Studia i Analizy
Studies & Analyses

Centrum Analiz
Społeczno-Ekonomicznych

Center for Social
and Economic Research

241

Marek Dąbrowski, Wojciech Paczyński, and Łukasz Rawdanowicz

Inflation and Monetary Policy in Russia: Transition Experience and Future Recommendations

Warsaw, 2002

This paper was prepared under the TACIS technical assistance project on "Russian-European Centre for Economic Policy" (RECEP) carried out by a consortium led by the University Pierre Mendes France (UPMF) in Grenoble, France.

The publication was financed by Rabobank Polska S.A.

Key words: **inflation, exchange rate and monetary policy, Russia.**

Graphic Design: Agnieszka Natalia Bury

DTP: CeDeWu Sp. z o.o.

ISSN 1506-1701, ISBN 83-7178-289-6

Publisher:
CASE – Center for Social and Economic Research
ul. Sienkiewicza 12, 00-944 Warsaw, Poland
tel.: (4822) 622 66 27, 828 61 33, fax (4822) 828 60 69
e-mail: case@case.com.pl

Contents

Marek Dąbrowski

Marek Dąbrowski is a professor of economics, one of the founders of the Center for Social and Economic Research (CASE), Warsaw, and chairman of the CASE Foundation Council. Since 1991 he has been a policy advisor to governments and central banks in Bulgaria, Georgia, Kyrgyzstan, Kazakhstan, Macedonia, Moldova, Mongolia, Romania, Russia, Ukraine, Uzbekistan, and Yugoslavia. In 1989–1990 he was first deputy minister of finance of Poland. From 1991 to 1993 he was a deputy in the Sejm (the lower house of the Polish Parliament). From 1991 to 1996 he was the chairman of the Council of Ownership Changes, an advisory body to the Prime Minister of Poland. In 1994–1995, he was a visiting consultant to the World Bank's Policy Research Department. Since 1998 he has been a member of the Monetary Policy Council of the National Bank of Poland. His recent research interests concentrate on macroeconomic policy problems and the political economy of transition.

Wojciech Paczyński

Wojciech Paczyński received an MA in International Economics from the University of Sussex in 1998, followed by an MA in Economics 1999 and MSc in Mathematics in 2000 from Warsaw University. Since 1998 he has been working as an economist at the Center for Eastern Studies of the Ministry of Economy of Poland. In 2000 he began cooperation with CASE. He is the editor of "The Global Economy", a CASE quarterly analytical/forecasting publication. He was recently involved in the World Bank sponsored CASE project on trade policy in the Caucasus region. His research interests include economies in transition, political economy and game theory.

Łukasz Rawdanowicz

Łukasz Rawdanowicz graduated from Sussex University in 1998 (MA in International Economics) and Warsaw University – Department of Economics in 1999 (MA in quantitative methods). He is a co-editor of the "Polish Economic Outlook" and "The Global Economy". He was also involved in the project on the development of a macro-model in the Kyrgyz Republic (2000). His main area of interest is econometrics and macroeconomics, in particular issues of international economics, and forecasting.

Abstract

This paper seeks the main factors behind inflation in Russia over the period 1996–2001. It presents a succinct description of Russian monetary policy and inflation developments. The econometric analysis establishes a long-run relationship between demand for the real money balances on the one side and the real income and short-term interest rate on the other side. It also presents several specifications of modeling short-run dynamics of inflation. An account is made for the change in the exchange rate regime after the financial crisis of August 1998. It finds that apart from strong inertia, money expansion and exchange rate depreciation played a role in fueling the CPI. However, there were significant shifts in the underlying trends driving inflation during the studied period.

Until 1999 fiscal policy posed the biggest obstacle to the disinflation process in Russia. In 2000–2001 the main responsibility for sustained inflation pressure can be attributed to monetary policy trying to target money supply and exchange rate at the same time. The way out from this policy trap leads through the adoption of one of the so-called 'corner' solutions, i.e. either a permanently fixed exchange rate, or independent monetary policy under a free float regime. Taking into consideration a historically limited credibility of macroeconomic policy and the high level of dollarization, the first variant seems to be a better solution for Russia. However, its implementation would require the accompanying fiscal, banking and other structural reforms creating a healthy policy-mix and flexible microeconomic environment.

1. Introduction

The purpose of this paper is to explain the main sources of the continued inflation in Russia and propose a policy remedy to this situation[1]. Russia's inflation performance in the period following the currency and banking crisis of August 1998 cannot be considered as dramatically bad but also cannot be accepted as normal. The danger of returning to the very high inflation or even hyperinflation that was real in the aftermath of the crisis was avoided. After an initial jump to the annual level of 126% in July 1999 caused by massive devaluation of the ruble, inflation came down to the level of 18.5% in September 2000. However, this disinflation trend was first stopped and later slightly reversed (24.8% in April 2001). In the following months, inflation slowed down somewhat again, however, still remaining at the range of 15–20% in annual terms.

While these were chronic and large fiscal imbalances and rapidly built debt trap that could be blamed for the failure of the 1995–1998 disinflation attempt, more recently fiscal policy seems to be beyond any suspicions. The fiscal surplus recorded in 2000 and 2001 cannot be responsible for the high rate of growth in base money (and consequently, broad money). On the contrary, it helps to partly sterilize this growth that originates from a huge balance of payments surplus. Thus, the difficulties with controlling money supply and inflation should be identified in the area of monetary policy itself. Namely, attempts to focus simultaneously on the exchange rate and money supply targets seem to be the main cause of the current (and probably also future) problems. Solving this problem in the medium and longer perspective requires an exit from the current 'impossible triangle' trap towards one of the so-called 'corner' solutions, i.e. either conducting a national monetary policy under a fully floating exchange rate, or giving up monetary independence opting for one of the forms of the 'hard' currency pegs.

The paper begins with a short summary of main theoretical findings explaining inflation phenomenon (Section 2). Then we present an overview of inflation developments in Russia during the transition period (Section 3). This is followed by a description of characteristics of the Russian monetary and exchange rate policies in last

[1] This paper was prepared under the TACIS technical assistance project on "Russian-European Centre for Economic Policy" (RECEP) carried out by a consortium led by the University Pierre Mendes France (UPMF) in Grenoble, France in the period June–December 2001 on the basis of data available as of June 2001. In the following months, the first draft was subsequently updated and corrected. The first completed version under the same title was published in RECEP Research Papers in February 2002 (http://www.recep.org/rp/). The current version contains some minor updates comparing to the previous one and is published with permission of RECEP.

decade (Section 4). Section 5 deals with some specific questions related to monetary transmission mechanisms (behavior of money multiplier) and to demand for money. We present and evaluate on both monetization and dollarization dynamics. Section 6 reports the results of an econometric analysis trying to identify major inflation determinants in Russia. In Section 7 we turn to practical questions of the disinflation policy: what kind of the monetary/exchange rate strategy can help Russia to achieve a low (one-digit) inflation rate. Section 8 concludes.

We want to express our gratitude to Karoly Attila Soos and Pavel Kadotchnikov for their extensive comments to the first draft of this paper. In addition, remarks given by the participants of the IET and RECEP seminars in Moscow in November 2001 helped us to clarify our views related to the key dilemmas of the monetary and exchange rate policies in Russia. The paper, however, reflects only the personal opinions of the authors. They should not be attributed to the EU, the Government of Russia, RECEP, CASE and other institutions, authors may be associated with. The authors accept the sole responsibility for the quality of this paper.

2. Summary of Theoretical Models

The analysis of inflation has attracted a lot of research interest and this phenomenon has been studied very thoroughly. In the literature three main underlying causes of inflation are generally distinguished: frictions on the goods market, on the money market and on the labor market. Each market is usually described with a separate model. On top of this, there is an issue of inflationary expectations that are entangled in the three theoretical concepts. This section briefly discusses these three factors behind inflation and their relevance for Russia.

In a very simple model, frictions on the goods market boil down to the output gap. The mismatch of supply and demand causes price pressures. If supply exceeds demand, there is a downward pressure, and vice versa. An example of such pressures is provided by supply-side shocks. For instance, cuts in oil output with unchanged demand lead inevitably to an oil price hike. The supply-side shocks are important in shaping inflation – in particular in the case of sensitive commodities like energy and food. The former has limited impact on Russian inflation as the country relies heavily on its own resources and prices have been controlled administratively to a great extent. On the other hand, the regulations of food prices are limited and food dominates the CPI basket in Russia. Foodstuff prices are sensitive to weather conditions and the production cycle in the

agricultural sector. In Russia these prices have also been contingent significantly upon the exchange rate, as a considerable share of foodstuff has been imported[2].

On the level of the whole economy, this phenomenon can be also described in the Phillips curve paradigm. The level of demand determines the level of output and, in turn, the level of employment. If the unemployment remains below/above the natural rate of unemployment, an upward/downward pressure on prices emerges. There is large literature on both theoretical and empirical aspects of this issue. The usual conclusion is that the trade-off between inflation and unemployment holds only in the short run. The problem of setting the natural rate of unemployment (often referred to as NAIRU – non-accelerating inflation rate of unemployment) is central in an empirical investigation of this model. In the case of Russia (similarly to other transition economies), it is virtually impossible to undertake such an estimation. In transition economies that constantly undergo structural changes the quest for NAIRU is a heroic task as most probably it changes over time. The existence of the large shadow economy in Russia further exacerbates the problem.

Monetary factors include the exchange rate and money supply. The exchange rate adds to inflation mainly via prices of imported goods and services. If the domestic currency depreciates, then ceteris paribus (domestic currency) prices of import increase. In open economies with significant share of imports (of both raw commodities and finished goods) this channel proves to be very important and prompt. Thus, many countries trying to combat inflation adopt some forms of pegged exchange rate as a nominal inflationary anchor. This channel turned out to be very important in the wake of the Russian crisis of 1998, when inflation rocketed immediately on the back of the ruble depreciation fueled mainly by import prices (see Section 3). Dąbrowski et al. (1999) point to another factor that proved important in the early stage of the crisis, namely the expectations and speculative demand for storable goods. This last channel was strengthened by uncertainty concerning the political situation, fresh memories of sizable depreciation, high inflation and low credibility of economic policies.

Growth of money supply can be seen as the second monetary driver of inflation. In the doctrine of monetarism, given the stable money velocity and exogenous output, the control of money supply allows to curb inflation. However, in the real world the

[2] Dąbrowski et al. (1999) cite estimates putting the share of imported food at close to 50% of domestic supply before the August 1998 crisis. However, they make an important point that significant part of the population relied on home-produced food. After the crisis Russian imports of food decreased substantially.

precondition of stable velocity is not met very often. This is certainly the case of Russia (see Section 5). In addition, it is commonly admitted that in the short run changes in money supply do affect real output as well as prices. Despite the difficulties in applying the exact monetarism theory, there is clearly a strong link between money supply and the price level in a longer run. High growth of broad money leads to higher inflation. While analyzing the impact of money supply it is important to investigate, which components of broad money contributed most to inflation (see Figure 1). In many transition economies with loose fiscal policies and a dependent central bank the monetary financing of the budget deficit was the main factor behind price increases. On the other hand, in developed countries with the well-established private banking sector, credits to private entities contribute significantly to price developments.

At this point, the relation between money supply and the exchange rate should be brought to attention. This relation is contingent on the exchange rate regime adopted in a given country. Russia prior to the crisis of 1998 pursued the exchange rate band and then the ruble was formally allowed to float but the central bank intervened heavily on several occasions (in fact, the current Russia's exchange rate regime can be described as a heavily managed float). In the case of the pure free float regime, monetary policy has a room for maneuver to set its policy instruments and control money supply via market mechanisms, whereas in the case of an exchange rate peg the money supply becomes exogenous. Consequently, the managed flow regime also limits the autonomy of the monetary policy due to some implicit or explicit obligations in respect to an exchange rate trajectory (see Section 7).

Frictions in the labor market and their consequences for inflation mainly refer to the wage bargains. This factor is especially important in countries with strong and pervasive labor unions where wages in the significant part of the economy are set at a national level. The higher wage demands, the higher pressure on labor costs and in turn on inflation. While this factor may be of significant importance in developed economies with low inflation it does not seem to be a great contributor to inflation in transition economies (see Walewski, 1998), and particularly in Russia. Labor unions in Russia are virtually non-existent and there are no wage contracts at the national level. Besides, in the case of Russia its impact would be extremely hard to measure on the empirical grounds as data on wages are not very indicative of real developments. First, there is a large shadow economy. Second, payments in kind played an important role in some periods. Finally, wage arrears have been very common and thus data on due wages do not correspond to the actual flows of money to employees.

When investigating the labor market and wages settings it is important to take into consideration the role of expectations. If labor unions want to secure real wages and

expect high inflation in the coming period, then they would demand at least the same nominal increase in wages as their expected rate of inflation. Similar mechanisms take place on the side of producers. In the environment of high inflation and expectations of its persistence producers are more inclined to rise their prices than in the case of low inflationary expectations. High inflationary expectations lead to the introduction of many indexation mechanisms in order to maintain real balances. These mechanisms, however, support inflationary expectations and built them permanently into the market behavior. Consequently, fighting inflation becomes more difficult. In Russia and other CIS countries inflationary expectations and inflationary inertia are partly mirrored in the occurrence of dollarization in certain transactions and wage contracts (see Section 5). However, it concerns only some selected products and market services (such as real estate and durable goods) and highly remunerated employees.

3. Inflation Developments in 1992–2001 – An Overview

The period until mid-1994 was marked by a very high inflation. Annual rates of growth of the CPI (for the sake of simplicity in the latter part of this paper it will be referred to as CPI_12) stayed at four- to three-digit level. This initial surge in inflation was typical to almost all transition economies and can be attributed mostly to the price adjustment after the price and exchange rate liberalization as well as the weak current monetary and fiscal control (Dąbrowski, 1999). As these developments were, to a large extent, confined to first years of transition, and also because through most of that period Russia did not pursued truly independent monetary policy (due to the continued existence of the ruble zone until autumn of 1993 – see Dąbrowski (1997)), the analysis in this section will concentrate on the post–1993 period.

In the first months of 1994 monthly inflation was finally brought down to a single-digit level, but in the last quarter of this year the disinflation trend was reversed – after the first spectacular currency crisis on 'Black Tuesday', October 11, 1994 (see Antczak, 2001). Only in March 1995 monthly inflation fell below 10% and the CPI_12 returned to a downward path only in August 1995, i.e. after the introduction of the exchange rate band. The exchange rate based stabilization proved successful as during the following 3 years the CPI_12 showed a stable decline to slightly above 5% in summer of 1998.

The financial crisis that erupted in August 1998 represented a major inflationary shock. In September 1998 alone, prices rose by 38%, mainly due to the increase in

prices of imported food and non-food products as well as speculative demand and expectations of further price hikes (Dąbrowski et al., 1999). In fact, prices continued to rise sharply until February 1999. From then on, monthly increases averaged to some 1.7% until summer 2000. In September 2000, the CPI_12 bottomed out at 18.5% and then showed a steady rise in the following month up to 24.8% in April 2001. After that CPI_12 decreased somewhat again, to the level of 18.6% in December 2001 and 16.2% in May 2002.

