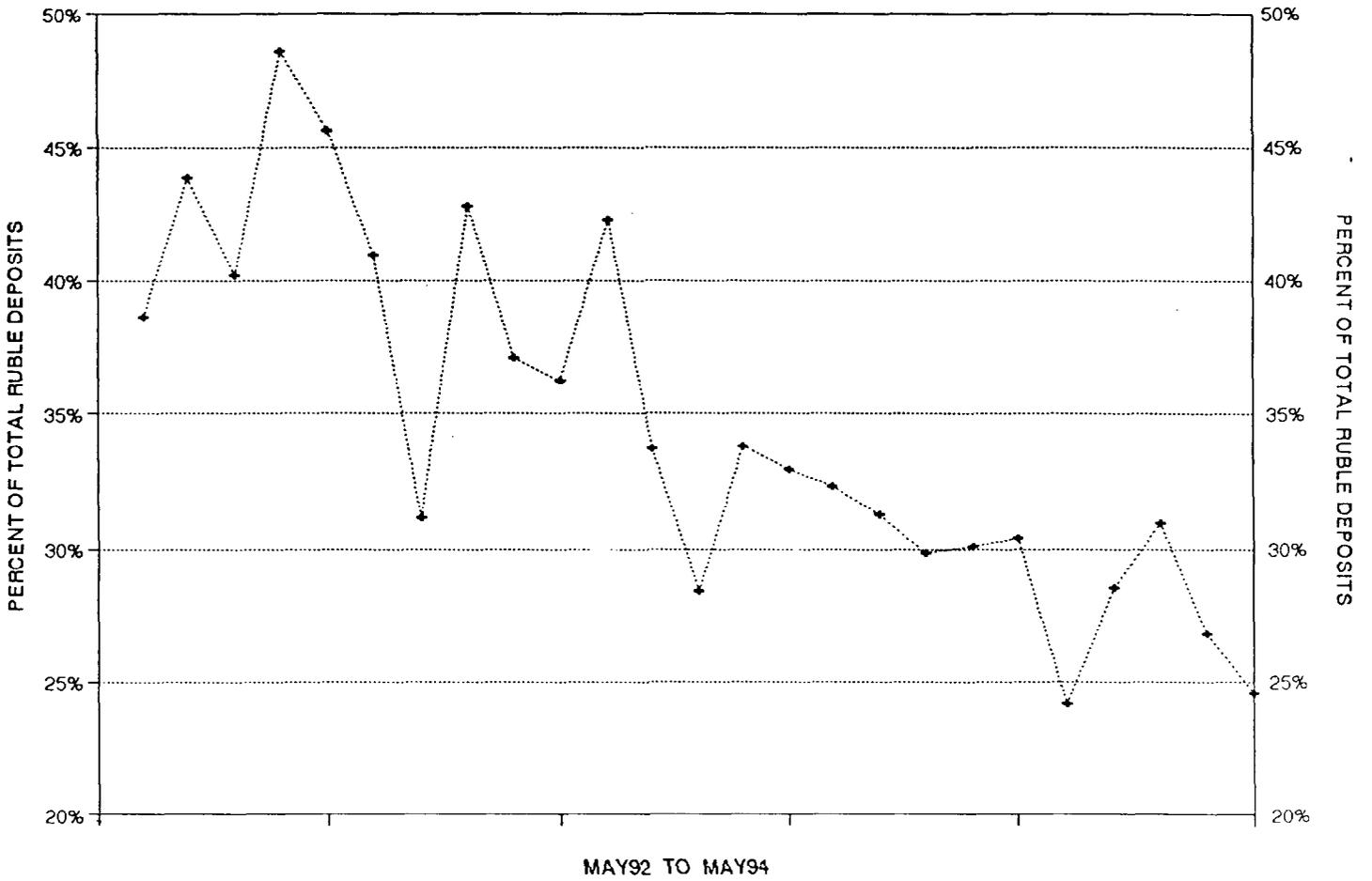
6/ See Liang Ming-Yih (1986) for a discussion of the impact of check float on the definition of money.

Chart 1. Daily Excess Reserves for a Sample of Moscow Banks¹
(In millions of rubles)



Source: Central Bank of Russia.
¹Observations relate to business days in June 1992.

CHART 2
BANKS' CORRESPONDENT ACCOUNTS AT CBR



SOURCE: CENTRAL BANK OF RUSSIA, AND STAFF ESTIMATES.

identify the payment float, or distort the size of balance sheets, thereby complicating the implementation of monetary policy. The procedural delays and other factors that cause a large and variable float could set up incentives for delaying payments in order to take advantage of the erosion in the real value of payments under high inflation, and contribute to payments system gridlock and inter-enterprise arrears. Factors causing float also exacerbate the risks in the payments system, thereby affecting the supply of reserves if the central bank assumes part of such risks. 1/ In addition, operational delays in the payments processing, together with poorly designed security features, could create an opportunity for fraud and result in major losses in the banking system, often borne initially by the central bank.

In the face of such difficulties, it is crucial to introduce very quickly both transitional and medium-term reforms in the payments system. Transitional reforms typically consist of measures based on readily available technology designed to reduce the size and variability of float by speeding up transportation of documents, modifying accounting practices, and standardizing operating procedures. Medium-term reforms based on modern telecommunications also need to be initiated as early as possible because of long lead time. A major aspect of medium-term reforms of payments system structure consists of the introduction of a large value transfer system (LVTS)--a gross or net settlement arrangement using central bank money for large value interbank fund transfers that require finality, a high degree of security, and immediate, same-day or value-dated settlements--as well as introduction of net settlement arrangements through clearing houses typically for small payments. 2/ Alternatively, depending upon the country size, volume of payment transactions and other initial conditions, a single gross or net system for all payments could suffice. The consequences of transitional and medium-term reforms for monetary policy and money market development, and the impact of the features of monetary arrangements for the

1/ The extent to which the central bank assumes the risks will depend on specific risk management and risk-sharing arrangements in payments systems. Risk management issues are discussed in Summers (1994), Borio and Van den Bergh (1993), Hook (1992), and Bank for International Settlements (1990).

2/ These reforms have to be supported by appropriate changes in legislation, organizational arrangements, bank account structure, technology platform, and technical standards. Other key components of medium-term reforms in the payments system include: introduction of new payment instruments, particularly for bulk payments, modification of intrabank clearing and fund management arrangements, and establishment of linkages with securities clearing.

design of payments systems, are more fully discussed elsewhere 1/ and are selectively taken up in the next section.

2. Implications for the design and mix of monetary operations

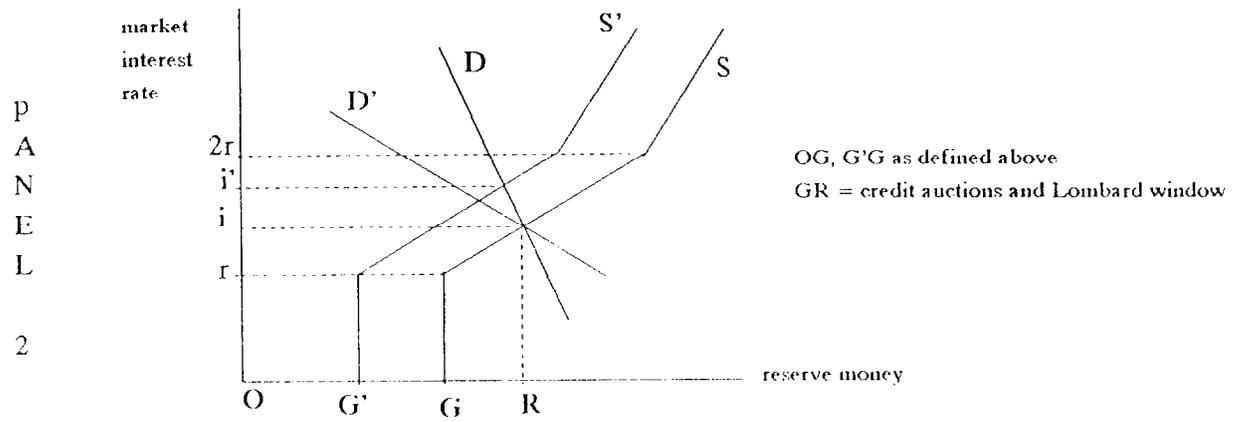
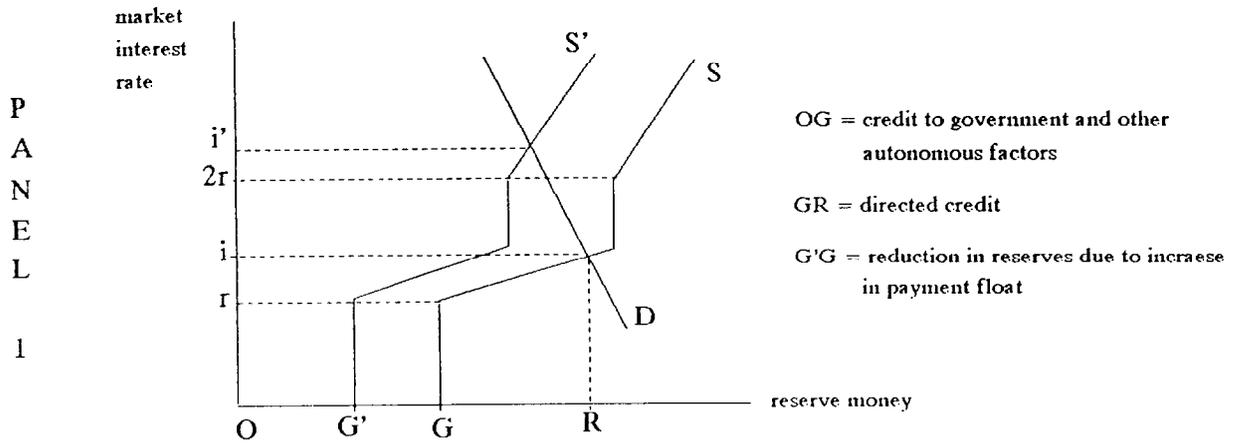
The design and mix of monetary policy instruments, particularly the design of borrowing facilities for commercial banks such as a discount window, and the related monetary operations could be influenced by the need to counter the adverse consequences of large and variable float on system-wide liquidity. Following the breakup of the former Soviet Union, the practice in the Russian Federation was initially to offer only an overdraft facility at a high penalty rate, in addition to directed credits at a pre-announced rate with a lengthy application procedure, thus making the use of central bank credit highly inflexible with respect to market conditions. 2/ This configuration of instruments is illustrated in Chart 3 which shows in Panel 1 the initial setup in the Russian Federation, and in Panel 2 an alternative mix of monetary instruments designed to address unexpected changes in float. In Panel 1, D is the downward sloping demand curve for reserve money at the central bank, and S is the supply curve with different segments reflecting the initial instrument mix. OG is the supply of reserve that is not under the control of the central bank (e.g., credit to government, float, etc.); GR is the supply of reserves through directed credit; reserves to the right of R are supplied via the current CBR overdraft facility; r is the pre-announced finance rate charged by the central bank on directed credit. The portion of the supply curve to the right of point (G,r) is upward sloping to reflect the cost associated with obtaining directed credits; in general, the shape of the curve between points G and R, will depend upon the details of operating procedures that determine ease with which directed credits could be obtained. The vertical segment of the supply curve reflects the fact that additional reserves beyond OR can only be obtained through overdrafts at double the finance rate. The portion of the supply curve depicting the overdraft facility is steeply upward sloping in order to capture the stringent conditions

1/ See Baliño, Dhawan, and Sundararajan (1994), Marquardt (1994), and Vital (1989); Angel (1992) notes that a monetary regime and payments system design (i.e., large value interbank funds transfer system) need to be compatible, but market participants and policymakers should not mechanically subordinate payments system design to a particular existing monetary policy regime.

2/ In the meantime, the CBR has introduced auctions of unsecured central bank credit as a means to allocate some portion of financing. When held frequently enough, credit auctions enable central banks to price credit according to market conditions.

Chart 3

Russia: Monetary Impact of Payments System Shocks and Benefits of Alternative Monetary Instruments



associated with requests for overdraft--more often than not, the central bank may block payments instead of granting overdraft. 1/

Let us assume as depicted in Panel 1 a contractionary shock to reserve money in the form of an unexpected increase in payment float (S shifts to S' , reserves shrink by $G'G$). The initial equilibrium point is (R, i) . Because of the discontinuity in S , the marginal cost of funds jumps from i to i' , above $2r$ as a system-wide shortfall of reserves occurs. A succession of contractionary and expansionary shocks that characterize the Russian payments system would result in large fluctuations in market interest rates. Even the best banks would be pushed into overdraft because they could not forecast shocks to the payments system. As a result, payments of otherwise liquid customers may be blocked, depending on the stringency of overdraft access. The usual behavior would be for all banks to hold large amounts of reserves in order to ensure smooth payment services to their customers and avoid the penalty of overdraft financing. Under the circumstances, central banks are faced with the policy choice of letting interest rates fully reflect the shocks as in Panel 1 or accommodating part of the shocks in order to smooth out interest rate movements through redesigned monetary instruments. An instrument mix that allows partial accommodation in the short run, while ensuring overall monetary control, is often the preferred course of action because orderly price movements best promote market development.

The redesign of instruments that results in a more interest-elastic supply of reserves is illustrated in Panel 2. The reserve supply curve in Panel 2 reflects new instruments and operating procedures aimed in part at offsetting the payments system shocks and smoothing interest rates. The segment to the right of point (G, r) represents the supply of reserves through a combination of directed credit, credit auctions, and a Lombard or equivalent facility that obviates the need for overdraft access. Credit auctions provide reserves at the initiative of the central bank at interest rates that reflect interbank market conditions. Auctioned amounts could be managed to influence market interest rates. The Lombard facility is drawn at the initiative of commercial banks at an interest rate that is above, but

1/ CBR overdraft decisions were initially left to the managers of local CBR branches, called cash settlement centers (CSCs), who received a quarterly allocation of centralized credit which they could use at their discretion. Because of arrears in the repayment of overdraft credit, the CBR Board has significantly tightened operating procedures, in several steps taken since June 1993, as described in the Appendix.

close to, market rates. ^{1/} Such a facility is designed to provide short-term liquidity to the system as a whole, based on uniform access criteria, and its operations would be distinct from any lender-of-last-resort support provided to individual problem banks on a case-by-case basis.

While the introduction of market-based instruments, especially, a Lombard facility based on uniform criteria, has many benefits for monetary control and money market development, one important consequence would be to make the supply of reserves more elastic with respect to market rates. In the context of a reserve money program, elastic access to the Lombard window might have to be offset by other instruments operated at the initiative of the central bank (e.g., bill auctions) to maintain overall control on the desired operating target. These changes would help reduce the volatility of interest rates in response to payments system shocks, as shown in Panel 2 of Chart 3. As in Panel 1, a contractionary payments system shock would shift the supply curve from S to S' and reduce reserves by $G'G$, but market interest rates would increase by less than in Panel 1, from i to i' . Interest rate volatility could be further dampened, if reserve averaging were permitted. In this case, the demand curve would become more elastic, reflected in the change from D to D' in Panel 2, making the increase in the equilibrium rate due to payments system shocks even more subdued. In short, the task of managing the level of reserves or the level of short-term interest rates without excessive volatility would be facilitated if the central bank's instrument mix were properly designed to take into account the vagaries of the payments system.

