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Reihe Osteuropa / East European Series No. 49

November 1997

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Abstract

The role and influence of inter-enterprise arrears on Russian economy and implications for the monetary policy are considered. A brief overview of major trends in inter-enterprise arrears development in Russia is given. The reciprocal nature of arrears and strong correlation between the overdue receivables and the overdue payables of the enterprise are emphasized. Money demand interpretation of arrears accumulation and expectations based arrears-inflation mechanism are introduced.

Keywords

JEL-Classifications

1 Introduction

Countries in transition face many difficulties most of which are the consequence of the economic system executed in the past. In particular, such a widespread and commonly accepted form of payments for the purchased or sold goods and services as trade credit had a very peculiar form in the former Soviet Union. Since a market for the trade credit as it is encountered in the market economies is very slow and uneasy to develop, inter-enterprise arrears have emerged to substitute for trade credit. One may consider inter-enterprise arrears as an involuntary form of trade credit. Statistical data for the countries of the former Soviet Union, and for Russia in particular, suggest that inter-enterprise arrears must have a considerable influence on performance of the economies of these countries. Table 1 provides evidence for such a statement.

Table 1: Distribution of the enterprises and organizations having overdue payables/receivables as for January 1, 1994.

	Total number of enterprises (without joint ventures and small businesses)	Number of enterprises with overdue:		The percentage of enterprises with overdue:	
		receivables	payables	receivables	payables
Total	71965	36551	29455	50.8	40.9
Industry (total):	21948	12569	10165	57.3	46.3
Electricity	255	136	113	53.3	44.3
Coal and natural gas	565	363	327	64.2	57.9
Iron and steel industry	229	185	166	80.8	72.5
Non -ferrous metal industry	204	135	113	66.2	55.4
Machinery	4384	3044	2650	69.4	60.4
Chemicals and petroleum	511	389	345	76.1	67.5
Wood and wood products	3484	2110	1714	60.6	49.2
Construction materials	2299	1504	1307	65.4	56.9
Glass, glass products and china industry	127	87	72	68.5	56.7
Light industry	2413	1390	1084	57.6	44.9
Food	5111	2233	1546	43.7	30.2
Grain mill products	441	252	227	57.1	51.5
Agriculture	28361	12782	10472	45.1	36.9
Construction	15920	8814	7273	55.4	45.7
Transport	5730	2386	1545	41.6	27.0

Source: *Goskomstat.*

This paper attempts to analyze the situation that prevailed in Russia for the period July 1992 to June 1995, with the particular emphasis being given to the causes and development of inter-enterprise arrears viewed from both macroeconomic and microeconomic perspectives. The macroeconomic part investigates the relationship between arrears and monetary aggregates and inflation, as well as analyzes the effects inter-enterprise arrears have on the macroeconomic environment in Russia. Factors determining the rate of inflation are always of primary interest, since low inflation is often thought to be a top-priority target for the government and the Central Bank. Furthermore, the financial aid for the economies in transition is often contingent on the commitment of the authorities to maintain, or not to exceed, a certain level of inflation. Thus, it is very important for the policymakers to know what is driving the inflation rate in the long run and in the short run. It is often argued that for the period July 1992 to May 1995 in Russia the long term trends of inflation were clearly determined by the money supply, the lag of adjustment being 4-6 months. The importance of inter-enterprise arrears is usually overlooked.

The microeconomic part attempts to explore the nature of inter-enterprise arrears. Although the obtained results are preliminary and based on a sample of four hundred and thirty nine Russian enterprises, it is interesting that the data show strong correlation between the level of overdue receivables and the level of overdue payables of an enterprise. We suggest an interpretation of this phenomena which, to the best of our knowledge, was not explicitly brought forward in relevant literature before.

There are many difficulties in using Russian statistics. The data used in this paper came from different sources. Macroeconomic data were taken from the official yearbooks, publications of the various institutions carrying out economic estimations and from various economic magazines. Microeconomic data came from the enterprise survey conducted by the World Bank.[1] Clearly, different sources present data in different ways, and, although much attention has been given to the use of statistical data in order to ensure comparability, one should be aware of such a diversity in original sources.[2]

The structure of the paper is as follows. In section 2 we present historical background and major turning points in arrears related policies. Section 3 gives the most recent trends regarding the changes in structure and nature of arrears. The purpose of the next section is to challenge the seemingly obvious approach to the relationship between inflation and money supply. Section 5 incorporates arrears into the analysis and consists

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[1]See Alfandari and Schaffer [1] for detailed description of the survey data and comparison of Goskomstat and survey data.

[2]Besides the raw data, certain variables based on authors' calculations were used in this paper including the variables obtained through recoding of the World Bank survey data to ensure consistency and accuracy.

of three subsections dedicated to the investigation of the chain effect in arrears and payment strategy of enterprises, velocities analysis and inflation dynamics respectively. Section 6 contains some concluding remarks. Appendix A presents a counterexample the purpose and nature of which will be clarified in the paper. Appendix B has certain estimation results which are not explicitly discussed in this paper but nonetheless are of certain interest.

2   Historical Background

Till[3] July 1, 1992, the increase of overall indebtedness on so called "Cartotheque-2" accounts, which every enterprise had, served as an indication of arrears problem. On July 1, 1992, such a system was abolished, and within the next 3 months the largest amounts of debt were transferred to the special account No. 725. So, the drop in the total amount of debt on "Cartotheque-2" balances reflects the described transferral of the indebtedness to the account No. 725. Beginning July 1, 1992, the enterprises are fully responsible for the reception of the due payments for the goods and services provided.

Table 2: Overall debt on "Cartotheque-2" accounts (bln. roubles)

At the end of the month	
1991	
December	34
1992	
January	141
February	606
March	777
April	1855
May	2057
June	3200
July	1876
August	1200
September	900
October	420

Source: Russian Economic Trends, March 1995, Monthly Update.

Table 3 shows that since the end of June total arrears in industry have not increased substantially, on the contrary, they have dropped in real terms.

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[3]This review is based on the articles by Yanovskiy [9], Stepanov [6], Chikker [3], materials from Russian Economic Trends [5] and various newspaper sources including Nevskoye Vremya (Neva Time) and Vecherniy Peterburg (Evening Petersburg).

Table 3: Inter-enterprise arrears (receivables & overdue
receivables in industry, 1992, trln. roubles)

At the end of the month	Industry: total	Industry: overdue	Industry & construction: total	Industry & construction: overdue
June	–	1.5	–	–
July	2.9	1.8	–	–
August	3.1	1.8	–	–
September	3.0	1.9	–	–
October	–	–	–	1.6
November	3.7	1.8	4.1	2.0
December	–	–	–	2.0

Source: Russian Economic Trends, March 1995, Monthly Update.

It has to be noted, though, that the data in Tables 2 and 3 are of different nature. The numbers in the latter table show overdue receivables of the industrial enterprises, whereas indicators of "Cartotheque - 2" take into consideration all enterprises. Moreover, there are some other problems that make data in preceding tables hardly legitimately comparable. For example, data in the latter table are taken from enterprises' balance sheets, whereas data for "Cartotheque - 2" came from enterprises' bank accounts.

In the first quarter of 1992 due to price liberalization accompanied by tight monetary and credit policy (and to the opposition of the enterprises to the policy in question) reciprocal indebtedness has shot up among enterprises. For the 1st of January 1992 overdue payables to the suppliers and overdue credits to the banks amounted to 34.8 bln. roubles, by March 1 to 606 bln. roubles, and by April 1 to more than 1500 bln. roubles. On the one hand, enterprises were trying to accumulate inputs in amounts going beyond the real needs of the production process, and on the other hand they were accumulating inventories in hope for the future price increases.

Many enterprises went on producing output that did not correspond to the demand, often at the sky-high prices. Obviously, they tried not only to cover expenses connected with the production process, increasing payroll and capital expenses, but also to ensure a certain level of profit. Financially backed up demand did not match the proposed supply, and, as a consequence, the chain of arrears spread among all branches of the economy.

Furthermore, many enterprises were waiting for the inter-branch inter-enterprise arrears clearing that was undertaken in the Soviet Union each year. Such clearings were not effective even in the past. The amount of the debt cleared was approximately 13-17%.

Experience showed that in 30-40 days after a clearing took place, arrears regained almost the same value as before the clearing. All enterprises were accumulating patiently the arrears until the next clearing.

A number of factors suggest certain caution while undertaking such measures, for instance, commercial banks can not automatically provide credit that is not supposed to be returned; a clearing has to involve not only Russian enterprises but also the enterprises of the CIS countries, otherwise such a clearing can not be effective; a huge amount of total arrears requires the corresponding amount of credits (at that time, approximately 1300 bln. roubles) that might trigger the inflation; many goods would be paid for which are not in demand. Despite all these factors the decree of the President of the Russian Federation No. 725 signed on July 1, 1992, put the clearing into force.

Lack of essential circulating capital is usually named as one of the main objective causes of the spreading of arrears in Russian economy. The enterprises that had large inventories or any other substantial assets formed considerable additional working capital through revaluation. Price liberalization led to the increase in retail and wholesale prices which, in turn, stimulated the need for additional circulating capital. Before 1992 such a need was satisfied through budget financing from the centralized resources, and then, through virtually costless credits provided by the special state banks. Since 1992 when credits have started to cost and the prices have had to be formed competitively, the enterprises have begun to calculate prices of their outputs on the basis of the need in current liquidity and not on the basis of the financially supported demand for products. As it was mentioned before, outrageous prices led to the fall in sales and to the rise of inter-enterprise arrears. By the end of 1992 78% of industrial enterprises had either overdue receivables or payables, or both, in some branches the percentage reaching 90-95.

The first remedy that was tried to solve the arrears problem was the implementation of prepayments.[4] However, exploited for many years tight structure of all industrial (agricultural, etc.) sectors, which essentially means the fundamental and deep division of labor leading to natural monopolies, and rigid vertical integration inside the branches, resulted in a situation when necessary commercial partners (both suppliers and buyers) proved to be unable to pay for the purchases.