This short overview allows for separating six different periods of inflation developments, taking into account institutional arrangements and macroeconomic background:

– up to June 1995: inflation was very high, the ruble was floating, and the authorities pursued generally very lax monetary and fiscal policies; this period was marked by the several unsuccessful stabilization attempts and currency crashes with the 'Black Tuesday' of October 11, 1994 as the most spectacular crisis episode;

– after 'Black Tuesday' monetary policy became gradually tightened and starting from June 1995 the crawling band exchange rate regime brought the annual inflation measured by the CPI (CPI_12) slowly but continuously down; however, fiscal stance continued to be a serious problem and authorities resorted to monetary expansion at several occasions; this led to the financial crisis of August 1998 and brought a major inflationary reversal;

– August 1998 – February 1999: the ruble was allowed to float (with some interventions of the Central Bank of Russia (CBR)) and depreciated dramatically while the monetary expansion was responding to the fiscal strands; inflation rapidly accelerated;

– March 1999 – September 2000: the ruble exchange rate remained relatively stable (it depreciated from 24 to 28 rubles against the dollar); fiscal policy was tightened but money aggregates expanded at a rather high pace; the CPI_12 fell gradually down to the level of 18.5% in September 2000;

– September 2000 – end of 2001: in the environment of relatively stable nominal exchange rate (helped by the CBR interventions) CPI_12 was on the rise again (up to 24.8% in April 2001) with strong fiscal surplus and M2 growth driven by NFA and CPS components; the second half of 2001 brought a limited improvement in the situation but year-end inflation figure of 18.6% exceeded significantly the government target.

4. Russian Monetary and Exchange Rate Policies in 1992–2001 – Stylized Facts

The collapse of the Soviet Union at the end of 1991 did not bring an immediate dissolution of the common currency area – the ruble zone[3]. At the beginning of political independence of the former Soviet republics, most of them (except from the Baltic countries) were interested in continued use of the ruble as a common currency although without surrounding prerogatives in the monetary policy sphere to either the Central Bank of Russia (CBR) or any kind of supranational monetary authority. As a result, the ruble zone was governed by several national central banks parallelly, each of them pursuing its own credit policy. Neither in Russia, nor in other FSU countries such an institutional environment was supportive to the fight with inflation. On the contrary, it created a temptation to moral hazard behaviors, i.e. conducting expansionary monetary and fiscal policies and 'exporting' their inflationary consequences to other partners.

The dissolution of the ruble area had a gradual character with the Russian authorities unilaterally tightening control over the money emission (first in relation to credit money and later to cash money), on the one hand, and subsequent countries leaving the common currency zone, on the other. This process lasted from mid 1992 to the second half of 1993, so only at the end o1993 Russia could start its own independent monetary policy.

Apart from ruble area problems, the effectiveness and actual conduct of Russian monetary policy in its early period was strongly affected by developments in the fiscal sphere. Fiscal policy was lax especially in the second half of 1992 and the large deficit of the central government budget was financed by the CBR. This resulted in the growth in central bank credit to the government equivalent to some 25% of reserve money (monetary base) in the last quarter of 1992. At the beginning of 1993, fiscal stance improved somewhat but further easing took place in the later part of the year and in 1994. The scale of CBR budget financing in that period can be illustrated by the fact that monetary authorities net domestic assets more than quadrupled during 1994 (Balino et al., 1997).

Year 1995 saw a significant change in the macroeconomic policy (see IMF, 1999). Early that year the CBR adopted a tighter monetary stance. In April, the new Law on CBR was approved, which provided this institution with independence in the formulation of

[3] A detailed description of the evolution in monetary policy in Russia until 1997 can be found in Balino et al. (1997). The following discussion draws from that paper. See also Dąbrowski (1997).

monetary policy and prohibited the direct lending to the government. These formed the ground for the introduction of an exchange rate band in June 1995. Russia entered a 3-year period of the pegged-exchange-rate-based monetary policy[4].

Also, fiscal policy was tightened somewhat in 1995 (the federal budget deficit was halved to around 6% of GDP). These developments allowed for a sizable reduction in growth of monetary authorities' credit to government, which, however, remained a main driving force of M2 expansion (see Appendix 2 and Figure 2).

Still, the fiscal stance remained weak as revenue shortfalls along with rising expenditure commitments resulted in the accumulation of arrears. The authorities inability to cope with this problem together with continued existence of soft budget constraints in the enterprise sector (see Rostowski, 1993) led to a widespread culture of non-payment in the Russian economy. In the following years, budgetary arrears were growing along with the high budget deficit and nonpayments were becoming more and more common in other spheres of the economy. The fiscal pressures were evident already at the end of 1995 and intensified in 1996, which happened to be the year of presidential. At the same time, the implementation of structural reforms that could form a basis for balanced economic growth and provide monetary authorities with more room for maneuver was delayed.

Despite these unfavorable developments, the CBR credit to government showed a clear downward trend in 1995–1997. Such a situation resulted from the emergence of a new source of financing – the treasury bills market. This market was initiated already in 1993 but took off only in 1995 and experienced a rapid expansion in 1996 and 1997. In view of favorable international developments and the improved outlook for the Russian economy (as perceived by the majority of observers; later this appraisal proved wrong), treasury bills (GKO and OFZ) were considered as attractive instruments by both domestic and foreign investors. In addition, between November 1996 and December 1997 Russia successfully issued US$4.5 billion Eurobonds[5].

The Asian crisis of 1997 changed investor sentiments. Capital outflow exerted a largepressure on the ruble exchange rate but the CBR managed to defend the band. However, the market interventions in November 1997 led to losing to over US$6 billion, i.e. 2/3 of all liquid reserved held by the CBR at that time. Apart from defending the currency, the CBR was, once again, forced to finance the budget deficit. Due to legal prohibition of direct lending to the government, the CBR was involved in redeeming maturing treasury bills from the market on the behalf of the government. Monetary

[4] A detailed description of the functioning of the system can be found e.g. in IMF (1999) p. 74.

[5] For more details see IMF (1999) and Antczak (2001).

authorities net credit to the government expanded by 14.7% in the last quarter of 1997 (see Appendix 2 and Figure 1). Also, the CBR supported weakened commercial banks.

The next big wave of capital outflow came in May 1998. During April and May CBR's reserves decreased by US$2.3 billion. On August 17, 1998, faced by the full-scale financial crisis Russian authorities decided to adopt a series o the emergency measures[6]. In particular, the ruble was effectively devalued by 50% as the ceiling of the exchange rate band was widened to 9 rubles per dollar. Despite this move and the massive intervention to defend the new wider exchange rate band, the authorities were forced to suspend the trading at the foreign exchange market and then to float the ruble on September 2, 1998. The floating regime has been formally in operation since then; however, the CBR has been regularly intervening in the market.

Among other problems that emerged after the crisis, one should note the collapse of the banking system. Monetary authorities tried to inject liquidity to the system but these actions proved largely unsuccessful as commercial banks were increasing their deposits at the CBR – seeing this as the only safe investment.

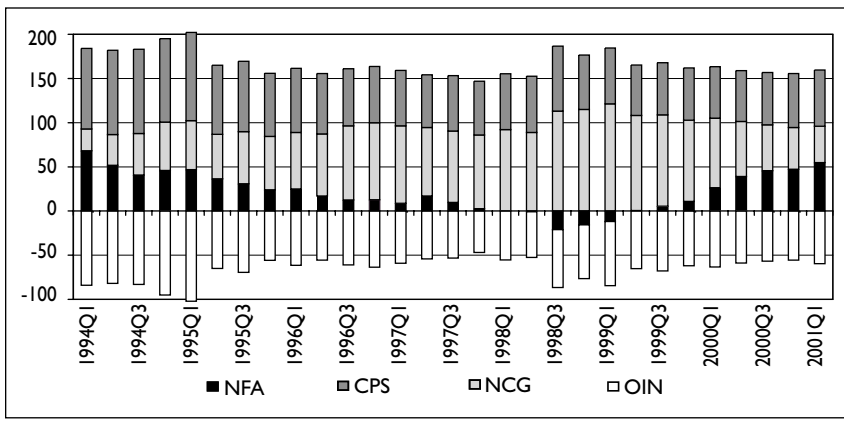
The CBR's policy in the months following the crisis was determined, to a large extent, by the need to monetize the government deficit and provide liquidity support to the troubled commercial banks (the latter decisions were made on a case-by-case basis). The expansion of the CBR net credit to the government was equivalent to 100% of reserve money (as of the end of the second quarter of 1998) in the third quarter of 1998. In the last quarter of 1998, it expanded by additional 40% of reserve money (as of the end of third quarter). Net credit to commercial banks increased by 28% of reserve money in the fourth quarter of 1998.

In 1999, the monetary policy was tightened. Along with a rebound of economic growth and the improving fiscal stance, the growth rate of net credit to the government was reduced. However, in the same period (i.e. 1999), the CBR credit to banks increased by 50% of reserve money as of the end of 1998. In addition, the CBR foreign currency reserves were used to settle external debt obligations. As noted by the IMF (2000), an important feature of the CBR's approach in that period was its reluctance to use market-based instruments of monetary policy. Instead, it resolved to reserve requirements that were raised on four occasions between the end of 1998 and the middle of 2000. It is also worth noting that faced with the lack of alternative liquid instruments (after the collapse of the GKO market) banks were inclined to hold reserves at the CBR above the amounts required by the central bank. 2000 saw a major decrease in the stock of monetary authorities net credit to government (by 50% of reserve money as of the end of 1999) – see Appendix 2 and Figures 1 and 2. The growth in net foreign assets became the major factor contributing to the reserve money and M2 expansion.

[6] For an extensive discussion of the Russian financial crisis of August 1998 see e.g. Antczak (2001).

The financial crisis impacted heavily on Russia's external position. The current account balance, which has been in surplus already before the crisis, skyrocketed in the following quarters reaching US$24.6 billion in 1999, US$46.4 billion in 2000 and some US$11.5 billion in the first quarter of 2001. Two reasons should be mentioned here. Firstly, the strong real depreciation of the ruble had a substantial effect on the import side. On the export side, a positive boost from rising prices of oil and gas was a major factor, while non-energy exports did not increase significantly. This put the CBR in a difficult position in managing monetary and exchange rate policies. Their ultimate goals were, to some extent, contradictory or at least hard to coordinate. On the one hand, the CBR did not want to allow for nominal appreciation (as it happened, to some extent, in Ukraine in 2001) that could jeopardize the recovery in the real sector. On the other hand, monetary expansion caused by the massive CBR interventions on the forex market could easily lead to increased inflationary pressure and, therefore, real appreciation of the ruble.

Figure 1. M2 decomposition, 1994–2001 (% of M2)

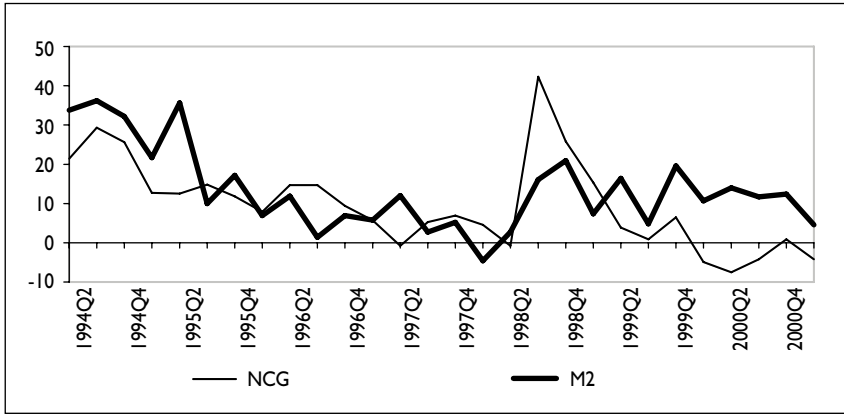


Note: Appendix 1 provides data plotted above.
Source: IFS, CBR.

As already mentioned, driving forces of monetary aggregates underwent frequent changes in the period under consideration. Figure 1 plots the decomposition of a broad money aggregate M2 into four components – net foreign assets (NFA), net credit to government (NCG), credit to private sector (CPS), and other items net (OIN). Stock of NCG and CPS remained positive and OIN negative throughout the whole period. On the other hand, stock of NFA showed a downward trend in 1994Q1–1998Q1, and turned negative in the following quarters. Starting from the second quarter of 1999 it was again positive and growing.

The behavior of the NCG component is of particular importance as it reflects the fiscal stance of public finances. Some fiscal tightening can be seen during the end of 1994 and 1995. The return to budget deficit financing by the central bank is visible at the beginning of 1996 and then represents a generally declining trend with some fluctuations until summer 1998. In the three consecutive quarters after the crisis, NCG expanded at a very high pace pushing M2 up. The significant improvement in the budget situation after 1999 is evident in the shrinking NCG during 2000 and the first quarter of 2001. From the second quarter of 2000 the NCG growth turned out to be negative. This means that it ceased to be a factor contributing to monetary expansion and even helped in sterilizing growth of monetary base due to growing NFA. The latter factor has recently become the main driving force of money growth and inflationary pressures.

Figure 2. Net credit to government and M2, 1994–2001 (% changes, qoq)



Source: IFS, CBR.

5. Transmission Mechanisms and Demand for Money

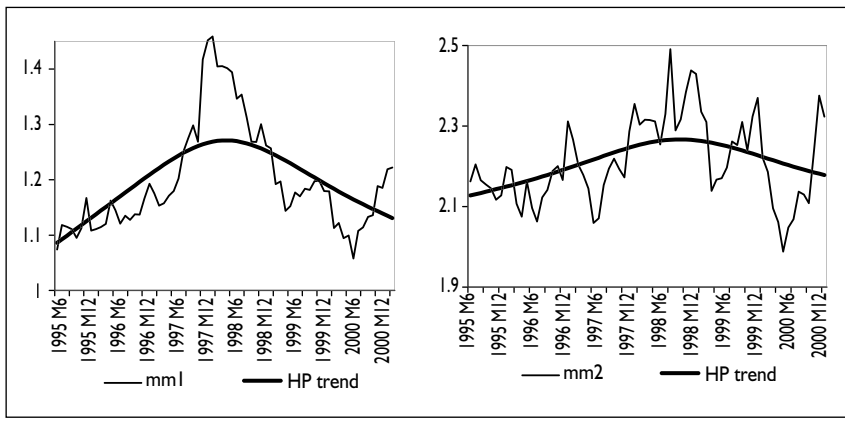
In this section we will try to look at some additional issues, which can help in assessing both monetary policy and inflation developments. First, we will analyze money multiplier trend, which reflects changes in monetary policy instruments and, consequently, in monetary policy transmission mechanism. As demand for money in Russia has not been

stable during the transition period we also want to analyze changes in monetization level. Finally, the limited credibility of the domestic currency, domestic banking system, and the overall economic policy is reflected in the sustained dollarization phenomenon.

5.1. Money Multiplier

In analyzing the transmission mechanism from monetary aggregates to inflation, one should note the pass-through from reserve money to broader money aggregates such as M1 and M2. While monetary authorities supply reserve money, these are commercial banks that create broad money aggregates. Hence, changes in M1 and M2 can be attributed to both changes in reserve money and changes in multipliers. The multipliers are affected by the decisions of all economic agents, i.e. monetary authorities (e.g., reserve requirements for banks), commercial banks (e.g., decisions concerning the stock of excess reserves), and households (e.g., composition of cash holdings and deposits).

