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Russian monetary policy: Assessing the track record

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Russian Monetary Policy – Assessing the Track Record

by
Claudia M. Buch



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Assessing the Track Record**

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Abstract

Since early 1995, monetary stabilization has gradually been achieved in Russia. Extremely high real interest rate have been maintained throughout autumn 1996, an exchange rate target has been adhered to since mid-1995, auctions of Central Bank credit have gained in importance, and subsidized lending has been cut down. However, the conduct of monetary policy remains a trial-and-error process: Indirect budget financing through the CBR still occurs, the fixed exchange rate regime has caused a lack of control over the monetary base, and the money multiplier is relatively unstable. Preliminary empirical evidence shows that money demand has remained relatively stable since the beginning of reforms. Still, short-run fluctuations of money demand are substantial, and further portfolio adjustments are likely if inflationary expectations decline and if the capital account becomes more open. The success of monetary stabilization crucially depends on the effectiveness with which the CBR can defend its independence. Because financial sector stability is an important condition for a predictable and stable monetary policy, further measures to restructure and to consolidate the banking sector need to be pursued in parallel to structural reforms of the Russian economy.

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1. Motivation¹

Since the liberalization of prices in January 1992, Russian monetary policy has been a mirror-image of the overall reform and stabilization process. Several attempts at enforcing tighter monetary conditions and at containing inflation have been succeeded by periods of monetary expansion and renewed increases of prices (Graph 1). Although consumer price inflation has fallen continuously, there has been a sustained trend towards stabilization of the monetary sector only since early 1995. Real interest rates have increased to extremely high positive levels, money growth has been reduced, and monthly inflation rates have remained in the single digits. The key question in autumn 1996 is thus whether Russian monetary policy can stay on this path towards greater monetary stability without imposing unnecessarily harsh liquidity constraints on the real sector and without resorting to the monetization of the budget deficit. Considering the erosion of regular tax revenue of the government that is taking place,² the resulting pressure on the Central Bank of Russia (CBR) to loosen its monetary stance, and the increasing indebtedness of the non-financial sector, the current stabilization may indeed appear relatively fragile.

In view of the various channels of interaction between the monetary sector and other reform areas, this paper takes a quite narrowly defined approach. Its main goal is to assess the track record of Russian monetary policy since 1992. In order to restrict the analysis, institutional issues such as the independence of the CBR the prudential regulation of commercial banks, or the situation of the commercial banking sector are not covered in detail.³ Rather, the paper starts by analyzing the money supply process (Part 2). It will be shown that the CBR has had limited power to control the growth of base money because of budgetary pressure and – since 1995 – because of the fixed exchange rate regime that has been adopted. Furthermore, the impact that a change in the monetary base has on broad money supply is determined by the money multiplier which is largely beyond the control of monetary authorities. Part 3 analysis the stability and structure of money demand. First, preliminary evidence is presented which indicates that the demand for ruble M2 has remained relatively stable throughout the transformation process, and no significant structural breaks can be detected. Part 4 studies the sustainability of monetary stabilization and points at the need to coordinate monetary policy with other reform areas.

¹ The author would like to thank Jörg Döpke and Mechthild Schrooten for most helpful comments on an earlier draft. Of course, the author is responsible for all remaining errors and inaccuracies.

² The revenue of the budget in percent of GDP has declined from 26.2 percent in 1995 to 23 percent for the first eight months of 1996 (DIW/IfW/IWH, 1996c).

³ See Buch/Schrooten (1996) for an analysis of commercial banks in Russia.

2. Money Supply During Transformation

In December 1990, the responsibilities of the Central Bank and of commercial banks in Russia have been separated and the monobank system, which prevailed under central planning, has been abolished.⁴ At the end of 1991, the Central Bank of Russia, which had been founded already in July 1990, took over the central banking responsibilities of the Soviet Gosbank. In principle, the CBR can affect money supply by influencing the level of base money (B) which is related to total money supply (M) through the money multiplier (m)

$$(1) \quad M = m \cdot B$$

As any other central bank, the CBR has a fairly direct influence only on the monetary base which sources are composed of a domestic component and of foreign exchange reserves. Yet, if the money supply process can be influenced by political interest groups, even the control of the CBR over the domestic component is not ensured. During the transformation process, the political economy of money creation has certainly changed. Whereas in particular between 1992 and 1993 monetary policy accommodated the credit demands of state-owned enterprises determined money supply, the CBR has now a much tighter grip on domestic money creation.

The foreign component of the monetary base is controllable only if flexible exchange rates or if capital controls are in place. In a fixed exchange rate system without capital controls, changes in the demand for domestic money will automatically transmit into changes of foreign exchange reserves. Furthermore, the central bank cannot control broad money because adjustments in the money multiplier are determined by the behavior of households, firms, and commercial banks. The induced lack of control over monetary aggregates hampers a policy of monetary targeting, or may even render it impossible.

More fundamentally, the question has been raised whether central banks in transition economies should try and target monetary aggregates in the first place. Because of microeconomic distortions in the financial sector, a policy of monetary tightening might lead to credit rationing of the private sector and to bankruptcies of firms which are in principle viable (Bofinger, 1992). Bofinger thus proposes a flexible monetary policy without the announcement of monetary targets. Other authors, although acknowledging the need to flexibly adjust targets, favor a policy of monetary targeting over direct inflation or interest rate targets (Ize, 1996).

⁴ For an overview of banking reform in the former Soviet Union see Buch (1993).

This section will thus try to answer the questions whether the CBR could control the supply of base money, and whether there is a stable relationship between base money and broader monetary aggregates.

2.1. *Instruments of Monetary Policy*

Generally, direct and indirect instruments of monetary policy can be distinguished (Lindgren, 1991). Through *direct* instruments, central banks administratively control the activities of commercial banks by setting the interest rates and/or the credit volume. *Indirect* instruments influence the liquidity conditions of banks and – in a more indirect sense than interest rate controls – the short-run interest rate level of an economy. These instruments can again be split into two groups. Non-market-based indirect instruments such as minimum reserve requirements imply an implicit taxation of the commercial banking sector if deposits with the central bank yield an interest rate below the market rate. Market-based indirect instruments (rediscount facilities, open market operations, credit auctions) affect the liquidity of the banking system by inducing the banks to change their asset structure as a reaction to price signals.

The choice of the instruments of monetary policy is substantially influenced by the institutional structure of financial markets. At the beginning of the transformation process, it may be necessary to rely on fairly direct, non-market-based instruments of monetary control simply because the effects of more sophisticated instruments are unknown or because economic agents are unlikely to react to market signals. Yet, in order to avoid microeconomic distortions to be magnified or even caused by monetary policy, those instruments should be chosen that have the least negative feedback effects on the efficiency of the banking system (Buch, 1996). Instruments that fulfil these requirements are those that (i) do not distort relative prices, (ii) do not preserve oligopolistic market structures, (iii) do not bias the allocation of credit towards inefficient, state-owned enterprises, and that (iv) provide the commercial banks with incentives to engage in an active liquidity management. The following sections will show that the CBR has not always followed this prescription. At least during the first two years of reforms, the CBR has used fairly direct, non-market-based instruments of monetary policy. Only gradually have market-based instruments such as credit auctions gained in importance.

2.1.1. Centralized Credit and Financial Repression

Up to early 1994, central bank credits were primarily issued in the form of directed credits. In 1992 and 1993, 104 and 98 percent, respectively, of central bank lending has been in the form of these loans (IMF, 1994). About 75 percent of the directed credits were channelled through commercial banks directly to enterprises, the remainder were loans to the government. At the end of 1993, directed credits accounted for almost one fourth of the stock of commercial bank loans. The recipients of directed credits were determined by a Credit Policy Commission of the CBR and of the government. Commercial banks could earn a maximum spread of 3 percentage points on directed credits. The banks had no incentive to assess the creditworthiness of a borrower or to enforce loan repayment. Instead, politically powerful lobbyist determined the allocation of credit. It has thus not come to a very big surprise that most centralized credits have turned out non-performing in the meantime.

The dominance of centralized credits had a quite devastating impact on real interest rates.⁵ Centralized credits usually carry interest rates below the market rate of interest and thus constitute a subsidy towards the borrower. Because of the dominance of centralized credits and thus the lack of market-based refinancing, the lending rate of the CBR for commercial banks was highly negative in real terms from the beginning of 1992 up to late 1993 (Graph 3).⁶ The recipients of directed credits, i.e., the Ministry of Finance and priority sectors such as agriculture, the fuel and energy industry, and the Northern territories, thus received substantial subsidies through the financial system. It has been estimated that the subsidization of the Russian economy through directed credits amounted to 15.5 percent of GPD in 1992, 5 percent in 1993, and 2.5 percent in 1994 (RETa, Vol. 5 (1)). This form of subsidization has not been relevant anymore in 1995.⁷

⁵ Ideally, real interest rates would have to be calculated as the difference between the nominal interest rate and the expected inflation rate. Because data on inflationary expectations cannot be obtained, the current inflation rate has been used as a proxy. Real interest rates are thus equal to the difference between the monthly nominal interest rate (r^{nominal}) and the monthly increase in prices (ΔP): $r^{\text{real}} = ((1 + r^{\text{nominal}})/(1 + \Delta P) - 1) \cdot 100$.

This specification implies that one-time adjustments of prices have an impact on the real interest rate even if these shifts do not influence inflationary expectations. For the calculation of real deposit (lending) rates, the consumer (producer) price index CPI (PPI) is used.

⁶ On overdraft refinancing credits, a penalty rate of twice the refinancing rate was charged up to July 1994, this factor has been lowered to 1.3 in July 1994. There is not information available concerning the enforcement of the penalty.

⁷ Some sectors still receive low-interest loans. However, these loans are now subsidized through the budget rather than issued by the CBR.

Despite the formal abolition of interest rate controls for commercial banks, most other relevant interest rates were negative in real terms in 1992 and 1993 as well. There are at least two explanations for this phenomenon. *First*, commercial banks either directly or indirectly through moral suasion were guided by the monetary authorities to keep lending rates low. *Second*, because the banks were effectively shielded from foreign competition, they could retain low deposit rates as well and still earn a sufficiently high spread on their activities.

The repressed financial system, which characterized the early stages of reforms, had negative effects on the efficiency of financial markets. The main incentives of commercial banks and of their customers were to find inflation hedges in order to avoid the erosion of their real wealth. The soft budget constraints of firms were perpetuated. Because the demand for loans at negative real interest rates is in principle infinite, the CBR had to contain credit growth by quantitative controls. Those large successor banks of the former Soviet Gosbank which were in charge of financing the state-owned industrial and the agricultural sector – the so-called „channel banks“ – were the main beneficiaries of the directed lending programs (World Bank, 1993). Because of the prevalence of directed credits, monetary policy in Russia did not fulfill any of the criteria outlined above, at least up to the end of 1993. Directed credits have not been priced competitively, they have been channeled only through selected banks, and they have been biased towards the existing firms.