By the decree No. 1005, May 23, 1994, the President of the Russian Federation implemented the shipment of the production right after the prepayment has been made, and established at the same time the priority of payments (with the top priority given to

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[4] At that time prepayments were widely used by newly established private enterprises, however for different reasons. Since for most of these enterprises the rouble to dollar exchange rate constituted a vital part of their pricing policy, they had to require a 100% prepayment in order not to suffer huge losses due to forex market volatility. Besides that, money transfers between different commercial banks could take up to a month (or even more). Unfortunately, this problem is still not resolved in full.

the various outlays to budgets of different levels). The commercial banks were named as the institutions which must control the execution of the decree. However, regarding the arrears commercial banks mainly serve as a destabilizing factor, rather then a stabilizing one.[5]

A number of other solutions for the inter-enterprise arrears problem have been proposed and tried at different periods of time, such as usage of the tradeable uniform bills of exchange, factoring, and again a compensation scheme among the enterprises within the region as it was recommended by the government of the Russian Federation on the 9th of August, 1994. As for the transferral of the liabilities to the uniform bills of exchange, such a measure does not raise the liquidity of payables, it is rather a form of an anti-inflationary credit of the Central Bank to commercial banks. On the contrary, usage of the bills of exchange issued by the banks themselves, i.e., when sound and respectable banks serve as a guarantor of the debt, was rather successful.

A global compensation scheme, or a clearing, is not a solution to a problem since there is no possibility to take into account the quality of the liabilities, which results in favoring overpriced goods and ineffective production technologies.

3   Recent Trends

In this section we just outline recent trends and changes that are of certain interest. In March 1996, the government and the CB decided not to grant any further credits or loans for the settlement of inter-enterprise arrears problem. In the structure of overdue arrears there have been substantial changes since the beginning of the reforms. During the first years of the reforms inter-enterprise arrears comprised the huge bulk of total arrears, the share in total arrears reaching 80% in 1992-1993. By contrast, at the end of December 1995, debts among enterprises amounted to only 51% of total indebtedness, while debts to the budget reached 25%. In the structure of overdue payables, substantial percentage goes to the debts more than 3 months overdue.[6]

At the beginning of December 1995, from more than 60 trln. roubles of tax arrears, payments to the budget and extrabudgetary funds, approximately 40 trln. roubles were deferred payments to the budget, i.e. arrears "authorized by the government". Almost 44,5% of deferred payments represent liquidity received by enterprises through the mechanism allowing to reserve certain amount of money on bank accounts on favorable condi-

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[5]Many of the commercial banks have been established just to satisfy the needs of particular enterprises not taking much care about the proper regulations and viability of the bank. Numerous frauds, bankruptcies in the banking sector, long periods for completing a payment, and many other factors substantially deteriorated the credibility of the banking sector.

[6]See Volkov [8].

tions. By December 1, 1995, the indebtedness of the budget to the enterprises for goods and services amounted to 14,2 trln. roubles compared to 11 trln. roubles by February 1, 1995, i.e. increased by almost 30%. Consequently, this indebtedness creates payment problems among enterprises and by enterprises to the budget.[7]

4 Monetary Aggregates and Inflation: the Nature of Obvious

Here we discuss observed empirical evidence for the inflation rate and the rate of growth of money supply overlooking arrears. We will incorporate arrears into inflation dynamics on later stages.

Figure 1: graphs the CPI and M2 in percentage change.
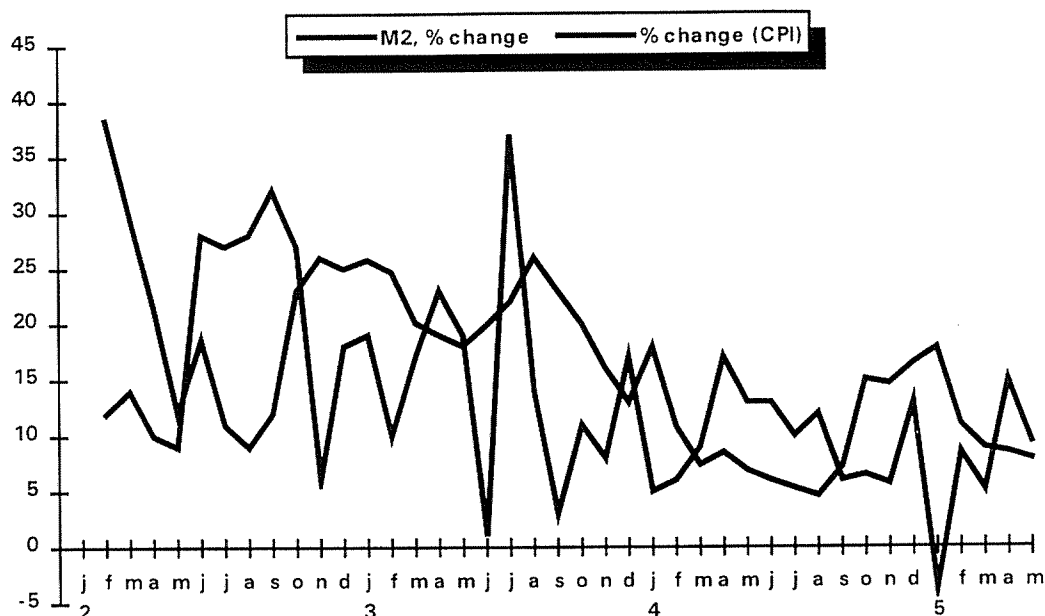
Source: *Russian Economic Trends, vol. 3(4), 1994 and author's calculations.*

It is often argued that the relationship between M2 and the CPI can be described simply stating that the CPI adjusts to the variations in M2 with the 4 to 6 months lag. These variations are of primary interest. Routine explanations are as follows: weakening of the inflationary expectations of people, strict reserve requirements to commercial banks, introduction of currency band[8], all of these and some other factors are usually said to

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[7]Ibid.

[8]Since July 1996 a crawling currency band said to be pegged to the inflation rate is introduced.

contribute to the fact that the lag of adjustment has been growing. At the same time, still high inflationary expectations, frequent price increases for electricity and transportation, and weak control over natural monopolies' pricing are believed to be the main causes for still high inflation. At this time it is worth mentioning that usually arrears crisis is not associated with inflation.

We start with showing that the lag of price adjustment to changes in M2 is indeed tends to increase with time. We use Chow test[9], or the test of structural change, to test for the stability of coefficients in the regression equation of the CPI on lags of M2. Separate regressions of the CPI on one of the lags all produce significant coefficients, and thus, not informative.

We first estimate the equation for all available observations, then we estimate separately for the first 16 observations (1992.08 - 1993.11) and for the last 19 observations (1993.12 - 1995.06). The obtained results are presented below.

Results 1.1

LS // Dependent Variable is CPI
SMPL range: 1992.08 - 1995.06
Number of observations: 35

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2.2924640	1.7823509	1.2862024	0.208
M2(-4)	0.3053451	0.0811806	3.7613067	0.001
M2(-5)	0.2813656	0.0825875	3.4068794	0.002
M2(-6)	0.3113793	0.0860591	3.6182027	0.001

R-squared	0.661996	Mean of dependent var	14.96857
Adjusted R-squared	0.629286	S.D. of dependent var	6.945577
S.E. of regression	4.228904	Sum of squared resid	554.3924
Durbin-Watson stat	0.751012	F-statistic	20.23831
Log likelihood	-98.00703		

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[9] A special case of F-test.

Results 1.2

LS // Dependent Variable is CPI
SMPL range: 1992.08 - 1993.11
Number of observations: 16

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	10.171248	3.4143688	2.9789540	0.012
M2(-4)	0.2582687	0.0971924	2.3486278	0.037
M2(-5)	0.2960058	0.1147608	2.5793272	0.024
M2(-6)	0.0351800	0.1292443	0.2721979	0.790

R-squared	0.531439	Mean of dependent var	20.59375
Adjusted R-squared	0.414299	S.D. of dependent var	5.000729
S.E. of regression	3.827113	Sum of squared resid	175.7615
Durbin-Watson stat	1.091982	F-statistic	4.536780
Log likelihood	-41.87533		

Results 1.3

LS // Dependent Variable is CPI
SMPL range: 1993.12 - 1995.06
Number of observations: 19

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	4.0935635	2.5957011	1.5770551	0.136
M2(-4)	0.0153204	0.1672883	0.0915810	0.928
M2(-5)	0.2240720	0.1040224	2.1540744	0.048
M2(-6)	0.3311096	0.1114985	2.9696315	0.010

R-squared	0.437635	Mean of dependent var	10.23158
Adjusted R-squared	0.325162	S.D. of dependent var	4.297680
S.E. of regression	3.530480	Sum of squared resid	186.9644
Durbin-Watson stat	0.655171	F-statistic	3.891027
Log likelihood	-48.68138		

We apply F-test to test for the null hypothesis of stable coefficients.

$$F = \frac{(RRSS - URSS)/4}{URSS/27} = 3.5667428,$$

where RRSS is the restricted residual sum of squares, and URSS the unrestricted residual sum of squares. In our case F has an F-distribution with degrees of freedom 4, 27. From the F tables the 5% significance point is 2.73. Thus, the hypothesis of stable coefficients has to be rejected at 5% level of significance. It has to be noticed, though, that the performed test does not distinguish between changes in constant and changes in coefficients. So, some of the instability is certainly due to the shifts, i.e. to the variations in the constant.

Recall that we have assumed at the beginning of this section that there are no other variables involved in the story, just M2 and the CPI. Even in this case the preceding analysis shows that knowledge of the outlined relationship gives no sound instrument to the policymaker because the relation is unstable. Moreover, decomposition of the CPI graph shows that different components of the CPI respond with diverse lags to the changes in money supply. Two components, food and non-food, dominate in the CPI, most of the time moving in the same direction, but from time to time compensating for each other. In particular, this happens on the edge of the year when the CPI food experiences extra increase (seasonal factor), and the CPI non-food exhibits downward trend. In general, there is a big deal of seasonality in decomposed CPI components. At the same time CPIs for paid services and alcohol are much more volatile and exhibit substantially different trends than the averaged CPI.[10] The following graphs clarify this point further. Figures 2 and 3 plot the averaged CPI in comparison with its components.

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[10]Variations in the CPI alcohol are of interest because they contribute half the amount of the paid services. The share of paid-services in consumer expenditures is unbelievably small, but even if data are not absolutely reliable, the message is rather clear: the restructuring of the Russian economy has still a very long way to go.