Figure 3. Money multipliers (M1 and M2), 1995–2001



Note: HP trend – Hodrick-Prescott filter with $\lambda = 1600$.
Source: Authors' calculations based on IFS and CBR data.

As depicted in Figure 3, during the analyzed period money multipliers with regard to M2 and M1 exhibited distinct patterns. Until the beginning of 1998, the M1 multiplier was increasing (35% rise since mid-1996) and falling thereafter – as a result of the currency and banking crisis – below its 1996-level in mid-2000. Later on, this trend was reversed and the M1 multiplier soared in the second half of 2000 and first months of 2001 what

can reflect the recovering confidence in the Russian banking system among residents. The period of highest volatility was recorded between summer of 1997 and summer of 1999. In turn, the behavior of the M2 multiplier was characterized by no clear trends and showed substantial variability throughout the entire examined period. Some weak ascending trend can be discerned in the period before the crisis. It is also important to note some seasonal fluctuation of the M2 multiplier, which usually rises at the beginning of each year (January–February) and declines around mid-year.

In the analysis carried out in this paper, M2 is referred to as a main aggregate describing the monetary expansion. The analysis above gives some hints with regard to the extent to which the econometric analysis can capture the underlying inflationary processes. While the relative stability of M2 multiplier in the long run makes the analysis in such a time framework feasible, its short-run variability constitutes a major problem in modeling the inflation dynamics over few-months period.

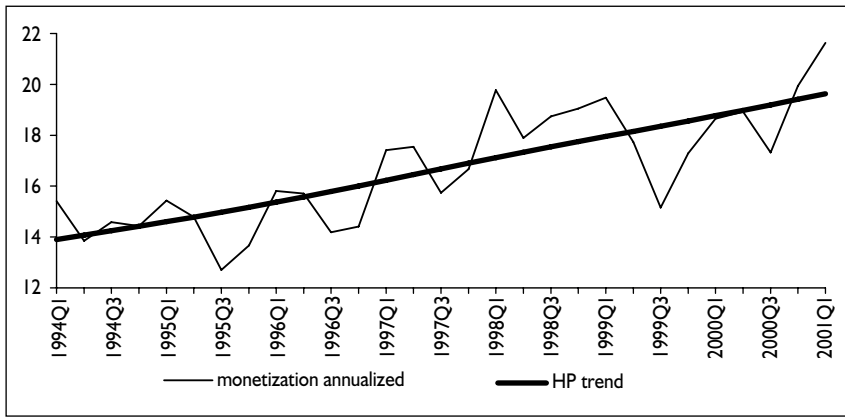
5.2. Monetization Dynamics

The monetization in the Russian economy has been gradually rising since the beginning of 1994 (see Figure 4). After reaching the low of slightly above 12% it amounted to around 19% at the end of 1998. In 1999 it dropped and only by the end of 2000 it once again surpassed 19%. The seasonal pattern clearly evident in Figure 4 stems primarily from the seasonal fluctuations of GDP. The lower nominal figure for first-quarter GDP results in hikes of monetization, while in third quarter Russian GDP usually takes the largest values and thus monetization drops in these periods[7].

It is also important to look at the currency structure of M2. It turns out that the substantial part of it was held in foreign currencies. Thus, the more appropriate measure of the confidence in national currency is provided by the evolution of ruble M2. Figure 5 plots the share of ruble M2 in total M2. It is evident that after a period of variability in 1994–1995, there has been a slow upward trend until devaluation of August 1998. Devaluation automatically reduced this share. However, what is more interesting is that

[7] As monetization is usually presented as a ratio of M2 (or other money aggregate) to annual GDP figure, the problem arises how to calculate annualized GDP for the presentation of quarterly data. In the high inflation environment calculating the cumulated nominal GDP for the last four quarters tends to overestimate monetization. In the case of Russia, the period under consideration was marked by large swings in inflation (from several percent to several hundred percent annually), and therefore such a definition would not be very useful. On the other hand, the variant used in this paper (i.e., a ratio of M2 at the end of quarter to nominal GDP in that quarter multiplied by four) is distorted by the seasonal fluctuations.

Figure 4. Monetization of the Russian economy, 1994–2000 (M2 as % of annualized GDP)



Notes: 1. Monetization is defined as a ratio of M2 at the end of quarter to nominal GDP in that quarter multiplied by four.

2. HP trend – Hodrick-Prescott filter with $\lambda = 1600$.

Source: Authors' calculations based on IFS and CBR data.

Figure 5. Ruble M2, 1994–2000 (% of total M2)

Source: Authors' calculations based on IFS and CBR data.

the confidence in the ruble (as measured by this ratio) has not rebounded since the end of 1998 until the beginning of 2001. The above observations clearly show the importance of studying the issue of dollarization in Russia in more detail.

5.3. Dollarization in Russia

The phenomenon of dollarization is common to many transition economies. Hard currencies are considered by households as a safe investment and a mean of storing value, and are also used in some transactions. Dollarization results from several reasons such as high inflation and ensuing uncertainty with regard to future prices, high rate of domestic currency depreciation, the weak and unsafe banking sector (there were several episodes resulting in losses of savings deposited in banks). Dollarization in transition economies has been subject of several studies, e.g. Sahay and Vegh (1995) and Balino et al. (1999).

All the above mentioned factors played some role in explaining the degree of dollarization in Russia. Brodsky (1997) analyzed the causes of this phenomenon and stated that the most important factor underlying the dynamics of the dollarization process was the difference between growth in the ruble exchange rate versus the dollar and the rate of inflation (i.e., real exchange rate dynamics). This finding was actually quite interesting as it supported the view that investment decisions of individuals are rational. Among other factors, which were found to increase the degree of dollarization, Brodsky pointed to policy instability and lowering interest rates on government bonds (GKO).

For the purpose of this paper, it is important to discuss first the evolution of the degree of dollarization and then to show its impact on monetary policy and inflation developments. One single factor making any estimates of the scale of dollarization in Russia very difficult is the fact that individuals are believed to hold large stocks of dollars in cash. For example, Brodsky (1997) cites the CBR estimates that at the beginning of 1996 Russians held about US$20 billion in cash (at that time M2 was equal to around US$59 billion). Cash holdings can be spent in various ways, e.g. non-registered trade, tourism, and illegal currency operations (transfers of foreign currency abroad).

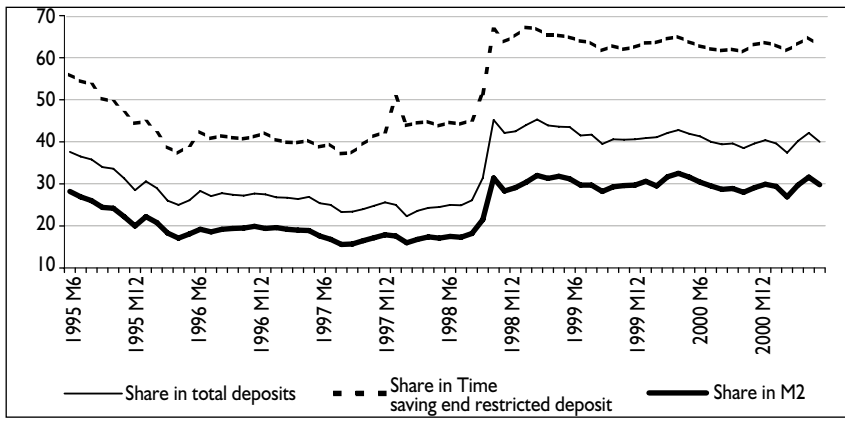
Various studies attempted to estimate the degree of dollarization in Russia, using different techniques. Brodsky (1997) presents a survey of these studies. Despite the high degree of uncertainty concerning estimates presented in any particular study, they produced quite similar results. It was found that the dollarization level during 1996 oscillated in the range of 35%–50% of M2.

The only statistics that can be safely used in estimates of dollarization are data on foreign currency deposits in Russian banks and data on foreign currency purchases and sales carried by the authorized banks. The latter data show, in particular, the amounts sold and purchased from the individuals. Figure 6 plots the dynamics of the share of

foreign currency deposits in total deposits held at Russian banks in 1995–2001. After the fluctuations around 40% in 1993–1995 this share was on a slow but steady decline during the operation of the exchange rate band (June 1995–August 1998).

Devaluation in August 1998 naturally brought a rapid increase in this share even though the foreign currency deposits measured in US dollars actually declined by around US$3.5 billion from the end of July until the end of October 1998. Despite the stability of the ruble during most of 1999, this share remained generally unchanged at a rather high level of 40% in 2000 and during the first months of 2001 (the inflation rate clearly surpassed the nominal depreciation rate, leading to real ruble appreciation).

Figure 6. Foreign currency deposits as share of total deposits, 1995–2001 (%)



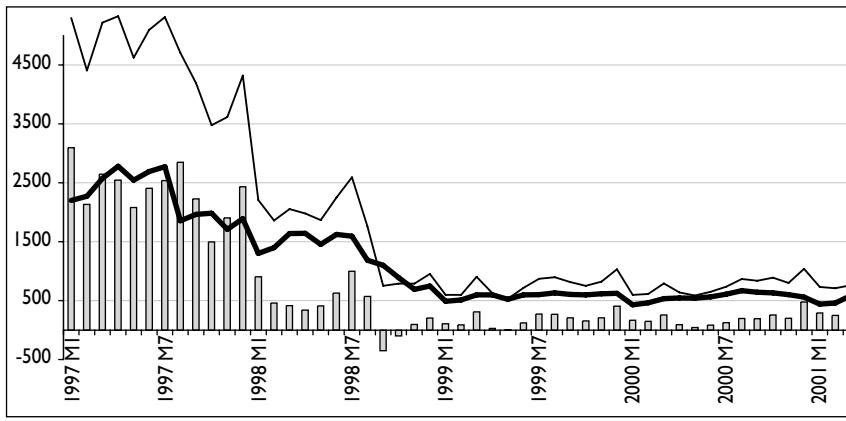
Sources: Authors' calculations based on IFS and CBR data.

In order to provide some check of robustness of this measure the share of foreign currency deposits is also plotted against the groups of deposits classified as time, savings and foreign currency deposits. Both lines show an almost identical dynamics giving some support for the usefulness of this indicator. The share of foreign currency deposits in M2 stayed around 20% before the August 1998 crisis and rose to 30% afterwards. This last number provides a lower boundary for dollarization estimates.

Estimating the amount of cash dollars is definitely a more difficult task. Figure 7 plots the dynamics of the sales and purchases of foreign currency between individuals (residents and non-residents) and Russian banks. It is evident that prior to the August 1998 crisis the transactions were much higher than in the period after the crisis. Moreover, one can distinguish several periods with respect to the amount of net sales. Every month of 1997, banks were selling to individuals some US$2 billion more than they purchased. From the

beginning of 1998 this figure was reduced to some US$0.5 billion, to turn slightly negative for a few months just after the crisis. From mid-1999 until the first months of 2001 net sales averaged at around US$210 million monthly. It is difficult to give a simple and convincing interpretation to the evolution of these indicators. One possible explanation is that after the crisis shuttle imports and tourism were reduced substantially and thus the demand for foreign currencies declined. Also, sizable depreciation, that occurred between August 1998 and the beginning of 2001, implies that in ruble terms the drop in net purchases of foreign currencies by individuals is less sharp. Also, as noted above, in the period prior to the crisis the share of foreign currency deposits in all deposits was on a declining trend, while after the end of 1998 it remained very stable.

Figure 7. Foreign currency sales and purchases by individuals, 1997–2001 (million US$)

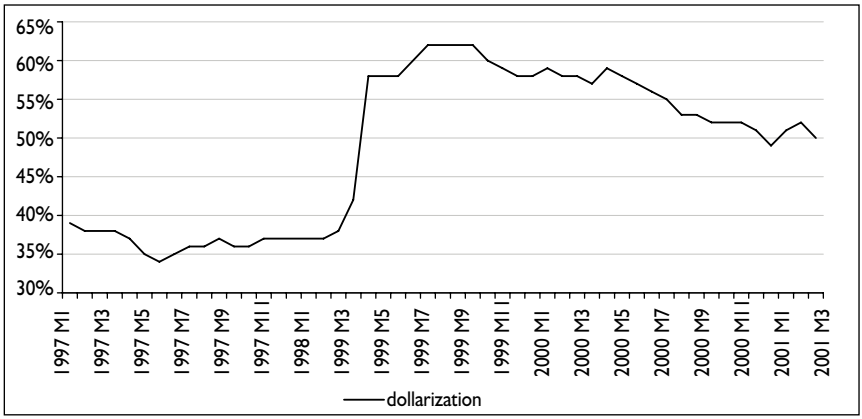


Note: Monthly data refer to exchange offices in banks.
Sources: CBR, Bulletin of Banking Statistics – various issues.

In view of the lack of more precise tools, in the following exercise it is assumed that at the end of 1996 the level of dollarization in Russia was at 40% of GDP (Brodsky, 1997), i.e. cash holdings amounted to some US$20 billion. It is then assumed that starting from 1997 10% of net purchases of foreign currency by individuals is saved and kept in cash. The value of foreign currency holdings consists of foreign currency held as bank deposits (on which data are available) and cumulatively growing cash holdings. The result of such an exercise or a hypothetical dollarization level is plotted in Figure 8. However, it should be stressed that presented figures should not be considered as giving any precise information as to the degree of dollarization in Russia. Rather, they reflect a probable evolution of the dynamics of this process.

It is quite difficult to assess the potential impact of dollarization on inflation developments in Russia. Obviously, it significantly weakens the effectiveness of monetary policy. Probably the strongest impact of dollarization was felt in the aftermath of the 1998 crisis. As noted by Menshikov (1999), the sales of foreign exchange holdings (both cash and deposits) significantly influenced money growth and thus added to inflation. Indeed, the foreign currency deposits decreased by US$1.7 billion in September 1998 and further US$0.96 billion in October almost precisely matching the growth of M1 in these periods. At the same time banks' exchange offices became net buyers of foreign currency (see Figure 7).

Figure 8. Evolution of dollarization, 1997–2001(approximation)



Note: Presented figures are rough estimates. See text for more details.
Source: Authors' calculation based on IFS and CBR data.