2.1.2. Refinancing Policies

Interest Rates

The beginning of 1994 marks a shift in the interest rate and credit policy of the CBR because credit auctions were conducted for the first time. Already during 1993, the monetary authorities aimed at reducing the gap between the official refinancing rate and the interbank lending rate. This has been achieved in October 1993. Since April 1994, the maximum spread between the refinance and the interbank rate has been set at 4 percentage points. Because of the short-term nature of credit auctions – the maximum maturity has been 2 months –, the stock of these loans has remained fairly small. In 1994, auction credit contributed only 1.6 percent to total credit growth; for the first seven months of 1996, this share was 11.5 percent.⁸

⁸ These numbers have been calculated from various issues of IFS and RETa.

Reflecting an increase in inflation towards the end of 1994 and a temporary decline of nominal interest rates, real interest rates showed a declining trend throughout 1994 and eventually turned negative again in the last months of the year. This return to negative real interest rates after an initial upswing at the beginning of the year could be avoided in 1995. Another major difference between the development of interest rates in 1994 and in 1995 is striking. Both the official refinancing rate and the auction rate have substantially exceeded the interbank rate on short-term loans during a sustained period in 1995 and in the first half year of 1996. The official CBR refinancing rate has thus for the first time during the transformation process become the marginal sources of refinancing for commercial banks. The substantial increase in the cost of refinancing prompted a declined reliance of the commercial banks on central bank credit. Between December 1993 and July 1996, the importance of CBR credit as a source of finance for the commercial banks dropped from 14 to 4.8 percent of commercial banks' liabilities and equity (Table 2). Interestingly, the quite substantial interest rate gap between the refinancing rate and the interbank rate did not induce a substantial increase in the use of money market instruments which in July 1996 only accounted for 4.2 percent of liabilities' and equity.

Design of Credit Auctions

Auctions of credit resources in transition economies – while generally constituting a welcomed move to a more market-based allocation of central bank credit – must be carefully designed (Saal/Zamalloa, 1995). Because of asymmetries in information on the quality of banks, central banks may end up with a pool of risky borrowers due to adverse selection effects. In addition, uncompetitive market structures may lead to collusion among banks, thus repressing interest rates. There are two ways of preventing asymmetries in information and collusion from distorting the outcome of credit auctions.⁹ *First*, the access to auction credit should be based on the provision of collateral. Because of the lack of assets which might serve as collateral, government bonds and foreign exchange accounts can be used in the short-run. In the medium-term, the securitization of enterprise debt should be promoted in order to de-link monetary policy and the financing of the government deficit.

Second, access to credit auctions should follow clear and transparent rules, and only solvent banks should be admitted. Improved banking supervision can help to classify banks, and the access of banks to the interbank market can be taken as

⁹ Furthermore, credit auctions are ill-suited to withdraw liquidity from the market if the central bank wishes to sterilize the impact of inflows of foreign capital on the monetary base (Ize, 1996).

an indicator of solvency. Anecdotal evidence from Russia indeed suggests that access to the interbank market is guided by solvency indicators. After a liquidity crisis on the interbank market in August 1995, commercial banks confined lending to the best borrowers, they demanded the provision of collateral such as government bonds (GKOs), and they required the disclosure of financial information (Winkler, 1996).

Commercial banks that participate in credit auctions of the CBR also have to fulfill certain solvency requirements (IMF, 1994). The limit for borrowing on credit auctions has been set at twice the capital of the bank or 10 percent of its assets, whichever is lower. Since the beginning of March 1996, access to Central Bank refinancing credit is based on the provision of collateral, mainly government bonds. The maximum maturity of credit disbursed through this Lombard facility is 30 days; the volume of credit and the type of the credit auction are determined by Board of Directors of the CBR (RETa, Vol. 5, No. 1). In April and May 1996, seven Lombard credit auctions were conducted (CBRa, 7(38), 1996). Altogether 1,200 billion ruble were offered, but only 475 billion ruble or 40 percent were actually taken up by the banks. This amount is almost as high as the volume of loans that was extended through credit auctions in 1995 (538.3 billion ruble). Interest rates on Lombard credits varied between 45 and 63 percent in April and May, and were thus less than half of the official refinancing rate at that time (120 percent). This interest rate differential can be justified by the fact that loans which are backed by collateral carry a comparatively low credit risk.

In principle, the move from the use of directed credit to market-based, collateralized lending to commercial banks marks an important shift in the lending policy of the CBR. It must be noted, however, that the refinancing facility may also be used to indirectly finance the budget deficit. In 1996, the interest rate on government bonds has temporarily exceeded the official refinancing rate. Because commercial banks use government bonds as collateral for borrowing from the CBR, this opens an interest rate window, and the banks can make an arbitrage profit from buying government bonds with central bank loans. In response to such arbitrage opportunities and to their need for safe assets, commercial banks have substantially restructured their balance sheets towards claims on the government. These claims have increased in importance from 5.2 percent of total assets at the end of 1994 to 17.9 percent in December 1995 and to 23 percent in July 1996 (Table 2).¹⁰

¹⁰ Out of all securities in the banks' portfolio at the end of June 1996, more than two-thirds were state securities (CBRa, 8(39), 1996).

2.1.3. Minimum Reserves

The CBR has frequently adjusted the minimum reserve requirement for commercial banks. On average, minimum reserves, which do not pay interest, have been relatively high (20 percent on demand deposits) and have thus constituted a quite substantial cost for the banks. Assuming that banks use demand deposits only to finance loans as their only assets, a 20 percent reserve requirement *cet. par.* implies an interest rate spread of 25 percent of the deposit rate.

In February 1994, reserve requirements were adjusted to 20 percent of ruble demand deposits and 15 percent of other interest-bearing ruble deposits; no reserve requirements applied to foreign exchange deposits. At about the same time, case-by-case exceptions, which freed certain banks from meeting reserve requirements, were abolished (IMF, 1994). In February 1995, minimum reserve requirements were set at 22 percent on demand deposits and time deposits up to 30 days, 15 percent on time deposits between 30 and 90 days, 10 percent on deposits over 90 days, and 2 percent on foreign exchange deposits (Sokolov et al., 1996). These rates were temporarily lowered in May 1996 and have been raised again in July to 20 percent on deposits with a maturity of less than 30 days, to 16 percent on deposits with a maturity of 31-90 days, to 12 percent on deposits with a maturity of more than 90 days, and to 2.5 percent on foreign exchange deposits (Seeb erg/Winkler, 1996). This last increase in minimum reserves came as a response to a profit transfer to the budget which had been ordered by the government (Kommersant, 1996), and which is not backed by the regulations of the Central Bank Law. Effective November 1, 1996, reserve requirements for ruble deposits have been lowered slightly and those for foreign currency deposits have been raised in order to increase the attractiveness of holding ruble deposits (OMRI, 31.10.1996).

2.1.4. Exchange Rate Policy

Up to mid-1992, Russia maintained the Soviet multiple exchange rate regime with differentiated exchange rates for tourists foreign trade, or capital account transactions. After the unification of the exchange rate between the Russian ruble and the US-Dollar in July 1992 (Buch et al., 1995), the CBR has frequently intervened in the foreign exchange market but did not announce any exchange rate target up to mid-1995.¹¹ In January 1995, the maximum daily deviation of the exchange rate was set

¹¹ For details on the exchange rate policy and foreign exchange regulations see the various issues of DIW/IfW/IWH.

at 10 percent. An exchange rate target of 4,300-4,900 ruble per US-Dollar has for the first time been announced in July 1995 and remained unchanged until the end of that year. In January 1996, the corridor was adjusted to 4,550-5,150 ruble for the first six months of that year. In July 1996, the CBR announced the move to a „crawling“ exchange rate corridor which is intended to shift on a daily basis while maintaining a width of 600 ruble (RETb, 16.7.1996). In June 1996, current account convertibility of the ruble as required under the IMF's Article VIII has been introduced while restrictions on the capital account are being maintained (EIU, 1996). Although the entry of foreign investors into the Russian capital market has been liberalized somewhat, entry barriers will remain in place at least until the end of 1997. Foreign banks can only enter the Russian market after they have received a license from the CBR, and the maximum amount of foreign capital in the Russian banking system has been restricted to 12 percent.

2.2. The Structure of Base Money

The use of centralized credit facilities, the structure of the Russian capital market, and the exchange rate policy have influenced the process of base money creation. This section shows which impact these factors had on monetary policy.

2.2.1. The Endogeneity of Money Supply

The close interaction between monetary policies and quasi-fiscal activities¹² in transition economies implies that a central bank may not be able to credibly commit itself to the announcement of a monetary target which disregards the credit needs of the budget and of state-owned enterprises. A part of the money supply in transition economies may thus be endogenously determined (Bofinger, 1994). Through its access to refinancing credit of the central bank, the (quasi-) fiscal sector receives seigniorage revenue.¹³ The extent to which such revenues can be obtained depends on the independence of the central bank.¹⁴

¹² The quasi-fiscal deficit comprises the official government deficit plus the deficits/losses of extrabudgetary funds, state-owned enterprises, and banks.

¹³ There are two concepts for the calculation of seigniorage (Klein/Neumann, 1990): (i) The *opportunity cost* concept considers seigniorage as the interest expense saved by the government if it obtains an interest-free loan from the central bank. Seigniorage is thus equal to the nominal interest rate on government bonds times the real stock of base money; (ii) *monetary seigniorage* treats the revenue of the government as the change in the real stock of money.

¹⁴ At the same time, it must be borne in mind that central bank independence is only a necessary, not a sufficient condition for monetary stability.

The institutional framework in which the CBR has been operating has indeed been conducive to undermining its autonomy. Throughout the years 1992 to 1994, the Central Bank Law did not even formally establish the independence of the monetary authorities from the government. Rather, the head of the Central Bank was a member of the government, and monetary policy was *de facto* determined by political considerations. A new Law of the Central Bank, which has been passed in January 1995, intended to establish central bank independence, but has thus far only succeeded partially (DIW/IfW/IWH, 1995a). The CBR has to report on its activities to the parliament, and its decisions still need to be coordinated with a banking committee of the government. Although the government may in principle not receive credits from the CBR, exceptions to this rule may be specified in the budgetary law. Against this background, the success of the CBR with containing inflation is quite remarkable.