Figure 2
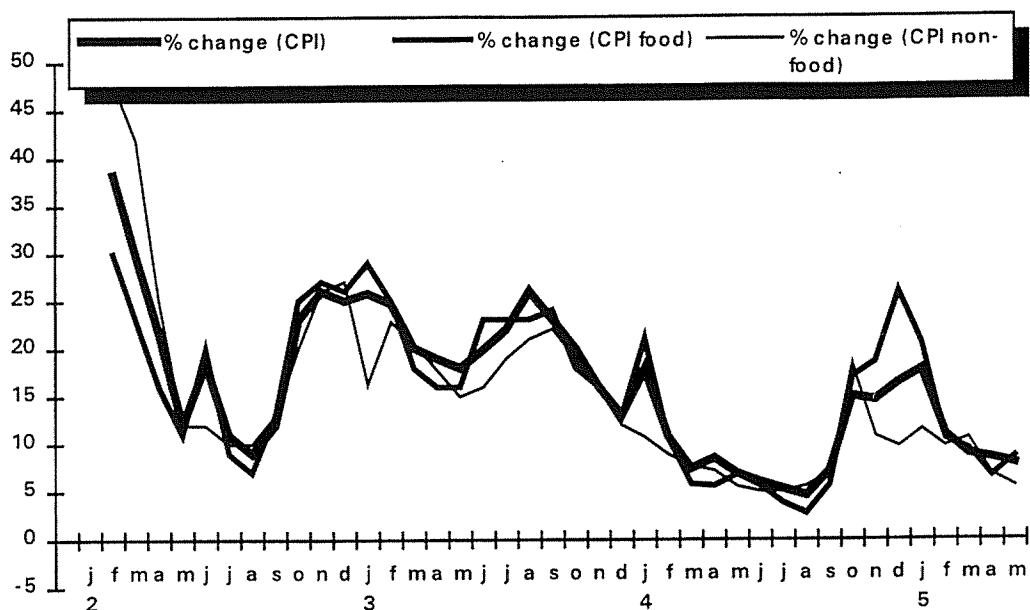
Source: *Russian Economic Trends, vol. 3(4), 1994 and author's calculations.*

Figure 3
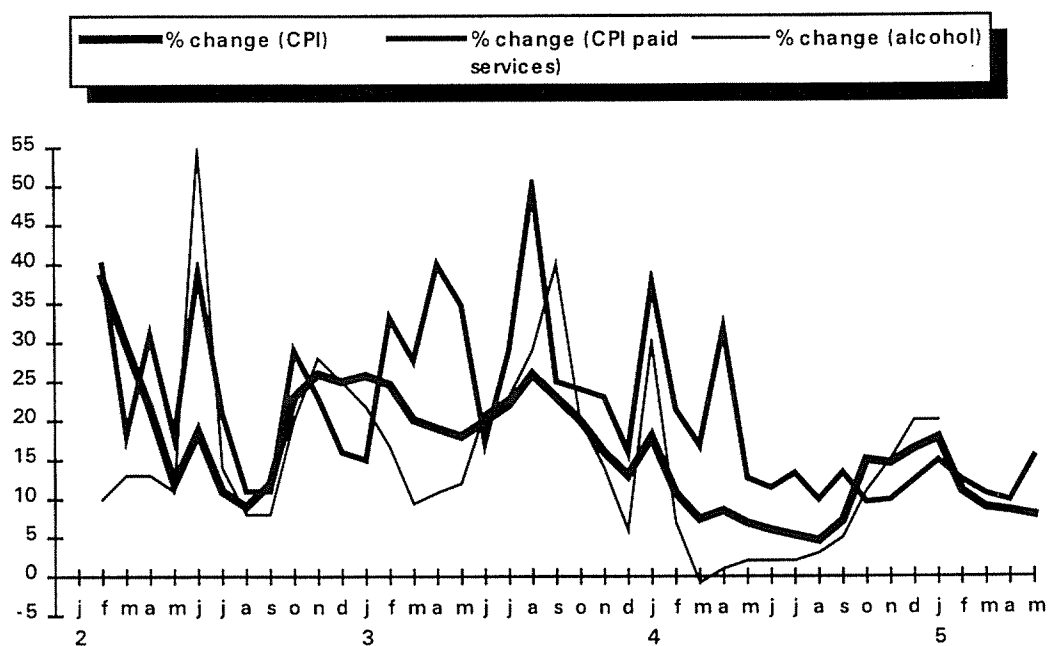
Source: *Russian Economic Trends, vol. 3(4), 1994 and author's calculations.*

Figures 4 through 7 graph M2 in percentage change with the various components of the decomposed CPI.

Figure 4
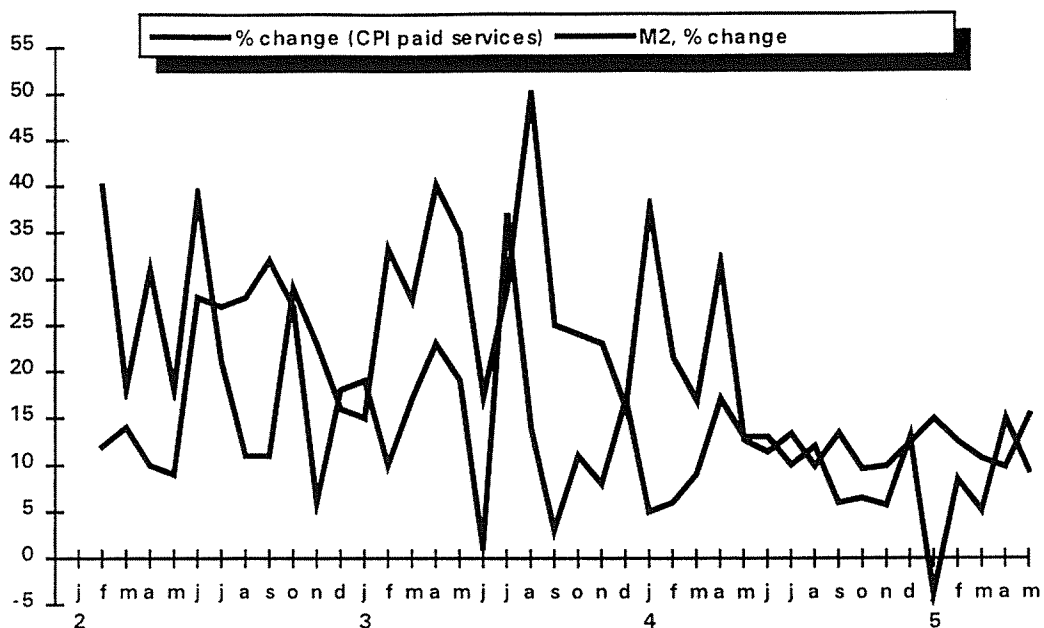
Source: *Russian Economic Trends, vol. 3(4), 1994 and author's calculations.*

Figure 5
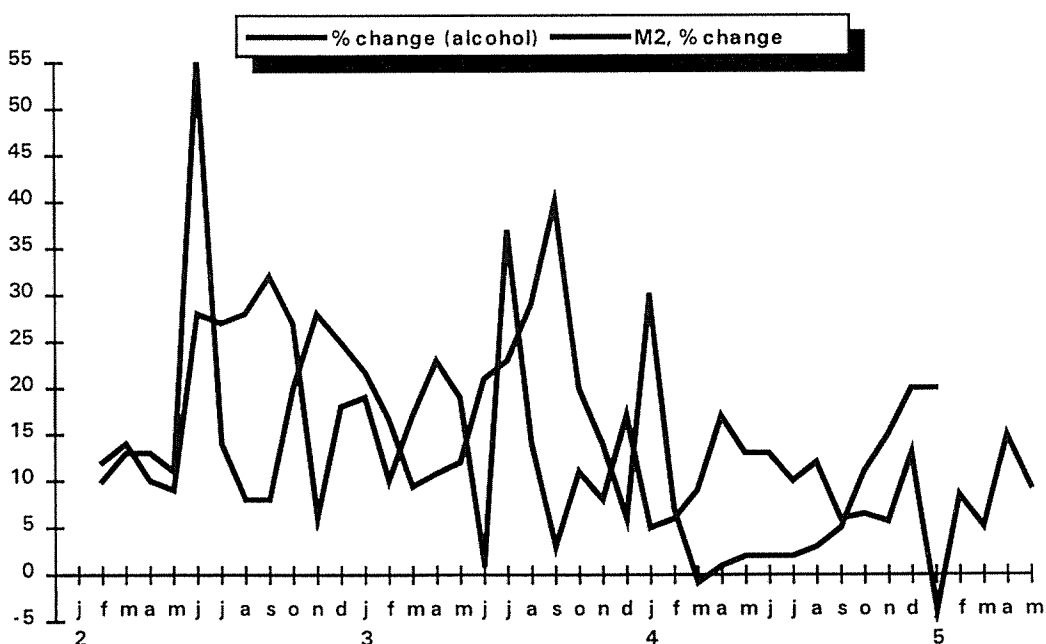
Source: *Russian Economic Trends, vol. 3(4), 1994 and author's calculations.*