6. Empirical Testing of Inflation Determinants in Russia

Despite clear theoretical models of inflation, the empirical investigation of this phenomenon is much more complicated. In the real world there is a wide range of different factors responsible for price changes. As IMF (2001) points out, the authorities (government and/ or central bank) may have some incentives to accommodate these various factors. Consequently, the ensuing inflation dynamics may become very complex and have little in common with the primary impulse. Thus, in any econometric modeling

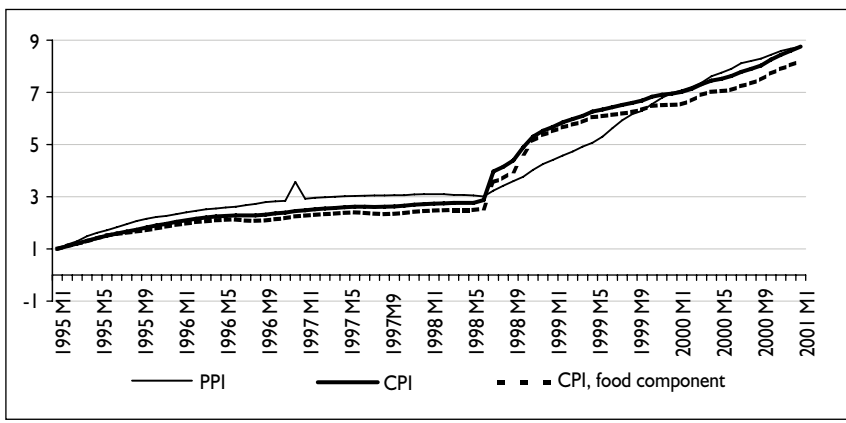
of inflation there is a high risk of the occurrence of the omitted variable problem. In addition, the obtained results may prove spurious.

The above reservation should be born in mind especially in the case of transition economies where many market imperfections exist (for instance, these already mentioned – payment arrears, high dollarization, etc.) and the above problems become even more aggravated.

Prior to turning to the models' description we would like to devote a few lines to the issue of price measurement. It should be noted that there are several measures of price changes in a given economy. The broadest one is provided by the GDP deflator, as it captures not only domestic prices but also export prices (that are excluded from other price indicators). However, it is not used extensively, as it is usually available only on a quarterly basis, and with significant time lag.

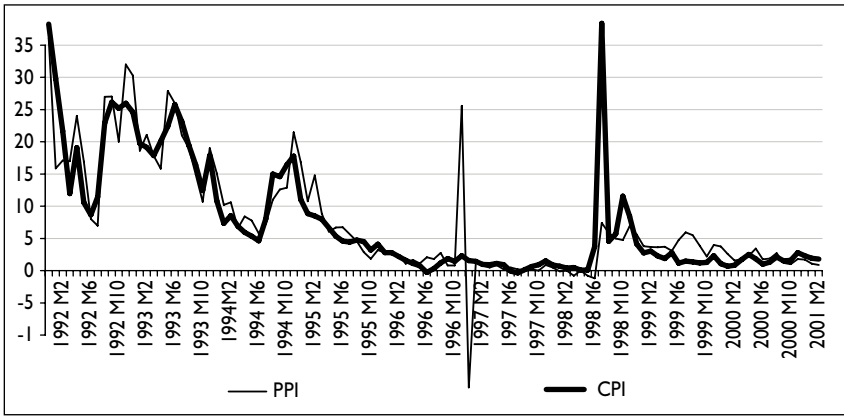
In addition, it includes factors that can hardly be influenced by economic policies in one country. Another commonly used measure of inflation is the producer price index (PPI). It covers prices of several intermediate inputs in the production process. The track of the PPI gives feelings about competitiveness of a given economy and helps to investigate price pressures in a more profound manner than only by analyzing the CPI. However, in the case of Russia the dynamics of PPI may be biased due to the administrative regulation of energy prices, which contributes more to the dynamics of the PPI than to the CPI. As the energy prices remain below a world level, the PPI is artificially suppressed.

Figure 9. Price indexes, 1995–2001 (January 1995=1)



Sources: IFS, CBR and OECD.

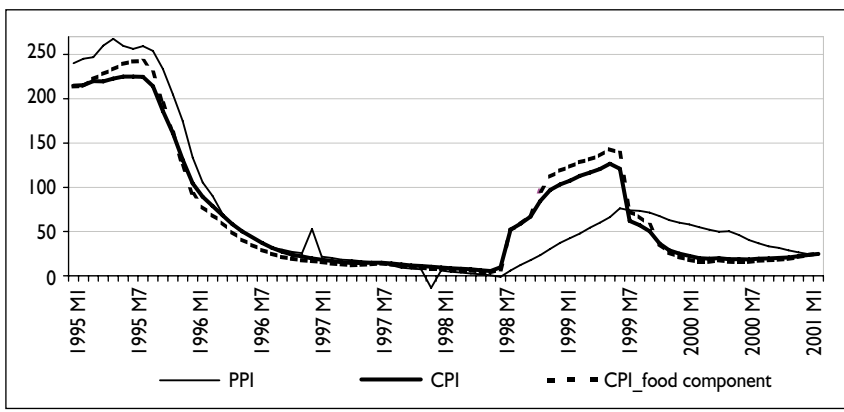
Figure 10. Consumer and producer prices, 1992–2001 (% changes, mom)



Sources: IFS and CBR.

Following practice of the majority of inflation studies, this paper focuses on the dynamics of the Consumer Price Index (CPI), which is most relevant for the situation of households. Certainly it also bears some disadvantageous characteristics. In Russia (and in many other countries) food products constitute a large part of the basket used for calculations of the CPI. In addition, some products that are included in the basket are priced using administrative rather than market mechanism. Consequently, the index shows some seasonal pattern (in summer, prices of the fresh food products decrease) as well as it can be affected by administrative price increases (which often take place at the beginning of the year). Figures 9–11 plot the dynamics of the PPI, CPI as well as the food component of the CPI.

Figure 11. Consumer and producer prices, 1995–2001 (% changes, yoy)



Sources: IFS and CBR.

Being aware of various methodological hardships in testing inflation determinants in Russia we started with a detailed statistical and econometric analysis of the variables of our interest (inflation measured with the CPI – June 1995=100, M2 – end-month value in million of rubles, exchange rate – monthly average, interest rate – monthly average money-market-overnight rate). All variables were tested for stationarity using both informal (visual inspection) and formal (ADF tests) tools. CPI, M2, exchange rate and interest rate proved to be integrated of order one. No formal account for the seasonality and structural breaks in the ADF test was pursued though these two factors should not bias the results considerably.

In order to secure the sufficient number of observations, we decided to use monthly data. This solution involves, however, certain costs. With monthly periodicity, there is a problem of accounting for seasonality. In addition, it is more difficult to identify the structure of lags and the model specification becomes very sensitive to the sample size. The advantage of this approach in our research is the possibility of testing two different samples: pre- and post-crisis. In order to provide some sensitivity analysis we also decided in some cases to estimate quarterly models for benchmarking purposes.

We started with an attempt of estimating a simple money demand function, where the real money balances (M2/CPI) is explained with a real activity variable (proxied here by the industrial production index – IP) and a money market interest rate (IR). This model is estimated in the semilog form with monthly data:

$$\log(M2_t/CPI_t) = \alpha_1 + \alpha_2 \log(IP_t) + \alpha_3 IR_t + \varepsilon_t \qquad (1)$$

Neither industrial production index nor the overnight-money-market interest rate is a perfect proxy in this application. Industrial production constitutes only a part of the economic activity and may not precisely mirror developments in other spheres. Also, due to changes in the money and exchange rate markets, overnight rates may not ideally represent the alternative costs of holding money in the Russian economy. The choice of both indicators was solely determined by the availability of the monthly data over the entire studied period.

Given our interest in the long-run properties of the real money demand function and the fact that the used variables are I(1) we pursue a VAR approach. The estimation sample covers the period from January 1996 to March 2001. In the VAR model, apart from M2, inflation, industrial production and interest rate variables, we also inserted a dummy for the Russian crisis (DUM9809) and centered seasonal dummy for every January. The rationale for the seasonal dummy is twofold. First, the inflation at the beginning of each year has been usually higher due to rises in controlled prices. Second,

M2 supply has been usually lower as compared to December (i.e., the month-on-month increase was relatively small). This effect is probably attributable to technical and accounting measures in the banking system – until the end of December financial institutions work normally and the seasonal holidays take place only in the first part of January.

According to Johansen (1995), the centered (orthogonalized) seasonal dummy is more appropriate than the normal one as it does not shift the trend of time series in the VAR system but only the mean. The structure of lags of the VAR was chosen basing on the Schwarz criterion. It yielded the one-lag VAR model. This criterion, as pointed by Green (1993), renders more parsimonious models than for instance the Akaike's information criterion given its stricter treatment of the additional regressors with no explanatory power. Detailed results of the VAR estimation are provided in Appendix 4.

In order to identify a long-run relation, we used the Johansen cointegration test. Data were assumed to contain the linear deterministic trend. The test yielded two cointegrating vectors. After the normalization one of the vectors has the following form (the numbers in parentheses denote the asymptotic standard errors):

$$\log (M2_t/CPI_t) = -16.07 + \underset{(1.06)}{3.55}*\log(IP_t) - \underset{(0.002)}{0.003}*IR_t \qquad (1')$$

The elasticity of the money demand with respect to the industrial production is rather high for developed-countries' standards (Fair (1986) provides results from the modified form of money demand function in a range of 0.3–1.3) though this result is similar to estimates for developing countries. For instance, Kalra (1998) arrived at the elasticity of 3.73 for Albania over the period 1993–1997. On the other hand, the low elasticity of real money balances with respect to interest rates, as compared to that of real activity variable, is not surprising given the very high levels of interest rates (above 50% in early 1996 and above 100% in September 1998).

The identical quarterly estimation yielded similar results (see Appendix 5) though the estimation sample was different – it started from the first quarter of 1994. The money demand elasticity with respect to industrial production turned out slightly higher and with respect to interest rates lower. Despite insufficient number of observations to test the lag structure properly, the quarterly model seemed to confirm results obtained in the estimation with monthly data.

The analysis of impulse response functions in the monthly model as well as quarterly model – see Appendix 4 and 5 – shows that the shocks with regard to industrial production and interest rate have effects as one would expect. The former increases the

real balances, whereas the latter dampens them. The robustness of impulse response functions allows to draw conclusions over the one year horizon – the 2-standard error band indicates a lack of significance in the longer horizon. These results tend to suggest a rather long persistence of these shocks.

Having obtained the long-run money demand function we turn to the examination of a short-run model in the error correction model (ECM) framework. The error correction term is captured by the gap between money supply and demand, i.e. by the residuals from the long-run money demand equation (i.e., positive residuals – excess of money supply over demand, negative residuals – shortage of money supply). The following model is estimated:

$$dlog(CPI_t) = c + \Sigma_i \alpha_i dlog(CPI_{t-i}) + \Sigma_i \beta_i dlog(ER_{t-i}) + \gamma RES\_MON_{t-1} + \varepsilon_t, \qquad (2)$$

where d stands for a difference (i.e., value of the variable in period *t* minus the value at period *t-1); RES_MON* – the ECM component, i.e. residuals form the equation (1), *i* – the index of lags (*i*=1..4). Equation (2) was estimated using the OLS method. The structure of lags was obtained in a testing-down approach, starting from four lags. This produced the following final form – detailed results are provided in Appendix 6 (*t*-statistics in parentheses):

$$\begin{aligned} dlog(CPI) = {} & 0.003 + 0.651*dlog(CPI(-1)) + 0.341*dlog(ER) - 0.267*dlog(ER(-1)) + \\ & (2.28) \quad (7.80) \quad (10.13) \quad (-7.70) \\ & 0.045*dlog(ER(-2)) + 0.024*dlog(ER(-4)) + 0.068*RES\_MON(-1) + 0.056*DUM9809 \\ & (5.07) \quad (2.50) \quad (1.49) \quad (2.28) \end{aligned} \qquad (2')$$

The signs of the variables are generally as expected and all the variables are significant but the ECM term *(RES_MON(-1))*. This suggests that the pressure from the money supply-demand variable does not help to explain inflation in this specification. This may stem from econometric problems and incapability of the model of incorporating this issue properly. Probably, the short-run inflation dynamics is volatile and the channels of transmission are more complex.

Thus, we estimated another short-run model but without the ECM term. Similarly to the equation (2) the general model:

$$dlog(CPI_t) = c + \Sigma_i \alpha_i dlog(CPI_{t-i}) + \Sigma_i \beta_i dlog(ER_{t-i}) + \varepsilon_t \qquad (3)$$

was tested down with respect to significance of the explanatory variables. The final model (see Appendix 7) took a form (*t*-statistics in parentheses):

$$\begin{array}{l} \text{dlog(CPI)} = 0.002 + 0.702\text{*dlog(CPI(-1))} + 0.414\text{*dlog(ER)} - 0.292\text{*dlog(ER(-1))} + \\ \qquad\qquad (1.83) \qquad\qquad (10.44) \qquad\qquad (43.88) \qquad\qquad (10.02) \\ + 0.039\text{*dlog(ER(-2))} \\ \qquad (4.18) \end{array} \qquad (3')$$

The diagnostic tests proved desirable econometric properties with an exception of the structural break. The analysis of recursive coefficients clearly showed a significant shift in coefficients on the exchange rate at the moment of the crisis. Another confirmation of the existence of the structural break was provided by the Chow breaking point test (see Appendix 7). This was hardly surprising given the change of the exchange rate regime in September 1998. Consequently, the pass-through mechanism of the exchange rate was altered.

Against this background, we decided to split the above model in the two samples: pre- and post-crisis (see Appendix 7). The testing down procedure over the pre-crisis sample rendered a model where the exchange rate does not matter at all. In the face of the exchange rate band this is hardly surprising. The constrained exchange rate volatility does not help to explain high inflation rates (see Figure 12). In the post-crisis sample the exchange rate variable came as significant though the coefficient on the first lag turned out to be negative (see Appendix 7).

These findings and attempts to investigate also the impact of monetary aggregates on inflation inclined us to augment the model (3) with the M2 variable and conduct the same analysis as above. The general form of the model:

$$\text{dlog}(CPI_t) = c + \Sigma_i \alpha_i \text{dlog}(CPI_{t-i}) + \Sigma_i \beta_i \text{dlog}(ER_{t-i}) + \Sigma_i \gamma_i \text{dlog}(M2_{t-i}) + \varepsilon_t , \qquad (4)$$

was tested for lag structure starting from the inclusion of 4 lags. We obtained the following equation (see also Appendix 8):

$$\begin{array}{l} \text{dlog(CPI)} = 0.001 + 0.564\text{*dlog(CPI(-1))} + 0.420\text{*dlog(ER)} - 0.257\text{*dlog(ER(-1))} + \\ \qquad\qquad (0.89) \qquad\qquad (6.88) \qquad\qquad (47.83) \qquad\qquad (-7.70) \\ + 0.046\text{*dlog(ER(-2))} + 0.097\text{*dlog(M2(-1))} \\ \qquad (5.24) \qquad\qquad (3.05) \end{array} \qquad (4')$$

As in the case of model (3) there is evidence of the existence of a structural break - see the Chow breaking point test's results in Appendix 8. The sub-sample models were tested down for the lag structure starting with 3 lags. The limited number of available observations largely determined this choice. The two models past all basic econometric tests for good properties of models. For detailed results see Appendix 8. In all three estimations of model (4') M2 occurred significant but only at the first lag. The elasticity was in a range of 0.097–0.118.