Generally, there are four different, albeit related, channels through which a transformation-induced endogeneity of the money supply can arise:

- Insolvent, state-owned firms can be financed directly by the monetary authorities. These loans to enterprises would be channelled through the banking system but are essentially earmarked for special recipients. Such indirect subsidies in the form of directed credits have indeed been one main driving force behind monetary expansion in 1992 and 1993 (Section 2.1.1.).
- The allocation of directed credits is a first step which leads to a build up of non-performing loans on the balance sheets of banks and thus to banking distress.¹⁵ Hence, a second channel emerges if insolvent banks are kept liquid through the refinancing facilities of the central bank even if the losses of enterprises have been fully consolidated into the budget. Facing a large number of distressed financial institutions, it may be in the interest of the central bank to provide insolvent banks with low-interest refinancing credits if it assigns a positive weight to the stability of the banking system. After the liquidity crisis on the Russian interbank market in August 1995, for example, the CBR provided the banks with liquidity at the amount of 1.9 Trillion ruble (2 percent of the monetary base) (DIW/IfW/IWH, 1995b).
- The substitution of bank credit by trade credit can eventually counteract restrictive monetary policies (Abel/Siklos, 1994). A decline in the real stock of bank credit

¹⁵ In a situation of banking distress, commercial banks are insolvent but not illiquid because they can obtain additional funds from the central bank and/or from depositors. Banking distress thus turns into a banking crisis if these refinancing opportunities dry up.

may imply that firms have less working capital available to finance production inputs.¹⁶ Upon a tightening of (central) bank credits, enterprises can obtain additional liquidity by falling into arrears with their suppliers. Although interenterprise debt is not included in the traditional money stock, it may be monetized by the monetary authorities and could thus be an indicator of (future) monetary expansion. Firms will actually gamble on this option the more frequent bail-outs have been in the past or, more generally, the less credible an initial monetary tightening has been.¹⁷

- While the financing needs of state-owned enterprises, the insolvency of banks, and the emergence of interenterprise credit have occurred in virtually all transition economies, the political goal to provide (soft) loans to the successor states of the former Soviet Union has been a unique feature of the transition in Russia. Until the ruble zone broke up in June 1993, the non-Russian successor states of the Soviet Union had the possibility to create non-cash rubles but the authority to issue cash ruble was retained by the CBR.¹⁸ Hence, the eventual accommodation of the issuance of ruble cash through loans to the successor states undermined Russian monetary autonomy. New lending to these states, however, was stopped in 1994.

While there is some evidence on the provision of directed credits or of emergency loans to firms, banks, and other successor states (Section 2.2.2), the impact of interenterprise debt on monetary policy is more difficult to detect. Data which is available on the payables and receivables of enterprises since mid-1992 allow a first assessment whether the monetization of enterprise arrears has had an impact on monetary policy. Both payables and receivables of enterprises moved relatively in parallel, with gross receivables exceeding payables because of net claims on firms outside Russia. Between July 1992 and March 1993, real receivables declined sharply by about 75 percent which is mainly due to a netting of claims and to improvements in the payments system (Kim/Kwon, 1995). Graph 2 shows that there is some evidence that – at least since late 1993 – bank loans and interenterprise debt

¹⁶ Calvo and Coricelli (1992) have made such a credit crunch responsible for the output decline in Eastern Europe. However, a decline in the stock of real credit also indicates that the debt servicing requirements of the enterprise sector fall, thus improving the financial position of firms (Schmieding, 1993).

¹⁷ Kim and Kwon (1995) show that interenterprise arrears will occur in transition economies even if budget constraints of firms are relatively hard and if monetary policy remains unchanged.

¹⁸ Hardy and Lahiri (1996) analyze the effects of this cash shortage on the economies of the successor states. See also Buch et al. (1995) on the monetary reforms in selected successor states.

moved in parallel.¹⁹ While this observation may also be explained by a third, omitted variable which drives both time series, the graph also shows that the positive correlation between the series ended in early 1995. Since then, real bank loans declined, while real enterprise debt increased. This can be interpreted as weak evidence that banks have been less willing to refinance the debt of enterprises since early 1995.

2.2.2. Determinants of the Monetary Base

The asset side of the Central Bank's balance sheet shows the sources of base money growth and gives some indication concerning the financing of the (quasi-) fiscal deficit. Between 1994 and 1996, net domestic assets have overall been the driving force behind money growth (Table 3). As a result, they exceeded the targets agreed upon by the IMF and the Central Bank from May 1996 onwards.²⁰ The structure of the balance sheet of the CBR shows that claims on the government increased in importance in 1994, declined somewhat in 1995, and rose again in 1996 (Table 4). These claims also include government bonds bought by the CBR. Reportedly, the CBR has at the end of 1994 recommended to finance the budget deficit through the issuance of bonds which would then be bought by the bank (Sokolov et al., 1996). In parallel to the increase of claims on the government, claims on banks declined from 19 to 7 percent of assets.

During much of 1995 and in the first quarter of 1996, net foreign assets increased quite substantially. This increase in foreign assets reflects the adoption of the fixed exchange rate regime which forced the CBR to absorb capital inflows. These capital inflows came in response to the stabilization of the nominal exchange rate and to high real interest rates which resulted from of backward-looking inflationary expectations (Ize, 1996). The CBR reacted by unsterilized intervention, and by allowing some appreciation of the nominal exchange rate. Because of a lack of open market operations,²¹ sterilized interventions, which would require a decline in net domestic assets, were difficult to achieve. Still, the inflationary impact of the capital inflows has been relatively modest. The inflows mainly reflected a return of hoarded foreign exchange, and the increased money supply was partly absorbed by an increased demand for money.

¹⁹ Data on interenterprise credit is identical to the payables to enterprises (RETa). To some extent, the relatively sharp increase in January 1994 is attributable to a break in the time series.

²⁰ See RETa (Vol. 5, No. 1) and RETb (13.9.1996).

²¹ Only since late October 1996 has the CBR offered overnight loans through repurchase agreements.

Considering the impact that the financing of the (quasi)-fiscal deficit and the fixing of the foreign exchange rate had on money supply, the question arises as to why inflation could be contained quite successfully. Apart from a general trend towards a decline in inflation because of the reduced scope for adjustments in relative prices, two observations can be made. First, the nominal growth of the monetary base has been continuously reduced. In 1995, the CBR has particularly cut down growth of credit to the banking sector which declined quite substantially in real terms. This reduction of lending to banks, together with the move to high real interest rates, has been one cause of the liquidity crisis in the banking system in August 1995. Second, a downward trend in the income velocity of money (Section 3.1), and thus an increase in money holdings, has reduced the inflationary impact of a given increase in the money stock.

As regards the uses of the money base, the CBR accommodated the initial fall in cash money balances after the liberalization of prices in January 1992. Between May and September 1992, real cash money increased to a post-liberalization high. The share of cash in total CBR assets has continued to rise from 23 to 36 percent between late 1993 and mid-1996. In real terms, however the stock of cash money showed a downward trend, combined with strong seasonal upswings. Deposits of commercial banks, comprising mandatory and excess reserves, have slightly declined in importance and virtually stopped to increase in 1996. Mainly, this decline is driven by a fall in excess reserves which were reduced from 80 percent of total reserves at the end of 1992 to 62 percent in June 1996 (RETa). This fall can be attributed to improvements in the payments systems and to a better liquidity management of the commercial banks.

2.3. The Money Multiplier

The supply of base money in Russia has quite strongly been influenced by political considerations and by the exchange rate regime that has been adopted. Even if these factors were not relevant, the question is whether the CBR could in principle gain greater influence over overall money supply by bringing base money under its control. Broad money supply depends also on the money multiplier, that is on the behavior of banks and non-banks. Transformation of (1) by making use of the definition of the monetary base by its uses $B = CC + RR + ER$ (CC = currency, RR = required reserves, ER = excess reserves) yields

$$(1') \quad M = m \cdot B = \frac{1+cc}{cc+rr+er} \cdot B$$

where cc = the ratio of currency to total deposits in the banking system, and rr (er) = the ratio of required (excess) reserves to total deposits. Changes in broad money are thus the sum of changes in the monetary base and in the money multiplier

$$(1'') \quad dM = m \cdot dB + \frac{dm}{dr} \cdot B + \frac{dm}{dc} \cdot B \quad \text{with} \quad \frac{dm}{dr} < 0, \frac{dm}{dc} < 0$$

The CBR does have a direct influence only on the ratio of required reserves to deposits. As far as the other two components of the money multiplier as well as the total money supply are concerned, the central bank has both a control and an information problem (Neumann/von Hagen, 1987). In fact, a statistically significant relationship between base and broad money could not be established.

The *control problem* emerges because changes in the portfolio structure of households as well as in the excess reserve holdings of commercial banks cannot be predicted accurately. Unexpected changes in cash demand and of the currency ratio may be particularly high during the early reform period when the separation between cash and non-cash monetary circuits is lifted, and when the seasonal pattern of the demand for cash is unknown as yet. Generally, households will decrease their cash holdings if more interest bearing financial assets, which raise the opportunity costs of holding cash, become available. The introduction of new payment techniques may, in addition, reduce the transaction demand for cash money. Also, there is no more need to hold cash balances for the purchases of previously rationed consumer goods. During transformation, excess reserves and thus excess liquidity in the banking system are furthermore likely to be high and difficult to predict (Balino et al., 1994). Banks will raise their voluntary excess reserves if no other liquid investment opportunities are available. In addition, involuntary excess reserves will be caused by inefficiencies in the payments system. If the payments system is organized by the central bank, excess reserves reflect the float that originates from settlement delays. Hence, while excess reserves can in the long run be expected to decline due to a more efficient organization of the payments system, temporary upswings may occur. Yet, if excess reserve holdings are high, changes in the required reserve ratio may leave the money multiplier and thus money supply unaffected because banks can simply convert excess into required reserves.

Graph 4 shows the development of the components of the money multiplier. For 1993, only aggregated data for the multiplier of ruble M2 have been available. Between the last quarter of 1992 and the third quarter of 1993, the ruble multiplier declined quite substantially. A given increase of base money thus transmitted into

smaller changes of M2. After some stabilization until the third quarter of 1994, the multiplier increased sharply towards the beginning of 1995, but this increase gradually levelled off thereafter. These basic trends are the same for the multiplier of broad money, which includes foreign currency deposits. Most of the variation in the broad money multiplier is caused by swings in the currency ratio. The reserve ratio has declined rather continuously from the end of 1993 to the first quarter of 1996, which by itself would imply an increase in the multiplier. There was an increase in the reserve ratio only in the third quarter of 1994, possibly as a result of the currency crisis in October. The currency ratio, instead, declined in 1994, and rose to its early-1994 level during 1995. One possible explanation of the increase in the currency ratio in 1995 is the fact that solvency problems of commercial banks were increasingly brought to the surface. Hence, households and firms may have reacted to the perceived risk of loosing their deposits by holding more currency. In addition, the decline in the inflation rate reduced the opportunity costs of cash holdings.