Figure 6
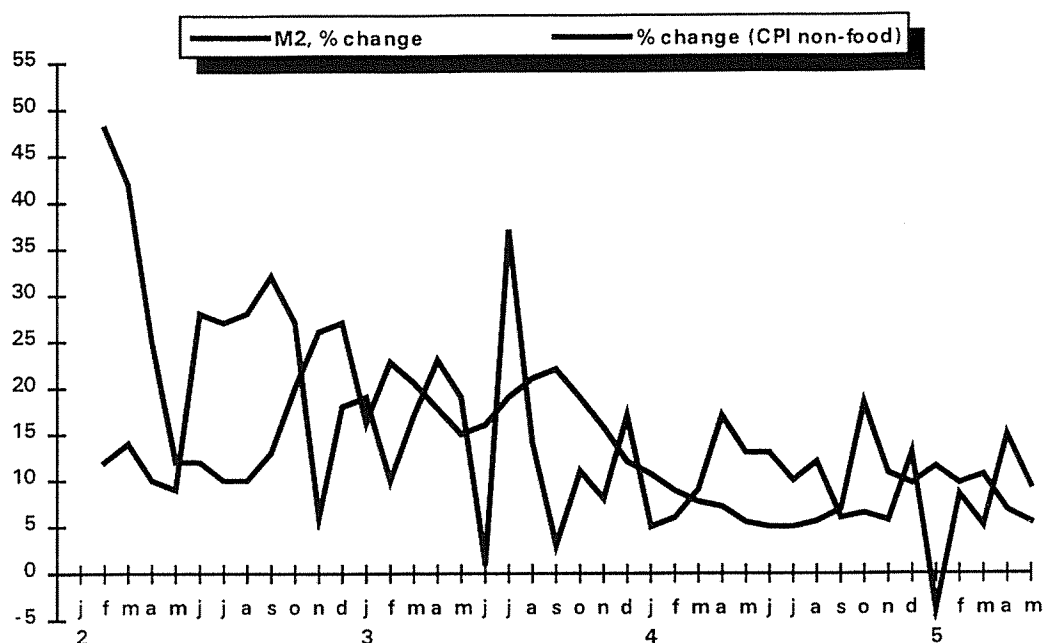
Source: *Russian Economic Trends, vol. 3(4), 1994 and author's calculations.*

Figure 7
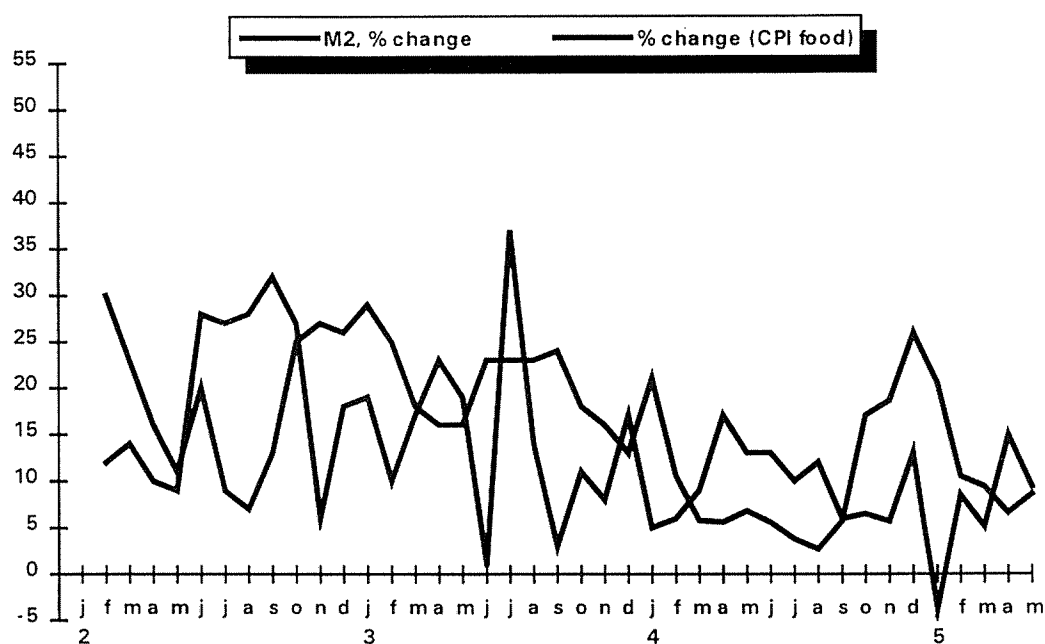
Source: *Russian Economic Trends, vol. 3(4), 1994 and author's calculations.*

In other words, some prices adjust relatively fast to the variations in M2 aggregate while other exhibit relative rigidity. If such a difference in the speed of adjustment is not taken into consideration, the intended effect of the monetary policy could be seriously deteriorated.

5   Arrears Enter the Scene

5.1   The Nature of Arrears: Critique and Hypotheses

Alfandari and Schaffer in their article[11] argue that the arrears can be subdivided into two categories differing by nature: late payments and bad debts. The distinction between "bad debts" and "late payments" is made on the basis of the assumption that late payments are eventually paid out. First of all, it seems rather impossible to apply this criteria on practice. Moreover, they find that overdue arrears are not concentrated in financially distressed firms, and on the basis of this they make a conclusion that "the bulk of inter- enterprise arrears would appear to be late payments rather then bad debts". In order to be able to make such a conclusion, one must assume in advance that only financially distressed, in Alfandari and Schaffer's definition, firms can have bad debts. This assumption does not seem plausible to us, even if we put up with the initial subdivision of overdue arrears which is, in fact, rather vague. Evidence suggests only that overdue arrears do not pile up in distressed firms. And in our view , there is nothing strange or inconsistent in the fact that overdue arrears are not concentrated in such firms whatever defined. This issue has been discussed in article by Calvo and Coricelli [2] focusing on the evidence for Poland and Romania. Moreover, empirical analysis executed for Russia confirms the chain structure of overdue arrears.

The idea behind the empirical estimation is to prove that there is a high degree of circularity, or reciprocity, of arrears, in other words the enterprises with high overdue receivables tend to have high overdue payables. To put it in a different way, the presence of overdue receivables forces enterprises to have a fraction of them in overdue payables. We come back to this issue when we discuss the role of arrears in inflation dynamics. At this point we want to draw attention to the fact that our hypothesis is substantially different from the interpretations that can be found in literature. It is true that net arrears are considered to be important since they represent the liquidity flow from the liquidity rich to liquidity poor enterprises. However, we argue that enterprises assess not only the liquidity at their actual disposal (not to be confused with the liquidity they demand for transactions), but also the value of their overdue receivables, and form expectations on how much of the future sales will be paid for.

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[11]See Alfandari and Schaffer [1].

As evidence suggests and as it is confirmed by many sources, enterprises in certain industrial sectors in Russia tend to have more arrears, and on the contrary, some sectors tend to be more liquid for purely structural reasons. Table 1 gives a distribution of the enterprises and organizations having overdue payables/receivables as for January 1994.[12] So, it was necessary to include sectoral dummies into the estimated equations in order to compensate for this effect, i.e. to allow for the different intercepts across different sectors accounting for different structural composures of sectors. Furthermore, we deflate overdue arrears by employment. This is supposed to eliminate heteroscedastic effects and take care of the fact that the large companies are likely to have more overdue arrears in nominal terms than the small ones, even if overdue arrears of the small enterprises are very high relatively to their size. See Results 2.1.

The coefficient for the overdue receivables is less than one which is consistent with the fact that the industrial enterprises tend to be net creditors to the trade sector.The ratio of enterprise's indebtedness to the banks to overall creditor indebtedness is a proxy, or an instrumental variable, for the ratio of bank credit to all liabilities of the enterprise. We decided to use a proxy since from the survey data a consistent and legitimate ratio of the bank credit to liabilities could not be computed without a loss of a bulk of observations. The negative coefficient obtained for the ratio is consistent with the assertion that the more bank credit is available to the enterprise for transactions (the more it uses credit in financing its operations), the less overdue payables it "demands".

At the same time we found that non overdue receivables are not significantly correlated with non overdue payables. There are two major implications. First, it makes the correlation between overdue arrears very meaningful, and not just a manifestation of the fact that the enterprises usually look for a balanced balance sheet. Second, it suggests that enterprises do not treat overdue and non overdue arrears equally, i.e. we emphasize that the overdue portion indeed serves as a substitute for the liquidity demanded for transactions. See Results 3.1.

Furthermore, enclosure of the variable accounting for the share of the state in privatized enterprises produced a significant coefficient. This can be interpreted as a dependence of financial situation of the firm on the ownership structure, namely, enterprises mostly owned by the state still have more inertia from the past (regarding financial management) than newly established or non-state enterprises. Also, it seemed reasonable to assume that enterprises selling their output to new private or privatized firms tend to have less overdue payables. The coefficient has a plausible sign, but is significant only at 20% level. This might suggest that one again must differentiate among privatized enterprises on the basis of their ownership structure. See Results 4.1.

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[12]See also Alfandari and Schaffer [1],pp. 32-33, Table 3, for the breakdown of arrears in nominal terms across sectors.

Results 2.1

LS // Dependent Variable is OP_EMP94
SMPL range: 1 - 433
Observations excluded because of missing data.
Number of observations: 171

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
OR_EMP94	0.2153230	0.0382594	5.6279710	0.000
BA_LIAB	-1.3409835	0.4214433	-3.1818837	0.002
SEC1	3.8913581	0.8316433	4.6791192	0.000
SEC2	2.1605246	0.5550945	3.8921741	0.000
SEC3	1.2412870	0.9441232	1.3147510	0.191
SEC4	0.5429929	0.5567658	0.9752628	0.331
SEC5	1.4557350	0.4028930	3.6132048	0.000
SEC6	0.8085402	0.3749839	2.1561995	0.033
SEC7	0.7606887	0.6191897	1.2285229	0.221
SEC8	0.6285051	0.5115905	1.2285317	0.221
SEC9	1.0112062	0.6077690	1.6638003	0.098
SEC10	0.7550752	0.3995669	1.8897341	0.061
SEC11	0.6274693	0.6741835	0.9307100	0.354
SEC12	1.4603311	0.7672067	1.9034388	0.059
SEC13	1.4170325	0.7007752	2.0220928	0.045
SEC14	0.8265568	0.7757962	1.0654303	0.289
SEC15	0.5864314	0.5165839	1.1352104	0.258
SEC16	0.8253440	0.4644886	1.7768874	0.078
SEC17	0.5685408	0.6746135	0.8427653	0.401
SEC19	1.1887457	0.4569144	2.6016816	0.010
SEC20	0.7867932	0.3757376	2.0939965	0.038
SEC21	0.9036507	0.3875005	2.3319987	0.021
SEC22	0.8392957	0.4359887	1.9250402	0.056
SEC23	1.9687161	0.5704029	3.4514483	0.001
SEC24	1.2491948	0.5305284	2.3546238	0.020
SEC25	0.1503763	0.9354300	0.1607563	0.873

R-squared	0.462536	Mean of dependent var	0.903743
Adjusted R-squared	0.369870	S.D. of dependent var	1.660636
S.E. of regression	1.318225	Sum of squared resid	251.9690
Durbin-Watson stat	2.133945	F-statistic	4.991428
Log likelihood	-275.7819		