A shift in monetary management procedures to bring about more elastic supply of (and demand for) reserves requires several internally consistent changes in instrument mix, instrument design, payments system operations, and money market practices. First as already mentioned, market-based instruments to absorb reserves--e.g., T-bill auctions--are needed to ensure overall control over bank liquidity, even while accommodating individual banks who might be adversely affected by payments system shocks. This raises many operational issues to ensure coordination of technical features (maturities, settlement rules, etc.) and policy settings (interest rates, volumes) of different instruments, and calls for active short-term liquidity management using these instruments. Second, appropriate risk control measures would be needed to avoid excessive exposure to individual banks through credit auctions and Lombard facility. Such measures include provision of timely prudential information on the banks' condition and market information on bank liquidity in order to guide responses to credit

^{1/} In the presence of substantial payments system float, the interest rate on Lombard credit should be close to market rates and should not be a high penalty rate; otherwise, access to Lombard credit may not be sufficiently sensitive to market conditions and provide the offsetting influence to compensate for exogenous fluctuations in reserves. See Cacy, Higgins, and Sellon (1981) for a discussion of whether discount rate should be a penalty rate.

requests, the use of collateral requirements, or the development of repurchase operations in specified securities; and limits on access based on uniform criteria. Third, accounting and operating procedures in payments processing would have to be changed in order to provide timely and reliable information to both the central bank and the commercial banks, on current settlement balances, and on the amounts to be settled based on interbank payments clearing. Such reforms of clearing and settlement procedures would have to allow sufficient time for the commercial banks to seek funds in the interbank market based on information on the clearing balances before resorting to central bank credit, and for the central bank to assess market conditions before providing Lombard credit. 1/ Finally, in order to support timely settlements of central bank credit and interbank funds transfers, the central bank should quickly provide a large value transfer system--even if limited in geographic and technical scope initially--for the transfer of balances in the correspondent accounts of the central bank for same-day and irrevocable settlement.

As already noted, the design and implementation of LVTS is a crucial reform, as it ensures the secure, cost-effective, timely, and irrevocable transfer of central bank money among the accounts of the participating banks and thereby supports the development of interbank money and foreign exchange markets, and the implementation of monetary policy through indirect instruments. 2/ As such, LVTS has become the backbone of efficient financial markets and has fostered technical efficiency, innovation, and integration of domestic and world financial markets. The resulting low-cost and secure arbitrage of funds between markets has enhanced the transmission of policy impulses from the central banks (and in tandem speeded up the transmission of innovations from market to market).

A comprehensive LVTS based on modern telecommunications could take many years to implement, warranting the development of transitional systems that could provide more immediate support to the payments system and to monetary policy. In the Russian Federation--and in other transition economies--developing a full-fledged interbank settlement system that is efficient and cost-effective requires centralization of commercial banks' accounts with the central bank from the initial situation of highly distributed accounting system (one account for each branch) to one or few accounts for each bank. The account consolidation--either physically or logically through centralized processing--requires major changes in intrabank clearing and central bank account processing, and this will necessarily take some time.

1/ Timely and adequate provision of information is in any way crucial for banks to avoid recourse to overdrafts, or adjust account balances if reserve averaging were introduced. The overdraft facility could be discontinued, with the availability of Lombard facility and timely information on clearing balances. Reserve averaging, which permits temporary access to required reserves for settlement purposes, would also obviate the need for overdraft facility.

2/ See Akinari and Summers (1994).

In the meantime, a "low-tech" transfer system could be designed as a step toward and consistently with the development of a full-fledged LVTS in the medium term. The low-tech system would be based on readily available technology, but would fulfill the objectives of same-day settlement on the books of the central bank and timely account information to participants. As a first step, it would be dedicated to the clearing and settlement of transactions between local banks, perhaps only for a limited window of time during which banks would fund their payment obligations at the central bank. Progressively, the window could be enlarged and real-time links would be established with other financial centers. This approach would provide the needed support to the development of money and foreign exchange markets during the transition. It would also help reduce the size of float to some extent (a substantial reduction in float will require significant progress in the implementation of medium-term reforms), and facilitate redesigned monetary operations and market-based instruments discussed earlier.

3. Monetary aspects of payments system design

In general, the choice of payments system design and the monetary operations framework should be mutually compatible. The monetary aspects of medium-term reforms of the payments system, such as the design of LVTS, new payment instruments, and new accounting and risk management systems are summarized below and discussed more fully in Baliño, Dhawan, and Sundararajan (1994).

The specific design of interbank funds transfers and settlements in an LVTS, such as the choice between gross or net settlements, the type of information flows among participants, the nature of the interface between settlement procedures and reserve requirements and refinance policies, and the operational connections between clearing systems, money markets, and the LVTS, together influence the demand and supply of bank reserves and the structure of money markets. The design of the LVTS would in turn be influenced by monetary policy considerations, as noted in Marquardt (1994).

The architecture of the interbank settlement system and the demand for reserves interact to influence the nature of instruments available in the money markets and the volatility of the market rate for bank reserves, hence influencing the transmission mechanism for monetary policy. For example, the following factors strongly influence the demand for reserves and the type of instruments offered in the money markets: whether interbank money market transactions are settled immediately, at the end of the day, or with a lag (or whether there is a mixed system), and whether timely information on account positions is available to the participants from the interbank clearing and settlement systems. Also, the characteristics of the interbank

settlement system would, in turn, be influenced by the changing composition of payments and the evolving structure of money and financial markets. 1/

In many transition economies, making the interbank settlement system efficient and cost-effective requires centralization of commercial banks' accounts, as mentioned earlier. The centralization of accounts requires major changes in intrabank clearing arrangements and in the way monetary policy is implemented, and sharply reduces the demand for bank reserves by obviating the need to maintain positive balances in a large number of settlement accounts. Also, any significant shift from interbank payment arrangements, based on correspondent banking among some or all domestic banks, toward arrangements requiring settlement with central bank funds (or a shift in the opposite direction) will clearly affect the demand for reserves and the size of the float.

Reforms in accounting and processing rules for the timing of bank and customer accounts' crediting and debiting (e.g., funds availability rules, electronic verification of large checks, etc.) also influence the demand for, and variability of, reserves. The introduction of new payment instruments (e.g., new debt instruments for enterprises and households) or changes in the relative attractiveness of different instruments (pricing, reliability) might cause changes in the size and variability of bank reserves, particularly if there are pronounced seasonal or structural shifts in the relative use of credit and debit instruments.

As payment reforms proceed, the dominance of cash might decline, with the increasing access to direct debits, direct credits, and other retail payment instruments such as giro transfers. As has been the case in other countries, the introduction of electronic funds transfers, and other payments system innovations that enhance the liquidity of various saving instruments and that help integrate different segments of the financial market, can influence the stability of relationships between money and other economic variables.

Finally, the introduction of an appropriate financial risk management framework in payments systems would reduce the likelihood of losses, and unexpected pressures, on central bank credit, thereby enhancing monetary stability.

1/ Angelini and Giannini (1993) analyze the value of information to participants in the payments system and the institutional factors governing the features of the interbank system. An illustration of the effect of payments system architecture on money markets is the evolution of intraday money markets in Japan following the development of the BOJNET, a large value transfer system; see Akinari and Summers (1992). Also see Summers (1994) for a discussion of alternative designs of information flows in an LVTS.

III. Payment Float in Russia: Causes, Measurement, and Determinants

This section discusses the determinants of payment float in Russia and estimates the impact of reforms since 1992 by analyzing the behavior of payment float of the Central Bank of Russia. First, key institutional developments and operational aspects of the Russian payments system are briefly reviewed as background to the measurement and interpretation of CBR payment float. An equation specifying the main factors affecting CBR payment float is developed and estimated in order to highlight its determinants and assess the impact of payments system reforms. Regression results are based on monthly data for the period May 1992 to May 1994.

1. Institutional and operational aspects of the Russian payments system

Recent developments in the policies, institutions, and operations relating to the Russian payments system are discussed in greater detail in the Appendix; key developments are summarized here for convenience. The CBR inherited, as did other countries of the former Soviet Union, a payment, clearing, and settlement system, characterized by dominance of cash, limited range of noncash payment instruments, main reliance on credit payment instruments, slow paper-based clearing operated by the central bank with uncertain and often long lags between debiting and crediting, and gross settlements with automatic recourse to central bank overdrafts, although at a penalty rate. These features, together with a highly decentralized accounting system, contributed to payment delays and significant float. There are some 1,600 CBR branches known as cash settlement centers (CSCs), which maintain accounts for each commercial bank branch in the territory, and perform cash disbursement and payment processing services. ^{1/} Moreover, the increase in the number of banks--from five in 1988 to over 2,000 by the end of 1993--initially outstripped the payment processing and transportation capacity of the CBR. This was especially true in the Moscow region in light of the concentration of banks and payment traffic there (some 70 percent of the total value of payments in the Russian Federation).

Against this background, structural inadequacies quickly emerged in the CBR system, while the commercial banks organized alternative arrangements for clearing and settlement, particularly for intercity payments, as explained more fully in the Appendix. Reflecting episodes of congestion and logjams in payment processing, and the concerns of the authorities to contain fraud, most of 1992 was characterized by frequent changes in

^{1/} This decentralization of accounts evolved because most new multi-branch banks initially used--and some continue to use--the CBR for intrabank clearing. The Gosbank's policy was to provide payment services to all bank entities through the creation of CSCs. The policy was implemented in late 1990 and was continued by the CBR until early 1992.

operating procedures and large disruptions to payment services. Congestion and delays in the summer and fall of 1992 resulted in part from the centralization of processing and accounting of interstate payments in Moscow, and the processing of accumulated payment documents relating to the clearing of inter-enterprise arrears. In addition, limited training of the new users in payments system procedures at a time of an explosion in the number of documents, without adequate standards, formats, and bank numbering scheme, and continuous changes in operating procedures--some of them with retroactive effect--also resulted in numerous errors, significant rerouting or duplication in payment traffic, outright loss of documents, and processing in violation of instructions from CBR headquarters. Persistent fraud is alleged to have evolved in this context. 1/ It led the CBR at various times to tighten control over the processing of payments. These measures caused further delays as a result of difficulties in the implementation of frequently adjusted processing rules to tackle fraud, and the general shortage of staff, particularly in key centers, such as Moscow.

Table 1 contains a summary of measures and developments in the domestic payments system operated by the CBR during 1992-94; details and context can be found in the Appendix. Overall, the CBR measures were initially designed to speed up the transportation of payment documents, streamline operating procedures, strengthen security to contain fraud, and reorganize and update automation and computer systems. While these measures served to stabilize the CBR payments system or respond to particular emergencies, the CBR has also planned a series of medium-term reforms aimed at establishing a modern payments system within 3-5 years. Main components of the medium-term reform are the establishment of an LVTS based on real-time gross settlement, the clearing of bulk payments through CBR-licensed private clearing houses and through selected CSCs converted into CBR-operated clearing centers, the further development of standards, a legal and a supervisory framework, the planning of new instruments, and the construction of a technology platform, including a communications system. As part of the automation program of the CBR, a number of payments-related projects have been in progress since 1992 in six regions, each implemented by a different vendor. 2/ The CBR has begun to license commercial bank-operated clearing houses, developed in

1/ Evidence of fraud is mostly anecdotal. A well-publicized instance seems to be the Chechen fraud of mid-1992 (see *The Economist*, July 30, 1994). The CBR has also reported that Rub 500 billion of fraudulent payments were discovered in late 1992-early 1993, through new verification procedures on telegraphic payment avisos. Causes and mechanisms of fraud in the Russian context are discussed in the Appendix.

2/ Some of these projects are well-advanced and provide highly reliable electronic payment services in the region. For example, in the Ryazan branch, the CBR provided beginning in early 1994 virtually real time electronic payment processing, and real time accounting and settlement, connecting 26 cash settlement centers in the region and the banks and branches served by them.

Table 1. Russian Federation: Major Developments in the
Domestic Payments System Operated by the CBR, 1992-94

Date	Measure	Comments (Purpose/Effects)
January 1992	New Russia check introduced.	New debit payment instrument; led to fraud owing to weak regulatory and operational framework; use was sharply curtailed in second half of 1992.
April 1992	Procedural changes in CSCs to contain fraud.	Requirement to process all payments--including local--through the CBR led to congestion in CSCs; withdrawn in May.
April-June 1992	Centralization of processing of interstate payments, first in main regional offices (April), then in Moscow (June).	To improve monitoring of accounts of other FSU states with CBR, and thereby control any balance of payments financing of other states. Led to congestion in Moscow.
July 1992	Payment demand order discontinued.	To strengthen financial discipline in inter-enterprise payment practices, contain inter-enterprise arrears, and reduce processing work load of commercial banks.
Summer 1992	Processing of unpaid payment documents as of July 1, 1992.	To clear inter-enterprise arrears; led to congestion due to cumbersome processing arrangements; net arrears were eventually monetized.
Fall 1992	Dedicated courier services between CSCs.	To improve security of transportation on trunk lines, speed up document transmission, and standardize transportation time.

Table 1. Russian Federation: Major Developments in the
Domestic Payments System Operated by the CBR, 1992-94

Date	Measure	Comments (Purpose/Effects)
Fall and winter 1992	New security procedures for telegraphic payments.	To introduce arrangements for large value payments; scope was tightened on January 1, 1993.
Spring 1993	International Steering Committee and six working groups were established.	To develop medium-term reforms and build consensus between the CBR and commercial banks.
June-October 1993	Special authentication procedures for large values (above Rub 100 million).	To combat fraud; withdrawn in October 1993.
June-November 1993	Steps to streamline overdraft use of commercial banks at the CBR.	To curtail arrears in repaying CBR overdraft credit, and prevent further recourse to overdraft. Reflected basic weaknesses in CBR payments system and requires comprehensive reforms to eliminate overdrafts.
August 1993	Provisional guidelines on interbank electronic funds transfers.	To guide regional pilots and to serve as a basis for future funds transfers rules.
November 1993	Licenses for private clearing houses issued.	To introduce the possibility of netting arrangements.
Throughout 1993 (also 1992)	Development of special program for information technology for the CBR.	To automate accounting in CSCs and introduce electronic funds transfer system; continued implementation of regional pilots under this framework.

Table 1. Russian Federation: Major Developments in the
Domestic Payments System Operated by the CBR, 1992-94

Date	Measure	Comments (Purpose/Effects)
Fall 1993	Proposal for altering settlement system for treasury bill is discussed in CBR Board.	Draft regulations prepared in March 1994.
May 1994	Detailed operating rules, and privileges and obligations of participants, of clearing houses approved by CBR.	Several operational and regulatory constraints continue to delay the establishment of clearing houses.
May 1994	Detailed user requirements for a pilot large value transfer system prepared.	Consultations with commercial banks and regional offices are proceeding.

cooperation with the commercial banks detailed operating procedures for the clearing houses, and has started work on specifying concrete user requirements for large value transfer system, a project to which CBR attaches high priority. The CBR is also considering the establishment of a dedicated large value transfer system to support the rapidly growing treasury bill, foreign exchange, and interbank markets, and steps to centralize commercial bank accounts with the CBR. For example, the system of settlements for treasury bill transactions is being modified to permit settlements in the accounts with the CBR rather than the current settlement method of using funds predeposited with an outside settlement agent. The CBR is also modifying its monetary operations procedures to better manage money market liquidity. In particular, the CBR has already introduced credit auctions, and is planning to introduce Lombard and bill rediscounting facilities.