Central banks not only lack the means to influence the supply of broad money, they also have an *information problem* because they observe the behavior of the money stock with a time lag. Whereas the monetary base comprises liabilities of the central bank that are readily observable, the money stock consists of liabilities of the commercial banking system. In order to observe the actual money supply, the CBR thus depends on information that it receives from the commercial banks. During the transformation process, this kind of information is likely to be inaccurate and delayed. The accounting system and thus the definition of monetary aggregates in the socialist banking system differed markedly from the accounting standards in a market economy. Substantial structural breaks in the time series occur as a result of the introduction of new reporting standards. The experience from Russia is quite illustrative in this regard.²² Up to early 1995, two so-called „investment accounts“ existed. Both of these were included in the stock of money up to January 1995. After one of these accounts has been dropped from the calculation, reported broad money fell. As for ruble M2, short-term foreign currency deposits were occasionally reported by the commercial banks until the end of 1994. In addition to these conceptional problems, there are at least three different time series for M2 in circulation which are all claimed to be official, and which are reported by different departments of the CBR. These factors have caused substantial delays, inaccuracies and revisions of the monetary data and complicate the analysis of Russian monetary policy.

²² The following information has been obtained from Roland Nash who has been in charge of the monetary statistics at the Russian European Centre for Economic Policy.

2.4. Money and Credit

Increases in ruble M2 have not automatically been transmitted in increases of bank loans to enterprises and households (Graph 2), at least since early 1995. While the two time series have moved relatively in parallel in 1994, an increase in real M2 has been accompanied by a decline in real credit since the first quarter of 1995. A reduced propensity to lend to firms is also evidenced by the structure of the balance sheet of commercial banks (Table 2) as claims on firms declined from 59 to 51 percent of assets between 1993 and 1996. At the same time, the share of claims on the state sector in total claims on firms and households declined from 44 to 34 percent. This may imply that, despite a reduction of lending to firms, private sector firms have suffered less than state firms. Because of the impossibility to distinguish new private firms from firms in mixed ownership or firms with a dominant state shareholder, however, no definite conclusions can be drawn. The consolidated accounts of the monetary authorities and the commercial banks also reveal that claims on the central government have increased in importance since 1994 (Table 1). While in 1994 the increase in claims on private and state-owned firms could explain 48 percent of broad money growth, this share had come down to about 30 percent in the first half of 1996. Over the same period, claims on the government increased in importance from 35 to 77 percent.

3. The Structure of Money Demand

3.1 Money Demand and Velocity

In order to determine the effects of an increase in money supply on prices and output it needs to be assumed that the money market is in equilibrium.²³ The effects of changes in money supply can thus only be determined if information about the structure of money demand is given. The importance of the stability of money demand for monetary targeting can be shown with the quantity equation which relates (percentage) changes in prices (\hat{P}) to changes in the stock of money (\hat{M}), in the income velocity of money (\hat{V}), and in real income (\hat{Y})

$$(2) \quad \hat{P} = \hat{M} + \hat{V} - \hat{Y}$$

Price increases are proportional to a rise in the money stock and in the income velocity of money, reduced by the amount of increases in real income. Taking the expansion of real output as exogenous in the long-run, there is a stable relationship between the stock of money and prices only if the demand for money is itself a stable function. Money demand, in turn, depends on the opportunity costs of holding money, on income, and on real wealth.

During the transformation process, money demand is likely to undergo major changes which tend to complicate a policy of monetary targeting. Such transformation-related shifts in money demand mainly have two causes (Khan/Sundararajan, 1992). *First*, one-time structural shifts occur if administrative restrictions are abolished. Because decisions of banks and non-banks in the socialist banking system were highly regulated by direct controls on holding certain monetary assets and on interest rates, agents are likely to adjust their portfolios to the desired composition after these controls are lifted. *Second*, the money demand function itself may change during transformation. Most importantly, a hardening of the budget constraints of enterprises will lead to an increased interest elasticity of money demand of the corporate sector. Prior to their privatization and to the enforcement of a bankruptcy law, banks and enterprises react to price signals only to a limited degree. A policy which aims at limiting the amount of liquidity in the system by raising the interest rate for central bank credits may thus be ineffective. Furthermore, to the extent that real interest rates turn negative, households and enterprises will resort to inflation hedges,

²³ Some theories such as the buffer stock approach allow for a short-term deviation from the long-run equilibrium (Willms/Clausen, 1995).

and they will particularly increase their holdings of foreign currency (dollarization).²⁴ These considerations imply that monetary targets would need to be adjusted to structural shifts in money demand. Once a target has been set and money demand increases, sticking to the original target would lead to an overly restrictive monetary policy, and vice versa. This trial and error process, however, should be clear and transparent to the public in order to minimize the scope for a destabilization of the private sector. Generally, if the structural shifts of money demand have occurred and if the budget constraints of firms have been reasonably hardened, a rule-based monetary policy becomes more feasible.

The measurement of the income velocity of money is additionally complicated by a transformation-specific factor. Private sector activity is often not fully reflected in production statistics. If private sector production is contributing an increasing share to total output, actual GDP rises over measured GDP. As a consequence, measurement of velocity which only takes measured GDP into account will lead to an underestimation of the true income velocity of money. Mismeasurement of private sector activity is in fact a quite important factor in the Russian economy. Estimates put the share of the pure private sector in total GDP to 25 percent in 1994, the non-state sector contributed an even higher share of 62 percent to GDP.²⁵ To the extent that the private sector has gradually gained in importance – the pure private sector accounted only for 5.3 percent of output in 1989 –, and that this increase is insufficiently reported, velocity is thus increasingly underestimated.

Between mid-1992 and mid-1996, there has been no large overall change in the income velocity of the ruble money stock (Graph 5). Since the first quarter of 1994 – consistent earlier data for the broad money stock have not been available – ruble M2 and broad M2 have moved relatively in parallel. This indicates that the share of foreign currency holdings has remained relatively constant.²⁶ The share of cash holdings (M0) in M2 has increased from 24 to 37 percent between 1992 and 1996, thus causing a greater rise of M2 than of M0 velocity. There is thus no evidence for the prior presumption that the transformation process has led to a decline in cash holdings. Because velocity has been calculated on the basis of monthly data for both money and GDP, some seasonal pattern of money demand become evi-

²⁴ See Diehl (1996) on the experience with dollarization in transition economies.

²⁵ These data have been taken from EBRD (1995). The non-state sector comprises collective farms and companies with minority private ownership.

²⁶ Underlying this measure of dollarization is the difference between ruble M2 as reported in Russian Economic Trends and broad money reported by the IMF. Hence, only officially recorded foreign exchange holdings are taken into account.

dent. Velocity tends to increase – and thus money demand to fall – towards the end of the first and third quarter of each year.

3.2. Estimation of a Money Demand Function

3.2.1 Model Specification²⁷

The empirical estimation of a money demand function for the transformation period in Russia is, most importantly, complicated by the lack of long-run time series. Only short-run series, covering essentially four years of the post-reform period, have been available. This has at least three implications. *First*, finding a stable relationship in the data is a necessary but not a sufficient condition for long-run stability of money demand. Because the short-run demand for money is relatively unstable even in developed market economies (Willms/Clausen, 1995), it may not even be feasible to find a stable structure in the data. At the same time, the reaction of money demand and thus the transmission of monetary impulses into prices may be relatively fast in Russia because the financial system is not very sophisticated. The time period for the transmission of monetary impulses into prices has been estimated to be about 4 months (Koen/Marrese, 1995). This is considerably shorter than in developed market economies. *Second*, consistent time series have only been available for a relatively small number of variables. The choice of explanatory variables has thus mainly been guided by data availability, and different model specifications could hardly be tested. *Third*, all tests are performed on a relatively small sample of 52 monthly observations (6:1992 – 9:1996) and thus have a considerable margin of error. Support for a certain hypothesis may thus only be found because of the small sample size. The results therefore have to be interpreted with extreme caution, and future research will have to confirm the main findings.

Generally, money demand depends on real income, wealth, and on the opportunity costs of holding money. Whether there is a stable long-run relationship between these variables can be tested with an error-correction-model (ECM)

$$(3) \quad \Delta M2R_t = (\bar{\alpha}_0 - 1)[M2R_{t-1} - \beta X_{t-1}] - \sum_{i=1}^{n-1} \bar{\alpha}_i \Delta M2R_{t-i} + \beta_0 \Delta X_t - \sum_{i=1}^{m-1} \bar{\beta}_i \Delta X_{t-i} + \varepsilon_t$$

where $M2R$ = demand for real ruble M2, and X = the set of explanatory variables. All variables are expressed in logarithms and have been seasonally adjusted by a sim-

²⁷ All estimates have been made with the statistical software package EViews 2.0. For details see EViews (1994/95).

ple multiplicative technique which averages the ratios of a series relative to a centered moving average for a given season. The error correction model in (3) can be derived from a general rational lag distribution and does therefore not restrict the dynamic structure of the model (Hansen, 1993: 133n). The specification implies that changes in money demand depend (i) on deviations from long-run-equilibrium, i.e., on the error-correction term in brackets, and (ii) on short-run effects of changes in the exogenous and in the lagged endogenous variables. If the coefficient $(\bar{\alpha}_0 - 1)$ is significantly less than zero, money demand declines (increases) if it has been above (below) its equilibrium level in the previous period. There would thus be a stationary long-run relationship between the variables, i.e., the variables would be cointegrated.