Results 3.1

LS // Dependent Variable is NOP_EM94
SMPL range: 1 - 433
Observations excluded because of missing data.
Number of observations: 175

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
NOR_EM94	0.0834140	0.1840789	0.4531429	0.651
BA_LIAB	-1.5225885	1.3582404	-1.1210007	0.264
SEC1	2.7473223	2.4807998	1.1074341	0.270
SEC2	8.5105904	1.6304829	5.2196748	0.000
SEC3	0.6055189	3.0586601	0.1979687	0.843
SEC4	0.3334521	1.7077513	0.1952580	0.846
SEC5	1.6083499	1.2780085	1.2584814	0.210
SEC6	0.6640318	1.2052228	0.5509619	0.583
SEC7	0.7583110	2.0017072	0.3788321	0.705
SEC8	0.7258954	1.6553205	0.4385225	0.662
SEC9	0.9755649	1.9650614	0.4964552	0.620
SEC10	0.6430576	1.2892181	0.4987966	0.619
SEC11	1.0350671	2.1836870	0.4739998	0.636
SEC12	0.4384943	2.4832836	0.1765784	0.860
SEC13	0.5543407	2.1620501	0.2563958	0.798
SEC14	0.8066133	2.2429427	0.3596228	0.720
SEC15	0.6202724	1.5714946	0.3947022	0.694
SEC16	0.8533956	1.4974196	0.5699108	0.570
SEC17	0.6548154	2.1725924	0.3013982	0.764
SEC18	1.5225885	4.4822577	0.3396923	0.735
SEC19	0.7336906	1.4754969	0.4972498	0.620
SEC20	0.8808172	1.2212310	0.7212536	0.472
SEC21	0.7033156	1.2496567	0.5628070	0.574
SEC22	0.8002284	1.4075308	0.5685335	0.571
SEC23	2.0674302	1.7756891	1.1642974	0.246
SEC24	1.4491022	1.7122004	0.8463392	0.399
SEC25	0.3330817	3.0276753	0.1100124	0.913

R-squared	0.149958	Mean of dependent var	0.759829
Adjusted R-squared	0.000626	S.D. of dependent var	4.272849
S.E. of regression	4.271512	Sum of squared resid	2700.381
Durbin-Watson stat	2.699523	F-statistic	1.004191
Log likelihood	-487.7459		

Results 4.1

LS // Dependent Variable is OP_EMP94
SMPL range: 6 - 427
Observations excluded because of missing data.
Number of observations: 110

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
OR_EMP94	0.1300822	0.0453559	2.8680297	0.005
BA_LIAB	-1.7211158	0.5867126	-2.9334907	0.004
STATESHA	1.8982126	0.6256573	3.0339495	0.003
S_PRIVAT	-0.5507058	0.3968725	-1.3876140	0.169
SEC1	1.7147600	1.3794888	1.2430402	0.217
SEC2	0.5191360	0.6733370	0.7709898	0.443
SEC3	1.3008495	0.9434519	1.3788192	0.172
SEC4	0.3601619	0.7733461	0.4657190	0.643
SEC5	1.6386288	0.5784001	2.8330369	0.006
SEC6	0.8410361	0.4911123	1.7125130	0.091
SEC7	0.6971460	0.6930082	1.0059708	0.317
SEC8	0.5928000	0.6345673	0.9341799	0.353
SEC9	0.9429649	0.9232121	1.0213958	0.310
SEC10	1.0498893	0.5961688	1.7610606	0.082
SEC11	0.4481067	0.9444245	0.4744759	0.636
SEC12	1.8183960	0.9487832	1.9165559	0.059
SEC13	1.8249825	0.7218937	2.5280490	0.013
SEC14	1.6372807	1.3507528	1.2121246	0.229
SEC15	0.6443815	0.7313421	0.8810945	0.381
SEC16	0.9551347	0.5926548	1.6116206	0.111
SEC17	-0.3895503	0.9544883	-0.4081247	0.684
SEC19	1.4354848	0.6550603	2.1913782	0.031
SEC20	1.0765559	0.6403871	1.6811018	0.097
SEC21	1.4465360	0.5091825	2.8408991	0.006
SEC22	1.1372441	0.5265797	2.1596810	0.034
SEC23	2.1420443	0.6266787	3.4180903	0.001
SEC24	1.5955193	0.8701290	1.8336584	0.070

R-squared	0.442448	Mean of dependent var	0.818182
Adjusted R-squared	0.267793	S.D. of dependent var	1.514352
S.E. of regression	1.295817	Sum of squared resid	139.3688
Durbin-Watson stat	1.049057	F-statistic	2.533271
Log likelihood	-169.0986		

In the regression to follow we included a dummy variable that attains 1 if the enterprise is a non-incorporated state-owned firm or a "commercialized state-owned firm" (i.e. joint- stock company with 100% state ownership), and 0 otherwise.

Results 5.1

LS // Dependent Variable is OP_EM94
SMPL range: 1 - 433
Observations excluded because of missing data.
Number of observations: 171

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
OR_EMP94	0.2000802	0.0373729	5.3536204	0.000
BA_LIAB	-1.4609039	0.4100653	-3.5626130	0.001
D_LSTATE	0.9396551	0.2910245	3.2287838	0.002
SEC1	3.7198308	0.8076140	4.6059512	0.000
SEC2	1.9113415	0.5433966	3.5173968	0.001
SEC3	1.2856117	0.9149613	1.4050995	0.162
SEC4	0.5238607	0.5395403	0.9709389	0.333
SEC5	1.4359890	0.3904524	3.6777565	0.000
SEC6	0.6999932	0.3649124	1.9182496	0.057
SEC7	0.8224733	0.6003017	1.3700999	0.173
SEC8	0.3964116	0.5009172	0.7913716	0.430
SEC9	0.8721797	0.5905019	1.4770141	0.142
SEC10	0.7187556	0.3873449	1.8555958	0.066
SEC11	0.6698910	0.6534180	1.0252105	0.307
SEC12	1.1832573	0.7483620	1.5811296	0.116
SEC13	1.5286428	0.6799326	2.2482270	0.026
SEC14	0.2519560	0.7725263	0.3261455	0.745
SEC15	0.3612761	0.5054053	0.7148245	0.476
SEC16	0.7746604	0.4503645	1.7200742	0.088
SEC17	0.1586637	0.6659143	0.2382644	0.812
SEC19	1.1285568	0.4431436	2.5467065	0.012
SEC20	0.5887578	0.3692209	1.5945951	0.113
SEC21	0.8893389	0.3755153	2.3683157	0.019
SEC22	0.9034172	0.4229409	2.1360368	0.034
SEC23	1.9013053	0.5531163	3.4374420	0.001
SEC24	1.1742195	0.5146078	2.2817755	0.024
SEC25	0.1843591	0.9064956	0.2033756	0.839

R-squared	0.498820	Mean of dependent var	0.903743
Adjusted R-squared	0.408329	S.D. of dependent var	1.660636
S.E. of regression	1.277364	Sum of squared resid	234.9588
Durbin-Watson stat	2.215748	F-statistic	5.512379
Log likelihood	-269.8058		

Again we obtained a significant coefficient for the variable accounting for the ownership structure.

Coming back to the subdivision of overdue arrears into two types, let us examine the criteria according to which Alfandari and Schaffer distinguish between these two kinds. To start with, it is not clear at all, how one can know in advance which arrears will be eventually paid out. Furthermore, it is argued that "the stock of arrears due to late payment is roughly stable over time" because of approximately equal inflows and outflows of overdue arrears. This is, in a sense, the main underlying feature of late payments. That is what, according to Alfandari and Schaffer, distinguishes late payments from bad debts. Undoubtebly, the paper that the authors are well aware of the arising difficulties when treating countries with high inflationary environment. Nevertheless, they seem to overlook the possibility for the stock of overdue arrears to be stable over time not due to the fact that some of the arrears are eventually paid out, but due to the changes in the rate of inflation and measurement peculiarities. A simple arithmetic example presented below will clarify this point further.

Suppose the enterprise has to purchase the same amount of inputs each half a year. Assume that the due date is seven months from the date of the purchase and the enterprise never pays for its inputs. Furthermore, let the arrears be measured only every eighth month and the inflation rate jump for 100% from the period of the second purchase of inputs to the period of the third purchase, and be stabilized from that moment on. Also assume that the enterprise does not index its liabilities. Simple arithmetic calculations show that under made assumptions the ratio of overdue payables to total payables of the enterprise with be the same for all periods. We can even allow for some dynamics in the inflation rate, so that the ratio will exhibit certain oscillations. Of course, made assumption can be criticized for being too rigid and unrealistic, but it is worth emphasizing that the aim of the above exercise was not to present a true framework, but to show that observed evidence can be consistent with the story quite different from the one proposed by Alfandari and Schaffer. This example also suggests that it is very important to distinguish between the old and new stocks. Especially, it might be true if the enterprises do not index their liabilities in time, so old stock shrinks substantially when the rate of inflation goes up.[13]

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[13]See Appendix A for the numerical example with the actual data for Industrial Price Index.

5.2   A Closer Look at Velocities.

As evidence suggests, both M2 velocity and M2 plus payables velocity[14] have shot up after the price liberalization. The following graphs picture both velocities in question as well as currency velocity.

Figure 8

Source: *Russian Economic Trends, vol. 3(4), 1994 and author's calculations.*

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[14]Defined as monthly GDP divided by M2 plus overdue payables of the enterprises to the suppliers at the mid-point of the month (assuming a constant growth rate of M2 during the month), and multiplied by 12.