In the current operation of the CBR payments system, reliable next-day settlement has become the norm for in-city payments. However, intercity payments through the CBR system remain too uncertain and settlement time cannot be guaranteed. In response, a major development in the Russian payments system has been the emergence of private sector payment services through clearing banks beginning in 1993. The resulting payments system is a mixture of private services for clearing of intercity payments combined with CSC services for the clearing and settlement of mostly local payments. In this system, any intercity payment is essentially converted into a series of local payments that ensure finality on the books of the CBR; the configuration is illustrated in the Appendix. Several commercial banks have expanded the network of correspondent banks through which interbank funds transfers can be completed rapidly, and interbank money market transactions can be initiated and completed efficiently. Also, new institutions to service interbank credit needs emerged. 1/ The developments in commercial bank correspondent banking and the related settlement and money market trading services have exacerbated concerns of systemic risks due to large interbank exposures, and have underscored the urgency of developing an appropriate risk management framework, including the establishment of a rapid and secure interbank gross settlement system using central bank money.

2. Issues in the measurement of the payment float of the CBR 2/

We now turn to the analysis and measurement of payment float of the CBR whose size and variability mirrors the impact of developments and reforms of the payments system. Data on float were constructed from the monthly trial

1/ The role of formalized exchanges and bankers' clubs in the money market in Russia is explained in the Appendix.

2/ The payment float between the banks and their customers (or customer float) is not analyzed in this section due to the uncertainties in the quality of data from commercial banks. Data on customer float would provide an additional measure of the impact of the payments system on the end users.

balance sheets of the CBR, based on the section of the Soviet plan of accounts dealing with interbranch settlements; the 70 or so accounts in this section remained broadly in consistent use throughout the period as suspense accounts for items in transit. 1/ However, it is necessary to monitor the use of these accounts, as well as several other accounts outside the section on interbranch settlement, in order to identify possible changes in account usage, consolidation or discontinuation of transactions, and generally, the accounting effects of CBR measures designed to stabilize the payments system.

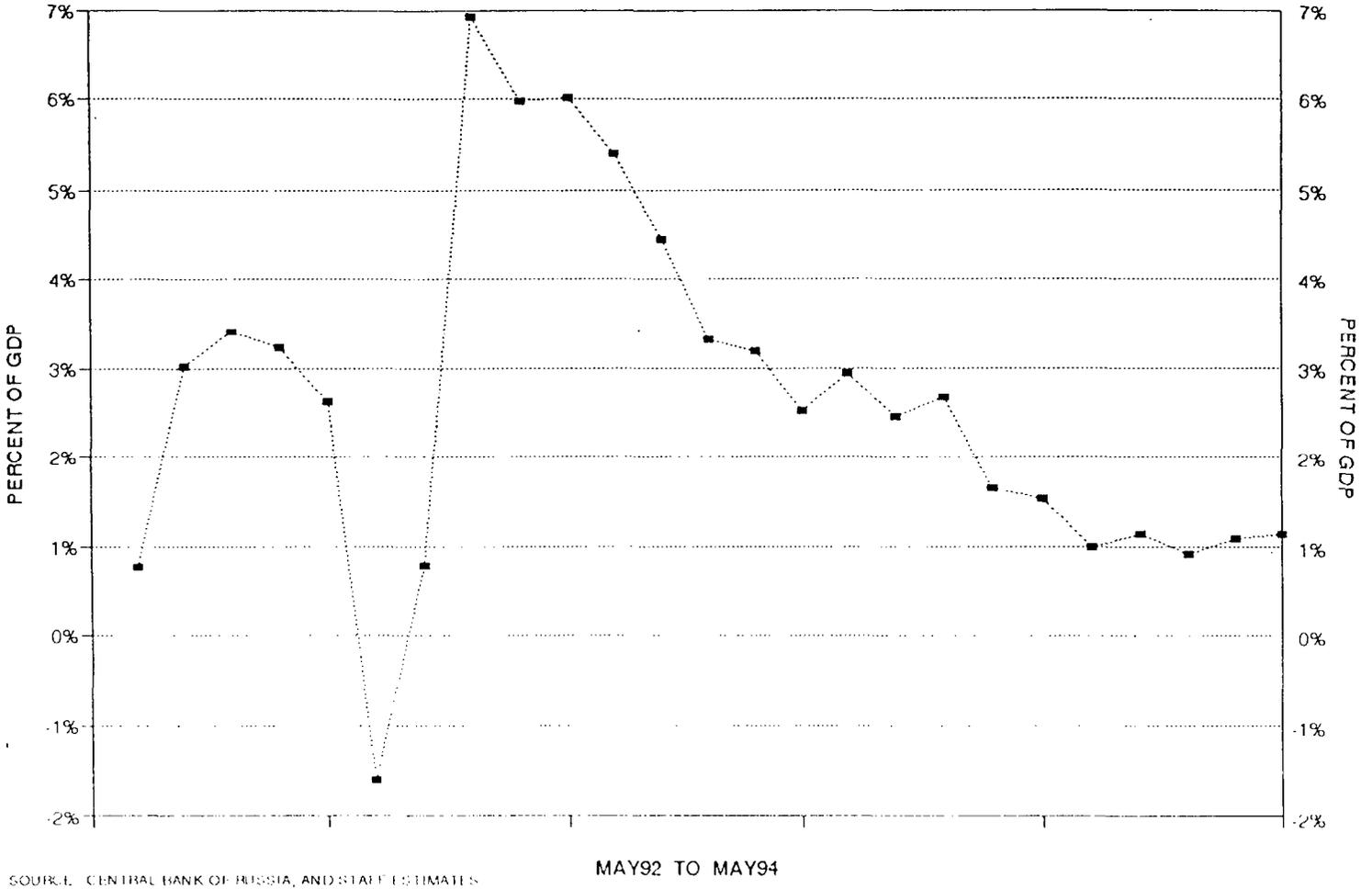
At any given time, the nominal stock of payment float of the CBR is measured as the sum of payments sent by each cash settlement center to all the others minus the sum of payment documents received by each CSC from all the others. 2/ Chart 4 shows the size and variability of the CBR payment float since May 1992 as a ratio to GDP. During this period, CBR payment float has mainly been a credit float--a withdrawal of liquidity from the system, and fluctuated between -1.5 percent and 7 percent of GDP around an average of 2.7 percent. The variability is a product of the prevalence of credit over debit payment instruments; in typical payments systems, delays in payment processing equally affect credit and debit instruments, giving rise both to credit and debit floats with a tendency for the two to offset each other. Initial difficulties in the payments system and the subsequent impact of reforms designed to improve the reliability of payments as a result of measures initiated in the second half of 1992 are reflected in the behavior of central bank payment float; since mid-1993, there has been a tendency toward more stability. When expressed as a percent of GDP, average float measured before and after May 1993 declined from 3.3 percent to 2.5 percent; the standard deviation declined from 2.1 percent before May 1993 to 1.1 percent after May 1993. Clearly, these statistics are dominated by onetime events of the second half of 1992 as depicted in Chart 4. In particular, the sharp drop of credit float in September-October 1992 may be attributed to the concomitant acceleration of inflation, while the increase in November-December is mostly due to the increase in net credit to government. The effects of inflation and credit to government on CBR float are discussed below.

The measurement of float that genuinely results from the operation of the payments system, that is, funds in the process of settlement, poses many difficulties in Russia. For various reasons, the accounting framework inherited from the Gosbank does not permit a straightforward measurement of such a concept. This is partly due to the fact that the accounts and accounting procedures which reflect the operation of the payments system are

1/ The methodology was developed in the course of discussions with CBR staff during the period May 1992-May 1993.

2/ See next section for the formula defining the stock and flow measures of float. Within these measures, a distinction is made between debit payment instruments which create a debit float, and credit instruments which give rise to a credit float.

CHART 4
CBR PAYMENT FLOAT



SOURCE: CENTRAL BANK OF RUSSIA, AND STAFF ESTIMATES



also used to record other transactions. As a result, as shown in Chart 5, it is necessary to perform certain adjustments in order to isolate the genuine payment float. These adjustments remove special factors that are unrelated to the payments system such as the clearing of domestic inter-enterprise arrears (IEA) between July and October 1992, and the recording of government reporting float.

- The clearing of domestic inter-enterprise arrears consisted in reprocessing the accumulated payment documents through the normal accounting entries for current payments. As a result, the clearing of the arrears resulted in the recorded increase of the CBR's payment float. This, however, was a bookkeeping entry with no monetary effect at the time when the payment documents were being processed. 1/ Chart 5 shows the size of this adjustment in 1992.

- Government deposits collected in the CBR branches are periodically *reported* (but not transferred) to Moscow. The reporting, however, triggers accounting entries that are identical to those that would be seen in the actual processing of payment documents. The actual *transfer* of government deposits from the CBR branches to Moscow occurred only once a year starting in January with a final reconciliation round in June. Chart 5 shows how this factor unrelated to the payments system also affected CBR float, particularly in 1992 and 1993. 2/

3. Determinants of CBR float--an analytical framework

This section presents an analytical framework for the CBR payment float in order to derive some testable hypotheses concerning its determinants. The hypotheses are tested using the Russian data. More specifically, CBR payment float is derived as a distributed lag function of the nominal value of transactions processed at various points in time, with the lags representing the delays in clearing and settlement. Only the shape of the lag distribution would reflect the efficiency of the CBR payments system, as improvements in the payments system would lead to a reduction in delays in settlement, and a corresponding change in the lag structure.

In the context of accounting and payment practices of Russia, central bank payment float may be represented algebraically in the following stylized manner in the case of payment orders. Let:

1/ The monetary effect occurred starting in October 1992, when CBR began extending credit to banks in order to settle the net amounts due after offsetting payables and receivables.

2/ The system was abolished in 1994.

V_t = value of payment orders entering the central bank payments system in period t

N_t = number of payment orders entering the central bank payments system in period t

v_t = average value of individual payment order in period t, V_t/N_t

During each period t, the correspondent accounts of commercial banks at the central bank are debited by the amount V_t , as this represents the aggregate value of payment orders that are presented by commercial banks to the cash settlement centers during period t for transmission to payee destinations where the payees' banks will be credited. It is assumed that a proportion α_i ($i=0,1,\dots,L$) 1/ of payment orders which enter the system in period t is received at the cash settlement center of payees' banks in period $t+i$ and that the amount $\alpha_i V_t$ is then credited to the payees' banks (and in due course to the payees). The maximum lag in the transmission of payment documents is assumed to be L, and therefore,

$$\sum_{i=0,L} \alpha_i = 1 \quad (1)$$

Given the proportions α_i , the aggregate of credits posted to the banks' reserve accounts in period t due to payment order processing can be expressed as a distributed lag in current and past values of payment orders issued. That is,

$$\sum_{i=0,L} \alpha_i V_{t-i} \quad (2)$$

The net effect on bank reserves due to payment order processing in period t can then be expressed as,

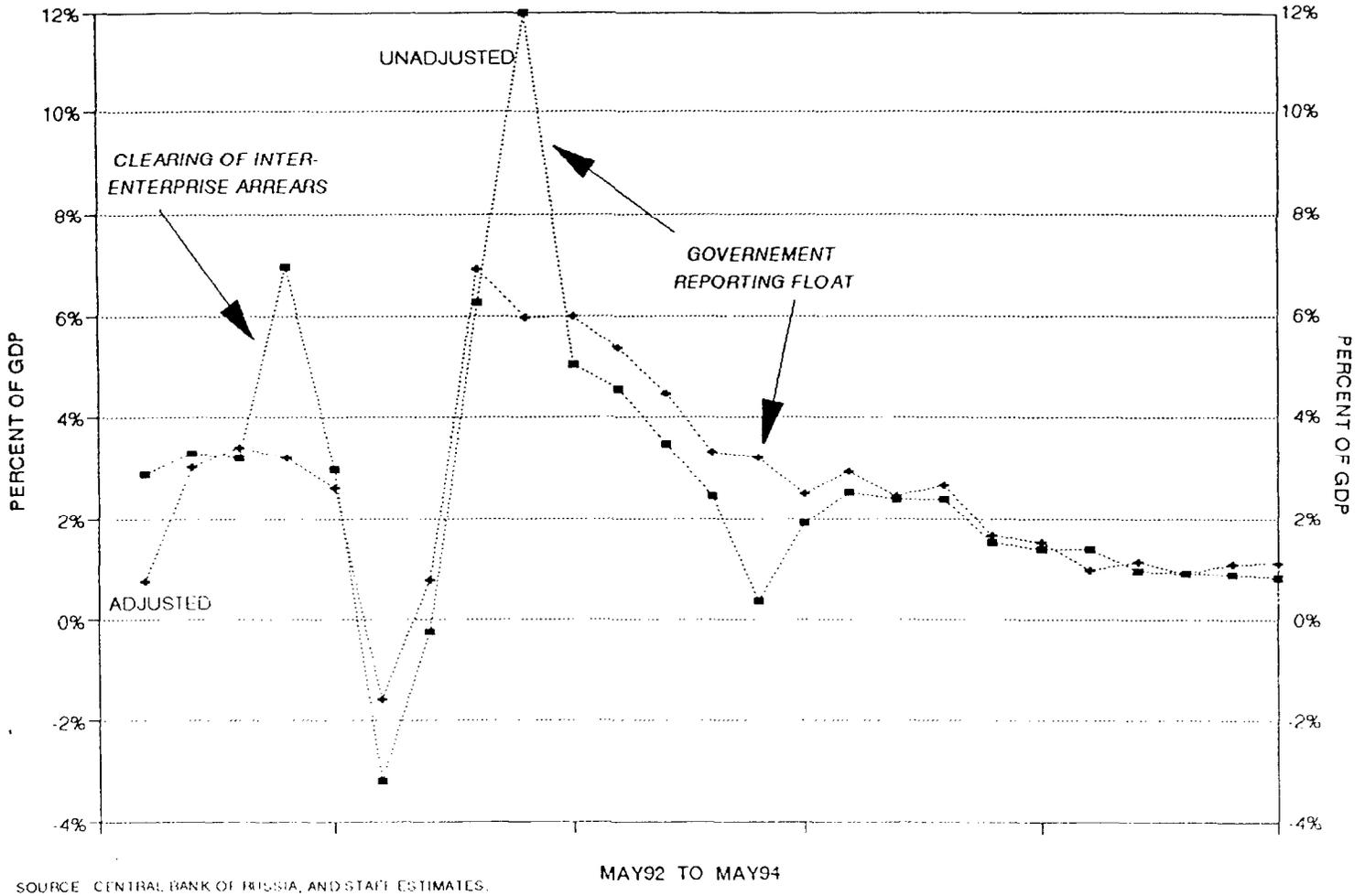
$$\Delta F_t = V_t - \sum_{i=0,L} \alpha_i V_{t-i} \quad (3)$$

Equation (3) represents the difference between the amount of payment orders debited in the current period t, and the amount of currently and previously issued payment orders (in periods t, t-1, t-2, etc.) that are being credited in the current period. This difference is typically positive; it represents then a contraction of reserves during period t. A negative difference would represent an expansion of reserves. The expression (3) can be regarded as a flow measure of central bank payment float.

In the balance sheet of the CBR however, a stock measure is typically used, representing the difference between the cumulative value of debits and the cumulative value of credits. The accounting framework is summarized in the table below.

1/ The lag coefficients are assumed constant.