The variables have been specified as follows:

- *Real money demand* is given by the nominal stock of ruble M2, deflated with consumer prices.
- *Real income* has been proxied by real monthly GDP, the index of retail sales, or the disposable income of households. However, as will be explained below, none of these variables was found to have a significant impact on money demand. Since a variable measuring *real wealth* has not been available, it has been assumed that (changes of) real income is a reasonably good proxy.
- The opportunity costs of holding money have been captured through the return on domestic and foreign financial assets. The domestic interest rate level has been proxied by the refinancing rate of the CBR because of the lack of sufficiently long time series for other interest rates. The return on foreign financial assets is given by the foreign interest rate times the expected rate of depreciation of the domestic currency. Under the assumption of perfect financial markets, the return on domestic and foreign assets must be identical (uncovered interest parity)

$$(4) \quad (1+i) = (1+i^*) \frac{e^e}{e}$$

where i (i^*) = domestic (foreign) interest rate, e (e^e) = current (expected) exchange rate. If the expected return on foreign money increases, domestic money is replaced by foreign currency (currency substitution).²⁸ One key problem in finding a variable representing the RHS of equation (4) is the lack of a forward market for foreign exchange. Hence, a reliable estimate of exchange rate expectations is not

²⁸ Filosa (1995: 25) analyzes money demand functions for a sample of Western European countries and finds no evidence to reject the hypothesis that currency substitution has an impact on money demand. One main reason why currency substitution has become an issue in Western Europe is that regulations on capital account transactions have been lifted. In Russia, in contrast, currency substitution has occurred on a large scale despite the maintenance of formal restrictions on convertibility as a response to high domestic inflation, negative real domestic interest rates, and political instability.

available. As will be explained below, the only variable with a significant impact on money demand has been the current exchange rate.

Economic theory predicts that the demand for ruble M2 should react positively to an increase in real income because an increase in income raises the transaction demand for money, and negatively to increases in the domestic interest rate because of the higher opportunity cost of holding money. The reaction to an increase of the exchange rate (depreciation) is somewhat undetermined. On the one hand, a higher exchange rate lowers the opportunity costs of obtaining domestic currency, which should raise demand for domestic money. On the other hand, an increase in the exchange rate may be taken as an indicator of a future devaluation and would thus lower demand for ruble M2. Under the extreme assumption of static expectations, the current exchange rate would be the only variable on which expectations are based.

3.2.2 Augmented Dickey-Fuller-Test (ADF-Test) for Integration

In order to apply a test on cointegration, the variables must be integrated of the same order. Hence, before estimating the money demand function (3), an (augmented) Dickey-Fuller-Test is performed which tests for the stationarity of the variables specified above. This is done by running a regression for the first difference of each seasonally adjusted variable X, including all exogenous and endogenous variables, on its lagged level and on its first differences

$$(5) \quad \Delta X_t = a_0 X_{t-1} - \sum_{i=0}^{n-1} a_i \Delta X_{t-i} + \varepsilon_t$$

The hypothesis $H_0: a_0 = 0$ that the variable X is non-stationary is tested against the hypothesis $H_1: a_0 < 0$, i.e., X is stationary. The lag-length has been extended such that the residuals ε_t in (5) are white noise. A trend and/or a constant term have been included in the equations on the basis of the visual inspection of the time series (Graph 6). The critical values for the t-ratios of a_0 depend on the value of the constant term in the equation (Hansen, 1993: 145n). If $|t| > |t^*|$, X is at least I(1), i.e., it has to be differenced once to become stationary. Similarly, running the ADF-test for the differenced variables implies a test of $H_0: X$ is I(2).

Table 5 shows that the hypothesis that the refinancing rate, real money demand, and the exchange rate are I(1) is not rejected at a 5-percent level of confi-

dence while the first differences are stationary.²⁹ This result is consistent with the findings of Korhonen (1996) who shows that the Russian consumer price index, M2, and the refinancing rate of the CBR are I(1). The only variable for which the hypothesis of non-stationarity can be rejected is real GDP. The same result was obtained if the index of retail sales has been used as a proxy of real income. Because economic theory suggests that real income should have a significant impact on money demand, GDP may still be included if it would add to the explanatory power of the model and to the stability of the long-run relationship between the variables. However, since both real GDP and retail sales had the wrong coefficient and were insignificant, they have been dropped from the equation. One explanation for the low significance level of the income variable is that reported GDP captures only a fraction of the actual transactions taking place. The result thus supports the hypothesis that money demand mainly depends on nominal rather than real variables, as under conditions of hyperinflation (Taylor, 1991). This seems to hold even though Russia has experienced an inflation rate exceeding the hyperinflation benchmark (50 percent per month) only once, in January 1992.

3.2.3 Estimation of the EC-Model

The next step is to estimate whether there is a stable cointegration relationship among the variables in (3). The appropriate lag length for the first differences of real money demand, the exchange rate, and the refinancing rate has been specified by choosing the largest absolute value of the Schwarz and the Akaike information criterion. A maximum lag length of four months has been allowed for. The following equation has been estimated³⁰

$$\begin{aligned}
 \Delta M2R = & 2.07 & - 0.70 M2R_{-1} & - 0.001 REF_{-1} & - 0.09 E_{-1} & + 0.61 \Delta M2R_{-1} \\
 & (7.38) & (-7.52) & (-4.34) & (-5.86) & (5.98) \\
 & + 0.29 \Delta M2R_{-2} & + 0.32 \Delta M2R_{-4} & + 0.001 \Delta REF_{-4} & + 0.13 \Delta E_{-3} & - 0.14 DUMMY \\
 & (2.69) & (2.80) & (2.07) & (2.02) & (-3.87) \\
 (3') & R^2 = 0.66 & F-statistic = 11.97 & & & Akaike info criterion = - 6.23 \\
 & & & & & Schwarz criterion = - 5.88
 \end{aligned}$$

t-ratios in brackets; sample (adjusted) 1992:6 – 1996:9; 52 observations

²⁹ If a 10% level of confidence is used as a benchmark, the hypothesis that the exchange rate is I(0) cannot be rejected. Because of the significant impact of the exchange rate on money demand, however, it was included in the equation (Krämer, 1996: 112n).

³⁰ All variables have been taken from various issues of the Monthly Update of Russian Economic Trends.

M2R (real money demand) = log of (ruble) M2, deflated by consumer prices

REF (domestic interest rate) = (nominal) refinancing rate of the CBR

E (nominal exchange rate) = log of the current exchange rate of the ruble vis-à-vis the US-Dollar

DUMMY = dummy variable for the period after August 1993 (= 1) (= 0 before August 1993)

The interpretation of the results reported in equation (3') is only valid if the assumptions of the linear regression model are not violated (Hansen, 1993). Most importantly, the residuals ε_t in (3) should not contain any systematic information but should rather be white noise. This implies that the expected value of the residuals should be zero, i.e., that the regression parameters³¹ and the variance of the residuals should be constant (homoscedasticity), and that the residuals should not be autocorrelated. Furthermore, the explanatory variables in X_t should be weakly exogenous, and the residuals should be normally distributed.

The Breusch-Godfrey LM-Test tests the H_0 -hypothesis of no autocorrelation in the residuals. In the χ^2 -version of the test (Maddala, 1992: 251), the hypothesis cannot be rejected if the respective χ^2 -value is sufficiently small. The critical χ^2 -value at a 5-percent significance level is 9.49. With a value for a test of 4th-order autocorrelation of 3.23, the hypothesis of no autocorrelation in the residuals can thus not be rejected. The same result is obtained for a test on first order autocorrelation. Without including a dummy variable, the hypothesis that the residuals are heteroscedastic could not be rejected on the basis of the White-test ($F = 3.93 > F^*$). Visual inspection of the residual plot without the dummy variable indicated that the residual variance was greater in the period until August 1993 than afterwards.³² Including the dummy variable reduced the White test statistic to 1.76. The hypothesis that the residuals are homoscedastic can thus not be rejected. Also, by including the variable, the quality of the estimated equation in terms of its explanatory power and of the stability of the long-run relationship could be improved without changing the qualitative nature of the results.³³

In order to check whether the explanatory variables of the model are weakly exogenous, they have been regressed on the error-correction-term, i.e., on the lagged residuals of a regression of M2R on the levels of the explanatory variables (Engle-Granger-equation) (Hansen, 1993: 103n). If the lagged residual turns out to be insignificant in the EC-Model of the exchange rate and the interest rate, the vari-

³¹ See also Section 3.2.4.

³² Also, the CUSUM-of-Squares test indicated parameter instability of the series at about this time.

³³ One possible explanation of the negative impact of the dummy variable on money demand may be that it captures an interest rate effect. According to this interpretation, the gradual move to positive real interest rates since late 1993 increased the opportunity costs of holding money and thus reduced money demand.

ables can be considered weakly exogenous. In fact, none of the coefficients of the lagged residual has been statistically significant.

The Jarque-Bera-Test tests the H_0 -hypothesis that the residuals ε_t in (3) are normally distributed (Graph 8). H_0 is not rejected if the test statistic is sufficiently small. The respective value of the test statistic is 1.64 and H_0 is accepted at the 5-percent significant level.

Comparing the t-value of the lagged endogenous variable (-7.52) to the critical value of the Kremers-Test for an equation with 3 exogenous variables shows that there is statistical evidence for a stable money demand function. The null-hypothesis of no cointegration ($\bar{a}_0 - 1 = 0$) is clearly rejected at the 1-percent significance level ($t^* = -4.59$) (Banerjee et al., 1992). The sign of the coefficient of the domestic interest rate is in line with theoretical presumptions: ruble money demand reacts negatively to a change in domestic interest rates. Money demand also declines if the nominal exchange rate increases. This can be interpreted as evidence that the current exchange rate is taken as an indicator of a future depreciation. A number of alternative specifications of the return on assets denominated in foreign currency has been tested:

- Using the exchange rate of the next period implies that households have perfect foresight of the future exchange rate.³⁴ Again, a significant negative effect on money demand was found while the remaining results changed very little. However, under this specification, the hypothesis that the residuals are autocorrelated could not be rejected.
- The interest rate on 7-day US-Dollar deposits (London offer) was used to calculate the return on foreign assets. However, no significant impact on ruble money demand was found. One explanation of this result is that currency substitution in Russia mainly takes the form of cash-Dollar holdings of households and firms. Hence, the relevant rate of return on these assets is the (expected) rate of change of the exchange rate, rather than the interest rate on off-shore Dollar deposits.
- Neither the current nor the future change in the exchange rate had a significantly impact on money demand.

³⁴ The assumption of rational expectations implies that economic agents forecast the future exchange rate on the basis of the available information. For the implications of this assumption on econometric modelling see Hansen (1993: 255n).

The long-run coefficients of the exogenous variables can be obtained by setting the short-run changes in the variables equal to zero ($M2R = M2R_{-i}$, $REF = REF_{-i}$, and $E = E_{-i}$) and solving for $M2R$:

$$(3'') \quad M2R = 2.97 - 0.002 \text{REF} - 0.13 \text{E} - 0.20 \text{DUMMY}$$

where $i = 1, \dots, T$. A 1 percent increase in the exchange rate, i.e., a depreciation of the ruble by 1 percent, induces a 0.13 percent increase in the demand for ruble $M2$. The (semi-)interest rate elasticity, in contrast, is very small: an increase in the refinancing rate by 1 percentage point leads to a 0.002 percent decline in money demand. There are two possible explanations for the extremely low interest rate elasticity of money demand. *First*, a low interest rate elasticity can be expected if the budget constraints of enterprises are soft. Enterprises would thus not react to price signals. Conversely, a hardening of budget constraints through, for example, a more rigorous enforcement of the bankruptcy law can be expected to lead to an increase in the interest rate elasticity. *Second*, the official refinancing rate of the CBR that has been used for the estimation is only a very inaccurate indicator of the true interest rate level which is relevant for the portfolio decision of non-banks. Central bank credit is increasingly allocated via credit auctions, and commercial banks' interest rates are less than perfectly correlated with the refinancing rate. Yet, a similarly low value for the interest rate elasticity was obtained when the interbank interest rate was used instead.