Figure 9

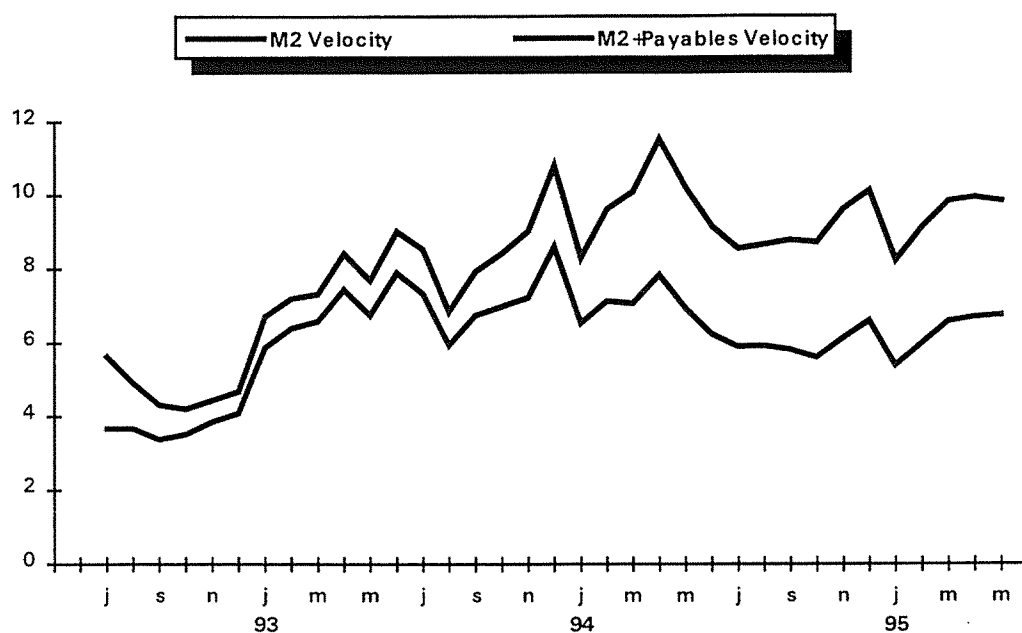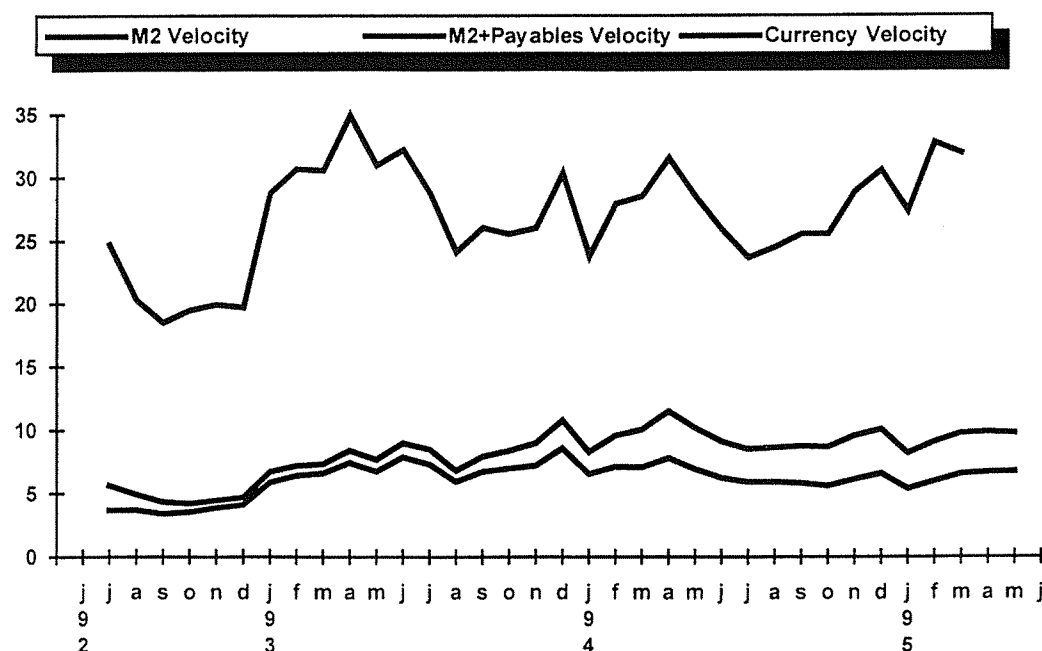| ——M2 Velocity | ——M2+Payables Velocity | ——Currency Velocity |

Source: *Russian Economic Trends, vol. 3(4), 1994 and author's calculations.*

Recent findings on the inter-enterprise arrears in Ukraine[15] showed that velocity of circulation of outside money plus arrears, the latter serving as a substitute for the bank credit, varies much more in line with the changes in inflation than traditional velocity. If we look at the similar parameters for the Russian economy, somewhat similar pattern can be seen, though less clear cut. As for the case with Ukraine, for Russia there exists a period when the ratio of GDP to M2 was increasing while the rate of inflation was going down. On the contrary, the velocity indicator corrected for arrears exhibits downward tendency consistent with decreasing rate of inflation. Econometrically, though, this distinction is very difficult to single out. Both regressions, of traditional velocity and corrected velocity on the CPI produced significant coefficients when adjusted for the autocorrelation effect. The Durbin-Watson statistic for the regressions of velocities on the CPI without any corrections was very low suggesting some type of autocorrelation. Analysis of the autocorrelations and partial autocorrelations of the residuals showed that ARMA correction had to be called for. The criteria for the choice of particular ARMA process included considerations of fit, standard error of the regression and randomness of the residuals for the corrected regression measured with Box-Pierce statistic.

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[15]See Ukrainian Economic Trends [4] and [7].

Results 6.1

LS // Dependent Variable is M2P_V
SMPL range: 1992.09 - 1995.05
Number of observations: 33
Convergence achieved after 4 iterations
AR(2) MA(1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	7.4794960	0.4902981	15.254998	0.000
CPI	-0.0588926	0.0271291	-2.1708285	0.038

R-squared	0.662936	Mean of dependent var	6.288788
Adjusted R-squared	0.628067	S.D. of dependent var	1.196909
S.E. of regression	0.729951	Sum of squared resid	15.45201
Durbin-Watson stat	2.000930	F-statistic	19.01235
Log likelihood	-34.30529		

Results 6.2

LS // Dependent Variable is M2_V
SMPL range: 1992.09 - 1995.05
Number of observations: 33
Convergence achieved after 7 iterations
AR(2) MA(1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	10.704659	0.6231727	17.177676	0.000
CPI	-0.1301695	0.0389513	-3.3418563	0.002

R-squared	0.763927	Mean of dependent var	8.344242
Adjusted R-squared	0.739505	S.D. of dependent var	1.836272
S.E. of regression	0.937209	Sum of squared resid	25.47246
Durbin-Watson stat	2.049031	F-statistic	31.28106
Log likelihood	-42.55296		

Enclosure of the lagged dependent and independent variables into the regression does not change substantially the results, meaning that the fit is still slightly better for the traditional velocity regression, whereas standard error of the regression is better for the equation with corrected velocity.

Results 6.3

LS // Dependent Variable is M2_V
SMPL range: 1992.08 - 1995.05
Number of observations: 34

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.8739996	1.1628533	1.6115528	0.118
CPI	-0.1235207	0.0485265	-2.5454293	0.016
CPI(-1)	0.1192817	0.0461234	2.5861403	0.015
M2_V(-1)	0.7909121	0.1030801	7.6727910	0.000

R-squared	0.778621	Mean of dependent var	8.243529	
Adjusted R-squared	0.756483	S.D. of dependent var	1.901205	
S.E. of regression	0.938196	Sum of squared resid	26.40636	
Durbin-Watson stat	2.200954	F-statistic	35.17139	
Log likelihood	-43.94706			

Results 6.4

LS // Dependent Variable is M2P_V
SMPL range: 1992.08 - 1995.05
Number of observations: 34

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.4393044	0.6726675	2.1396967	0.041
CPI	-0.0804103	0.0337196	-2.3846782	0.024
CPI(-1)	0.0968862	0.0334676	2.8949228	0.007
M2P_V(-1)	0.7372056	0.0913185	8.0729093	0.000

R-squared	0.741912	Mean of dependent var	6.211765	
Adjusted R-squared	0.716103	S.D. of dependent var	1.261304	
S.E. of regression	0.672048	Sum of squared resid	13.54944	
Durbin-Watson stat	2.481805	F-statistic	28.74647	
Log likelihood	-32.60365	Q-statistic	14.394	

In any case, empirical evidence suggests that the policymakers should take into consideration the behavior of inter-enterprise arrears, when deciding upon monetary policy.

5.3   Arrears and Inflation: Which Way Does the Causality Go?

We suggest that enterprises form their demand for money in accordance with their transaction needs. If the initial squeeze in the liquidity is high, the variations in the quantity of money demanded are transferred to, or compensated by, the variations in arrears, i.e. variations in mutual indebtedness of the enterprises. Firms, facing now very rigid liquidity constraints, switch to finance part of their purchases through arrears, in other words, M2 and arrears function as substitutes. Thus, at later stages enterprises consistently demand less money liquidity. Note that the hypothesis outlined above is consistent with our findings derived from the data on micro level.

Then, if authorities realize that they have to solve the arrears problem and inject credit into the system, we argue that this mainly will go to trigger inflation. Firms will not use this money to settle their payments. If they expect that the others will do the same, i.e. will not pay, they channel money to the forex market or invest somewhere else. The behavior of the enterprises is not strategic in a sense that they do not form any collateral agreements, but, of course, at each point in time they have to decide how much money they demand. Failure of econometric analysis to single out a unique lag of adjustment[16] of the CPI to the changes in money supply indirectly suggests that economic agents "treat" money supply differently at different points in time. These findings are consistent with the assumption we make regarding money demand as a main factor in arrears dynamics.[17] To summarize, if authorities do not take into consideration arrears estimating prospective money supply, they are likely to face high inflation as the result of such a policy. In other words, we can say that high arrears result in inflation. Had the initial squeeze been not large, though, the enterprises still could have not fallen into arrears by that much, and subsequent restoration, if any, of money supply would have channelled money into payments.

Alfandari and Schaffer find negative correlation between the CPI lagged one month and arrears measured in percentage to the industrial output. They state that the observed relationship is caused by the initial squeeze in liquidity, which made inflation go down and arrears go up. No endogenous relationship is assumed. Empirical analysis of the available data supports evidence found by Alfandari and Schaffer.

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[16]To be more precise, the lag has been changing over time. See section 4 for discussion.

[17]One way to test it is to look at the points in time when the lag of adjustment of the CPI seems to change, and to search for the corresponding changes in the level of inter- enterprise arrears in relation to industrial output.