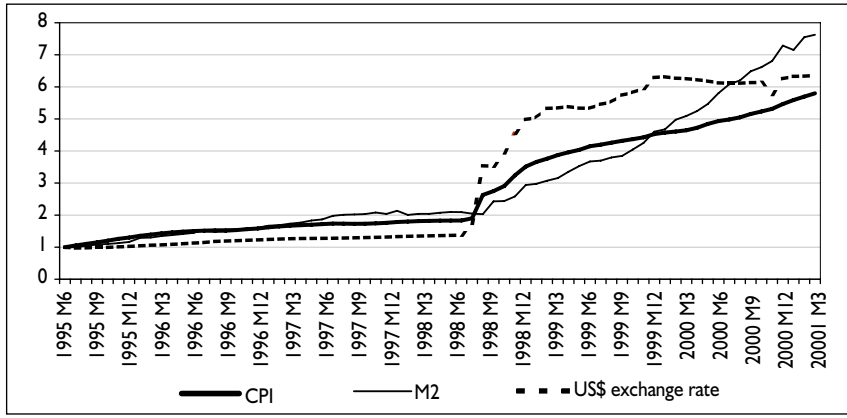
Now we turn to the comparison of short-term inflation models estimated in our exercises. The combined results are presented in Table 1. A first finding is that the inflation inertia was a very important factor. Its role – based on one lag inflation – was especially significant in the pre-crisis period (elasticity in the range 0.86–0.94) as compared to the post-crisis period (around 0.49). In the case of the exchange rate the conclusions are not that straightforward. The models rendered different lag structures and cannot be easily compared. Generally, it can be said that the exchange rate has an immediate impact on inflation and elasticity is usually in a range of 0.34–0.42. Only in the pre-crisis models the exchange rate turned out to be not significant or with wrong sign. In the face of the exchange rate band this result should not surprise.

Table 1. Comparison of short-term inflation models

	const	CPI(-1)	CPI(-2)	CPI(-3)	ER	ER(-1)	ER(-2)	ER(-4)	M2(-1)
Eq. (2')									
Total	0.003	0.651			0.341	-0.267	0.045	0.024	
Eq. (3')									
Total	0.002	0.702			0.414	-0.292	0.039		
Pre-crisis	0.001	0.862							
Post-crisis	0.006	0.489	0.096		0.386	-0.203			
Eq. (4')									
Total	0.001	0.564			0.420	-0.257	0.046		0.097
Pre-crisis	-0.001	0.942		-0.268	-0.869	1.066			0.109
Post-crisis	0.001	0.490	0.117		0.366	-0.225			0.118

Note: Presented numbers are coefficients of respective equations. See text for more explanation.
Source: Authors' calculations.

Figure 12. CPI, M2 and US$ exchange rate, 1995–2001 (June 1995=1)



Note: Variables presented as indexes.
Source: IFS and CBR.

All the statistical exercises carried out above suggest that while there is clearly a strong link between both money supply and exchange rate on the one hand and the inflation rate on the other, the short-run transmission mechanisms are hard to pinpoint in formal econometric models. Figure 12 provides some explanation to this situation. There were several changes in the behavior of the three variables under considerations. Before the crisis of August 1998, the CPI closely followed growing M2, while the exchange rate was lagging behind (the ruble was slowly appreciating in real terms). The crisis marked a breaking point. Substantial depreciation seems to be taking the role of the main driver of price growth, while the changes in M2 lag behind inflation. Another reversion of these trends occurred around January 2000, when real money balances returned to their mid-1995 value and rose significantly in the following months while the nominal exchange rate came to a virtual halt (the ruble experienced fast real appreciation).

7. Recommendations – How to Effectively Fight Inflation in Russia

The above analysis clearly shows that Russia faces a serious problem with bringing the inflation rate to low, i.e. one-digit level, being by any reasonable standards one of the basic conditions for a good investment/entrepreneurial climate and sustainable economic growth. Until 1999, the fiscal policy could be blamed as an ultimate factor being

responsible for this failure. However, in 2000 and 2001 Russia's fiscal situation radically improved, mainly on the back of the oil and gas prices boom on the international markets. Nonetheless, inflation pressure continues, this time coming from a huge balance of payments surplus and a rapid increase in the net foreign assets of the CBR.

In this context, the continued CBR's attempt to target both the exchange rate and money supply seems to be absolutely hopeless and have to be changed. Targeting any exchange rate level or trajectory makes money supply exogenous. Coordinating both policy targets (i.e. quantity of money and exchange rate) is unaffordable in the environment of the free capital movement and fluctuating money demand function. Both these characteristics are fully relevant to Russia's economic environment (in spite of some continuing restrictions on capital movement, they prove inefficient in stopping arbitrage between Russian and international financial markets).

In 2001, the situation became even more difficult for several reasons. First, as a remonetization process after the August 1998 financial crisis progressed fast in 1999–2000 the room for a further increase of demand for money narrowed. Second, the CBR does not have any significant sterilization possibilities as the level of mandatory reserve requirement is rather high, the Russian financial market is shallow and illiquid (particularly after the crisis), and any sterilization proves a very costly exercise. Third, being under the pressure of exporters' lobby (particularly that of the manufacturing sector) the CBR started to depreciate gradually the ruble exchange rate vis a vis the US dollar (imitating a kind of a crawling peg trajectory) that additionally strengthened an inflationary pressure through both price and money supply channels.

Defending the ruble real exchange rate from further real appreciation seems to become a serious concern of Russian policy makers. While it is indeed the fact, that the overvalued exchange rate can become a serious macroeconomic problem, dumping the economic growth, deteriorating balance of payments, and threatening another currency crisis in the future, three important remarks must be made at this point.

First, it is a methodologically unjustified practice to compare the current real exchange rate with any historical level in the past and particularly that immediately after the currency crisis (in 1998) and the associated market panic. Many factors such as, for example, remonetization, dramatically improving terms of trade, and the beginning of economic recovery impacted on the real exchange rate on the upside (i.e., strengthening real appreciation of the ruble). Generally, real appreciation of a currency is a normal phenomenon if it is matched by faster (than in a reference country) productivity growth, particularly in the tradable goods sector (the Harrod-Balassa-Samuelson effect).

Second, looking at the Russian balance of payments the exchange rate prevailing in 2000 and 2001 must be considered as being out of any equilibrium level (disregarding fundamental methodological difficulties with estimating an exact equilibrium exchange

rate), i.e. undervalued and not overvalued. Russia is running a huge current account surplus, which is partly corrected by the continuing capital outflows. Assuming even the modest progress in the investment climate the capital account will certainly improve both on the outflow and inflow side. This will further aggravate the current balance of payments disequilibrium.

Third and most importantly, in the world of free capital movement monetary policy cannot influence the real exchange rate, particularly when the scale of balance of payments disequilibrium is so high (see above). Any attempt to stop nominal appreciation or to achieve nominal depreciation (the current case) must bring an additional price increase acting towards real appreciation. Therefore, the whole struggle proves hopeless.

Fiscal policy can contribute more in this respect. And here the campaign for an even higher fiscal surplus to repay foreign debt (instead of applying for its subsequent restructuring) or create the oil/gas stabilization fund (following the experience of Norway and recently of Kazakhstan) has made much sense. Such a policy would not only help to slow down the pace of accumulation of foreign exchange reserves of the CBR (and therefore slow down growth in base money) but it would also improve the medium and long term fiscal position of Russia, enhance its financial rating and reduce a risk of another default in the future. However, it does not necessarily need to solve the problem of appreciation pressure, particularly in the longer run. Improving fiscal position and decreasing country's risk may discourage capital outflows and encourage inflows of foreign investment. This kind of a 'crowding-in' phenomenon has been observed in other transition economies.

In the light of the above discussion any effective anti-inflationary policy in Russia must involve abandoning by monetary authorities their dual policy goal, i.e. both fighting inflation and targeting the real exchange rate as well as attempts to operate simultaneously several monetary instruments – forex market intervention, lending rates, placing monetary certificates, changing reserve requirement, etc.

So far the CBR has run the hybrid monetary policy regime focusing both on exchange rate and money supply target. Empirical experience of many countries shows that this kind of regime is becoming increasingly ineffective in terms of achieving the ultimate goal of monetary policy (i.e., price stability) and, moreover, it makes an economy vulnerable to possible speculative attacks endangering a currency crisis.

What are the main weaknesses of hybrid (intermediate) regimes such as fixed but adjustable peg, crawling peg, crawling band, horizontal band, or managed float (Russia, in its short transition history has already experimented with the majority of them)? The first and the most fundamental flaw is that halfway solutions are unlikely to provide advantages of pure (so-called 'corner' regimes – see below), i.e., neither an exchange rate anchor nor a sufficient discretion in managing domestic liquidity. On the contrary, they may bring

both a substantial exchange rate volatility (actual or expected when the peg is not viewed as credible) and make money supply exogenous (i.e. beyond the control of monetary authorities). Second, compromised regimes are technically very difficult to manage because of fluctuating demand for money and changing market expectations. Moreover, the pressure from current economic and political conditions may bring temptation to go beyond the reasonable compromise. Third, transparency, and, therefore, credibility of intermediate regimes is lower than that of the extreme solutions. Exactly, this weakness of hybrid regimes, i.e. insufficient transparency and credibility has been strongly manifested during financial crises of the 1990s (Obstfeld and Rogoff, 1995; McCallum, 1999; Eichengreen and Hausmann, 1999; IIE, 1999).

This leads us to a more fundamental debate about the monetary and exchange rate regimes in the world of the free capital movement. Referring to the Mundell-Fleming model and the principle of the 'impossible trinity' (Frankel, 1999) one can argue that any country must give up one of the three alternative policy goals: exchange rate stability, monetary independence, and financial market integration. Having all three simultaneously is impossible. Assuming that the increasing capital mobility is irreversible, the choice remains between the monetary independence and the exchange rate stability. In practice this means either retaining monetary independence under the free float or giving up monetary independence by adopting an extreme version of the fixed exchange rate regime, such as currency board, monetary union, or a unilateral adoption of a foreign currency. This view is gaining ground in the recent economic literature (Mundell, 1999; Krugman, 1999; Eichengreen, 1999).

Deciding on which 'corner' solutions is better for the individual country should involve a careful assessment of advantages and disadvantages of both of them while taking into account country's specific characteristics. For example, choosing the monetary independence and the floating exchange rate regime can look attractive for a number of reasons. First, a country retains its formal monetary sovereignty what can be an important political and legal argument, particularly in the case of Russia. Second, the exchange rate remains as an ultimate shock absorber. Although neither the government nor the central bank can use it as a direct policy tool (intentional depreciation or appreciation) under the floating exchange rate regime, they can expect that the market exchange rate will follow changes in the trade flows and terms of trade unless they are counterbalanced by changes in financial flows (with the opposite sign). Third, there is also a purely theoretical risk that the foreign currency anchor will turn out to be less stable in future than would be the domestic currency. However, this does not seem to be a real danger for Russia that is still struggling with a legacy of low-credibility.

On the other hand, economic costs of running independent monetary policy as measured by interest rate spreads and exchange rate risk (the former is, to a significant

extent, the consequence of the latter) must be taken into account. This is strictly connected not only to the credibility of domestic monetary and in general macroeconomic policy but also with the phenomenon of currency substitution.

Increasing financial integration provides economic agents in most countries (including those applying partial capital controls) with an opportunity of effective currency arbitrage (see Dąbrowski, 2000), regardless whether it is conducted between countries or between currencies in one country. As a result, the monopoly power of the monetary authority to issue a national currency and to collect seigniorage becomes undermined.

Hence, it seems that an independent monetary policy and the free floating is a very difficult and costly option for countries that suffer from high or moderate chronic inflation, have recent inflationary memory, low level of monetization, and lack sufficient political and institutional credibility. These characteristics are typical for most transition countries, particularly Russia and other CIS countries. This implies that the free float under independent monetary policy is a viable option only for large economies or economic blocks (for instance, US, Japan, and the Euro zone) and some other countries, which have managed to establish the international reputation with respect to their currencies and their monetary authorities (for instance Canada, Australia, New Zealand, Switzerland and the UK – if it decides to stay out of the EMU).

The above hypothesis is confirmed by the results of empirical research demonstrating the low credibility and high macroeconomic costs of floating and intermediate currency regimes in a number of Latin American countries, that contrasts with the experience of Panama that has adopted the US dollar as a national currency (Eichengreen and Hausmann, 1999).

The ultimate-fix corner solution provides an economy with a credible anchor, which allows for importing low inflation, and lower interest rates, secures an exchange rate stability and lowers transaction costs. In addition, contrary to a pegged exchange rate under the intermediate regimes, it almost eliminates the devaluation risk and a danger of using monetary policy for other purposes than achieving the price stability. However, eliminating domestic credit activities on the side of the central bank and thus giving up its role as the lender of the last resort may create problems for managing the stability of a banking sector. The latter argument is particularly important for Russia, where the banking sector is fragile. Also, if a country represents a geographically diversified structure of its foreign trade, the choice of a single-currency anchor (the dollar or the euro in most cases) provides only a partial external price stability and only to some extent eliminates the exchange rate risk in trade transactions. Such a diversification of currency structure of foreign trade transactions is certainly the case in Russia[8]. The currency basket reflecting country's foreign transactions

[8] The Russia's specific characteristics also involve a regional factor. One may expect that for the Russian Far East the yen is and will be an important transaction currency.

structure, being the standard solution under the intermediate regimes is rather technically difficult to operate under the currency board regime[9] not mentioning the adoption of the other country's currency.

This fundamental discussion has influenced, to certain extent, evolution of monetary/exchange rate regimes in transition countries. This relates particularly to the Central Europe and Balkan region where some shift from intermediate regimes towards the so-called corner solutions can be observed. It is determined by both the unsatisfactory results of the previous hybrid regimes and, in some cases, by political developments.

Responding to severe currency and banking crises in 1996 and early 1997, Bulgaria introduced the German mark denominated currency board on July 1, 1997. The same kind of monetary regime was introduced in Bosnia and Herzegovina in 1997 as a consequence of the Dayton peace agreement. After the Kosovo crisis in 1999, the province, being under the temporary UN administration, introduced the German mark as a legal tender. In 1999, Montenegro introduced the German mark as the parallel currency (apart from the Yugoslav dinar) and in October 2000 German mark (euro) became the sole legal tender in this republic.

Much earlier, two Baltic countries adopted the currency board regimes: Estonia in June 1992 (German mark denominated) and Lithuania in April 1994 (US dollar denominated, re-denominated to euro in February 2002).

On the other hand, several Central European countries have moved gradually towards direct inflation targeting (DIT) under the floating exchange rate arrangement. The Czech Republic introduced this regime at the beginning of 1998 and Poland at the end of 1998. In the case of Poland (from April 2000) this is a genuine pure float without any intervention of the central bank. In 1998, Slovakia also moved towards a floating exchange rate regime although without a clear nominal anchor guiding its monetary policy operations. Finally, in June 2001 Hungary declared a significant widening of its exchange rate band, abandoning preannounced crawling peg, and approaching the DIT regime. The DIT strategy contributed to a relatively fast disinflation in the Czech Republic. In the case of Poland bringing the CPI_12 inflation to the level of approximately 4% took more than two years and involved the episode of major reversal of the disinflation trend in 1999–2000 (mainly due to limited consistency and credibility of monetary policy).