3.2.4 Tests on a Structural Break in Money Demand

Finally, it has been analyzed whether evidence for a structural break in the data could be found. General tests for parameter stability are the CUSUM and the CUSUM-of-squares tests. These tests are based on the calculation of recursive residuals and start by estimating the parameters of the model by successively adding observations. The difference between the forecasted values and the actual values of $M2R$ give a time series for the recursive residuals. The test statistics then compare the forecasted error with the standard deviation of the estimated equation when all T observations have been used. If the values for the CUSUM and the CUSUM-of-Squares test statistics remain within a certain interval of confidence, the H_0 hypothesis of parameter constancy cannot be rejected. Graph 7 shows that this is indeed the case. The hypothesis that the estimated parameters have been constant throughout the sample period cannot be rejected at a 5-percent significance level. Similarly, CUSUM-tests for the alternative parameter specifications described in Section 3.2.3 lead to reject the hypothesis of a structural break in the data.

Tests for parameter stability can also be performed by comparing the residual variance of a regression on a sub-sample of the observations with the residual variance of a regression on the entire sample (Chow-Test). In order to perform such a test, an economically sensible breakpoint in the data must be selected. Because the CBR and the government have agreed upon a monetary and fiscal stabilization program at the beginning of 1995 (RETA, Vol. 5, No. 1), one may expect that this agreement has induced a structural break in money demand. Expecting a qualitative shift in the money supply process and a larger preference of the monetary authorities for stability, households and firms may have adjusted their behavior. An n-step probability forecast-test on the basis of recursive residuals, however, does not indicate a structural break in early 1995 (Graph 7). Also, Chow breakpoint and forecast tests for a structural break in January 1995 lead to reject this hypothesis.³⁵ A dummy variable for a structural break in January 1995 has turned out statistically insignificant as well. The fact that a dummy variable for the time after August 1993 was significant in explaining money demand may imply that a structural break has taken place at this time. However, on the basis of Chow tests, there is no evidence on a structural break in the parameters in 1993.

³⁵ The critical value for accepting H_0 (no structural break) at a 5-percent significance level is 2.8, as opposed to the value of the F-statistic of 0.75 and 0.68, respectively.

4. Conditions for Sustained Stabilization

In early 1995, the Russian government and the Central Bank have agreed upon a program of monetary and fiscal stabilization. A number of factors do indeed indicate that stabilization has since then become a more important target of Russian economic policy. A positive and actually extremely high real interest rate on Central Bank refinancing credit has been maintained throughout autumn 1996, an explicit exchange rate target has been announced and adhered to since mid-1995, auctions of Central Bank credit have gained in importance, and subsidized lending has been cut down substantially. This implies that a quite significant structural break in the process of base money supply has taken place.

However, the analysis has also shown that the CBR has experienced problems with the control of base money. Indirect budget financing still occurs, and the fixed exchange rate regime that has been adopted causes a lack of control over the monetary base. The control of the monetary authorities over broader monetary aggregates is furthermore hampered by movements of the money multiplier, which are influenced by the behavior of commercial banks and non-banks. Notwithstanding the difficulties with controlling money supply, the CBR has been relatively successful in containing money growth. Because adjustments of the currency ratio and of the reserve ratio can be interpreted as indicators of crises in the banking system, stabilizing the financial sector can substantially contribute to a more stable money supply process. Measures to restructure and to consolidate the banking sector thus need to be pursued. These should also aim at a solution to the problem of non-performing loans on the balance sheet of banks. Facing higher lending risks, banks have restructured their portfolios away from loans to enterprises towards state bonds. To a substantial degree, the tighter monetary policy has thus been accompanied by a shift from corporate loans to loans to the government.

Despite the adjustments in the process of (base) money supply, money demand has remained remarkably stable since the beginning of reforms. While reliable estimates of money demand will have to be based on longer time series, some tentative conclusions can be drawn. Although the income velocity of money has changed during the transformation process, adjustments of money demand could to a large extent be explained by changes in the opportunity costs of holding money, in particular in the exchange rate. This, however, does not imply that a sound framework for monetary targeting is given. Short-run fluctuations of money demand are substantial, and further portfolio adjustments are likely to take place as inflationary expectations decline and as the capital account becomes more open. No evidence

for a significant structural break in the demand for real ruble M2 could be detected. Some weak evidence could be found that a shift in money demand has occurred in late 1993 which may be explained by the gradual move to positive real interest rates that started at that time.

Sustained monetary stabilization crucially depends on the effectiveness with which the CBR can defend its independence. Financial problems of the budgetary sector – notably the erosion of real tax revenue and the increasing interest burden of government debt – as well as insolvencies in the corporate and financial sector of the Russian economy put substantial pressure on the CBR to ease its monetary stance. In this situation, the Central Bank has fairly little room to maneuver. If, on the one hand, it keeps monetary conditions relatively tight and thus real interest rates high, investment credits will continue to be scarce. If, on the other hand, monetary conditions are loosened too quickly, it may sacrifice its credibility not to bail out the government, insolvent firms, and distressed banks. It is thus crucial for the CBR to adhere to a transparent monetary policy, and to disseminate clear information about monetary indicators on a regular basis. While some trial-and-error process is inevitable during transformation, transparency can help to minimize the destabilizing impact that monetary policy can have for the private sector.

The high level of real interest rates in the Russian economy does not only cause a substantial misallocation of resources, it is also the reflection of a deep mistrust in reforms and of persistent inflationary expectations (DIW/IfW/IWH, 1996c). Unilateral actions such as a lowering of CBR refinance rates are thus unlikely to bring much relieve. Even worse, they may undermine central bank credibility, trigger capital exports, and raise inflation. A superior strategy would thus be to open markets for foreign capital, and to allow foreigners to participate freely in the government bond market. Such a liberalization of markets, while currently being opposed by the incumbent banks which benefit from the high domestic interest rate spreads, would increase the trust in sustained reforms. Sustained stabilization, however, cannot be enforced by monetary policy alone. Rather, substantial structural adjustments in the Russian economy – notably a solution to the governments financial problems and to the arrears of enterprises – must be sought.

References:

- ABEL, Istvan, and Pierre L. SIKLOS (1994), Constraints on Enterprise Liquidity and Its Impact on the Monetary Sector in Formerly Centrally Planned Economies, *Comparative Economic Studies*, Vol. 36, No. 1, 13-32.
- BOFINGER, Peter (1992), The Experience with Monetary Policy in an Environment with Strong Microeconomic Distortions, in: Centre for Economic Policy Research (CEPR) (ed.), *The Economic Consequences of the East*.
- (1994), A Classical Explanation of the Output Decline in Central and Eastern Europe, in: SIEBERT, Horst (ed.), *Overcoming the Transformation Crisis – Lessons from Eastern Europe for the Successor States of the Soviet Union*, Tübingen, 223-247.
- BANERJEE, A., J.J. DOLADO, and R. MESTRE (1992), On Some Simple Tests for Cointegration: The Cost of Simplicity, *Discussion Paper of the Institute of Economics at Aarhus University*, Aarhus.
- BUCH, Claudia M. (1993), Das Bankwesen in den Nachfolgestaaten der Sowjetunion, Kiel Institute of World Economics, *Die Weltwirtschaft*, No.1, Kiel.
- et al. (1995), Währungsreformen im Vergleich: monetäre Strategien in Rußland, Weißenrußland, Estland und der Ukraine, Kiel Institute of World Economics, Kiel Study, No. 270, Tübingen.
- (1996), Creating Efficient Banking System: Theory and Evidence, Kiel Institute of World Economics, Kiel Study, No. 277, Tübingen.
- , and Mechthild SCHROOTEN (1996), Banken in Rußland – Von der Stabilisierung in die Krise?, forthcoming.
- CALVO, Guillermo A., and Fabrizio CORICELLI (1992), Stagflationary Effects of Stabilization Programs in Reforming Socialist Countries: Enterprise-Side and Household-Side Factors, *The World Bank Economic Review*, Vol. 6, No. 1, 71-90.
- CENTRAL BANK OF RUSSIA (CBRa), *Bulletin of Banking Statistics*, various issues, Moscow.
- (CBRb), Annual Report, various issues, Moscow.
- DEUTSCHES INSTITUT FÜR WIRTSCHAFTSFORSCHUNG, INSTITUT FÜR WIRTSCHAFTSFORSCHUNG, INSTITUT FÜR WELTWIRTSCHAFT (DIW/IWH/IFW) (1993a), Die wirtschaftliche Lage Rußlands – Systemtransformation auf dem Rückzug?, 2. Report, Kiel Discussion Paper, No. 208/209, Kiel.
- (1993b), Die wirtschaftliche Lage Rußlands – Monetäre Orientierungslosigkeit und realwirtschaftlicher Aktionismus, 3. Report, Kiel Discussion Paper, No. 220/221, Kiel.
- (1994a), Die wirtschaftliche Lage Rußlands – Beschleunigte Talfahrt durch verschleppte Reformen, 4. Report, Kiel Discussion Paper, Nr. 232, Kiel.
- (1994b), Die wirtschaftliche Lage Rußlands – Fortsetzung des Niedergangs ohne hinreichenden Strukturwandel, 5. Report, Kiel Discussion Paper, No. 240/241, Kiel.
- (1995a), Die wirtschaftliche Lage Rußlands – Auslandskredite wenig wirksam, 6. Report, Kiel Discussion Paper, No. 253, Kiel.

- (1995b), Die wirtschaftliche Lage Rußlands – Kurswechsel in der Stabilisierungspolitik, 7. Report (Part 1), Kiel Discussion Paper, No. 262, Kiel.
- (1996a), Die wirtschaftliche Lage Rußlands – Noch nicht mehr als ein Exporteur von Rohstoffen, 7. Report (Part 2), Kiel Discussion Paper, No. 265, Kiel.
- (1996b), Die wirtschaftliche Lage Rußlands – Investitionsschwäche verhindert Wachstum, 8. Report, Kiel Discussion Paper, No. 273, Kiel.
- (1996c), Die wirtschaftliche Lage Rußlands – Die Wirtschaftspolitik muß Investitionsanreize schaffen, 9. Report (Part 1), Kiel Institute of World Economics, Discussion Paper, No. 285, Kiel.