Results 7.1

LS // Dependent Variable is ARIO
SMPL range: 1992.05 - 1995.05
Number of observations: 37
Convergence achieved after 9 iterations
AR(2) MA(1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.3697072	0.0899272	15.231283	0.000
CPI	-0.0266193	0.0049260	-5.4038339	0.000

R-squared	0.809121	Mean of dependent var	0.974962
Adjusted R-squared	0.791768	S.D. of dependent var	0.356869
S.E. of regression	0.162848	Sum of squared resid	0.875143
Durbin-Watson stat	1.972402	F-statistic	46.62810
Log likelihood	16.76857		

Results 7.2

LS // Dependent Variable is ARIO
SMPL range: 1992.05 - 1995.05
Number of observations: 37
Convergence achieved after 9 iterations
AR(2) MA(1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.3080542	0.1000877	13.069081	0.000
CPI(-1)	-0.0236692	0.0053026	-4.4637308	0.000

R-squared	0.791644	Mean of dependent var	0.974962
Adjusted R-squared	0.772702	S.D. of dependent var	0.356869
S.E. of regression	0.170140	Sum of squared resid	0.955272
Durbin-Watson stat	2.019954	F-statistic	41.79423
Log likelihood	15.14781		

The following regression incorporates both the CPI and the one month lagged CPI as explanatory variables. Insignificant coefficient for the lagged CPI suggests that the relationship is not linear.

Results 8.1

LS // Dependent Variable is ARIO
SMPL range: 1992.04 - 1995.05
Number of observations: 38
Convergence achieved after 5 iterations
ARMA(1,1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.3680927	0.1512252	9.0467228	0.000
CPI	-0.0179766	0.0070844	-2.5374935	0.016
CPI(-1)	-0.0086881	0.0069117	-1.2570121	0.218

R-squared	0.814487	Mean of dependent var	0.964842
Adjusted R-squared	0.792001	S.D. of dependent var	0.357499
S.E. of regression	0.163044	Sum of squared resid	0.877253
Durbin-Watson stat	1.977362	F-statistic	36.22133
Log likelihood	17.68272		

However, we suggest different interpretation of this relationship. Suppose that enterprises indeed are reluctant to use "new subsidies" coming from increasing money supply for the payments. Nonetheless, enterprises are likely to channel at least some small portion of "new subsidies" into the payments for whatever reason. For example, they might want to settle some of the most important payments to the permanent suppliers etc. Again the expectations play the crucial role in the process. If the enterprise expects others to do the same, i.e. to settle some of the payments with "new" money, it will certainly do it itself. Furthermore, it takes some time for the enterprises to realize that the monetary policy is looser at the moment, and some time to form the expectations and come to the decision. As a consequence, we will observe the found correlation between arrears in real terms and the rate of inflation.[18] To support our point of view and to prove that arrears are connected with the demand for liquidity and function as substitutes for the credit, we look at the behavior of the ratio of overdue arrears to total credit to enterprises by commercial banks in relation to the nominal interest rate. A word of caution should be said regarding the data for the nominal interest rate. In calculating

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[18]By arrears in real terms we mean here the ratio of overdue payables to the industrial output.

the interest rate we used the CB of Russia yearly refinance rate. Since the refinance rate used to be stable for long periods of time some of dynamics on the credit markets is foregone.[19] Nevertheless, the results are instructive and certainly interesting to look at.

Results 9.1

```
LS // Dependent Variable is AR_CR
SMPL range:  1992.08 - 1994.06
Number of observations: 23
Convergence achieved after 3 iterations
ARMA(1,1)
```

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0322041	0.1807058	-0.1782130	0.860
NINT	0.0261561	0.0120392	2.1725835	0.043

R-squared	0.893485	Mean of dependent var	0.304332
Adjusted R-squared	0.876667	S.D. of dependent var	0.154436
S.E. of regression	0.054236	Sum of squared resid	0.055890
Durbin-Watson stat	1.932990	F-statistic	53.12631
Log likelihood	36.59292	Q-statistic [1]	3.764

[1] Q-statistic is a Box-Pierce statistic.

Results 9.2

```
LS // Dependent Variable is AR_CR
SMPL range:  1992.08 - 1994.06
Number of observations: 23
Convergence achieved after 5 iterations
AR(1) MA(2)
```

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0162331	0.1836394	-0.0883967	0.930
NINT	0.0254239	0.0121985	2.0841883	0.051

R-squared	0.896350	Mean of dependent var	0.304332
Adjusted R-squared	0.879984	S.D. of dependent var	0.154436
S.E. of regression	0.053502	Sum of squared resid	0.054387
Durbin-Watson stat	1.355842	F-statistic	54.76955
Log likelihood	36.90642	Q-statistic	5.466

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[19]Since a plenty of different interest rates exist on credit markets, for now we decided to stick to the "official" nominal interest rate. However, the interbank interest rate is thought to be a more flexible indicator, which, in turn, has the limitations and drawbacks of its own.

Regressions' results show the expected positive correlation between the above mentioned variables. The higher the nominal interest rate, the more expensive the financing of the purchases through the bank credit, holding other factors constant, and, consequently, the higher the ratio of overdue arrears to the bank credit.

Enterprises realize the tightening of monetary policy mainly through observing higher nominal interest rates charged by the banks, or through credit rationing. However, tight monetary policy is not the only reason why the interest rates might go up. So, the above arguments are not just a rephrasing of Alfandari and Schaffer's theory of exogenous nature of arrears-inflation relationship.

More insights can be obtained looking at the relationship between arrears in real terms and the real interest rate. It should be mentioned, however, that one could in advance expect to find the relationship opposite in sign to that with the CPI.[20]

We start with the following graph.

Figure 10
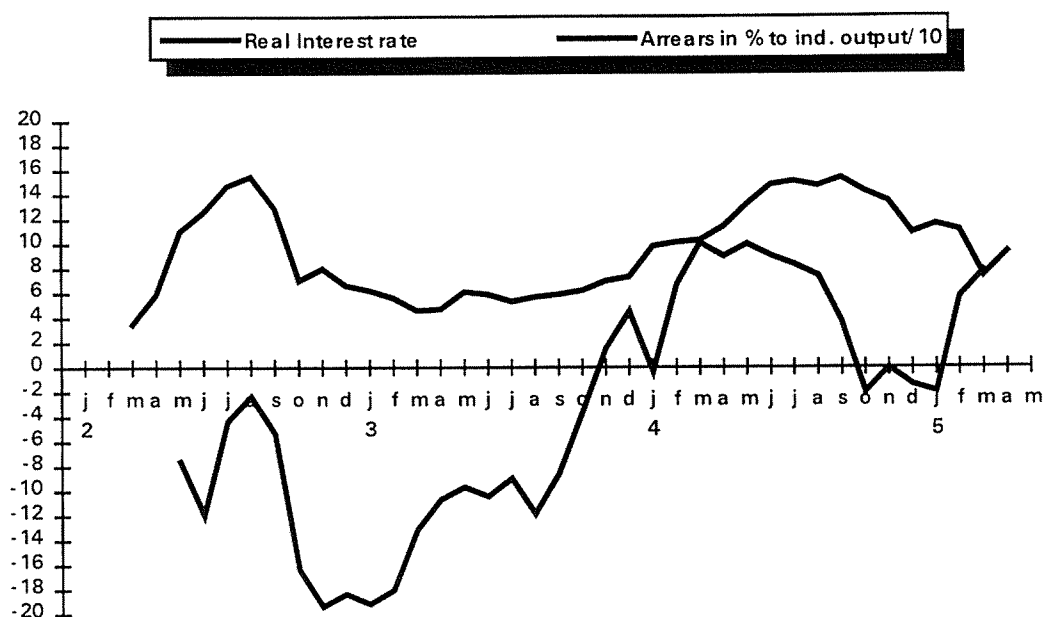
Source: *Tendencii Economicheskogo Razvitiya Rossii, 26 Marta 1996 g., Kratkiy obzor and Goskomstat and author's calculations.*

For the above graph the scale for the arrears in percentage to monthly industrial output is as follows: one unit of the scale for the real interest rate corresponds to 8% of the scale for the arrears in percentage to industrial output.

[20]Not surprisingly, the findings presented below are consistent with both discussed stories, so the nominal interest rate had to be considered.

The real interest rate was calculated on the basis of the CB yearly refinance rate (divided by 12) deflated by the percentage change in the CPI. In case if the refinance rate changed during the month, the interest rate for the month was calculated as the weighted average of the rates in force, the weights being the number of days the corresponding refinance rate was valid. For some months presented calculations differ from the calculations of the real interest rate reported to be done on the same basis.[21] The reason for such discrepancies is that the data of the same nature on Russian economy often differ across different sources.[22] Furthermore, the real interest rate computed on the basis of interbank nominal interest rates or treasury bond interest rates shows sometimes substantially different dynamics. The problem of the right choice is beyond the scope of this paper.

A brief look at the previous graph shows that the real interest rate and arrears in percentage to monthly industrial output varied more or less simultaneously for the period March 1992 to July 1993, and thereafter arrears seem to respond to the changes in the real interest rate with a lag and, in general, the correlation seems weak. Even for the first period when the real interest rate and arrears in percentage to industrial output seemed to vary in a synchronized way, there is a period December 1992 to April 1993 when the real interest rate was rising while arrears were diminishing. One might argue that during this period intensive usage of prepayments had a strong effect on the level of the arrears despite the bank credit being more expensive.

Results 10.1

LS // Dependent Variable is ARIO
SMPL range: 1992.07 - 1995.03
Number of observations: 33
Convergence achieved after 8 iterations
AR(2) MA(1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.9673116	0.0643355	15.035416	0.000
RINT	0.0175026	0.0046971	3.7262515	0.001

R-squared	0.838133	Mean of dependent var	0.966158
Adjusted R-squared	0.821388	S.D. of dependent var	0.374072
S.E. of regression	0.158092	Sum of squared resid	0.724801
Durbin-Watson stat	1.713706	F-statistic	50.05312
Log likelihood	16.17805		

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[21] I.e. some agencies publish reports with data different from presented here whereas calculations are said to be done on the basis of the CB refinance rate as well.