Which conclusions of this debate can be useful for Russia? First, there is no easy choice as each variant of monetary policy regime feature certain shortcomings. Second,

[9] Latvia that fixes its currency to the SDR provides an interesting example. While the country has not formally declared the introduction of the currency board, all the technical indicators are the same as in the currency board regime.

the strategic choice should concern one of the 'corner' regimes, as the continuation of any intermediate variant seems to be the worst solution.

However, chances for sovereign monetary policy in Russia with good results (i.e. significant lowering inflation) and at low costs for the real sector are rather bleak. Finding a variant of free float, which would be easy for operating in the specific Russian conditions, poses another difficulty. The direct inflation targeting (DIT) being the most popular variant of an independent monetary policy in the contemporary world requires a very high technical complexity and sophistication while the shallow financial market, fragile banking sector and extensive dollarization seriously complicate monetary transmission mechanisms in Russia. In addition, the DIT involves, by definition, a significant room for discretionary decisions, which requires to be backed by a strong anti-inflationary consensus both on the conceptual and political level. Thus, money aggregate targeting seems to be the only technically realistic and relatively transparent variant of an independent monetary policy for Russia.

The opposite 'corner' solution can also raise some doubts. Following the classical optimal currency area' arguments on asymmetric shocks one may argue that the ultimate fix is a not the good variant for the major exporter of basic commodities subject to international price fluctuations (Soos, 2001). Accepting this argumentation in the case of Russia means, however, that the exchange rate is expected to accommodate, at least partly, shifts in the balance of payments caused by changes in international oil and gas prices. As a consequence, the ruble would nominally appreciate in periods of high prices (like in 2000 and 2001) and depreciate when prices go down. But this would mean serious shocks both for the real economy and for domestic money demand. The latter is a particularly sensitive issue in a country with a fresh inflationary memory, limited credibility of macroeconomic policy, and advanced currency substitution.

Looking more generally how to accommodate major terms of trade fluctuations, we do not believe that monetary policy is able to do this under any particular monetary regime. Some accommodation can be only provided by fiscal policy, in the form of the aforementioned stabilization fund.

Thus, balancing all pros and cons, the 'hard peg' seems to be a more promising solution for Russia, especially taking into consideration its actual dollarization and limited confidence in domestic currency. However, implementation of this option would need a careful preparation and several accompanying policy reforms:

1. Accumulating net foreign reserves of the CBR, which will cover at least 100% of the monetary base (some additional margin would allow to create a special fund for providing the lender-of-last-resort window for commercial banks). This condition was met in summer 2001.

2. Choice of the anchor currency, taking into account both political and economic

arguments. While the former rather support the Euro the latter favor the US dollar for at least two reasons – the actual widespread dollarization and historical observation that oil prices are positively associated with the strength of dollar (see Soos, 2001).

3. Choice of the proper level of the ultimate exchange rate in relation to the anchor currency what involves a necessity to estimate a long-term equilibrium exchange rate *ex ante*.

4. Choosing the concrete form of a 'hard peg'. While the currency board allows to retain seigniorage revenues and national currency unit it may involve continuing uncertainty on the sustainability of this choice (danger of abandoning currency board in the case of an extreme speculative attack as it happened in Argentina in the beginning of 2002). Thus, from the credibility point of view dollarization seems to be a better solution than the dollar-denominated currency board because it eliminates any possibility of violating the adopted rules.

5. Achieving substantial progress in restructuring commercial banks prior to giving up credit activity of the CBR (in order to avoid the danger of a banking crisis in the future).

6. Achieving progress in repaying the external debt and fiscal consolidation (some headway has been already achieved in this area) in order to avoid the default in future.

7. Fiscal policy must become more active in absorbing terms-of-trade shocks (mainly coming from fluctuating prices of oil, gas and other commodities). The idea of an oil/gas stabilization fund could provide an adequate policy response to this challenge.

Dollarization can provide Russia with much needed stability and credibility but a success or a failure of this idea will depend on the overall policy mix. If such a solution is supported by a prudent fiscal policy, healthy financial and corporate sectors, and flexible markets of goods, services, labor and capital, this can create a sound foundation for sustainable economic growth (as in the case of Estonia). On the contrary, if fiscal policy is too expansive, banking sector is fragile, markets not flexible enough, and domestic politics unstable, the economy will experience stagnation or even recession (the case of Argentina). However, in such a situation it is difficult to find any good monetary regime, which could accommodate fundamental structural and institutional weaknesses.

8. Summary and Conclusions

Our research proves that inflation in Russia is, without any doubts, a monetary phenomenon although no simple and clear relationship between money supply and inflation, particularly in short term, was found. The econometric analysis helped to

establish a long-run relationship between real money balances and real output (proxied by industrial production) and interest rate. The obtained results stay broadly in line with similar studies for other emerging economies. The above does indicate clearly that there is a direct pass-through from monetary expansion to inflation in the long run. It is also clearly visible that the exchange rate strongly influenced CPI trends.

Our analysis clearly demonstrated that the financial crisis of August 1998 constituted a turning point in developments of M2, exchange rate, and the CPI. The attempt to model econometrically the short-run inflation dynamics proved difficult and the obtained results were tentative. In the short run past inflation proved to be the best predictor of inflation (meaning the strong inflationary inertia), with exchange rate also playing an important role. The pass through from changes in M2 to inflation proved hard to capture in the short-run. However, it should be kept in mind that our short-run models were very sensitive to their parameterization (the choice of a sample and the lag structure). They may fail to track down properly the complex underlying inflation dynamics. All the constructed models should be treated with caution as they may suffer form omitted variable problems and misspecifications. Thus, all the coefficient estimates should be indicative only of relative magnitudes and not treated as exact point-estimates.

The lack of a very clear relation between monetary aggregates and inflation stems from the fluctuating money velocity (monetization level), which is very sensitive to past inflation, devaluation episodes, changes in the monetary policy regime and in other areas of macroeconomic policy. The sustained high level of dollarization reflects the limited credibility of monetary policy in Russia and low confidence in the ruble. This constitutes one of the key arguments in favor of a radical change in the monetary policy strategy, which had a hybrid character so far.

In analyzing the existing policy choices in the environment of the de facto free capital movement it was found that more arguments support the choice of the permanently fixed exchange rate in the form of dollarization than the opposite 'corner' solution – fully independent monetary policy under the free float. However, a success of this option (and possibly of any discussed option) will depend on the accompanying fiscal, banking and other structural reforms creating a healthy policy mix and flexible microeconomic environment. The conditions of successful implementation of suggested strategy and technical aspects of such an operation certainly need further discussion.

References

Antczak, R. (2001). "The Russian financial crisis of 1998", in M. Dąbrowski (ed.), The Episodes of Currency Crises in Transition Economies, *CASE Reports*, No. 40, Warsaw.

Balino T.J.T., Hoelsher, D., and J. Horder (1997), "Evolution of Monetary Policy Instruments in Russia", *IMF Working Paper*, WP/97/80.

Balino, T.J.T, A. Bennett,, E. Borensztein (1999), Monetary Policy in Dollarized Economies, *IMF Occasional Paper* No. 171.

Brodsky, B. (1997), "Dollarization and Monetary Policy in Russia", *Review of Economies in Transition 6/97*, Bank of Finland, Unit for Eastern European Economies.

Dąbrowski, M. (1997), "The Reasons for the Collapse of the Ruble Zone", in: L.T. Orłowski, D. Salvatore (eds.), *Trade and Payments in Central and Eastern Europe's Transforming Economies*, Greenwood Press.

Dąbrowski, M. (2000), "Global Integration of Financial Markets and Its Consequences for Transition Economies", in: L. T. Orlowski (ed.): *Transition and Growth in Post-communist countries*, Edgar Elgar.

Dąbrowski, M. (ed.) (1999), "Disinflation, Monetary Policy and Fiscal Constraints – Experience of the Economies in Transition", *CASE Reports* No. 16.

Dąbrowski, M., U. Górski,, M. Jarociński (1999), "Inflationary Consequences of Devaluation Crises in Russian and Ukraine: The First Observations", *CASE Studies and Analyses* No. 159.

Eichengreen, B. (1999), "Toward a New International Financial Architecture: A Practical Post-Asia Agenda", *Institute for International Economics*.

Eichengreen, B., R. Hausmann (1999), "Exchange Rates and Financial Fragility", *NBER Working Paper,* No. 7418, November.

Fair, R.C. (1986), "International Evidence on the Demand for Money", *NBER Working Paper*, No. 2106, December.

Frankel, J. A. (1999), "No Single Currency Regime is Right for All Countries or at All Times", *NBER Working Paper*, No. 7338, September.

Ghosh, A.R. (1997), "Inflation in Transition Economies: How Much? And Why?", *IMF Working Paper*, WP/97/80.

Greene, W.H. (1993), *Econometric Analysis, Second Edition*, Prentice-Hall, Inc.

Griffiths, W.E., R.C. Hill, and G.G. Judge (1993), Learning and Practicing Econometrics, John Wiley & Sons, Inc.

Hernadez-Cata, E. (1999), "Price Liberalization, Money Growth, and Inflation During the Transition to a Market Economy", *IMF Working Paper*, WP/99/76.

IIE (1999), *Safeguarding Prosperity in a Global Financial System. The Future International Financial Architecture*, A Council of Foreign Relations-Sponsored Report, Institute for International Economics, Washington, D.C.

IMF (1999), "Russian Federation: Recent Economic Developments", *IMF Staff Country Report* No. 99/100, September.

IMF (2000), "Russian Federation: Selected Issues", *IMF Staff Country Report* No. 00/150, November.

IMF (2001), "The Decline of Inflation in Emerging Markets", Chapter IV in *World Economic Outlook*, May 2001, p. 116–144.

Johansen, S. (1995), *Likelihood-based Inference in Cointegrated Vector Autoregressive Models*, Oxford University Press.

Kalra, S. (1998), "Inflation and Money Demand in Albania", *IMF Working Paper*, WP/98/101.

Koen, V., P. De Masi (1997), "Prices in the Transition: Ten Stylized Facts", *IMF Working Paper*, WP/97/158.

Komulainen, T., J. Pirttila (2000), "Fiscal Expansions for Inflation: Any Evidence from Transition Economies?", *Bank of Finland Discussion Paper*, No. 11.

Korhonen, I. (1998), "A Vector Error Correction Model for Prices, Money, Output and Interest Rate in Russia", *Review of Economies in Transition* 5/98, Bank of Finland, Unit for Eastern European Economies.

Krugman, P. (1999), "Depression Economics Returns", *Foreign Affairs*, 78, 1.

Liu, O., O.S. Adedeji (2000), "Determinants of Inflation in the Islamic Republic of Iran: A Macroeconomic Analysis", *IMF Working Paper*, WP/00/127.

McCallum, B. T. (1999), "Theoretical Issues Pertaining to Monetary Unions", *NBER Working Paper*, No. 7393, October.

Menshikov (1999), "Macropolicies to Help Re-start Economic Growth in Russia", www.ecaar-russia.org/fast2.htm

Mundell, R. (1999), "The Priorities for Completing the Transition and the Model for the Future", paper prepared for the 5th Dubrovnik Conference on Transition Economies: *Ten Years of Transition: What Have We Learned and What Lies Ahead,* June 23–25, Dubrovnik, Croatia.

Mourmouras, A., S. H. Russel (2000), "Smuggling, Currency Substitution and Unofficial Dollarization: A Crime-Theoretic Approach", *IMF Working Paper*, WP/00/176.

Nachega, J. (2001) "A Cointegration Analysis of Broad Money Demand in Cameroon", *IMF Working Paper*, WP/01/26.

Obstfeld, M., K. Rogoff (1995), "The Mirage of Fixed Exchange Rates", *NBER Working Paper*, No. 5191.

Pesonen, H. and I. Korhonen (1998), "The Short and Variable Lags of Russian Monetary

Policy", *Review of Economies in Transition 4/98*, Bank of Finland, Unit for Eastern European Economies.

Rostowski, J. (1993), "The Inter-enterprise Debt Explosion in the Former Soviet Union: Causes, Consequences, Cures", *Communist Economies & Economic Transformation,* Vol. 5, No. 2.

Rother, P.C. (2000), "Inflation in Albania", IMF *Working Paper*, WP/00/207

Sachs, J.D, F. Larrain (1993), "Macroeconomics in the Global Economy, Prentice Hall.

Sahay, R., C. Vegh (1995), "Dollarization in Transition Economies: Evidence and Policy Implications", *IMF Working Paper*, WP/95/96.

Soos, K.A. (2001), "Does one size fit all? Remarks to the introducing a hard currency peg in Russia", RECEP, mimeo.

Walewski, M. (1998), "Wage-Price Spiral in Poland and other Postcommunist Countries", CASE-*CEU Working Papers Series*, No. 22.

Appendixes

Appendix 1. Broad money composition, 1994–2001 (millions of rubles)

	NFA	NCG	CPS	OIN	M2
1994Q1	36 708.1	13 380.0	49 030.0	-45 231.1	53 887.0
1994Q2	37 372.3	24 924.0	68 767.0	-58 984.3	72 079.0
1994Q3	40 055.0	46 020.0	93 759.0	-81 665.0	98 169.0
1994Q4	59 386.9	71 127.0	122 513.0	-123 295.9	129 731.0
1995Q1	74 058.0	87 585.0	157 426.0	-161 188.0	157 881.0
1995Q2	78 266.0	107 328.0	167 555.0	-139 099.0	214 050.0
1995Q3	72 614.8	138 902.0	187 147.0	-163 305.8	235 358.0
1995Q4	66 039.7	166 578.0	197 093.0	-153 929.7	275 781.0
1996Q1	73 629.5	188 308.0	213 890.0	-181 034.5	294 793.0
1996Q2	56 278.6	231 499.0	225 346.0	-183 354.6	329 769.0
1996Q3	42 123.5	279 898.0	216 096.0	-203 717.5	334 400.0
1996Q4	45 572.1	311 467.0	227 830.0	-227 545.1	357 324.0
1997Q1	32 880.7	331 670.0	237 038.0	-223 625.7	377 963.0
1997Q2	71 536.7	328 804.0	252 110.0	-229 194.7	423 256.0
1997Q3	42 003.4	351 404.0	272 540.0	-231 251.4	434 696.0
1997Q4	12 120.1	381 189.0	278 059.0	-214 123.1	457 245.0
1998Q1	60.9	402 172.0	275 377.9	-241 442.6	436 169.0
1998Q2	-4 230.6	398 568.0	284 842.6	-231 277.4	447 902.0
1998Q3	-109 700.0	588 177.0	382 156.7	-340 583.8	520 050.0
1998Q4	-98 770.5	722 237.0	386 875.0	-381 699.5	628 642.0
1999Q1	-80 289.3	818 415.0	427 475.0	-490 269.0	675 332.0
1999Q2	4 846.2	844 568.0	449 997.0	-513 341.2	786 070.0
1999Q3	44 591.1	851 721.0	486 225.0	-559 029.1	823 508.0
1999Q4	107 183.0	905 161.0	582 036.0	-609 505.6	984 874.0
2000Q1	288 120.0	856 878.0	635 791.0	-690 391.5	1 090 398.0
2000Q2	484 306.0	775 073.0	713 939.0	-730 470.8	1 242 847.0
2000Q3	633 277.0	722 694.0	822 279.0	-789 826.5	1 388 424.0
2000Q4	737 141.0	735 687.0	955 996.0	-868 861.0	1 559 964.0
2001Q1	896 109.0	670 507.0	1 037 092.0	-971 368.0	1 632 338.0

Notes: NFA – Net foreign assets,
NCG – Net claims on government,
CPS – Claims on private sector,
OIN – Other items net.