DIEHL, Markus (1995), Dollarisierung im Transformationsprozeß: ein Problem für die Wirtschaftspolitik?, *Die Weltwirtschaft*, No. 4, 471-486.

ECONOMIC INTELLIGENCE UNIT (EIU) (1996), Country Report Russia – 3rd Quarter, London.

EUROPEAN BANK FOR RECONSTRUCTION AND DEVELOPMENT (EBRD) (1995), Transition Report 1995, London.

EVIEWS, 1994/1995, User's Guide, Quantitative Micro Software (ed.), Irvine.

FILOSA, Renato (1995), Money Demand Stability and Currency Substitution in Six European Countries (1980-1992), Bank for International Settlements, Monetary and Economic Department, BIS Working paper, No. 30, Basle.

GOSKOMSTAT, Rossii (1996), Social'no – ekonomiceskoe polozenie Rossii janvar – August 1996, Moscow.

HANSEN, Gerd (1993), Quantitative Wirtschaftsforschung, München.

HARDY, Daniel C., and Ashok K. LAHIRI (1996), Cash Shortage in the Former Soviet Union, *Journal of Comparative Economics*, Vol. 22, No. 2, 119-140.

INTERNATIONAL MONETARY FUND (IMF) (1994), Russia – Recent Economic Developments, internal document, Washington D.C.

IZE, Alain (1996), Capital Inflows in the Baltic Countries, Russia, and Other Countries of the Former Soviet Union: Monetary and Prudential Issues, IMF Working Paper, No. 96/22, Washington D.C.

KHAN, Mohsin S., and V. SUNDARARAJAN (1992), Financial Sector Reforms and Monetary Policy, in: Jafarey, V. A. (ed.), *Structural Adjustment and Macroeconomic Policy Issues*, International Monetary Fund, Washington D.C., 58-79.

KHAN, Mohsin S., and V. SUNDARARAJAN (1992), Financial Sector Reforms and Monetary Policy, in: Jafarey, V. A. (ed.), *Structural Adjustment and Macroeconomic Policy Issues*, International Monetary Fund, Washington D.C., 58-79.

KIM, Se-Jik, and Goohan KWON (1995) A General Equilibrium Approach to Inter-enterprise Arrears in Transition Economies with Application to Russia, International Monetary Fund, IMF, Working Paper, No. 95/145, Washington D.C.

KLEIN, Martin, and Manfred NEUMANN (1990), Seigniorage: What is it and who gets it?, *Weltwirtschaftliches Archiv*, Vol. 126, No. 2, 205-221

KOMMERSANT (1996), Denejnaj Woronka, No. 22, 18.6.1996, 17-18.

KORHONEN, Jikka (1996), An Error Correction Model for Russian Inflation, *Review of Economics in Transition*, Bank of Finland, No. 4/1996 (10.7.1996), 53-61.

- KOEN, Vincent, and Michael MARRESE (1995), Stabilization and Structural Change in Russia, 1992-94, International Monetary Fund, Occasional Paper, No. 127, 53-67.
- KRÄMER, Jörg W. (1996) Zinsgewichtete versus herkömmliche Geldmengenaggregate – Theorie und empirische Evidenz für die Bundesrepublik Deutschland, Kiel Institute of World Economics, Kiel Studies, No. 274, Tübingen.
- LINDGREN, Carl-Johann (1991), The Transition from Direct to Indirect Instruments of Monetary Policy, in: Dowes, Patrick, and Reza Vaez-Zadeh (eds.), The Evolving Role of Central Banks, Central Banking Department, International Monetary Fund, Washington D.C., 307-325.
- MADDALA, G.S. (1992), Introduction to Econometrics, 2nd edition, New York.
- OPEN MEDIA RESEARCH INSTITUTE (OMRI), OMRI Economic Digest, Prague, various issues.
- RUSSIAN EUROPEAN CENTRE FOR ECONOMIC POLICY-(RETa), Russian Economic Trends, Quarterly, Various issues, Moscow.
- (RETb), Russian Economic Trends – Monthly Update, Various issues, Moscow.
- SAAL, J. Matthew, and Lorena M. ZAMALLOA (1995), Use of Central Bank Credit Auctions in Economies in Transition, IMF Staff Paper, Vol. 42, No. 1, 202-224.
- SCHMIEDING, Holger (1993), From Plan to Market – On the Nature of the Transformation Crisis, Weltwirtschaftliches Archiv, Vol. 129, No. 2, 216-253.
- SEEBERG, Stefanie, and Adalbert WINKLER (1996), Lending in a New Regulatory Environment – The Monetary Situation in Russia in the Summer of 1996, International Project Consult GmbH, Frankfurt, July, mimeo.
- SOKOLOV, Iurii A., et al. (1996), Commercial Banking in Russia, Russian and East European Finance and Trade, Vol. 32, No. 2, 5-91.
- TAYLOR, Mark P. (1991), The Hyperinflation Model of Money Demand Revisited, Journal of Money, Credit, and Banking, Vol. 23, No. 3m 327-351.
- WILLMS, Manfred (1993), The Money Supply Approach: Empirical Evidence for Germany, in: Gebauer, Wolfgang (ed.), Foundations of European Central Bank Policy, Heidelberg, 11-34.
- , and Volker CLAUSEN, (1995), Der Bufferstock-Ansatz der Geldnachfrage, in: Duwendag, Dieter (ed.), Schriften des Vereins für Socialpolitik, Vol. 235, Berlin, 11-44.
- WINKLER, Adalbert (1996), Banking After the Liquidity Crisis — The Monetary Situation in Russia at the Beginning of 1996, Interdisziplinäre Projekt Consult GmbH, Frankfurt a.M.
- THE WORLD BANK (1993), Russia – The Banking System in the Transition, internal document, Washington D.C.

Tables

Table 1 — Sources and Uses of Broad Money Growth, 1994-1996.

	1994	1995	1996 ^a
<i>(in percent of broad money growth)</i>			
<i>Assets</i>			
Net foreign assets	17.1	6.0	-8.1
Domestic credit	82.9	94.0	108.1
Credit to the government (net)	34.8	52.8	77.2
Credit to state enterprises	18.2	7.8	11.2
Credit to private sector	29.9	33.1	17.3
<i>Liabilities</i>			
Money	24.8	45.7	29.1
Quasi-money	24.5	36.0	26.7
Money market instruments	1.8	4.6	6.4
Capital accounts	18.2	22.4	46.8
Other items (net)	30.7	-8.8	-9.0
Change of balance sheet total = 100 percent. — a) January-July.			

Source: International Monetary Fund (IFS).

Table 2 — Balance Sheet Structure of Commercial Banks, 1993-96.

	1993	1994	1995	1996 ^a
<i>(in percent of total assets)</i>				
<i>Assets</i>				
Reserves	13.1	11.7	12.7	12.1
Foreign assets	26.2	23.8	13.2	13.2
Domestic credit	60.7	64.5	74.1	74.7
Credit to the government (net)	1.3	5.2	17.9	23.2
Credit to state enterprises	25.9	23.4	17.8	16.7
Credit to private sector	33.5	35.9	37.1	34.1
<i>Liabilities and Equity</i>				
Deposits	52.6	48.9	58.7	54.8
Demand deposits	20.8	15.8	19.8	17.4
Time and savings deposits	8.3	11.6	19.8	20.3
Foreign exchange deposits	20.0	18.1	16.3	14.4
Government deposits	3.5	3.4	2.8	2.7
Money market instruments	0.4	1.7	3.4	4.2
Foreign liabilities	7.8	7.0	8.6	9.6
Central bank refinancing	14.0	8.3	4.5	4.8
Capital accounts	19.9	12.7	16.2	19.6
Other items (net)	5.3	21.4	8.6	7.0
End of Period. — a) July.				

Source: International Monetary Fund (IFS).

Table 3 — Sources and Uses of Base Money Growth, 1994-96.

	1994			1995				1996		
	total	I	II	II	IV	total	I	II	total	
Net foreign assets	17.9	123.2	47.2	-4.8	42.9	44.1	65.1	-80.6	-24.7	
Net domestic assets	118.1	-70.5	56.5	190.9	25.4	57.4	-23.3	157.1	88.0	
Other items (net)	-36.0	47.3	-3.6	-86.1	31.7	-1.5	58.2	23.5	36.8	

Sources: Various issues of IFS.

Table 4 — Structure of the Balance Sheet of the Monetary Authorities, 1993-96

	1993	1994	1995	1996 ^a
<i>(in percent of total assets)</i>				
Foreign assets	45.7	28.9	38.8	34.4
Domestic credit	54.3	71.1	61.2	65.6
Credit to the government (net)	35.3	59.5	54.0	58.6
Credit to banks	18.7	11.4	7.2	6.7
Credit to enterprises	0.3	0.2	0.1	0.3
Reserve money	48.8	44.1	50.4	52.8
Currency outside banks	22.6	24.3	31.4	...
Foreign liabilities	8.9	11.6	17.9	21.8
Deposits of the government	14.7	12.0	9.7	5.6
Capital accounts	9.7	16.3	12.9	19.0
Other items (net)	17.8	15.9	9.2	0.8
End of Period. — a) August.				

Source: International Monetary Fund (IFS).

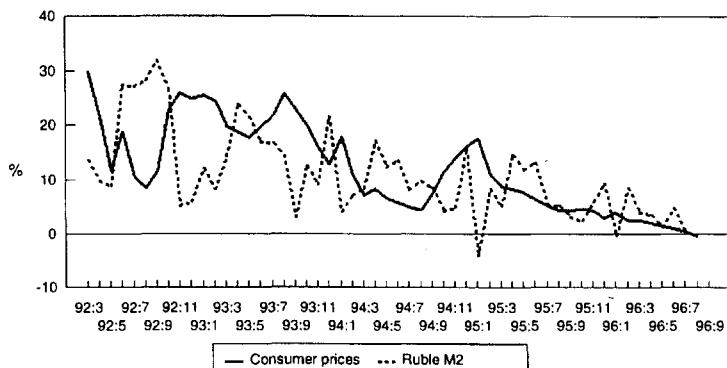
Table 5 — Results of the ADF-Test for a Unit Root.