CHART 5
CBR PAYMENT FLOAT, ADJUSTED



SOURCE: CENTRAL BANK OF RUSSIA, AND STAFF ESTIMATES.

<u>Time</u>	<u>Cumulative Sum of Debits</u>	<u>Cumulative Sum of Credits</u>	<u>Stock of Float</u>
t	$D_t = \sum_{i=0, L} V_{t-i}$	$C_t = \sum_{i=0, L} \sum_{l=0, i} \alpha_l V_{t-i}$	$F_t = D_t - C_t$

In the above table, the summation is extended over L periods. Accordingly, the value of payment orders debited in period t-L or earlier have been offset by corresponding credits and do not appear in the summation. Using the expression in the table, the nominal stock of float can be expressed as,

$$F_t = (1-\alpha_0)v_t N_t + (1-\alpha_0-\alpha_1)v_{t-1} N_{t-1} + \dots + (1-\sum_{i=0, L-1} \alpha_i)v_{t-L-1} N_{t-L-1} \quad (4)$$

where $V_t = v_t N_t$. It can be readily verified that expression (4) for the stock measure of float F_t can be used to derive the expression (3) for $\Delta F_t = F_t - F_{t-1}$.

V_t , the nominal value of transactions, increases *pari passu* with inflation and general economic activity. In order to take into account the pass-through effect on float of inflation and growth, it is useful to compute the value of float as a ratio to GDP, $f_t = F_t / \text{GDP}_t$ expressed as,

$$f_t = \sum_{l=0, L-1} (1 - \sum_{i=0, l} \alpha_i) \mu_{t-1} * N_{t-1} / \text{gdp}_{t-1} \quad (5)$$

where μ_t is the average real value of individual payments processed by the CBR, and N/gdp is the number of payment documents processed by CBR per unit of real GDP (gdp).

According to expression (5), CBR float is influenced by factors that affect the weights α_i , the average real value of transactions, and the number of transactions passing through the central bank system. The weights α_i are time-varying, endogenous variables that depend upon the characteristics of the central bank payments system, such as technology used to transmit payment information, interregional patterns of payment flows in the central bank system, organization of payment processing in the cash settlement centers, etc. The average real value of transactions would depend, among other things, on the timing of large disbursements such as disbursements of government funds, to the extent that such large payments go through the central bank system.

The number of transactions (adjusted for economic activity) transiting via the central bank system would depend on the multiplier effect of base

money expansion, on expected inflation, on the rate of use of noncash payments, and on the share of noncash payments passing through the CBR system. The multiplier effect of central bank liquidity injections influences both the number of transactions as well as the lags in the transmission of the payment instructions. In this regard, an important distinction needs to be drawn between the payments system effects of CBR credit to banks and CBR credit to government. The release of credit to banks occurs locally, i.e., in a much more diffuse way via the branches of the CBR. Lags in local, intracity payments are smaller--typically 1-2 days under normal operating circumstances--than intercity payments, as most of these payments transit via one local CSC. 1/ For this reason, one would not expect a significant first-round impact on CBR float of credit to banks. Second and subsequent rounds of payments are, of course, a mix of local and intercity payments. 2/ However, as discussed, banks have progressively routed intercity payments via correspondents outside the CBR payment centers and, therefore, the number of such transactions contributing to CBR payment float has declined throughout the period.

In contrast, the initial disbursement of new credit to government occurs in Moscow and its transfer to the regions is effected through the CBR network of CSCs. Accordingly, an increase in central bank credit to government is typically associated with an increased number of interregional payments and longer transmission lags. CBR payment float and credit to banks are plotted in Chart 6; there is no apparent co-movement between the two series. On the contrary, float and net credit to government shown in Chart 7 display a marked co-movement throughout the period.

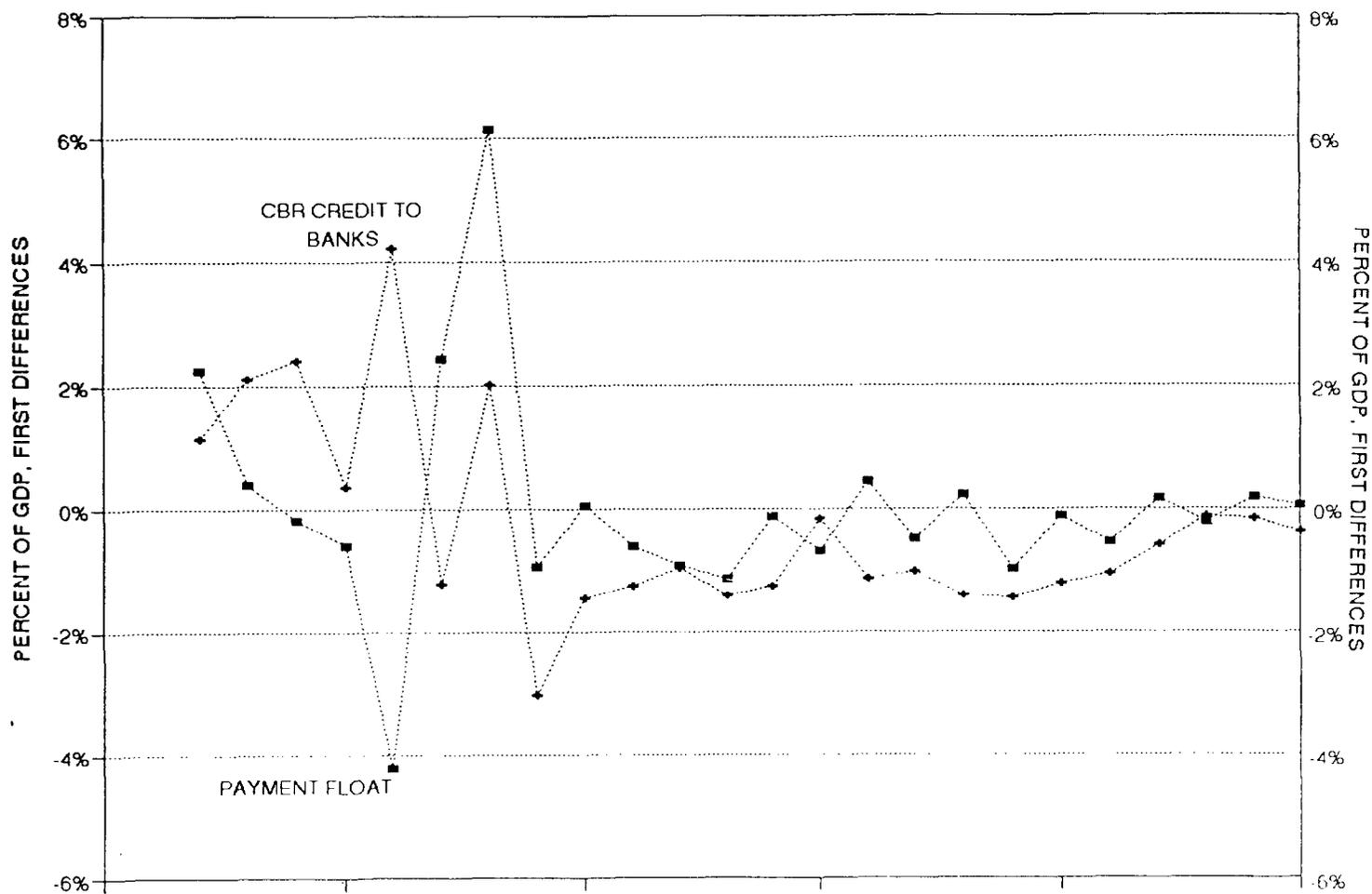
An acceleration of inflation would reduce demand for reserve money in real terms; to the extent that inflation is anticipated, the typical response of users of the payments system would be to attempt to offset an anticipated rise in inflation by delaying payments, if feasible, captured in equation (5) as a reduction in the number of transactions. Also, in reaction to inflation, an increase in the use of cash (to ensure immediate settlement) or the development of faster payment services outside the central bank circuit would reduce float. 3/ The historical relationship between CBR payment float and inflation is depicted in Chart 8. Notice in particular that the acceleration of inflation during July-October 1992 is associated with a switch from the usual credit float to a debit float, suggesting possibly an endogenous response of float to inflation expectations. In October 1992, the value of payment documents entering the CBR system (value of debits) measured as a ratio to GDP dropped from 198.1 percent to 188.4 percent, while the value of payments exiting the

1/ See the Appendix for a diagram illustrating intercity payments via the CBR's CSCs.

2/ For example, 70-80 percent of payments in value are local, based on a CBR survey of payment traffic during December 1993.

3/ Both effects may be canceled to some extent by the inflationary increase in the value of transactions.

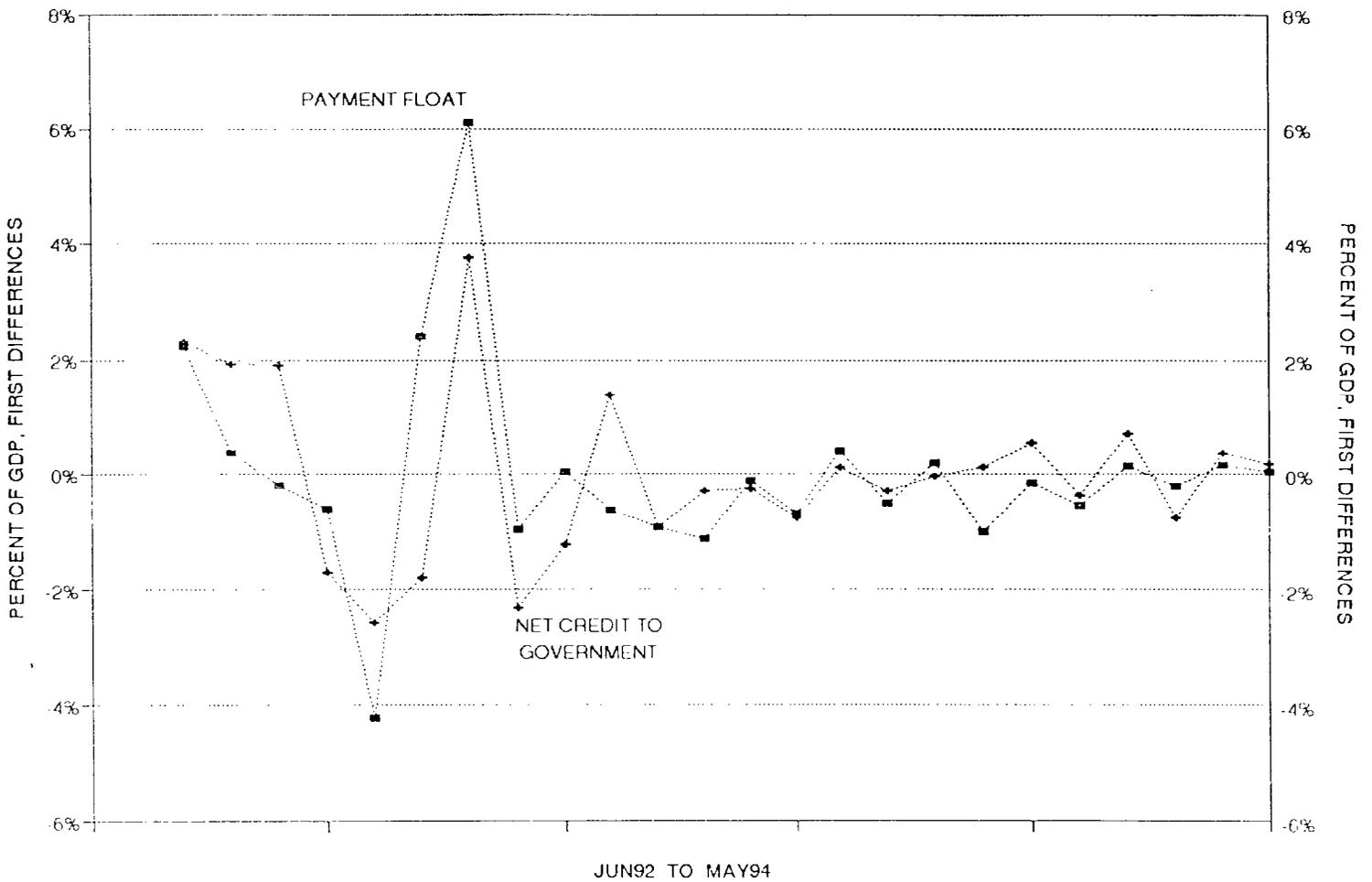
CHART 6
CBR PAYMENT FLOAT AND CREDIT TO BANKS



SOURCE CENTRAL BANK OF RUSSIA; AND STAFF ESTIMATES

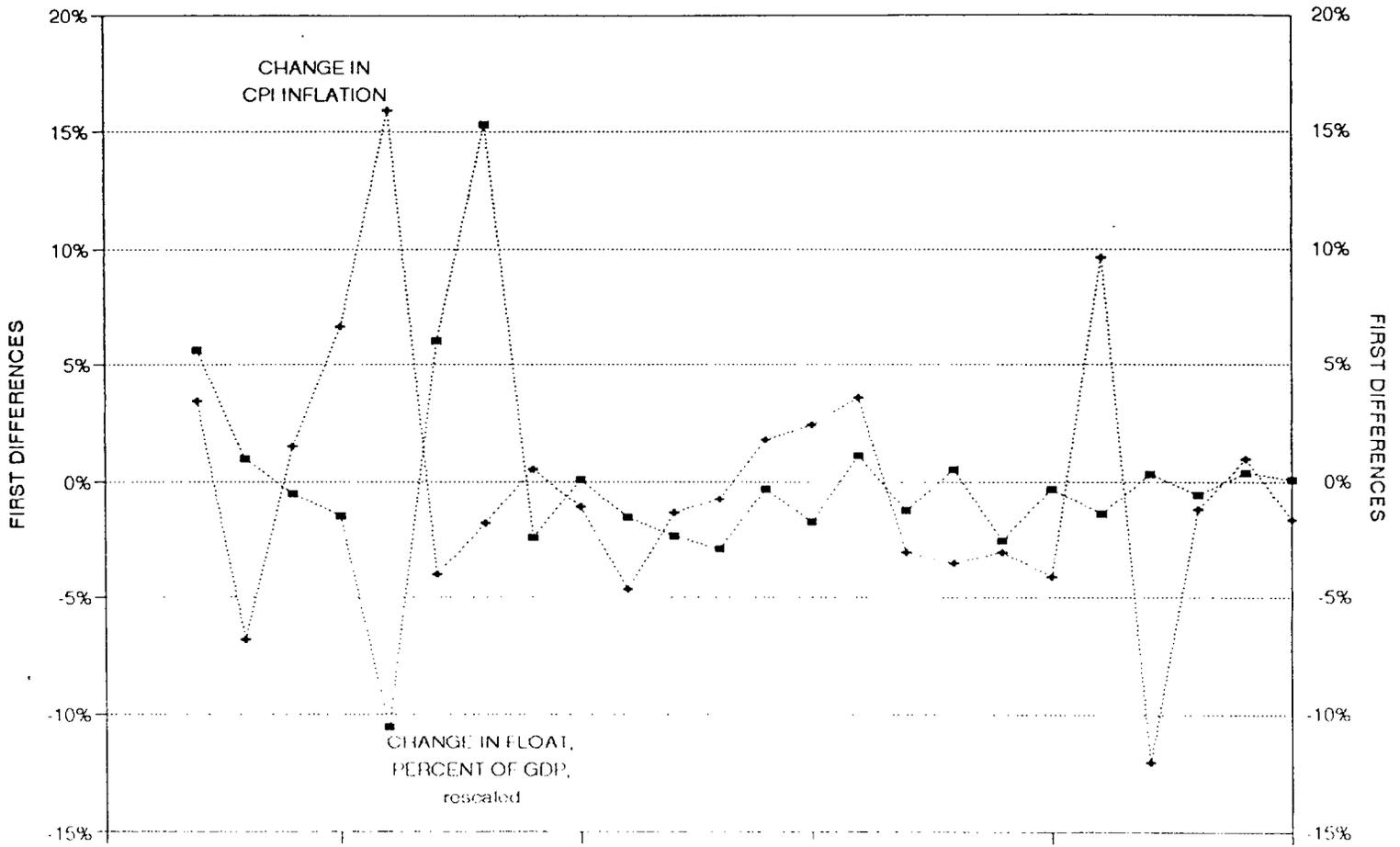
JUN92 TO MAY94

CHART 7
CBR FLOAT AND NET CREDIT TO GOVERNMENT



SOURCE: CENTRAL BANK OF RUSSIA AND STAFF ESTIMATES

CHART 8
CBR PAYMENT FLOAT AND INFLATION



SOURCE: CENTRAL BANK OF RUSSIA, AND STAFF ESTIMATES
JUN92 TO MAY94

CBR system (value of credits) only dropped from 197.5 percent to 192.1 percent, leaving a gap of 3.6 percent corresponding to the debit float of that month. However, in addition to inflationary expectations, these numbers may be explained by a bout of congestion in the CBR system. Overall, August-October 1992 were difficult months of operations for the CSCs, particularly in Moscow, as new procedures for interstate payments were introduced, the paper flow related to the clearing of inter-enterprise arrears slowed down current payments, and instances of payment fraud multiplied, leading to a slowdown of paper flow to conduct payment-by-payment verification. The importance of congestion may be seen in the surge in float in November 1992, when the backlogged documents were processed (thereby raising the value of debits in relation to credits).