Sources: IFS and CBR.

Appendix 2. Contributions to M2 qoq growth, 1994–2001 (%)

	NFA	NCG	CPS	OIN	M2
1994Q1					
1994Q2	1.23	21.42	36.63	-25.52	33.76
1994Q3	3.72	29.27	34.67	-31.47	36.20
1994Q4	19.69	25.58	29.29	-42.41	32.15
1995Q1	11.31	12.69	26.91	-29.21	21.70
1995Q2	2.67	12.50	6.42	13.99	35.58
1995Q3	-2.64	14.75	9.15	-11.31	9.95
1995Q4	-2.79	11.76	4.23	3.98	17.18
1996Q1	2.75	7.88	6.09	-9.83	6.89
1996Q2	-5.89	14.65	3.89	-0.79	11.86
1996Q3	-4.29	14.68	-2.80	-6.17	1.40
1996Q4	1.03	9.44	3.51	-7.13	6.86
1997Q1	-3.55	5.65	2.58	1.10	5.78
1997Q2	10.23	-0.76	3.99	-1.47	11.98
1997Q3	-6.98	5.34	4.83	-0.49	2.70
1997Q4	-6.87	6.85	1.27	3.94	5.19
1998Q1	-2.64	4.59	-0.59	-5.97	-4.61
1998Q2	-0.98	-0.83	2.17	2.33	2.69
1998Q3	-23.55	42.33	21.73	-24.40	16.11
1998Q4	2.10	25.78	0.91	-7.91	20.88
1999Q1	2.94	15.30	6.46	-17.27	7.43
1999Q2	12.61	3.87	3.33	-3.42	16.40
1999Q3	5.06	0.91	4.61	-5.81	4.76
1999Q4	7.60	6.49	11.63	-6.13	19.60
2000Q1	18.37	-4.90	5.46	-8.21	10.71
2000Q2	17.99	-7.50	7.17	-3.68	13.98
2000Q3	11.99	-4.21	8.72	-4.78	11.71
2000Q4	7.48	0.94	9.63	-5.69	12.35
2001Q1	10.19	-4.18	5.20	-6.57	4.64

Source: Authors' calculations based on IFS and CBR data.

Appendix 3. Selected monetary indicators, 1994–2001

	CPI	Average USD exchange rate	Monetization % of GDP	M2 velocity	Money multiplier (M2)	Money multiplier (M1)
1994Q1	46.50	1.58	15.41	6.49	1.98	1.09
1994Q2	25.22	1.87	13.84	7.22	1.89	1.11
1994Q3	18.40	2.15	14.59	6.86	1.97	1.08
1994Q4	42.52	3.16	14.43	6.93	2.08	1.10
1995Q1	49.79	4.27	15.44	6.48	2.33	1.01
1995Q2	27.61	4.94	14.79	6.76	2.16	1.07
1995Q3	17.87	4.47	12.70	7.87	2.15	1.11
1995Q4	13.97	4.55	13.67	7.32	2.13	1.17
1996Q1	10.90	4.76	15.81	6.33	2.11	1.11
1996Q2	6.58	4.98	15.70	6.37	2.10	1.14
1996Q3	2.03	5.27	14.19	7.05	2.14	1.13
1996Q4	3.12	5.48	14.41	6.94	2.17	1.17
1997Q1	5.41	5.65	17.41	5.74	2.20	1.15
1997Q2	3.42	5.77	17.55	5.70	2.06	1.18
1997Q3	1.77	5.81	15.73	6.36	2.19	1.28
1997Q4	0.70	5.91	16.67	6.00	2.17	1.42
1998Q1	3.17	6.04	19.77	5.06	2.30	1.40
1998Q2	1.51	6.15	17.89	5.59	2.31	1.39
1998Q3	16.24	9.16	18.74	5.34	2.49	1.31
1998Q4	39.79	17.46	19.05	5.25	2.38	1.30
1999Q1	22.91	22.89	19.48	5.13	2.34	1.19
1999Q2	8.52	24.49	17.74	5.64	2.17	1.15
1999Q3	6.22	24.82	15.15	6.60	2.26	1.18
1999Q4	4.09	26.27	17.29	5.78	2.24	1.20
2000Q1	4.48	28.46	18.65	5.36	2.22	1.11
2000Q2	3.76	28.38	18.92	5.28	2.06	1.10
2000Q3	5.30	27.79	17.32	5.77	2.07	1.11
2000Q4	4.91	27.91	19.94	5.02	2.11	1.19
2001Q1	6.68	28.54	21.63	4.62	2.32	1.22

Note: Monetization is defined as a ratio of M2 at the end of quarter to nominal GDP in that quarter multiplied by four.

Sources: IFS, CBR, OECD and Authors' calculations.

Appendix 4. Money demand model – equation (1)

Estimation results

Sample (adjusted): 1996:01 2001:03
Included observations: 63 after adjusting endpoints
Standard errors & t-statistics in parentheses

	LOG(M2_C/CPI_C)	LOG(IP_Y95)	IR
LOG(M2_C(-1)/ CPI_C(-1))	0.943174	0.023488	9.405382
	(0.02207)	(0.05014)	(16.2763)
	(42.7368)	(0.46844)	(0.57786)
LOG(IP_Y95(-1))	0.174483	0.759092	-70.84096
	(0.05136)	(0.11670)	(37.8813)
	(3.39699)	(6.50482)	(-1.87008)
IR(-1)	-0.000228	-0.000217	0.497352
	(0.00012)	(0.00027)	(0.08709)
	(-1.93179)	(-0.80739)	(5.71086)
C	-0.779528	1.108421	334.6804
	(0.23585)	(0.53583)	(173.939)
	(-3.30523)	(2.06859)	(1.92413)
DUM9809	-0.123718	-0.075105	93.37393
	(0.02077)	(0.04718)	(15.3149)
	(-5.95779)	(-1.59192)	(6.09695)
DUM01A	-0.062355	-0.069696	-0.815905
	(0.00888)	(0.02016)	(6.54559)
	(-7.02569)	(-3.45639)	(-0.12465)
R-squared	0.979975	0.664492	0.705416
Adj. R-squared	0.978218	0.635061	0.679575
Sum sq. resids	0.020831	0.107526	11330.39
S.E. equation	0.019117	0.043433	14.09889
F-statistic	557.8889	22.57831	27.29865
Log likelihood	163.0619	111.3615	-252.9446
Akaike AIC	-4.986092	-3.344809	8.220462
Schwarz SC	-4.781983	-3.140701	8.424570
Mean dependent	0.060826	4.567390	27.28810
S.D. dependent	0.129531	0.071897	24.90703
Determinant Residual Covariance		9.96E-05	
Log Likelihood		22.07717	
Akaike Information Criteria		-0.129434	
Schwarz Criteria		0.482890	

Estimation results

Sample: 1996:01 2001:12
Included observations: 63
Test assumption: Linear deterministic trend in the data
Series: LOG(M2_C/CPI_C) LOG(IP_Y95) IR
Exogenous series: DUM9809 DUM01A
Warning: Critical values were derived assuming no exogenous series
Lags interval: 1 to 1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.375547	50.36078	29.68	35.65	None **
0.268197	20.69544	15.41	20.04	At most 1 **
0.016124	1.024086	3.76	6.65	At most 2

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 2 cointegrating equation(s) at 5% significance level

Unnormalized Cointegrating Coefficients:

LOG(M2_C/CPI_C)	LOG(IP_Y95)	IR
0.634471	-2.253425	0.002001
-0.362928	2.103327	0.007136
0.989879	0.547720	0.001814

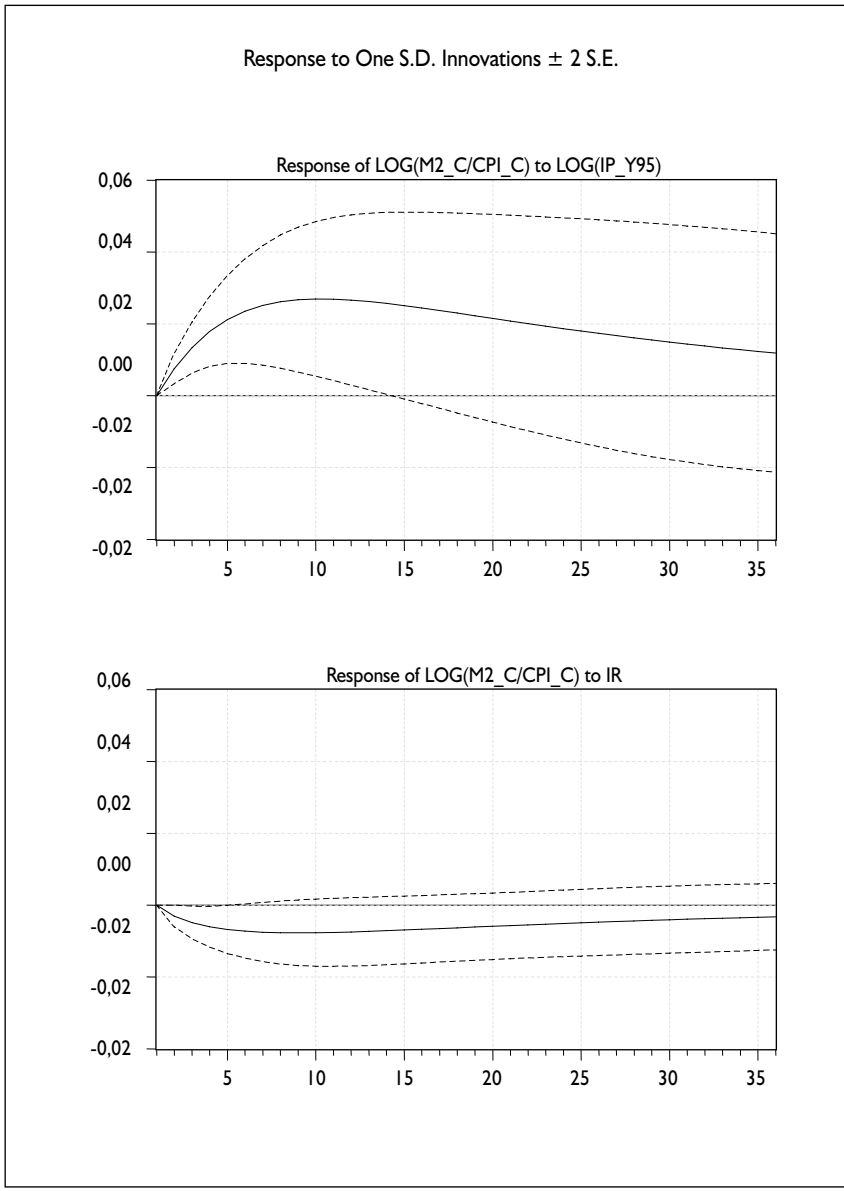
Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

LOG(M2_C/CPI_C)	LOG(IP_Y95)	IR	C
1.000000	-3.551659	0.003153	16.07073
	(1.06116)	(0.00215)	
Log likelihood	17.30649		

Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)

LOG(M2_C/CPI_C)	LOG(IP_Y95)	IR	C
1.000000	0.000000	0.039267	-1.165132
		(0.04787)	
0.000000	1.000000	0.010168	-4.852905
		(0.01193)	
Log likelihood	27.14217		

Impulse response function



Appendix 5. Money demand function – quarterly data

Estimation results

Sample (adjusted): 1994:4 2001:1
Included observations: 26 after adjusting endpoints
Standard errors & t-statistics in parentheses

	LOG(M2_C/CPI_C)	LOG(IP_Y95)	IR
LOG(M2_C(-1)/ CPI_C(-1))	0.706966	0.062710	266.8190
	(0.08971)	(0.09244)	(124.817)
	(7.88084)	(0.67837)	(2.13767)
LOG(IP_Y95(-1))	0.861181	0.746073	-130.9461
	(0.19111)	(0.19693)	(265.906)
	(4.50625)	(3.78843)	(-0.49245)
IR(-1)	-0.000350	-2.24E-05	0.719881
	(9.4E-05)	(9.7E-05)	(0.13072)
	(-3.72484)	(-0.23162)	(5.50707)
C	-4.022516	1.190385	712.0132
	(0.88434)	(0.91130)	(1230.46)
	(-4.54863)	(1.30625)	(0.57866)
DUM01A	-0.119279	-0.030606	17.68266
	(0.02412)	(0.02485)	(33.5579)
	(-4.94558)	(-1.23147)	(0.52693)
R-squared	0.856819	0.482141	0.639511
Adj. R-squared	0.829547	0.383501	0.570847
Sum sq. resids	0.049946	0.053038	96693.73
S.E. equation	0.048769	0.050255	67.85620
F-statistic	31.41696	4.887885	9.313554
Log likelihood	44.42147	43.64063	-143.7681
Akaike AIC	-3.032420	-2.972356	11.44370
Schwarz SC	-2.790479	-2.730414	11.68564
Mean dependent	-0.376488	4.578113	64.89538
S.D. dependent	0.118124	0.064005	103.5817
Determinant Residual Covariance		0.010212	
Log Likelihood		-51.08219	
Akaike Information Criteria		5.083245	
Schwarz Criteria		5.809070	

Cointegration test

Sample: 1994:1 2001:4
Included observations: 25
Test assumption: Linear deterministic trend in the data
Series: LOG(M2_C/CPI_C) LOG(IP_Y95) IR
Exogenous series: DUM01A
Warning: Critical values were derived assuming no exogenous series
Lags interval: 1 to 1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.751923	46.84232	29.68	35.65	None **
0.339087	11.99193	15.41	20.04	At most 1
0.063442	1.638584	3.76	6.65	At most 2

*(**) denotes rejection of the hypothesis at 5% (1%) significance level
L.R. test indicates 1 cointegrating equation(s) at 5% significance level