X-Variable	Specification ^a	t(a _o)	max. lag ^b	LM (1) ^c	LM(4) ^c
M2R	T, C	-2.45	1	0.05	1.16
GNPR	T, C	-6.33*	3	0.29	1.64
REF	0, 0	-0.40	1	0.22	1.28
E	T, C	-3.22	4	0.13	0.38
Δ M2R	0, 0	-4.75*	3	0.57	7.64
Δ GNPR	0, 0	-6.48*	6	0.20	4.36
Δ REF	0, 0	-4.68*	1	1.29	3.16
Δ E	T, C	-6.32*	4	0.14	2.52

All variables are expressed in logarithms and have been seasonally adjusted. * = significant at the 5-percent-level. For the critical values see Hansen (1993: 145n). — a) Indicates whether a linear trend (T) and/or a constant term (C) has been included. — b) Maximum lag length of the dependent variable. — c) χ^2 -value of an LM test on 1st (4th) order autocorrelation. Critical values at the 5-percent level of confidence = 3.84 (9.49) (Maddala, 1992: 614n).

Graphs

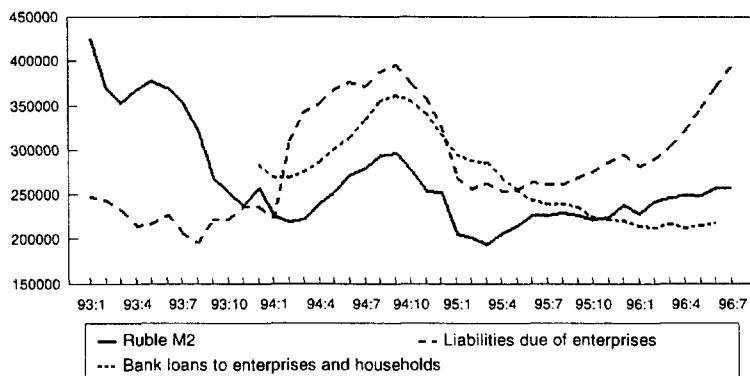
Graph 1 — Monthly Changes in Money and Prices, 1992-96.



Percentage change over the end of the previous period.

Sources: RET a and b.

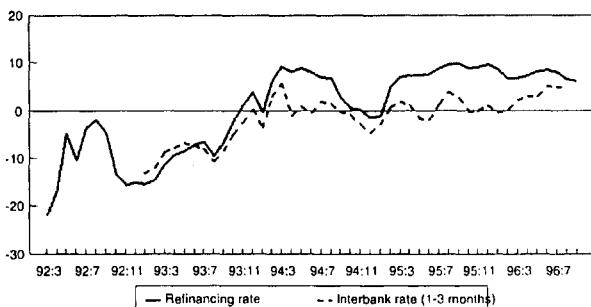
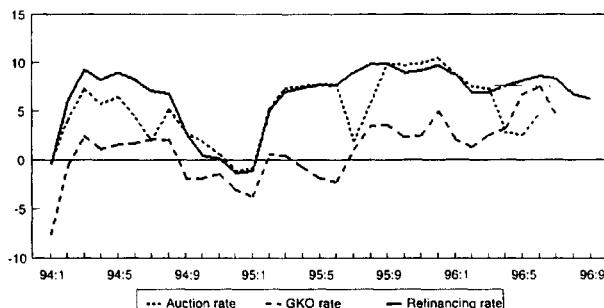
Graph 2 — Real Money and Credit (Bil. ruble), 1994-96.



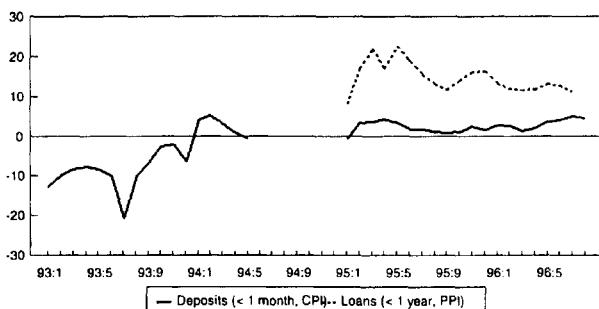
Deflated by producer prices, April 1994=100.

Sources: RETa, Goskomstat.

Graph 3 — Real Monthly Interest Rates, 1992-96.



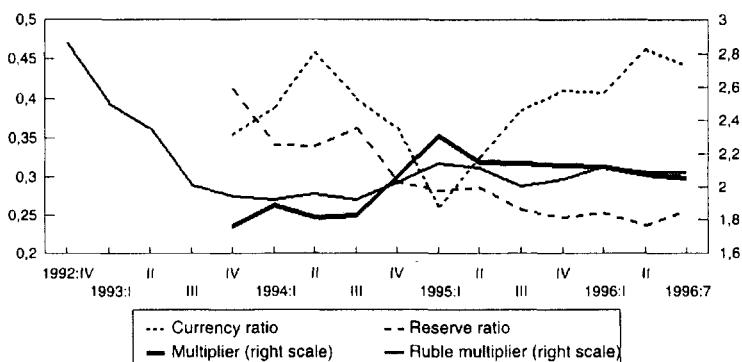
Deflated by consumer prices.



CPI = Consumer Price Index; PPI = Producer Price Index

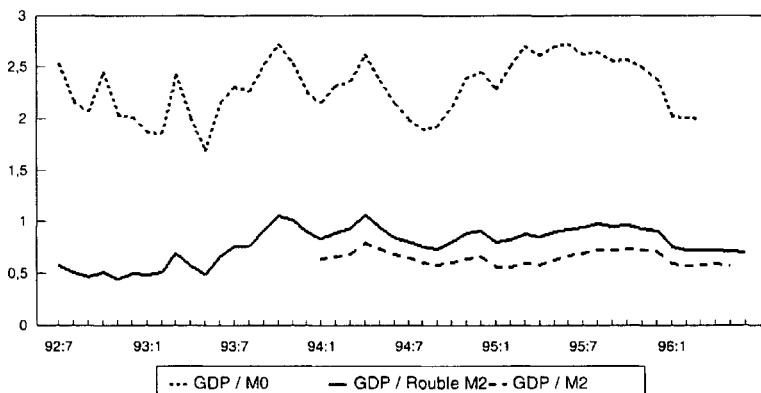
Source: RET; author's calculations.

Graph 4 — Money Multiplier, 1992-96.



Sources: IMF, RETa; author's calculations.

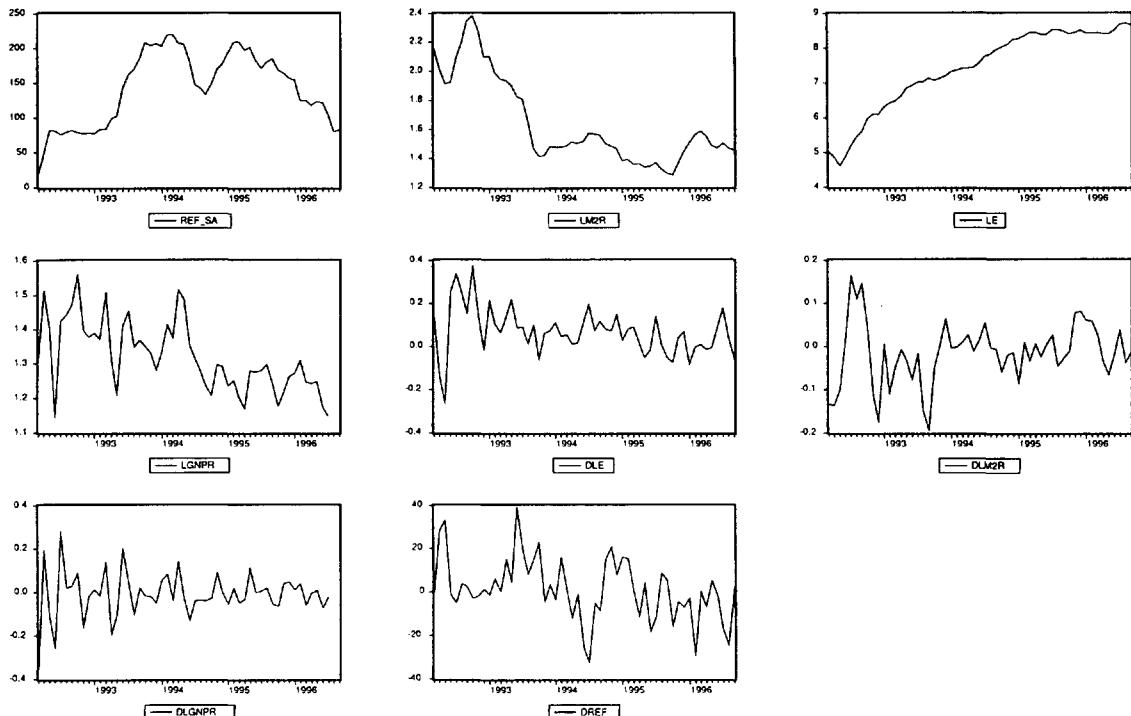
Graph 5 — Velocity of Money, 1992-96.



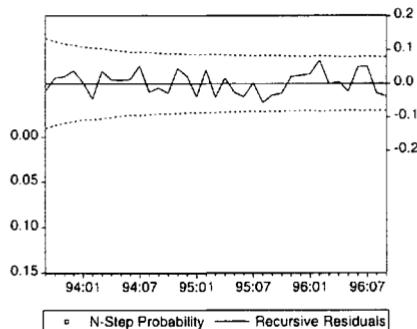
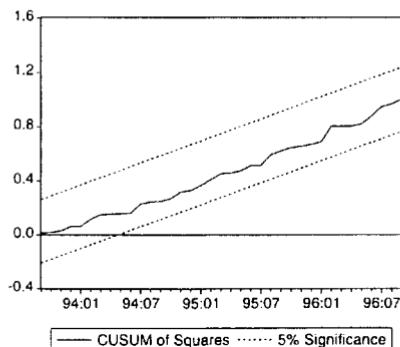
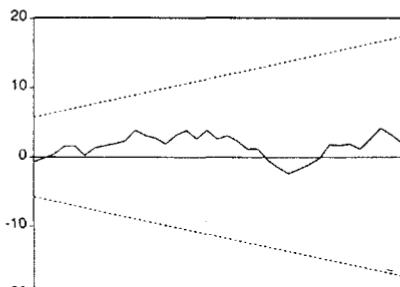
On the basis of the average money stock during the period.

Sources: IMF, RET; author's calculations. Monthly data.

Graph 6 — Level and Lagged Variables Underlying the ADF Tests (seasonally adjusted), 1992-96.



Graph 7 — Tests on Parameter Stability: Cusum Tests and Recursive Residuals Forecast Test.



Graph 8 — Jarque-Bera Test on Normal Distribution of the Residuals.