4. Regression results and impact of reforms

Based on the above discussion of determinants of CBR float, the following propositions may be considered. First, in the short run, the change in float would be influenced positively by the value of nominal transactions processed by the CBR, proxied by the change in central bank credit to government, and negatively by the change in inflation.

Second, the effect of measures undertaken by the CBR to improve the central bank payments system in late 1992 and early 1993 reduced thereafter the level of float and its variability, after controlling for other factors that influence float.

These propositions imply the following reduced form equation:

$$\Delta f = a_0 \Delta g - \alpha_1 \Delta \pi - \alpha_2 \text{DUM, where}$$

Δf = change in float as a ratio to GDP

Δg = change in net credit to government as a ratio to GDP

$\Delta \pi$ = change in inflation

DUM = dummy variable to capture the impact of payment system reforms in late 1992 and early 1993

The above equation was estimated to explain the monthly changes in central bank payment float in the Russian Federation, for the period May 1992 to May 1994. The quality of estimates is constrained by the limited number of observations, by ongoing difficulties in the measurement of central bank float, and by structural factors that cannot easily be captured, e.g., growth in correspondent banking network, which would reduce the value of payments processed by CBR. Nevertheless, plausible results were obtained as shown in the estimated equation below:

$$\Delta f = 0.74 \Delta g - 0.06 \Delta \pi - 1.93 \text{ DUM}$$

(2.17) (0.95) (4.88)

Adjusted $R^2 = 0.44$; DW = 1.56

(Figures in parentheses are t-statistic)

Coefficients have the anticipated signs; an increase in credit to government led to an increase in float and an increase in inflation reduced the float, although the latter effect is not statistically significant. Each 1 percentage point increase in net credit to government as a ratio to GDP led to an estimated 0.74 percent increase in CBR float with a standard error of 0.34 percent. This suggests that the CBR payments system acted as a buffer temporarily absorbing up to three fourths of new net credit to government. Specifications including credit to banks as explanatory variable yielded insignificant coefficients. 1/

As explained, an increase in expected inflation would tend to reduce the number of transactions as economic agents delay execution of payments--"play the float." However, when considered over the full period May 1992-May 1994, it appears that this effect played only a minor role in Russia, suggesting that congestion may have been the driving force behind movements in float in September-November 1992.

The dummy variable (DUM = 1, for March 1993 and DUM = 0, otherwise) captures the effect of payments system reforms during late 1992 and early 1993; it is assumed these reforms had their full effects by March 1993. The coefficient is statistically significant at the 1 percent level, indicating that by the end of the first quarter of 1993, the initial CBR stabilization measures contributed to reduce the CBR float permanently by almost 2 percent of GDP, 2/ all other things equal.

The impact of payments system reforms is also reflected in the behavior of the residuals of the estimated equation, which capture the variability of float due to factors other than changes in net credit to government and changes in inflation. These factors include, among other things, the operation of the system itself that were not captured by the dummy variable. The standard error of the residuals declined from 1.8 percent before March 1993 to 0.55 percent after. The sharp drop in the standard error of the residuals suggests that the CBR measures contributed to the reduction in the variability of float starting at the end of the first quarter of 1993,

1/ When credit to government is replaced by total credit, the explanatory power of credit drops and the explanatory power of inflation increases.

2/ Standard error of 0.39 percent. Alternative specifications included a dummy variable in February 1993 or April 1993; coefficients were small and insignificant.

in addition to reducing its size. However, this line of reasoning must be used cautiously, as a key structural factor affecting the Russian payments system starting in 1993 is the emergence of significant correspondent banking specifically to bypass the CBR payments system. The estimated equation does not control for this factor.

One particular CBR measure aimed at detecting fraud consisted of imposing between June and October 1993 special authentication requirements on large value payments. Using a dummy variable to capture the impact of this measure, a temporary increase of CBR float of 0.16 percent of GDP (standard error of 0.15 percent) was noted.

In conclusion, the main result of the above analysis is that the payment operations which generated the float served to offset the monetary effects of central bank credit operations and thereby dampened, in particular, the impact of CBR credit to government on money expansion. Accordingly, float acted as a kind of automatic stabilizer which absorbed surges in CBR credit, specifically credit to government. No such stabilization effect on credit to banks has been found to exist. The analysis also revealed that the initial measures to stabilize the central bank payments system have contributed to a sizable reduction both in the level and variability of the central bank float, that is, a significant improvement in the efficiency of the system. Another factor at work has been the development of correspondent banking.

Significant residual variability in CBR float, both intermonth and intramonth, remains, which would pose complications for the design of indirect instruments and the choice of appropriate operating targets for monetary policy. In particular, the past role of float as automatic stabilizer should not be extrapolated into the future. Moreover, a permanent reduction in the level of float, as a result of further reforms being undertaken to modernize the payments system, would need to be absorbed by appropriate monetary operations.

IV. Concluding Remarks and Summary

Some of the consequences of payments system developments for monetary policy--and for the transition to indirect means of monetary control--in the Russian Federation are illustrated by the behavior of the payment float of the CBR. Initial difficulties in ensuring security and reliability of payments led to large and variable float, high risks borne by the central bank, and large and variable balances in the correspondent accounts of banks at the central bank. The latter also reflected the absence of well-developed interbank money markets, in part a consequence of the unreliability in central bank clearing and settlement services.

The empirical analysis provided some evidence that the level and variability of float have been reduced significantly by the transitional reforms of the payments system implemented by the CBR in 1992 and early 1993. A factor which continues to be at work in reducing the level and variability of CBR float has been the development of correspondent banking. It was also found that CBR float acted as an automatic absorber of net credit to government by the central bank. Nevertheless, the level and variability of float still remain high, contributing to a continued large demand for reserves, given the typically penal interest rates charged on overdrafts and the absence of liquid interbank markets. Some of the reforms under way to streamline operating procedures of cash settlement centers to separate adequately the clearing and settlement procedures and to further develop new monetary instruments (credit auctions, Lombard facilities, etc.) would strengthen interbank money markets and facilitate monetary management.

The medium-term reforms being implemented should be closely monitored as to their scope and timing so that their monetary implications can be taken into account in the conduct of macroeconomic policy. The consolidation of accounts, the spread of netting arrangements through clearing houses, and the greater liquidity of interbank markets through a LVTS would all lead to a drop in the demand for reserves and to a reduction in credit float (an increase in the supply of reserves). The resulting expansionary thrust should be closely monitored and offset. The implementation of LVTS may have additional effects on the demand for reserves depending on the specifics of the design and its alignment with the monetary regime. This underscores the importance of proper coordination of payments system reforms with the ongoing reforms of monetary operations.

Institutions and Operations of the
Russian Payments System--Recent Developments

This appendix discusses the key features of the payments system in the Baltic States, Russia, and other countries of the former Soviet Union (FSU) during 1989-91, the main causes of the initial turbulence in the Russian system, the development of private sector responses, emergency measures by the Central Bank of Russia (CBR) to stabilize the payments system, and the ongoing development of a medium-term reform strategy.

1. The payments system in the former Soviet Union

The Russian Federation inherited, along with other countries of the former Soviet Union and the Baltic States, the philosophy, operating procedures, and payment instruments of the Soviet payments system. 1/

In the Soviet central plan (Gosplan), the payments system had been geared mainly at providing the financial record-keeping for the implementation of the central plan--financial record-keeping which, in turn, allowed to verify the separate reporting by enterprises of the material product. 2/ Under this philosophy, the circulation of "payment" documents was required not so much to transfer deposit balances from buyer to seller but to generate the financial record of the plan and monitor plan implementation; hence, operating procedures emphasized the compilation of detailed accounting information rather than speed and finality in funds transfers.

A unique feature of the Soviet payments system was that cash and noncash were not interchangeable, this being achieved through an elaborate Chinese Wall designed to prevent leakages between the "cash sphere" and the "noncash sphere." The use of cash was restricted to retail payments; enterprises could obtain cash only to pay wages and certain retail expenses allowed under specific Gosplan rules. 3/ A deposit money transfer system based on payment orders (credit instruments, issued by the payor) and payment demand orders (debit instruments, issued by the payee) was reserved to the enterprise sector (as explained below); however, there was no incentive to promptly process "payments" as enterprises did not own their monetary assets (although individual plants had elaborate financial accounts for plan purposes). Noncash payments were effected on a gross basis for the batch of payments arriving each day; payment instructions were paper-based and were transported by the postal system or, if transferred electronically (or through telegraph), the information was duplicated by a paper record.

1/ For a review of key developments in FSU countries other than Russia, see Sundararajan and Sensenbrenner (1994).

2/ The payments system was also a source of financing of deficit enterprises through overdraft-type credit.

3/ See Ickes and Ryterman (1992).

Structured mainly as a record-keeping procedure, there were no special procedures that would give priority to processing and settling large value payments and there was no monitoring of payment risks. Speed of and legal basis for noncash payment processing and settlement were not critical, since there was no real need to fund payment obligations. "Deficits" anywhere in the system were automatically funded by the "central bank" that accommodated the objectives of the plan.

Two instruments were mainly used, the payment order and the payment demand order (PDO). The payment order is issued by the payor to his bank instructing it to pay into the account of the payee at the payee's bank. The transfer of funds took place on the books of the central bank. In case of insufficient funds, a "working capital" loan would be typically granted. The payment demand order is issued by the seller (payee) to the buyer (payor) or to the bank of the buyer, typically when shipping the goods, instructing the latter to pay to the seller's bank account. The payment demand order becomes a payment order when the buyer's bank acts on it. Over 70 percent of the value of noncash payments was on account of PDOs until July 1992, when PDO was abolished as described later. Payors were given, by regulation, three days to oppose a payment requested through a PDO; if not, the payors' banks would consider the demand for payment non-opposed and pay. Transfers effected in this manner could subsequently still be canceled and the system allowed for a quasi-automatic reverse payment; a buyer (payor) would issue a refusal-to-pay document through his bank which would be acted on by the central bank's payment centers. If a buyer had insufficient balances to fund a payment, his bank would place the payment instruction in a queue (the so-called File #2), and was required to execute the payments on a first-in-first-out basis as funds became available in the payor's account.

2. Collapse and transition to post-Soviet system

In the final years of central planning, the ruble, which had been primarily a unit of account, began to acquire other attributes of money, as a result of the Gorbachev reforms aimed at decentralizing decision making and increasing the financial autonomy of plant directors. With the end of the centralized banking system (consisting of a central bank--Gosbank--and five specialized banks) starting in 1988-89, a growing number of new banks were created, while the branches of the five Soviet specialized banks progressively formed more autonomous entities. As Gosplan's central control over financial flows declined, decisions on production and on payments--more generally, on the use of bank deposits--shifted to enterprise directors or to the numerous trade associations controlling clusters of plants. ^{1/} Directors or association managers who now owned their noncash balances also founded commercial banks--so-called pocket banks--which would handle their financial operations and, chiefly, had access to the central bank's payments system via nostro accounts at the CBR. This decentralization of banking created a demand for interbank and intrabank payment services. The central bank payments system naturally evolved from a system for exchanging,

^{1/} See Joskow, Schmalensee, and Tsukanova (1994).

verifying, compiling, and centralizing plan data to a system for transferring bank balances and centralizing settlement on the books of the central bank. However, in the process, the structural inadequacies of the CBR payments system were exposed, while the private sector, whose response had initially been subdued, began to offer alternative payment services. These developments are described below.

a. Structural inadequacies of CBR payments system

Structural inadequacies quickly emerged in the payments system inherited by the CBR from the Gosbank as the number of payments dramatically increased, reflecting both the increased number of banks, 1/ bank branches, 2/ and bank customers, the marketization of economic activity that accompanied the demise of the plan economy, and the increased awareness of short-term arbitrage opportunities on the part of the holders of bank deposits which generated a growth in payment traffic hitherto largely unknown. In response to the sharp increase in the number of banks and in bank intermediation, the Gosbank initially, and then the CBR, created a network of so-called Cash Settlement Centers (CSCs), which provided payment, accounting, and cash disbursement services, and in which all banking entities (including bank branches) could open correspondent accounts. 3/ The CBR thus became the system's clearing bank; some 1,600 CSCs were eventually established.

Processing rules for a typical intercity payment clearing through CSCs may be illustrated as follows: 4/

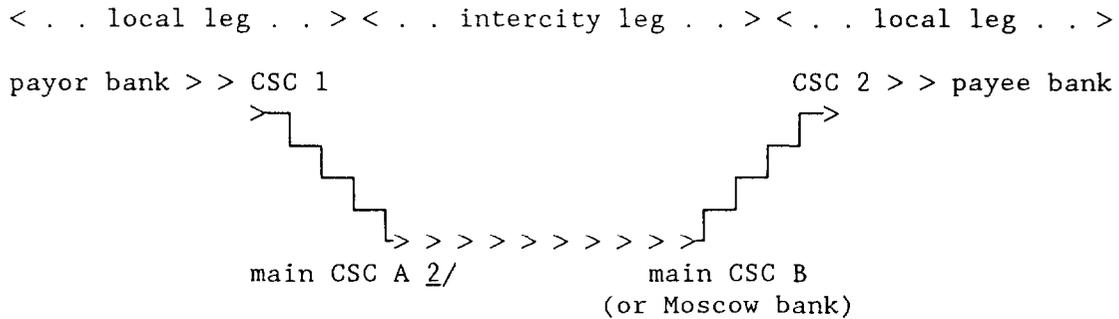
1/ As an example, in 1994, the Moscow branch of the CBR oversees some 1,200 banks and employs 2,000 staff compared to 100 in 1991. The branch has 12 CSCs, the largest of which employs 900 people.