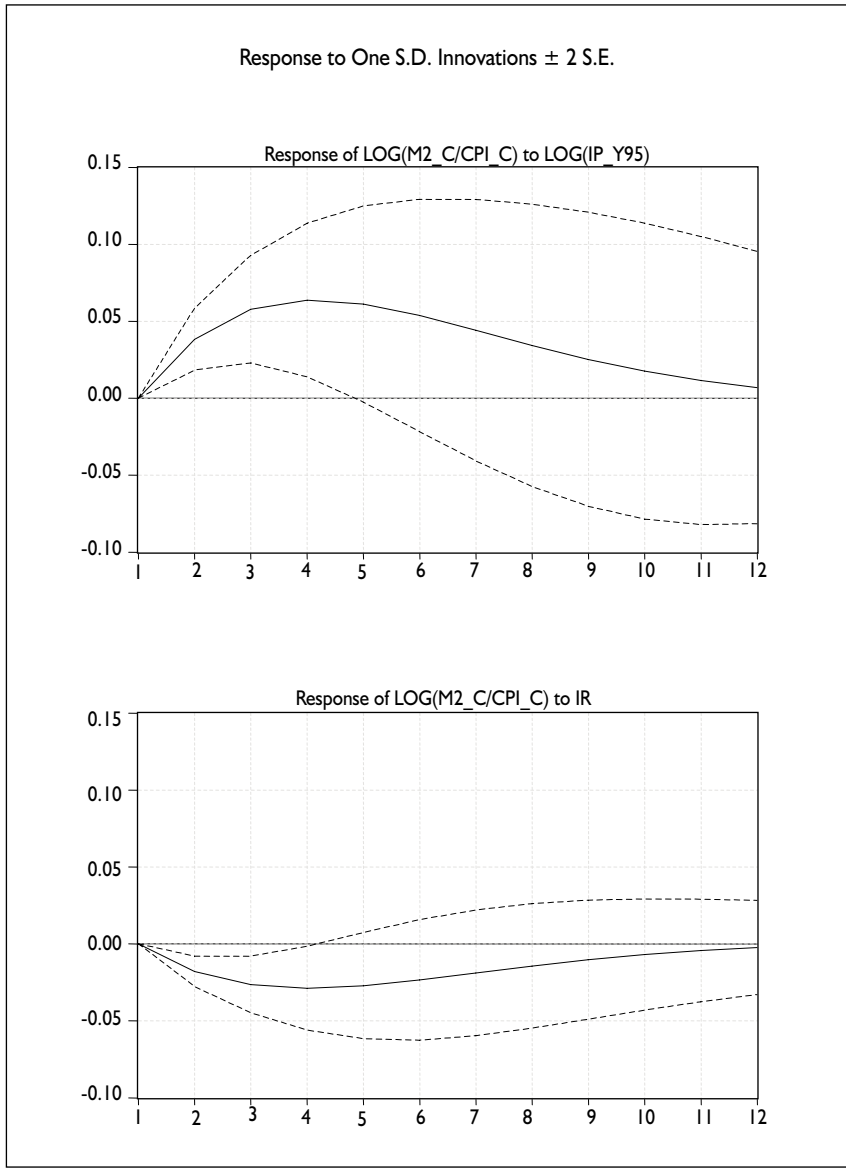
Unnormalized Cointegrating Coefficients:

LOG(M2_C/CPI_C)	LOG(IP_Y95)	IR
1.118597	-4.112556	0.001968
0.215096	-1.697156	-0.001904
2.072876	0.804111	-0.000901

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

LOG(M2_C/CPI_C)	LOG(IP_Y95)	IR	C
1.000000	-3.676532	0.001760	17.08587
	(0.87024)	(0.00052)	
Log likelihood	-36.66452		

Impulse response function



Appendix 6. Short-run price model – equation (2')

Estimation results

Dependent Variable: DLOG(CPI_C)
Method: Least Squares
Sample (adjusted): 1996:01 2001:03
Included observations: 63 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002943	0.001289	2.282744	0.0263
DLOG(CPI_C(-1))	0.650823	0.083476	7.796545	0.0000
DLOG(ER)	0.340574	0.033616	10.13117	0.0000
DLOG(ER(-1))	-0.266934	0.034651	-7.703572	0.0000
DLOG(ER(-2))	0.044639	0.008810	5.066592	0.0000
DLOG(ER(-4))	0.024287	0.009721	2.498317	0.0155
RES_MOM(-1)	0.067932	0.045458	1.494384	0.1408
DUM9809	0.059992	0.026261	2.284429	0.0262
R-squared	0.978360	Mean dependent var		0.023449
Adjusted R-squared	0.975606	S.D. dependent var		0.042676
S.E. of regression	0.006665	Akaike info criterion		-7.065594
Sum squared resid	0.002444	Schwarz criterion		-6.793450
Log likelihood	230.5662	F-statistic		355.2245
Durbin-Watson stat.	1.862317	Prob(F-statistic)		0.000000

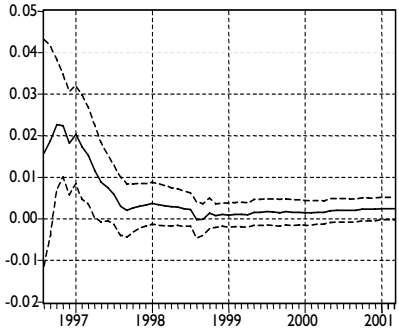
Appendix 7. Short-run inflation model – equation (3')

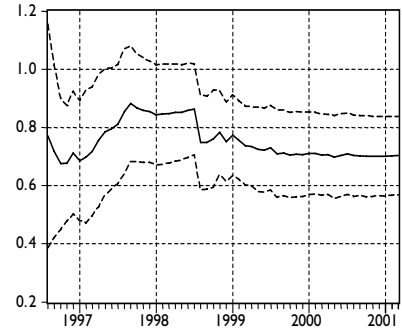
Estimation results – total sample

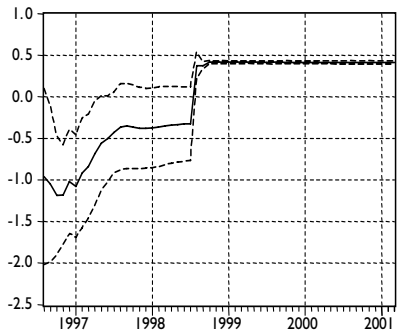
Dependent Variable: DLOG(CPI_C)
Method: Least Squares
Sample (adjusted): 1995:09 2001:03
Included observations: 67 after adjusting endpoints

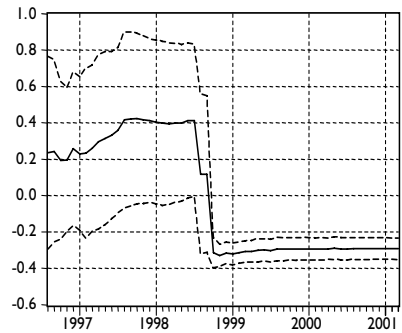
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002449	0.001339	1.828578	0.0723
DLOG(CPI_C(-1))	0.702492	0.067303	10.43776	0.0000
DLOG(ER)	0.414206	0.009439	43.88054	0.0000
DLOG(ER(-1))	-0.292348	0.029191	-10.01519	0.0000
DLOG(ER(-2))	0.039207	0.009388	4.176413	0.0001
R-squared	0.971492	Mean dependent var		0.024522
Adjusted R-squared	0.969653	S.D. dependent var		0.041608
S.E. of regression	0.007248	Akaike info criterion		-6.944393
Sum squared resid	0.003257	Schwarz criterion		-6.779864
Log likelihood	237.6372	F-statistic		528.2129
Durbin-Watson stat.	2.188289	Prob(F-statistic)		0.000000

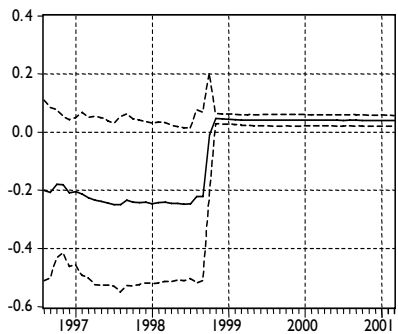
Recursive coefficients of model (3')











Chow Breakpoint Test

Chow Breakpoint Test: 1998:08

F-statistic	3.263779	Probability	0.011644
Log likelihood ratio	16.86840	Probability	0.004756

Estimation results – pre-crisis sample

Dependent Variable: DLOG(CPI_C)
Method: Least Squares
Sample (adjusted): 1995:08 1998:07
Included observations: 36 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000895	0.001378	0.649580	0.5203
DLOG(CPI_C(-1))	0.862128	0.061067	14.11765	0.0000
R-squared	0.854270	Mean dependent var		0.015366
Adjusted R-squared	0.849984	S.D. dependent var		0.014259
S.E. of regression	0.005523	Akaike info criterion		-7.505897
Sum squared resid	0.001037	Schwarz criterion		-7.417923
Log likelihood	137.1061	F-statistic		199.3080
Durbin-Watson stat.	2.228313	Prob(F-statistic)		0.000000

Estimation results – post-crisis sample

Dependent Variable: DLOG(CPI_C)
Method: Least Squares
Sample (adjusted): 1998:10 2001:03
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005716	0.002876	1.987345	0.0579
DLOG(CPI_C(-1))	0.488733	0.154109	3.171349	0.0040
DLOG(CPI_C(-2))	0.095717	0.025786	3.711956	0.0010
DLOG(ER)	0.386403	0.042642	9.061534	0.0000
DLOG(ER(-1))	-0.203239	0.061405	-3.309803	0.0028
R-squared	0.886660	Mean dependent var		0.025765
Adjusted R-squared	0.868526	S.D. dependent var		0.022059
S.E. of regression	0.007999	Akaike info criterion		-6.668104
Sum squared resid	0.001599	Schwarz criterion		-6.434571
Log likelihood	105.0216	F-statistic		48.89387
Durbin-Watson stat.	1.931119	Prob(F-statistic)		0.000000

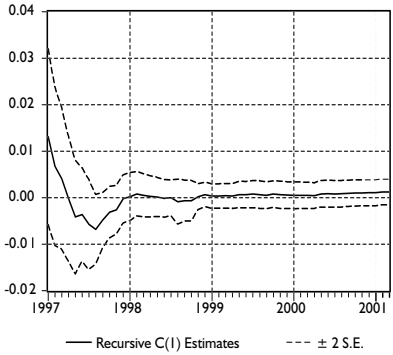
Appendix 8: Short-run inflation model – equation (4')

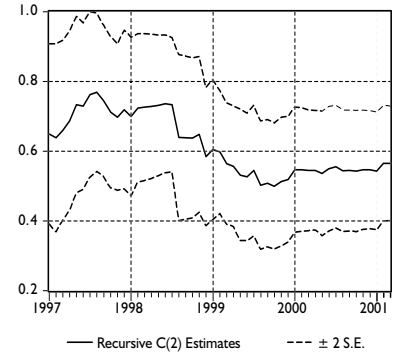
Estimation results

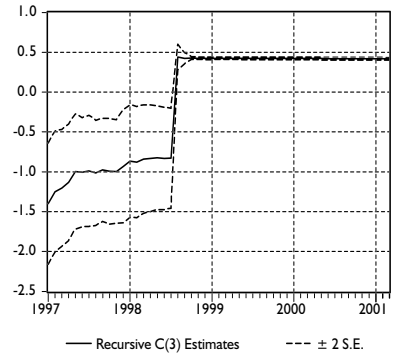
Dependent Variable: DLOG(CPI_C)
Method: Least Squares
Sample (adjusted): 1996:01 2001:03
Included observations: 63 after adjusting endpoints

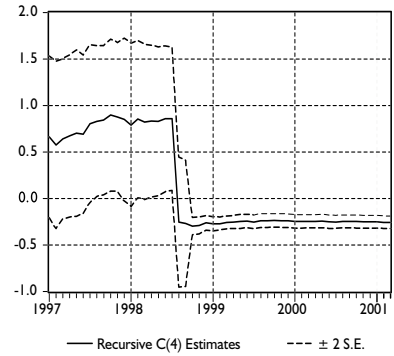
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001215	0.001370	0.886806	0.3789
DLOG(CPI_C(-1))	0.564440	0.082074	6.877184	0.0000
DLOG(ER)	0.419736	0.008775	47.83427	0.0000
DLOG(ER(-1))	-0.257320	0.033412	-7.701305	0.0000
DLOG(ER(-2))	0.046185	0.008822	5.235437	0.0000
DLOG(M2(-1))	0.097178	0.031891	3.047163	0.0035
R-squared	0.977907	Mean dependent var		0.023449
Adjusted R-squared	0.975969	S.D. dependent var		0.042676
S.E. of regression	0.006616	Akaike info criterion		-7.108358
Sum squared resid	0.002495	Schwarz criterion		-6.904250
Log likelihood	229.9133	F-statistic		504.5915
Durbin-Watson stat.	1.823004	Prob(F-statistic)		0.000000

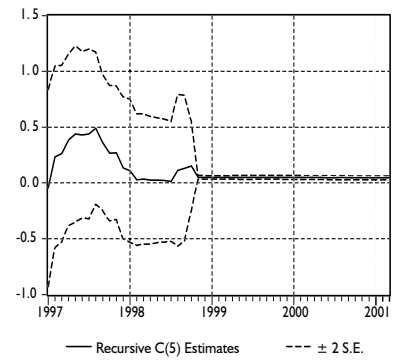
Recursive coefficients of model (4')

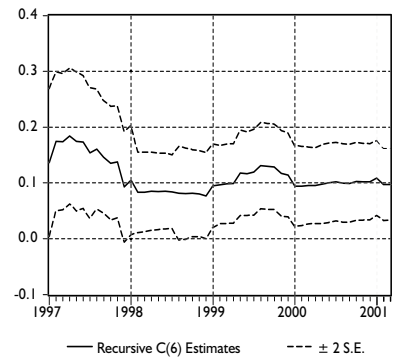












Chow Breakpoint Test

Chow Breakpoint Test: 1998:08

F-statistic	1.913540	Probability	0.096445
Log likelihood ratio	12.79157	Probability	0.046468

Estimation results – pre-crisis sample

Dependent Variable: DLOG(CPI_C)
Method: Least Squares
Date: 06/17/01 Time: 19:00
Sample: 1996:01 1998:07
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000666	0.001644	-0.405325	0.6887
DLOG(CPI_C(-1))	0.941840	0.120891	7.790792	0.0000
DLOG(CPI_C(-3))	-0.268280	0.109903	-2.441068	0.0221
DLOG(ER)	-0.869467	0.280638	-3.098177	0.0048
DLOG(ER(-1))	1.066384	0.279577	3.814270	0.0008
DLOG(M2(-1))	0.108876	0.030830	3.531487	0.0016
R-squared	0.846137	Mean dependent var		0.011054
Adjusted R-squared	0.815365	S.D. dependent var		0.009705
S.E. of regression	0.004170	Akaike info criterion		-7.949820
Sum squared resid	0.000435	Schwarz criterion		-7.672274
Log likelihood	129.2222	F-statistic		27.49652
Durbin-Watson stat.	2.026514	Prob(F-statistic)		0.000000

Estimation results – post-crisis sample

Dependent Variable: DLOG(CPI_C)
Method: Least Squares
Sample (adjusted): 1998:10 2001:03
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001212	0.003567	0.339684	0.7370
DLOG(CPI_C(-1))	0.490048	0.146050	3.355336	0.0026
DLOG(CPI_C(-2))	0.117291	0.026806	4.375621	0.0002
DLOG(ER)	0.366439	0.041678	8.792226	0.0000
DLOG(ER(-1))	-0.225184	0.059263	-3.799773	0.0009
DLOG(M2(-1))	0.118280	0.060394	1.958459	0.0619
R-squared	0.902278	Mean dependent var		0.025765
Adjusted R-squared	0.881919	S.D. dependent var		0.022059
S.E. of regression	0.007580	Akaike info criterion		-6.749698
Sum squared resid	0.001379	Schwarz criterion		-6.469458
Log likelihood	107.2455	F-statistic		44.31874
Durbin-Watson stat.	1.971896	Prob(F-statistic)		0.000000