[22] See Introduction.

Better results can be achieved taking four month lagged real interest rate as the second explanatory variable. ARMA correction is supposed to take care of autocorrelation.

Results 11.1

> LS // Dependent Variable is ARIO
> SMPL range: 1992.10 - 1995.03
> Number of observations: 30
> Convergence achieved after 5 iterations
> ARMA(1,1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.0465418	0.0269517	38.830252	0.000
RINT	0.0082416	0.0031411	2.6237636	0.015
RINT(-4)	0.0268989	0.0032233	8.3451419	0.000

R-squared	0.887214	Mean of dependent var	0.919067
Adjusted R-squared	0.869168	S.D. of dependent var	0.357699
S.E. of regression	0.129382	Sum of squared resid	0.418492
Durbin-Watson stat	1.728766	F-statistic	49.16468
Log likelihood	21.51626		

Another possibility to improve the results is to introduce dummies into the equation. In the regressions to follow D1 and D2 stand for dummies equal to 1(0) for the period March 1992 to July 1993 and 0(1) for the other period correspondingly.

Results 12.1

> LS // Dependent Variable is ARIO
> SMPL range: 1992.11 - 1995.03
> Number of observations: 29
> Failure to improve SSR achieved after 6 iterations
> AR(2) MA(1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1.0037318	0.0585551	17.141677	0.000
RINT*D1	0.0288954	0.0064740	4.4633084	0.000
RINT(-4)*D2	0.0237475	0.0075274	3.1548110	0.004

R-squared	0.877872	Mean of dependent var	0.926621
Adjusted R-squared	0.857517	S.D. of dependent var	0.361586
S.E. of regression	0.136488	Sum of squared resid	0.447093
Durbin-Watson stat	1.719755	F-statistic	43.12877
Log likelihood	19.34891		

The preceding findings suggest that when the real interest rate becomes positive enterprises take more time for their decisions since they might start considering an opportunity to deposit money to the bank. Moreover, the lag of adjustment tends to grow as well when the real interest rate attains positive values. Finally, we present a regression with a lagged dependent variable allowing for more dynamics.

**Results 13.1**

LS // Dependent Variable is ARIO
SMPL range: 1992.09 - 1995.03
Number of observations: 31

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.4534646	0.1269271	3.5726379	0.001
ARIO(-1)	0.5753916	0.1172007	4.9094567	0.000
RINT*D1	0.0155462	0.0042647	3.6453313	0.001
RINT(-4)*D2	0.0132954	0.0063054	2.1085789	0.044

R-squared	0.868045	Mean of dependent var	0.931045	
Adjusted R-squared	0.853384	S.D. of dependent var	0.357954	
S.E. of regression	0.137062	Sum of squared resid	0.507225	
Durbin-Watson stat	1.606832	F-statistic	59.20531	
Log likelihood	19.76111			

A rather strong correlation can be found between arrears in real terms and arrears in percentage to industrial output. The following graph demonstrates this point. Arrears in real terms are overdue payables deflated by Industrial Price Index (equal to 100 for December 1990). Arrears in percentage to industrial output are overdue payables by the end of the month in percentage to monthly industrial output.

Figure 11
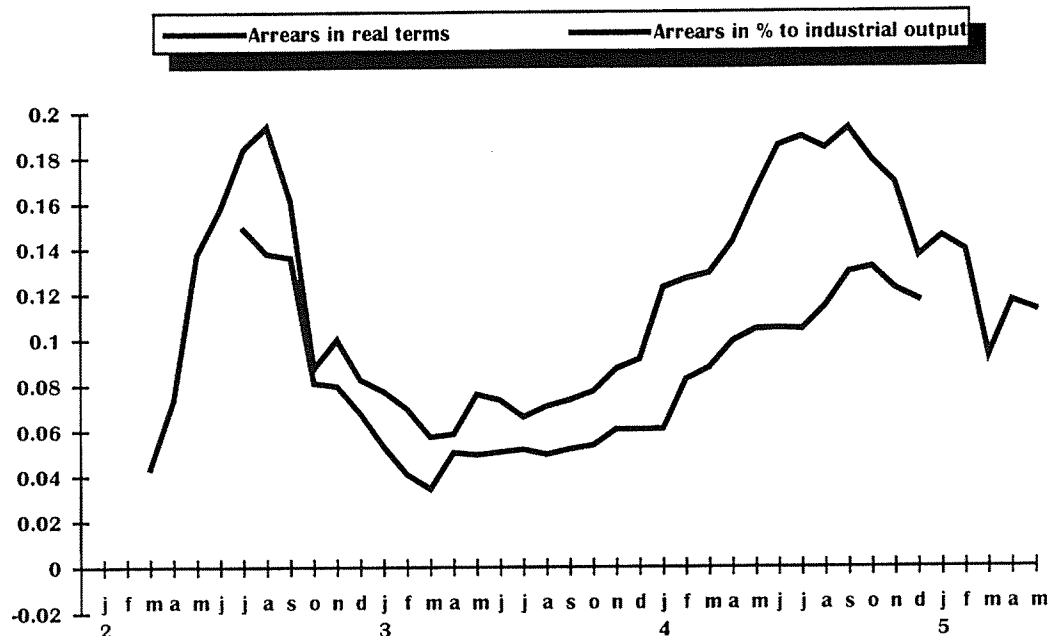
Source: *Tendencii Economicheskogo Razvitiya Rossii, 26 Marta 1996 g., Kratkiy obzor and Russian Economic Trends and author's calculations.*

The scale for the graph above is as follows: 0.01 of the scale for the arrears in real terms corresponds to 8% of the scale for the arrears in percentage to industrial output.

6   Concluding Remarks

Throughout the paper we have been trying to demonstrate that overlooking inter-enterprise arrears is a serious mistake for a policy-maker to make. We hope that the case is rather compelling, despite the fact that some of the estimation results are preliminary and the hypotheses have not been fully tested yet. Therefore, further research possibilities are open regarding both empirical estimation and theoretical framework.

However, in transition economies the situation can change swift and no assurance is warranted that the respond of the economy to different policies stays the same during the years of reforms. Hence, if on the one hand the credibility building commitment of a policymaker to complete the reforms is absolutely required, on the other hand the commitment to any particular policy without frequent adjustment and checking with reality is probably the worst error to make.

A   Appendix

This appendix uses data for industrial price indices (IPI) for Russia as reported by Russian Economic Trends, Vol. 3(4), 1994.

Let us keep all the assumptions outlined in the body of the paper, namely, the enterprise has to purchase the same amount of inputs each half a year, the due date is seven months from the date of the purchase and the enterprise never pays for its inputs and does not index its liabilities ("old stock"), and, finally, the arrears are measured only every eighth month.

The time period to be considered is February 1992 to August 1993. Table A1 shows IPI used in calculations.

Table A1

Inputs Purchase Date	Industrial Price Index	% change (IPI)
February 1992	2918	
August 1992	7261	148.8
February 1993	25804	255.4
August 1993	82025	217.9

With the above data we calculated the ratios of overdue payables to total payables of the enterprise. The results are presented in Table A2.

Table A2

Measurement Date	Ratio of Overdue to Total Payables (%)
October 1992	28.67
April 1993	28.29
October 1993	30.49

As it can be seen from the results the ratio even dropped from October 1992 to April 1993 and slightly rose for the second period, so the stock of arrears measured as the percentage overdue stayed roughly stable over time, but no payments occurred.

B   Appendix

In this appendix we present the estimation results for the arrears measured as the ratio of overdue payables to the sum of overdue payables and M2. Such a measure is rather unconventional, nevertheless, we decided to present the results in appendix.

Results 14.1

```
LS // Dependent Variable is RATIO
SMPL range: 1992.08 - 1995.03
Number of observations: 32
Convergence achieved after 5 iterations
AR(1) MA(2)
```

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.2438274	0.0489925	4.9768263	0.000
RINT	0.0027252	0.0011538	2.3620503	0.025

R-squared	0.941876	Mean of dependent var	0.229376
Adjusted R-squared	0.935649	S.D. of dependent var	0.095674
S.E. of regression	0.024270	Sum of squared resid	0.016493
Durbin-Watson stat	1.401858	F-statistic	151.2439
Log likelihood	75.72274		

Results 14.2

```
LS // Dependent Variable is RATIO
SMPL range: 1992.08 - 1995.03
Number of observations: 32
Convergence achieved after 7 iterations
AR(1) MA(2)
```

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.2577309	0.0674283	3.8222990	0.001
RINT	0.0031937	0.0011152	2.8638630	0.008
RINT(-1)	-0.0024914	0.0011449	-2.1760462	0.038

R-squared	0.950834	Mean of dependent var	0.229376
Adjusted R-squared	0.943551	S.D. of dependent var	0.095674
S.E. of regression	0.022731	Sum of squared resid	0.013951
Durbin-Watson stat	1.487787	F-statistic	130.5413
Log likelihood	78.40081		

Results 14.3

LS // Dependent Variable is RATIO
SMPL range: 1992.08 - 1995.05
Number of observations: 34
Convergence achieved after 5 iterations
AR(1) MA(2)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.2841772	0.0639509	4.4436755	0.000
CPI	-0.0024299	0.0011595	-2.0956005	0.045

R-squared	0.943034	Mean of dependent var	0.234403
Adjusted R-squared	0.937338	S.D. of dependent var	0.094959
S.E. of regression	0.023771	Sum of squared resid	0.016951
Durbin-Watson stat	1.425097	F-statistic	165.5436
Log likelihood	81.02026		

Results 14.4

LS // Dependent Variable is RATIO
SMPL range: 1992.08 - 1995.05
Number of observations: 34
Convergence achieved after 5 iterations
AR(1) MA(2)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.2714478	0.0708663	3.8304231	0.001
CPI	-0.0030660	0.0011336	-2.7045926	0.011
CPI(-1)	0.0023071	0.0011138	2.0714652	0.047

R-squared	0.949941	Mean of dependent var	0.234403
Adjusted R-squared	0.943036	S.D. of dependent var	0.094959
S.E. of regression	0.022664	Sum of squared resid	0.014896
Durbin-Watson stat	1.500139	F-statistic	137.5790
Log likelihood	83.21751		

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