2/ Each branch of a bank could have a correspondent account at the CBR. Few large network banks, including the former agricultural bank and the savings bank, inherited the organization and equipment to clear some of their intrabank traffic internally. The vast majority of the new multi-branch banks initially used, and some continue to use, the central bank payments system for intrabank clearing.

3/ On November 23, 1990, Gosbank issued regulations for organizing cash settlement centers, for opening correspondent accounts of the banks at the CSCs, and for effecting payments using these accounts.

4/ CBR telegram No. 18-612 of August 11, 1992.

Standard Configuration for Intercity Payments via CBR 1/



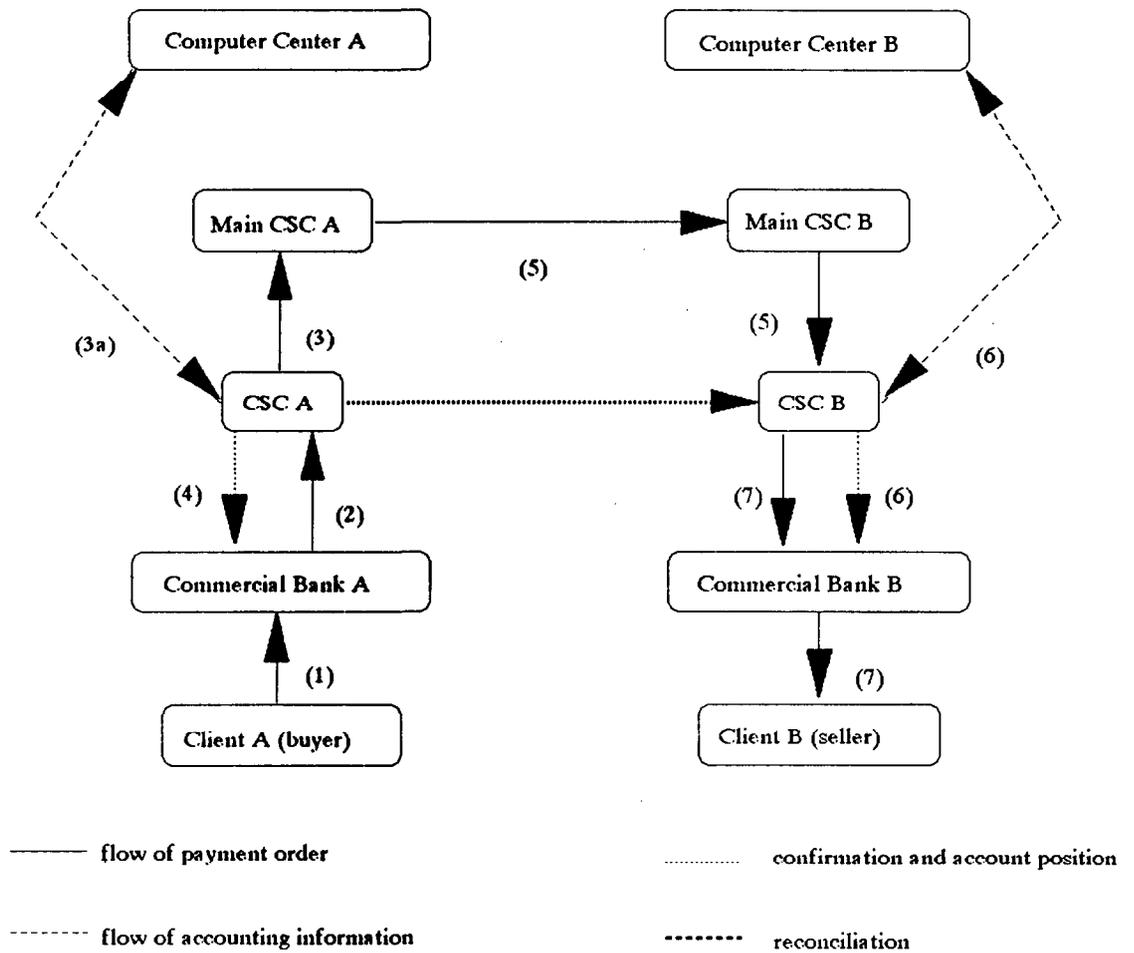
Established procedures called for CSC 1 to send payments to the main CSC of its region A, which would forward them to the main CSC of region B and on to CSC 2 where the payee bank has its nostro account. Message transmission used mostly mail or messenger arrangements. This processing was designed to prevent unauthorized access to the central bank payments system as dedicated transportation links between main CSCs were deemed more secure. It was, however, allowed for CSC 1 to transmit payments directly to CSC 2 in the same region, i.e., bypassing the main CSC, only if security was considered adequate. Also, in consideration of the concentration of payments in Moscow, a special treatment for Moscow banks allowed the speeding up of delivery; payment documents could be sent directly by any CSC via its main CSC to Moscow banks (instead of to one of the Moscow CSCs) which would then transmit them to their CSC for crediting.

Given this setup, the payments system became rapidly overstretched. Both the processing capacity in individual payment centers, and the capacity for physical transmission of paper-based payment instructions between centers came under pressure during most of 1992. The existing reconciliation and control procedures automatically generated their own paper traffic, and a second round of offsetting entries in suspense accounts came ten days after the first round payment accounting. The current flow of documents, accounting entries, and reconciliation procedures in processing a payment order in the CBR system is illustrated in Diagram 1, which also shows how a payment float arises. A computer grid did not exist to link the CBR branches and automate production, reconciliation, and centralization of

1/ For in-city payments, CSC 1, main CSC A, main CSC B, and CSC 2 would be identical.

2/ There are about 80 main CSCs which correspond to the larger administrative units of the Russian Federation.

Diagram 1: Document and Information Flow for Typical Payment Order in CBR Payments System



Notes to Diagram 1

- (1) Client A sends the payment order to Commercial Bank A. His account is debited; customer credit float arises.
- (2) Commercial Bank A forwards the payment order to the local CBR Cash Settlement Center (CSC) holding its account. Mode and time of delivery are decided by the bank.
- (3) At end of day, CSC A forwards the payment order to its main CSC for further transmission. This can be done electronically.
- (3a) At end of day, CSC A also transmits the accounting entries for the payment to the CBR Computer Center A that performs its accounting. By next morning, Computer Center A provides CSC A with account statement for Commercial Bank A.
- (4) Commercial Bank A is notified that its account at CSC A has been debited. Bank credit float arises.
- (5) Main CSC A forwards the payment order to main CSC B, for further transmission to local CSC B (local CSC B can be one of the CBR's main CSCs if Bank B is located in a city). Delivery can be made by mail, or by telegraph if requested by Bank A. Delivery for in-city payments takes one day; delivery times for intercity payments are uncertain.
- (6) CSC B transmits accounting entries to its CBR computer center. By next morning, Computer Center B notifies CSC B that the funds have been credited to the account of Bank B and CSC B notifies Bank B. Bank credit float disappears.
- (7) CSC B transmits payment document to Bank B, who advises Client B that its account is credited. Customer credit float disappears.

Reconciliation procedure:

Every ten days, CSC A compiles the list of payments that were sent in the preceding period to CSC B. CSC B compares the list to the payments actually received. Discrepancies are reconciled via accounting entries designed for each type of discrepancy.

records. The telegraphic network had not been designed to handle large volumes of instructions quickly and with the adequate level of security; and the mail and telegraphic systems became unreliable amidst the uncoordinated dismemberment of the initial Soviet network. The inexperience of back-office staff in the commercial and central banks were also a source of errors, thereby accentuating payment delays. With the breakup of the Gosbank system, banks in border areas of the Russian Federation were often connected to payment centers now situated "abroad" and vice-versa, resulting in confusion as to processing rules and procedures for recovery of documents and of funds sent abroad. In addition, the expanse of the country combined with tendencies toward greater regional autonomy from the center sometimes made it difficult to regain control over standards and procedures, to reconcile the validity of payments, or to recover lost documents.

The regulatory framework and standards definition that would allow for reductions in the number and volume of transactions through netting and paperless payments began to emerge only in late 1993. As a result, the basic design of the payments system inherited from the Gosbank has not changed significantly, and processing and transportation constraints were eased only gradually in the course of 1992 and early 1993. The system continues to be based mainly on paper instruments, physical transport, and gross settlements with limited distinction between large value and bulk payments. Because of variable processing and transportation delays, once a payor's bank account had been debited, the CBR could not commit to a date and time by which the funds would be credited to the payee's bank account. This, together with various other developments, seriously reduced the efficiency and reliability of the payments system through much of 1992, and led to a series of reforms. These developments and reforms are discussed in Section 3.

CBR was also exposed to considerable risks due to automatic overdrafts that resulted from specific operating procedures governing settlements. Once posted to the payee's bank account, payments were effectively irrevocable by virtue of CSC-operating procedures. Payments are received and sorted during the day, CSC staff compile records for computer entry, and key in data. The actual posting to accounts is computerized and occurs overnight. As a result, unfunded payment obligations and, therefore, the potential need for CBR overdraft credit only become known to payments system managers the next morning. In practice, if a manager were then to refuse overdraft, the CSC would have to unwind payments; this is not feasible. The CBR could, in principle, conduct a shadow posting, and thereby give enough time to debtor banks to fund their positions by borrowing on the interbank market. However, a dedicated large value transfer system (LVTS) would have to be operational during a short window of time in order to move borrowed funds across the books of the CBR. This has not been the case so far.

In this sense, CBR overdraft has been granted automatically--increasing steadily from 0.1 percent of GDP in May 1992 to reach a peak of 0.6 percent of GDP in March-June 1993--despite repeated efforts by the CBR Board to tighten access. Decisions on CBR overdraft were initially left to the managers of CSCs who received a quarterly allocation of centralized credit

which they could use at their discretion. This system favored banks who had connections to CSC managers. Because of arrears in the repayment of overdraft credit, the CBR Board instructed CSC heads, as of June 1, 1993, to process payments only against sufficient nostro balances. If overdraft is granted, it should be repaid within five days, or all payments from the bank are to be blocked. 1/ Because of continuing problems, CSCs were subsequently instructed to honor payment orders against balances in nostro accounts as of 12:00 a.m. The decision by a CSC manager to permit overdraft had now to be approved by the head of his main CSC. Credit was to be repaid within seven days; could not exceed 25 percent of the bank's required reserves; and incoming payments would automatically go toward repaying the overdraft. Immediate audits were ordered of banks who had overdraft arrears. Head CSC managers could recommend to CBR Moscow that existing overdraft arrears be rolled over into short-term credit at 150 percent of the base CBR rate. 2/ Partly as a result of these measures, CBR overdraft declined steadily from 0.6 percent of GDP in March-June 1993 to 0.1 percent in May 1994. 3/ In practice, it will remain difficult to control overdrafts ex-ante because of the lack of mechanism for monitoring nostro balances during the operating day. Moreover, as discussed in Section II of the main paper, CBR lacked flexible credit facilities that could have served as alternatives to overdraft credit.

b. Private sector responses

While the decentralization of banking and the unreliability of payments via the CSC network created a demand for privately organized interbank and intrabank payment services, the initial response of commercial banks was fairly subdued. This, in part, reflected a lack of trust between banks caused by a lack of quality information on credit risks that limited the growth in correspondent banking. 4/ The new Russian banks may also have reckoned that Gosbank's and, subsequently, the CBR's policy of being everyone's correspondent would, in due course, satisfy the demand for payment services.

However, the need for more rapid interbank payment services than the CBR could offer, and the limitations on short-term access to central bank credit, encouraged the development of commercial bank-operated payment services, and new institutions to service interbank credit needs. Correspondent banking, as an effective alternative to the central bank

1/ CBR telegram No. 87-93 of May 26, 1993.

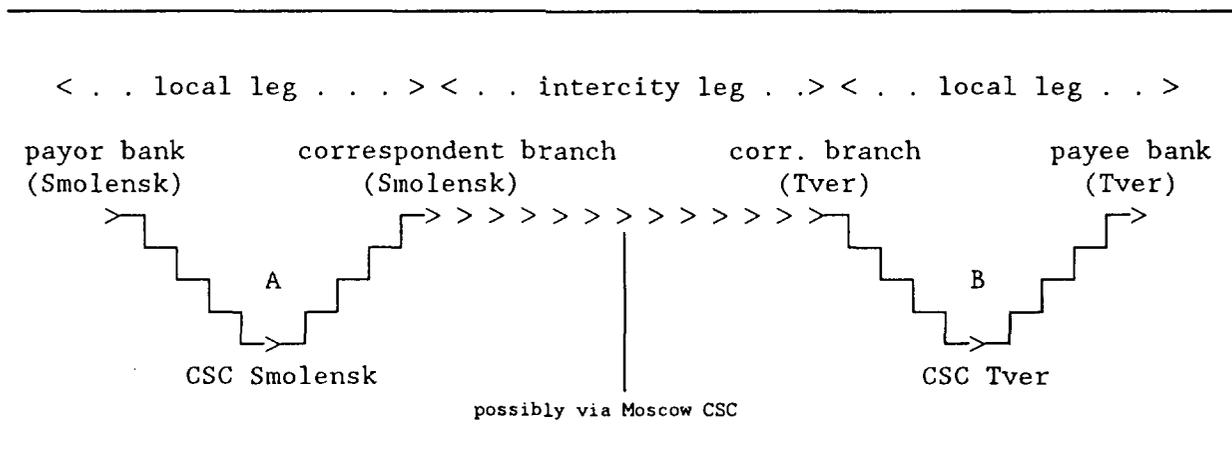
2/ CBR telegram No. 248-93 of November 20, 1993.

3/ CBR figures refer to current overdraft. As of November 1993, figures exclude minor overdraft arrears.

4/ The smooth functioning of correspondent banking as a means of delivering good funds from end-user to end-user (clearing service) relies on access to liquidity through interbank lines of credit (settlement service), that are adjusted flexibly based on continuous credit analysis, ability to mobilize collateral at short notice, up-to-date account information, and effective prudential norms. See Garber and Weisbrod (1992).

payments system, emerged in 1993, with de facto clearing banks linking electronically a network of correspondents, 1/ focusing exclusively on funds-transfer businesses and progressively on the associated interbank credit transactions to fund payments. As a result, the payments system in Russia today is a mixture of private services for clearing of intercity payments combined with the CBR's CSC services for the clearing and settlement of mostly local payments. Payment services between cities or regions are provided by clearing banks when the appropriate chain of correspondents can be found; settlement takes place on the books of the local CSCs where both the correspondent and the bank of the payee have accounts. In this system, intercity payments are converted into local payments to ensure finality on the books of the central bank. In-city payments usually clear and settle overnight--or in one to two days--through the local CSCs which therefore provide the basic infrastructure for relatively active local interbank money markets where banks can fund their payment obligations. The arrangement may be illustrated by means of a "W" configuration for a stylized intercity payment.

"W" Configuration for Intercity Payments via Clearing Banks



To effect a payment from Smolensk to Tver through the clearing banks, the payor bank has to have enough funds in his nostro account at the correspondent's branch in Smolensk. At the receiving end, the correspondent's branch in Tver would need to fund his nostro account at the local CSC because of the CBR's restrictions on overdrafts. In the above diagram, the payor bank uses a correspondent with branches in the relevant cities so that the intercity leg of the payment is really an intrabank payment and no question of funding arises there. If such a correspondent

1/ Some 20-30 banks have at least 50 correspondents. The larger clearing banks have up to 600 correspondent accounts.

cannot be found, the intercity leg of the payment becomes an interbank payment between two correspondents located in Smolensk (correspondent 1) and Tver (correspondent 2). The basic diagram remains the same, the branches being replaced by independent correspondents. However, in this case, correspondent 1 may not have enough funds in his nostro account at correspondent 2 and may not always be able to borrow on the interbank money market in a timely fashion, giving rise to funding risks.

Because funding risks tend to be higher in the shallower regional markets, regional banks are actively trying to open a branch in Moscow which gives them a nostro account at a Moscow CSC, a prerequisite for ready access to the Moscow money market. In the diagram, correspondent 1 and correspondent 2 would have nostro accounts in the same CSC in Moscow where they can move funds across their accounts overnight. 1/ In this configuration, the Smolensk-Tver payment has been decomposed into a string of interbank and intrabank payments: all local payments would be interbank, insofar as the CBR serves as a common correspondent with reliable payment services at the local level, and all intercity payments would be intrabank.

Private financial arrangements emerged to fund the short-term interbank credit needs created by the evolving payments system. Although figures are not available, the funding of intercity payments and the potential use of overdraft by clearing banks has become a source of concern to the CBR because of difficulties in evaluating bank creditworthiness and the potential for systemic risk. In the above diagram, payor banks need to have deposits at point A in the clearing bank to fund their daily payment obligations; the clearing banks need to have deposits at point B in the CBR. Clearing banks generally effect payments against balances on nostro accounts, but will also grant overdrafts on an ad hoc basis. For instance, one of the major clearing banks (22 branches, 400 accounts in Russia, 600-700 payments daily) uses on-line monitoring to block payments that are not funded. 2/ Overdraft is granted on a case-by-case basis, depending on the clearing bank's own liquidity position and on whether the correspondent has been granted the status of "transit bank." 3/ In mid-1994, overdraft in this clearing bank amounted to Rub 80 billion, of which Rub 50 billion

1/ During August-September 1994, the volume of 1-2 day interbank loans on the Moscow interbank market was in the range of Rub 30-60 billions per day, representing 50-90 percent of recorded interbank loans. Another bunching of maturities occurred at 6-7 days (source: INSTAR, Moscow). Longer-term maturities are considered too risky--there is no enforceable collateral. However, there is an interbank market not captured in these numbers, consisting of clusters of banks which trust each other enough to extend bilateral lines of credit that permit automatic funding of payments.

2/ It estimates that banks keep 5-15 percent of their assets, a function of business needs, on its books.

3/ Transit banks have preferred access to financing because, as correspondents of other banks, they channel sufficient payment business to the clearing bank.

was of three-day maturity. By comparison, in May 1994, CBR overdraft amounted to Rub 346 billion (maximum maturity of seven days).

In addition to credit being provided by clearing banks, bankers' clubs and other types of financial institutions began to act as brokers for interbank credits and deposits, with the aim of screening borrowers, standardizing contracts and settlement, and generally provide information that would enable members to trust each other enough to transact. These institutions set up formalized exchanges in late 1992 in Moscow for trading of interbank credit in open outcry auctions; trading volume amounted to a few hundred million rubles per month by mid-1993. By mid-1994, the main brokers handled some Rub 350 billion worth of interbank transactions per week with a growing number of deals with banks outside Moscow that had a long-standing relationship. 1/ Similar auctions evolved in a number of other cities, thanks to next-day settlement on the books of the CSCs for local payments. The phenomenon of bankers' clubs helped toward the formation of trust among banks, and progressively facilitated short-term credit transactions outside the exchanges among a cluster of "good name" banks.

3. Emergency stabilization measures

Throughout 1992 and early 1993, the aftermath of the collapse of the former Union created several sources of instability and stress in the payments system which the authorities had to address urgently, while simultaneously planning medium-term reforms. The main sources of shocks in the payments system were: inflation and cash shortages, inter-enterprise payment arrears, interstate payment arrears, the introduction of new procedures and accounting for interstate transactions, the introduction and hasty withdrawal of a check instrument, the withdrawal of the payment demand order, and weaknesses of security and internal audit which led to fraud and errors.

In order to combat fraud and contain delays in the payments system, the CBR took a number of emergency measures during 1992 and 1993. 2/ The CBR established dedicated courier services in September 1992 between its main cash settlement centers, 3/ cleared the stock of inter-enterprise arrears (including interstate inter-enterprise arrears) as of July 1, 1992, reorganized its payment centers and updated computer equipment, and standardized the procedures for the transportation and protection of payment documents between CSCs. The main text quantifies the impact of these

1/ A screen-based information system was also developed by one institution to replace the outcry method used initially.

2/ For a description of measures implemented in 1992, see Central Bank of Russia (1993).

3/ Dedicated couriers were also being introduced for interstate payments. Prior to this system, documents could stay in transit for up to one month; the new standard was a maximum of 72 hours to deliver payment documents between two CSCs.

measures on the payment float of the CBR and more generally on monetary conditions. 1/ Some of these measures, the context in which they were taken, and controversies which they generated, are discussed below.

a. Cash shortages

The liberalization of prices and the inflationary pressures that ensued made the available denomination of currency notes and the printing capacity for these notes inadequate. At the same time, pressures on noncash payment processing--noted earlier--initially added to the demand for cash, exacerbating cash shortages. Cash shortages were eased by the issuance of larger denomination notes 2/ and the growing acceptance of payment in ruble or dollar bank deposits instead of cash because of higher transaction costs in using cash--particularly the premium on cash over deposits until mid-1992--and improved in-city banking services. Against a background of moderating inflation, and to insulate Russia from demand pressures from countries continuing to use the ruble, a new Russian ruble was introduced in July 1993 with an appropriate denominational mix; at the same time, printing capacity was increased, while official cash shipments to countries of the former ruble zone were ended.

b. Inter-enterprise arrears

The buildup of inter-enterprise arrears during 1992 was blamed by some observers on the inefficiencies in the payments system. 3/ The large and variable float generated by the payments system drained unpredictable amounts of liquidity from the banking system and could have led to a gridlock. However, as the quantitative analysis of CBR payment float suggests, such liquidity contractions were generally overwhelmed by the ongoing credit emissions. Arrears crises continued to occur periodically, regardless of the state of the payments system. 4/ It became clear that, as result of progressively tighter credit in real terms, arrears resulted primarily from the illiquidity of buyers combined with the willingness of

1/ In May 1992, the CBR also issued an instruction imposing a penalty of 0.5 percent per day of delay in payments, including delays in its own CSCs (CBR telegram No. 108-92 of May 7, 1992). The extent to which the measure was enforced remains unclear.

2/ This measure becomes effective when the increase in denomination outpaces the creation of bank deposits (see Fischer and Lee, 1994). Cash shortages, and therefore a premium of cash over bank deposits, lingered on in Russia until mid-1992 when inflation moderated. The premium of cash also reflected a flight from bank deposits for ensuring finality of payments--some banks specialized in accumulating large amounts of cash. Finally, the premium may have reflected remaining restrictions on the conversion of bank deposits into cash.

3/ See, for instance, Sachs and Lipton (1992).

4/ Arrears reached a peak in the summer of 1992 at 70 percent of GDP, coincident with the peak in inflation. In the summer of 1994, arrears amounted to 10 percent of GDP (Moscow Times, August 22, 1994).

sellers to continue delivering goods without prepayment. 1/ By July 1994, GKI (the state bankruptcy agency) argued on the basis of an enterprise survey that bribes given to plant managers to induce them to ship goods for which their enterprises are unlikely to get paid have become the principal source of arrears. 2/ Finally, exaggerated and sustained price increases due to the monopolistic behavior of some firms may have exacerbated the arrears problem.

Nevertheless, inter-enterprise arrears had some impact on the payments system, as the clearing of domestic arrears accumulated until June 1992 was a source of congestion and processing backlogs during August-October 1992. This is because the method used for the clearing consisted of reprocessing the pre-June 1992 unfunded payments using the same processing channels as current payments (but with separate accounting to identify net amounts due from or to each party). 3/ This "old" traffic was thus superimposed on the current traffic, accentuating the delays in payment processing.

c. Interstate payment imbalances

The Russian payments system was also adversely affected in 1992 by the congestion that developed owing to changes in the rules for processing interstate payments. Soon after the dissolution of the Gosbank in late 1991, the CBR established correspondent accounts in its CSCs for other central banks of the FSU, and routinely processed the incoming and outgoing cross-border payment orders through these accounts, in the process automatically extending credit to other states to finance imports from Russia. The level of financing through this de facto automatic overdraft in central bank correspondent accounts became clear to the CBR with the accounting returns of the first few months of 1992. In order to limit balance of payments financing through these accounts, in two waves of measures, the CBR progressively centralized the processing of interstate payments, first through regional headquarters (in April), and subsequently through Moscow (in July), by forbidding other CSCs to send or receive payments from abroad. 4/ These measures initially resulted in extra payment traffic in and out of Moscow with the regions, and added confusion owing to the rerouting of payment documents already under way and hasty implementation of the new measures. A separate Moscow center for interstate payments was created in July 1992 to handle interstate payments, as part of the Information Technology Department of the CBR. The measures simply increased the transaction costs of making interstate payments through the

1/ The sellers' behavior may have been partly rational; in a model of collusive arrears, even viable enterprises will extend unenforceable trade credit in the expectation that a majority will choose the same strategy, ultimately forcing a collective bailout. See Perotti (1994).

2/ Financial Times, August 12, 1994.

3/ CBR telegram No. 166-92 of July 28, 1992; telegram No. 175-92 of August 6, 1992.

4/ CBR letter No. 4 of April 30, 1992; CBR letter No. 14 of July 9, 1992.

central bank system 1/ and because they could not, by themselves bring control over the demand for CBR credit on the part of the FSU central banks, the CBR periodically resorted to blocking payments (until new lines of interstate credit were negotiated), or only processing payments which were funded. Moreover, the repeated blocking by the CBR of incoming payments into Russia because of insufficient funds rendered interstate payments through the central banks highly unreliable. Commercial banks have been offering alternative services at depreciated exchange rates and/or higher fees, so that only payments against official lines of credit to finance state trade continue to transit via the central bank system.

Interstate inter-enterprise arrears may have created by themselves payment defaults within Russia's domestic payments system and it has often been argued that this effect contributed to the disorganization of Russia's domestic payments and in particular to the buildup of domestic arrears. Even though in mid-1992, interstate arrears were more than ten times smaller than domestic arrears, a chain effect of arrears is possible. 2/ However, both types of arrears originated not in intrinsic payments system inefficiencies but in the buyers' lack of funds (notwithstanding substantial financing by the CBR of the FSU central banks which were largely used to fund interstate enterprise payments). 3/

d. Russia checks

The new Russia checks introduced in January 1992 had a pre-authorized ruble limit on each check; checkbooks were issued by authorized banks. 4/ To be honored, checks had to be presented within ten days of issuance. Checks could not be used for payments to accounts of individuals. When presented by the payee's bank at its CSC, the amount would be credited to the bank's correspondent account. Long collection lags and inadequate verification methods led to serious abuses, including through counterfeiting. In response, the CBR honored only prepaid checks--special blocked accounts were created for that purpose; blank checkbooks could only be issued by CSCs, not anymore by banks; check usage was restricted to in-city traffic, where verification of bonafide nature of payment is typically faster. 5/ As a result, the check as a payment instrument, has so far failed to gain acceptance.

1/ Private firms began to specialize in effecting cross-border payments directly, even in cash, and at bilaterally negotiated exchange rates. This evolution ultimately led to the emergence of organized foreign exchange markets that could provide reference rates, in Moscow at MICEX and progressively also in the FSU countries.

2/ See Ickes and Ryterman (1992).

3/ See IMF (1994).

4/ CBR letter No. 18-11/52 of January 20, 1992.

5/ Telegram of the CBR No. 230-92 of October 15, 1992.

e. Procedures for large value payments

An expedited processing procedure for large value transfers was also established. Because of the financial importance of the Moscow region with regard to emerging money and securities markets, special efforts were applied there in early 1993 to reduce in-city delays to no more than three days, with most of the transactions completed on a next-day basis. Ease of use of the existing telegraphic infrastructure was improved by enhancing security through a system of same-day confirmation between CSCs for payments above Rub 10 million. 1/ However, while banks could initially prepare telegraphic documents themselves, by January 1, 1993, only CSCs had this authority. Payments to and from certain regions were also excluded from the telegraphic system due to security considerations; telegraphic capacity was also insufficient or unavailable on certain trunks. The CBR further proceeded to verify certain unusually large payments on a discrete basis instead of verifying the compliance of each document with prescribed procedures separately, as had been the practice hitherto. However, with suspicion of forgery in large value payments periodically arising, signals from CBR management have been confusing regarding internal procedures for such payments; the CBR Board tightened processing again in 1993, first for large value interstate payments from April 1993, and then for all large payments from June 1993; both measures were rescinded as of October 1, 1993. 2/ The control procedure involved the blocking of incoming payments above Rub 100 million in a special suspense account. Only when the recipient bank had certified the payment's validity would the funds be released to the bank's correspondent account. It was possible to inform the CSC in advance of the arrival of a large value payment; funds would then bypass the suspense account.

Plans are now under way to streamline CSC-operating procedures in order to support a LVTS and facilitate money and foreign exchange market transactions. This is described in Section 4 below.

f. Payment fraud

In order to understand causes and occurrences of fraud, it is necessary to describe some detailed operating procedures of the CSCs. All institutions which have accounts at the CBR are assigned a code number which identifies the CSC where a particular account is kept; in order to make a payment to an account, it is necessary to indicate this number on the payment order. The code book is distributed by the CBR to all banks.

Blank payment orders are issued to the banks by the CSCs. When CSC A receives a payment order, it debits the account of the bank and sends it to CSC B of the payee's bank; the stamp of CSC A is affixed. When CSC B

1/ CBR telegram No. 253-92 of November 30, 1992.

2/ CBR telegram No. 62-93 of April 6, 1993; CBR telegram No. 104-93 of June 18, 1993; CBR telegram No. 205-93 of October 1, 1993.

receives the payment order by postal means, it first verifies the stamp, then whether the payment order has been completed properly.

Against this background, a typical fraud may be described as follows. An account is opened in a Moscow bank 1/ affiliated to CSC B, the zipcode of which is known. Blank payment orders are obtained and the stamp of CSC A duplicated. A fake payment order is put in the mail from CSC A to CSC B. Upon receipt, CSC B credits the account of the payee's bank, and the payee withdraws the money. Every ten days, all CSCs participate in a reconciliation round which consists of comparing payments sent by CSC A to CSC B and payments received by CSC B from CSC A. This particular fraud would be detected when payments received by B from A exceed payments sent by A to B.

The CBR's response to fraud has been mainly to tighten security of postal transportation and telegraphic payments. In particular, dedicated courier services were established in September 1992 and new security features were introduced for the use of telegraphs. A comprehensive set of measures were also taken to improve data security by creating a separate Bank Information Protection Department within the CBR. Special message security and coding systems were developed to protect information on paper and cable documents. According to the CBR, as of April 1, 1993, the new telegraphic security system had enabled to prevent about Rub 500 billion from being fraudulently paid into the accounts of commercial banks and their customers through false documents. Additional technical protection measures are under development in the context of medium-term reforms.

4. Medium-term reform strategy of the Russian payments system

This section describes the medium-term strategy for payments system reform adopted in the Russian Federation.

As noted earlier, during 1992 and the first half of 1993, the authorities completed or initiated various reforms of the existing system, with readily available technology, to improve security of payments, streamline processing and transportation of documents, and selectively test new automation and electronic communications methods to speed up payment clearing and processing. A large number of other measures were being planned and implemented, including continuing studies of CSCs to improve the timeliness and quality of their operations, consideration of issues in standardizing payment documents and electronic message formats, etc., and development of regulations governing electronic interbank clearing procedures.

In this fluid environment, the authorities recognized that further improvements over the medium term will require a fundamental redesign of the payments system, as a basis for a systematic and wider application of

1/ Moscow payment traffic is too large to conduct systematic verifications of payments.

electronic technology. However, several organizational and strategic issues remained to be addressed in order to design a new conceptual and operational framework of the future structure of the Russian payments system, and begin to implement specific reforms within this overall framework.

First, a clear mechanism was needed to build consensus on technical and policy issues between the central bank and commercial banks and between different departments of the central bank. Payments system reforms are highly interdisciplinary involving accounting, monetary policy, regulatory policy, and technology, and also call for coordination of actions and plans of commercial banks and the central bank. Therefore, effective implementation of payments system reforms required both coordination of reforms in different central banking functions, and a clear delineation of CBR's role in the regulation and operations of the payments system.

Second, a large number of automation projects relating to payments clearing were being developed in different parts of Russia, both by the CBR and by commercial banks. As part of the automation program of the CBR, a number of payment-related projects have been in progress since 1992 in six regions, each implemented by a different vendor. In addition, numerous regional offices of the CBR have been independently implementing different payment-related automation projects. Several commercial banks were striving to establish their own network systems for internal funds management and improved customer service including interbank funds transfer. These developments raised several issues. First, the business requirements of various users of the payments system had to be synthesized to define the needed technology architecture rather than adapting technology-driven solutions that could be wasteful and expensive. Second, technical specifications of different projects had to be coordinated based on agreed standards for payment documents, form and format, bank routing codes, electronic message formats, and message security. Third, risks in interbank funds transfer system offered by commercial banks had to be monitored and contained.

In order to address such organizational and coordination issues, to provide overall direction for payments system reforms for the medium term, and to adopt a systematic approach to project management, in April 1993 the authorities constituted the International Steering Committee for Improvement of Payments System in Russia (ISC), which includes representatives of different departments and regional offices of the CBR, several commercial banks, the Association of Commercial Banks, five international organizations (IMF, IBRD, OECD, EC, and EBRD) and four cooperating central banks. ^{1/} The ISC, chaired by a Deputy Chairperson of the CBR, serves as a forum for the Russian officials from the central bank and commercial banks to build a consensus on various technical and policy issues, with the technical support of international advisors. The ISC is assisted by six Working Groups. Each Working Group is composed of officials from both the CBR and commercial

^{1/} Deutsche Bundesbank, Bank of France, U.S. Federal Reserve, and Bank of England.

banks, chaired by a Russian official, and focuses on a specific component of payments system design and implementation. The seven subjects covered by the Working Groups are: (1) large value transfer system; (2) interbank clearing and netting arrangements; (3) new payment instruments; (4) intrabank settlement; (5) information system and technology; and (6) payments system training.

Building on the organizational framework of the ISC and the supporting Working Groups, the authorities have made significant progress in the design and implementation of various medium-term reforms. The state of these reforms is discussed below.

A consensus has been built up on certain broad strategic directions:

- The future structure of the payments system will comprise real-time gross settlement system for interbank transfers of large ruble values and multilateral netting of small values through clearing houses.
- While the CBR will play an active regulatory and supervisory role in ensuring the safety and soundness of the payments system, its operational role will be flexible.
- A high priority will be attached to developing a large value transfer system which will be owned and operated by the CBR.
- The clearing system for payments would be based on a mixture of public and private sector participation. Appropriate criteria for the licensing and operation of private clearing houses have been formulated and the scope for developing some of the existing CSCs into clearing houses is being studied.

The CBR has also begun to formulate a medium-term conceptual design of the payments system and an implementation framework based on the work of the different Working Groups. First, the CBR is addressing several technical and policy issues that would shape the payments system design: appropriate legal and regulatory framework, particularly for electronic funds transfers; 1/ technical and security standards and formats for paper instruments and electronic messages; 1/ and the degree of centralization of account processing and holding. Second, as a basis for decisions on the overall design and on the choice of pilot sites for the initial implementation, the CBR has collected extensive statistics from most regions on the volume and value of payment flows according to size of individual payments and their destination (intra-CSC, intraregion, interregion, and interstate). This data collection process is still under way.

1/ In August 1993, the CBR issued "provisional statute on making inter-regional payments through the electronic system for interbank settlements," stating the procedures, responsibilities, and technical standards to effect electronic funds transfers, using cash settlement centers. This initiative was part of a broader strategy to automate CBR functions and services.

Against this background, some of the specific reforms in progress are described below.

a. Clearing system

Two types of private clearing houses have been licensed. One type would perform conventional multilateral netting with settlement in central bank books and the other, a prefunded clearing house, would allow settlement on the books of the clearing house, with members transferring funds from their correspondent accounts at the CBR into clearing house accounts for purposes of settlement. Both types of clearing houses are based on multilateral netting with revocability clauses. In November 1993, four institutions were granted clearing house licenses by the CBR, initially for one year. ^{1/} One of the four institutions has a conventional standard license. None of them has really begun operating. Another two clearing houses are expected to be licensed soon. The detailed operating rules of the clearing houses, stating the rights and obligations of different parties, have been approved by the CBR Board on May 7, 1994.

Effective implementation of a clearing house system would require many interim changes in the existing system. Accounting, communications, and control procedures in the CSCs have to be further modified to allow prompt settlement of multilateral net positions of members holding accounts in different CSCs; to monitor account balances of members each day; and to open a period between the time of availability of clearing results and the time limit for the final settlement of net amounts due by members with debit position. This last measure, supported by a procedure--based on readily available technology--for banks to transfer money into their accounts for immediate and final settlement (until a modern LVTS becomes operational), would greatly facilitate money market development and monetary management, while facilitating the startup of clearing house operations. The CBR is considering these issues and is also developing a strategy for the medium term, including conditions for transformation of CSCs into clearing houses, policy on pricing of clearing services, and standardization of forms and formats. Depending upon the speed with which netting arrangements through clearing houses were established, the opportunity for banks to economize on reserve holdings at the central bank would grow.

b. Large value transfer system

The CBR has decided to implement a system along the lines of the Swiss model (SIC) in three stages. ^{2/} The system would be used for payment orders in excess of Rub 100 million with the amount adjusted according to economic condition--especially inflation--and for interregional payment

^{1/} The Moscow Clearing Center, Interbank Financial House, Banking Information Technologies, and the URAL Financial Group.

^{2/} SIC stands for Swiss Interbank Clearing, a real time gross settlement system for interbank payments through accounts at the Swiss National Bank.

orders of any size and other "urgent payment orders." 1/ Stage 1 (at present) is to test converting paper payment orders to electronic messages in 12 regions and prepare the legal and regulatory structure to support the LVTS. Stage 2 is to undertake a pilot project in two regions--Tula and Sverdlovsk--to process large ruble payment orders in a real-time gross settlement system. The design of Stage 2 is well-advanced, with considerable progress in specifying detailed user-requirements as the basis to begin implementation. The system's operating hours would take into account the number of different time zones in Russia and the ramifications of operating hours on the development of a national and same-day money market in Russia.

Stage 3 (which would begin in 1995) is to have additional regions to the second stage's pilot project and to improve the pilot's features. Enhancements would include a queuing procedure for transfers that cannot be processed because the sending commercial bank does not have sufficient funds when the order is received.

The CBR, however, has realized that the impact of this strategy may be too far into the future at a time of the seemingly significant development of large value payments via correspondent banks. To the extent that clearing banks resort to risky overdraft to process payments, and allow large interbank exposures, the probability of a systemic crisis could increase. To counter this risk and to meet the pressing needs in the money and foreign exchange markets, the CBR needs to provide timely and reliable large value payment services and is considering the establishment of transitional LVTS based on readily available technology.

The design and implementation of the gross settlement system for interbank transfers will necessarily involve several key decisions affecting monetary operations and instrument design, including decisions on the degree of centralization of bank accounts and on whether to use required reserves for settlement purposes through period averaging, or develop specific central bank credit facilities and their pricing. Depending upon the specific monetary arrangements that are used in the design of LVTS, the demand for bank reserves would be affected significantly. In any event, measures to centralize account holding or processing would lead, in due course, to a major reduction in demand for reserves.

c. Other areas of reform

Regulations on the creation, discounting, and collection of certain types of bills of exchange--a form of banker's acceptance--are being developed. This has implications for the central bank's refinance policy

1/ For example, aggregate statistics for 32 regions in early December 1993 show that individual payment orders over Rub 100 million account for less than 1 percent in terms of total number of transactions but account for over 60 percent in terms of aggregate value.

and for the distribution of risks that arise in any bill collection service provided through the CSCs.

The CBR has developed a book entry clearing and settlement system for T-bills. The treasury bills are currently maintained in book entry form in the books of an agent, the Moscow Interbank Currency Exchange (MICEX), and the acquisition and transfer of bills are also settled in the books of the agent with funds transferred ahead of time from CBR accounts into MICEX accounts for purposes of settlement. In order to facilitate a national market in T-bills and to avoid major risks for the settlement agent, the Working Group has been developing a new system for transferring settlements back into the books of the CBR, while MICEX and its regional branches concentrate on developing securities depository and clearing services. The CBR's offices would buy and sell short-term government securities on behalf of commercial banks, and provide same-day settlement on the books of the CBR for these purchases and sales. The corresponding ruble clearing and settlement would be integrated with the overall design of clearing services and LVTS.

The CBR is also designing a telecommunications network, as an application-independent communications carrier, based on advanced but proven technology. When implemented, it should satisfy the needs of the new payment arrangements. However, in order to design the payment processing architecture on the network, the user requirements of different components of the clearing and settlement system needs to be spelled out in detail and several institutional and policy issues remain to be addressed. These include decisions on ownership of telecommunications networks, policy toward access to, and pricing of, data communication services, and whether or not the intrabank--and some commercial bank-operated interbank network (for transfers of funds and liquidity management)--is shared with CBR.

Bibliography

- Angelini, Paolo, and Curzio Giannini, *On the Economics of Interbank Payments System*, Banca d'Italia Discussion Paper Series, No. 193 (May 1993).
- Angell, Wayne D., "Large Value Payments Systems: What Have We Learned?" in *Payments Systems Worldwide*, (Winter 1992-93), pp. 57-61.
- Baliño, Tomás J.T., Juhí Dhawan, and V. Sundararajan, "The Payments Systems Reforms and Monetary Policy in Emerging Market Economies in Central and Eastern Europe," IMF Working Paper No. 94/13 (January 1994).
- Bank for International Settlements, *Report of the Committee on Interbank Netting Schemes of the Central Banks of the Group of Ten Countries* (Basle: BIS, November 1990).
- Borio, Claudio, and Paul Van den Bergh, *The Nature and Management of Payments System Risks: An International Perspective*, BIS Economic Papers, No. 36 (February 1993).
- Cacy, Higgins, and Gordon Sellon, "Should the Discount Rate be a Penalty Rate?" in *Federal Reserve Bank of Kansas City Economic Review* (January 1981), pp. 95-102.
- Central Bank of the Russian Federation, *Annual Report 1992* (Moscow: Russian Federation).
- Fischer, Stanley, and Michael Lee, "On the Shortage of Cash During Hyperinflations," presented at NBER Workshop on Macroeconomic History, Cambridge, MA (May 6, 1994).
- Friedman, Benjamin M., "Targets and Instruments of Monetary Policy," NBER Working Paper No. 2668 (1988).
- Garber, Peter M., and Steven R. Weisbrod, *The Economics of Banking, Liquidity and Money* (Lexington, MA: D.C. Heath, 1992).
- Hook, Andrew, "Managing Payment System Risk During the Transition from a Centrally Planned to a Market Economy," IMF Working Paper No. 92/95 (November 1992).
- Horii, Akinari, and Bruce J. Summers, "Large Value Transfer Systems," in *The Payments System: Design, Management, and Supervision*, ed. by Bruce Summers (Washington: International Monetary Fund, 1994).
- Ickes, Barry, and Randy Ryterman, "Inter-Enterprise Arrears and Financial Underdevelopment in Russia," mimeo, World Bank (September 1992).
- International Monetary Fund, "Financial Relations Among the States of the Former Soviet Union," *Economic Review*, No. 1 (1994).

- Joskow, Paul, Richard Schmalensee, and Natalia Tsukanova, "Competition Policy in Russia During and After Privatization," *Brookings Papers on Economic Activity, Microeconomics* (1994), pp. 301-381.
- Leite, Sérgio Pereira, and V. Sundararajan, "Issues in Interest Rate Management and Liberalization," *Staff Papers, International Monetary Fund* (Washington), Vol. 37 (December 1990), pp. 735-752.
- Liang, Ming-Yih, "Bank Float, Mail Float, and the Definition of Money," *Journal of Banking and Finance*, Vol. 10 (1986), pp. 533-548.
- Marquardt, Jeffrey C., "Monetary Issues and Payments System Design," in *The Payments System: Design, Management, and Supervision*, ed. by Bruce Summers (Washington: International Monetary Fund, 1994).
- McCallum, Bennett T., "Targets, Indicators, and Instruments of Monetary Policy," IMF Working Paper No. 90/41 (1990).
- Perotti, Enrico, "Collusive Arrears in Transition Economies," mimeo (Boston University, 1992).
- Sachs, Jeffrey, and David Litpon, "Remaining Steps to a Market-Based Monetary System in Russia," mimeo (June 1992).
- Sundararajan, V. and G. Sensenbrenner, "Linkages between Payment Systems Reforms and Monetary Policy: The Recent Experience in Russia and Other Former Soviet Union Countries," in *Proceedings of Fourth IMF Seminar on Central Banking*, ed. by Baliño, T. and Cottarelli, C., forthcoming (Washington: International Monetary Fund, 1994).
- Sundararajan, V., "Financial Sector Reforms and their Appropriate Sequencing," in *The 19th SEANZA Central Banking Course* (Tokyo: Bank of Japan, October-November, 1992), pp. 177-203.
- Tanzi, Vito, "Inflation Lags in Collection, and the Real Value of Tax Revenue," *Staff Papers, International Monetary Fund* (Washington), Vol. 24 (March 1977), pp. 154-67.
- Veale, John, and Robert Price, "Payment System Float and Float Management," in *The Payments System: Design, Management, and Supervision*, ed. by Bruce Summers (Washington: International Monetary Fund, 1994).
- Vital, Christian, *SIC: Market Responses to the Introduction of an Electronic Interbank Payments System*, paper presented at the International Symposium on Banking and Payment Services, sponsored by the Board of Governors of the Federal Reserve System, June 7-9, 1989 (Washington, D.C.).
- Young, John E., "The Rise and Fall of Federal Reserve Float," *Economic Review, Federal Reserve Bank of Kansas City* (Kansas City), Vol. 71 (February 1986), pp. 28-38.

